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TECHNICAL EDUCATION 1850-1914:  
SPECULATIONS ON HUMAN CAPITAL FORMATION

R. FLOUD

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Centre for Economic Policy Research  
6 Duke of York Street  
London SW1Y 6LA

Tel: 01 930 2963

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ABSTRACT

In the late 19th century, the industrial countries of Europe and North America developed very different systems of technical education for the workforce. Some emphasised full-time instruction, largely state-financed, while others relied on part-time instruction, financed by employees and seen as a supplement to work-place training. The paper suggests that the insights of human capital theory are useful in describing and understanding these systems and that the differences between them should be seen as rational responses to differing economic and social structures rather than to irrationality on the part of governments or entrepreneurs. Part-time training in Britain, in particular, is seen as suited to skills and educational level of British workers and to a fluid system of promotion within British industry.

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R. Floud  
Birkbeck College  
Malet Street  
London  
WC1E 7HX  
01 580 6622

## SUMMARY

Economists and economic historians have long known that the formation of human capital, in the shape of an educated and skilled workforce, is an important contribution to economic growth. In the late nineteenth century, when formal schooling typically ended at much younger ages than today, the part it played in education and training was relatively much less and that of training in the workplace relatively much greater than today. Economic historians should therefore pay particular attention to the systems of training which were developed in the industrial countries and should seek to explain why such different systems developed.

The paper argues that collective irrationality, which has been advanced as an explanation of the British failure to adopt German methods of industrial training, is inadequate to explain why Germany, the United States, France and Britain should each have developed and maintained entirely different structures of industrial training. Instead, it suggests that human capital theory and in particular the distinction between 'general' and 'specific' training, is illuminating in analysing these structures. At one end of a spectrum, the German system gave to the state the responsibility for the general training of a worker for a particular occupation, while the system in the United States relied entirely on specific training of the worker by an employer. Between these two extremes, the British and French systems embodied a division of responsibility between the employer, providing specific training in the workplace, and the state and the employee who provided general training often through part-time, evening classes.

The systems of training which developed were therefore different, probably because the tasks which they needed to perform were different. In both Germany and the United States, the need was

to socialise and train quickly a migrant population largely unused to manufacturing industry, while in France and Britain the longer history of manufacture had already socialised the workers and meant that they could be given greater responsibility for their own training. In any event, it is unlikely that the transplantation of one system into a different economic and social milieu, for example the Prussian system into Britain, would have been successful.

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## TECHNICAL EDUCATION 1850-1914: SPECULATIONS ON HUMAN CAPITAL FORMATION

Roderick Floud

History Department, Birkbeck College, London

During the second half of the nineteenth century, the developed and developing nations of Europe and North America typically devoted between 10 per cent and 20 per cent of their gross domestic products to gross domestic fixed capital formation. Armed with the factories, homes and equipment which were the physical embodiment of those savings, the peoples of those nations achieved growth rates of output per person employed of between 1 and 2 per cent per year, and, since capital-output ratios changed little, similar rates of growth of total factor productivity. They took the benefits of these growth rates in the form of higher real incomes, increased consumption and greater leisure and in return accepted the challenge of learning new skills to operate the new factories and machines. That challenge was substantial, for it involved the deskilling of sections of the labour force as well as imposing new skill requirements of machine operation on old handicraft trades and on occupations which had previously been entirely unskilled or unmechanised (More 1981). Yet, as the growth rates indicate, the challenge of the new machine age was more than met throughout Europe and in the United States. It was met by what has come to be known as the formation of human capital, investment by individuals in their own education and training and by states, firms and other institutions in the provision of educational and training facilities.

Human capital formation in the late nineteenth century has not, of course escaped the attention of historians and economists and there is a distinguished tradition, both in Europe and in the United States of investigation into the growth and development of educational systems. Primary or elementary education, which by 1900 was provided universally in developed countries, has been much studied and at the other end of the educational spectrum there have been numerous accounts of the universities and of the nature of their links through science and technology to the changing economy.

The importance of formal schooling and of scientific endeavour cannot be denied; the increase in levels of literacy made an enormous contribution to economic growth as well as to the comfort and happiness of the population as a whole. Equally important was the development of new scientific disciplines and the widespread diffusion of scientific knowledge through high schools and universities. Yet a very high proportion of human capital formation took place outside these two sectors of education, and was the result of investment by worker, manager and sometimes the state in training on-the-job or in relation to the job. In 1962

Jacob Mincer suggested that:

'Investment in on-the-job training is a very large component of investment in education in the United States economy. Measured in terms of costs, it is as important as formal education for the male labour force, and amounts to more than a half of total (male and female) expenditures on school education.' (Mincer 1962:73)

If this is true for the United States today, it is even more likely to have been true for a nineteenth century economy, in which the time spent by a child on formal schooling was several years less than is typical today and in which far longer on-the-job training was required for many occupations. As Mincer puts it, formal schooling and on-the-job training are substitutes '...whose degree of substitutability will vary among jobs and over time with changes in technology.' (Mincer 1962:50). The ending of formal schooling in nineteenth century societies at ages much younger than are normal today implied that the labour force had to learn its skills either while at work or in forms or education which complemented working life, in part-time study, apprenticeship, factory school or mechanics' institute.

The exact size of the investment in human capital which took place through these mechanisms is probably impossible to estimate; it is extremely difficult to make any estimates for the modern world and the complexities of training in the late nineteenth century are even greater than today. For almost as impressive as the amount of human capital investment which was required in that period is the multiplicity of ways in which children entering the labour force were transformed into workers possessing at least some degree of skill or work experience. Some differences between countries, and between different sectors of the economy within countries are to be expected, since each country took its own path towards economic development and produced institutions which suited its own factor endowments and its own problems of labour force adaptation, but the differences which developed were very large indeed. In particular, different countries adopted very different systems of technical education for the workforce.

In 1902, the U.S. Commissioner of Labor, introducing a report on Trade and Technical Education which surveyed practice in this field in Europe and the United States, wrote that:

'The fact must not be overlooked that the mode of educational organisation in European countries differs radically from that of the United States. In several continental countries, for example, a complete system of industrial education, from the kindergarten and manual training up through trade and technical schools to the higher engineering and scientific institutions, is established by law and subsidized and administered by the State. With us, on the contrary, there is not only no such complete system, but there are, with the exception of a few recently established schools, no schools of an industrial character receiving governmental aid.' (U.S. Commissioner of Labour 1902:13).

While this may be the most extreme contrast in form of organisation between different systems of technical education, between and even within

countries of Europe and North America there developed a multiplicity of different institutions devoted to technical training; in France, for example:

'At present there is an elaborate system of trade and technical schools organized and controlled by the Government; of schools maintained by the departmental and municipal authorities; and of schools operated under the auspices of private individuals and private bodies, such as trade organisations, employers' associations, stock companies, religious organisations, etc. As a general rule this development of institutions through so many independent initiatives has caused very little duplication.' (U.S. Commissioner of Labour 1902:704)

Even in Germany, which has often been taken to be the archetype of an organised educational system, the U.S. Commissioner and his staff found it necessary to classify trade and technical schools under nine different headings and to point out that major differences existed between the different German states even within those headings. (ibid 1902:877). It was because of this difficulty of classification, which appeared in each country that was surveyed, that the Report of 1902 took 1305 pages to present its findings, a length typical of the American and British reports on the state of technical education which appeared frequently during the late nineteenth century. Moreover, this variety was superimposed upon equal variety within formal schooling either at the primary or elementary stage or at later stages when formal training at high school or university complemented, substituted for or proceeded in isolation from the technical training of those in paid employment.

This immense variety in forms of human capital formation within the general field of technical training raises many interesting questions for the economic historian. First, why should countries which were so close to each other and which in many cases shared common cultures, common religions, even common languages, have developed systems of training which differed so greatly one from another? Second, is it possible to identify particular features of the different systems which were particularly conducive to, or which particularly hampered, economic growth? Third, to what degree did the experience of economic growth in the late nineteenth century lead to a consensus as to the best systems and thus to a convergence of systems in the late nineteenth and early twentieth centuries, as different countries learned from mistakes and successes of others? Fourth, what was the impact of the different systems on the opportunity for and the achievement of social mobility; in other words, irrespective of their virtues and vices as training systems, did they possess characteristics of wider relevance to the shaping of the societies of Europe and the United States? Fifth, how far does the behaviour of individuals and of the institutions of technical training conform to the predictions of human capital theory as it has been developed in the last fifteen years?

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The first task in answering such questions is to describe, in a schematic form, the different types of technical training that were developed. Just as much of the controversy about the development of formal schooling in the nineteenth century has been concerned with the growing

role of national and local governments in the provision of schooling, so it has been customary to judge systems of technical education in terms of the amount of state involvement and encouragement. David Landes has, for example, attempted to characterise the difference between British and German technical education as follows:

'...where Britain left technical education, like primary education, to private enterprise, which led in the event to a most uneven and inadequate provision of facilities, the German states generously financed a whole gamut of institutions, erecting buildings, installing laboratories, and above all maintaining competent and, at the highest level, distinguished faculties.' (Landes 1969:344).

While Landes also contrasts the 'late and stunted growth of technical and scientific education in Britain' with the 'vigorous, precociously developed German system' (Landes loc.cit.) this important temporal distinction is dependent, in his view, on the more fundamental distinction between a state financed system and one left to private initiative, and it is upon this distinction that his condemnation of the British system is based. Yet there are other distinctions between the British and the German systems, and still more between the systems of other countries, which deserve notice, differences in the degree of reliance upon full-time and part-time training, differences in the systems of apprenticeship, differences in the career structures of management and the professions, differences in the occupational structures of the various countries. To concentrate on the one dimension of the amount of governmental finance and control is to ignore these differences; state involvement is one, but by no means the only, important differentiating factor between the systems of technical instruction which were evolved.

As an alternative, it is possible and illuminating to utilise as an organising principle the insights of human capital theory and in particular the distinction between 'general' and 'specific' training of the labour force, and the consequent allocation of the costs of training between employee, employer and outside agencies. This has the advantage of concentrating attention on the nature of the training which was provided and on its relationship to the workplace, rather than concentrating exclusively on the role of the state. The distinction between 'general' and 'specific' training was first formulated by Gary Becker in the course of an analysis of how two rational actors, the employee and the employer, will divide the costs of on-the-job training. To Becker, 'general' training is training which increases the future marginal productivity of the worker outside (as well as inside) the firm in which the training takes place. Since the worker will capture the benefit of that training, he can be expected to be prepared to pay for it, by receiving lower wages than he would otherwise have received. By contrast, while

'Completely general training increases the marginal productivity of trainees by exactly the same amount in the firms providing the training as in other firms ..... some kinds of training increase productivity by different amounts in the firm providing the training and in other firms. Training that increases productivity more in firms providing it will be called specific training. Completely specific training can be defined as training that has no effect on the productivity of trainees that would be useful in other firms. Much on-



the-job training is neither completely specific nor completely general....' (Becker 1980:26).

This approach to the provision of training emphasises a division of responsibility between the employer who seeks to increase the marginal productivity of the worker within the firm and the employee who seeks, by the acquisition of general training, to increase his productivity both within the firm in which he is trained and outside that firm, in future jobs. Just as the responsibility is shared, so are the costs; the employee pays for his general training by foregone earnings, the employer by direct training costs and the reduction in productive output during the training period. The rewards are also shared; the employer's incentive lies in the increase in productivity which he can capture while the trainee remains with the firm and in the productive output of the trainee during the training period; the incentive for the employee lies in the wage received during training and in the opportunity to capture the value of his improved marginal product after he is trained. He may achieve this either by promotion within the firm or by a move to a position of higher responsibility and higher wage with another firm.

Becker's distinction related entirely to on-the-job training and to the respective roles of employer and employee. As Blaug has pointed out, the distinction and the human capital theory which has developed from it is highly individualistic; it leaves no role for outside institutions, in particular the state, who have in practice provided a great deal of the technical training of the work-force, both general and specific. (Blaug 1976:830-832). Nor does it consider the extent to which employees may seek to obtain general training by such means as part-time education or correspondence courses while they are at work. Once these institutions and other forms of training are introduced into the analysis, it is much harder to identify the costs of and returns to investment in different types of training by different actors, for example if tax revenues are used to provide training. Nevertheless, Becker's distinction between skills that are transportable and skills that are specific to a particular job in a particular firm can, if broadened to include instruction provided outside the workplace, be a useful basis for the classification of different systems of training, and an aid to understanding why they were so different. Since, in addition, it is implicit in human capital theory that the most efficient training system will be that which allows each actor to capture the value of his investment, the theory can be used to make a judgement as to the economic rationality of the different systems of training which were developed.

An initial scheme of classification, then, would place training schemes which provided entirely specific skills at one end of a spectrum of possibilities, with schemes which provided entirely general training at the other end. Towards the specific end would be placed, around the end of the nineteenth century, the United States. In that country, as the quotation above indicates, almost all technical education for the industrial worker took place within the individual firm. A number of manual training schools existed, it is true, in which elementary training was provided in the operation of machinery and tools, sometimes at private and sometimes at public expense; this training was of a general character, but it existed only in the large cities and was a preliminary to, rather than a replacement for or complement to, technical training on the job. As Becker's analysis makes clear, of course, on-the-job training is likely to include

general training, but the virtual absence of apprenticeship in American manufacturing and the concentration on the use of specialised machinery - the 'American system' - suggests that the emphasis of training was towards specific skills useful in a particular job. There was of course a different source of general training, provided to some extent at the expense of the state, in the land-grant colleges, but these colleges were concerned with educating future managers and owners rather than with training industrial workers.

This American neglect of industrial training contrasts strikingly with the European systems, of which Germany's was the archetype, which lie towards the opposite end of the scheme of classification. In such systems, the state took almost full responsibility for the production, at the end of a period of compulsory education (first full- and then part-time) of a fully trained worker able to practise his skills in any firm within the industry for which he or she had been trained. This training took place within full-time primary or elementary schools up to the age of 13 or 14 and at part-time continuation schools from the age of 13/14 to 18, instruction at the latter being complementary to and supplementing the training which was also received on the job. There was, of course, an element of specific training in this system, which it was presumed that the firm would provide during the working day, but the instruction was primarily intended to fit the future worker for any job appropriate to the skills which had been learned. For if the education was general in this sense, it was also highly specialised, as the U.S. Commissioner of Labor described:

'This specialisation of industrial or technical schools in Germany is the most characteristic feature of the system that has there been developed. In Germany it is always presumed that the young man has determined pretty definitely the career into which he expects to enter and will shape his education accordingly. By this is meant that a selection is made not merely of the industry or trade but also of the grade of employment, whether as a skilled artisan, a foreman or superintendent, or as a general manager or employer.... There are special schools for the training of employers and managers, for the training of foremen or bosses, and for the trade education of artisans.' (U.S. Commissioner of Labor 1902:671).

The British consul in Stuttgart in 1903 put it more vividly if less kindly; the technical instruction in secondary and lower technical schools was, he wrote, intended 'to provide the subaltern officers and rank and file of the industrial army'. (P.F. 1904:219).

The other European countries occupied positions on the spectrum between Germany and the United States. In general, they developed systems in which training within the workplace, often through the medium of apprenticeship as well as through specific training, was complemented by trade and technical schools, sometimes full-time but more usually part-time. These schools were organised by a multiplicity of institutions, of which the state was normally only one, so that direct state expenditure on technical training was normally significantly less per capita than in Germany, although significantly more than in the United States. Many of these systems emphasised the need for a workman to be trained in two ways, firstly in the principles and theory of his trade or craft and secondly in its practice or technique; in Britain, for example, this

distinction was expressed as a principle. As the Technical Instruction Act of 1889 put it, in a restatement of earlier legislation and practice, technical instruction meant:

'.... instruction in the principles of science and art applicable to industries and in the application of special branches of science and art to specific industries. It shall not include the practice of any trade or industry or employment.'

The system which was developed in Britain assumed that the employee would receive training from the employer in the detailed practice of the trade, and would become manually proficient through such training. It was not assumed that the training would be entirely specific; indeed, the reverse assumption was normally made, and lay behind the persistence of apprenticeship as a form of recruitment and training in British industry long after its disappearance in other countries.

It was recognised, both in the British system and in the French, that, although workshop training and apprenticeship might make the workman manually proficient, it could not give him the theoretical background which would either make him a better worker or allow him to progress to positions of greater responsibility within the industry. General training of this type, which was explicitly aimed at increasing the marginal productivity of the worker both outside and inside his present employment, came to be provided both by state and by private initiative and, almost exclusively, by part-time evening instruction. Part-time instruction had been a prominent feature of English adult education since the foundation of the Mechanics' Institutes early in the nineteenth century, but it expanded greatly after the 1860s and became much less concerned with basic literacy and more with scientific and technical instruction. As early as 1884, the Royal Commission on Technical Instruction could state, perhaps with some exaggerated self-satisfaction, that

'As regards evening science teaching, there seems to be nowhere in Europe any organisation for systematic evening instruction comparable, as regards the number of subjects taught and the facilities afforded for the establishment of classes and for the examination of the students' work, with that undertaken by the Science and Art Department in this country and recently supplemented, in the application of science to special industries, by the City and Guilds of London Institute.' (P.P. 1884, xxiv:48)

With even greater satisfaction, the Royal Commission also stated that Germany had no system for evening scientific or technical instruction comparable to that in France, Belgium or Britain,

'.... but the want of this instruction is much felt by the Germans themselves, who contemplate the organisation of a system of technical instruction.' (P.P. 1884, xxiv:42)

This statement may seem extraordinary, in the light of the comprehensive German system of technical instruction, but it stems from a feature of the German system which requires further emphasis. That system essentially assumed that the worker had been fully trained in the general practice of his trade by the time he left the continuation school at the age of 18; further training might of course be provided by the

employer, but that would be specific to the firm and to the worker's position within the firm. There was no need to provide any opportunity for further general training because there was no question of the worker seeking or gaining the extra responsibility for which further training would be needed; his place as labourer, artisan or foreman was set at age 14, or even before, and would not be altered. By contrast, the English and French systems assumed that the intelligent or able worker would aspire to higher or better-paid positions, either within the firm which had provided his early training or in another firm, and that it was sensible to provide, through further technical training of a general character, an opportunity for him to continue learning. There was, therefore, no upper age limit to attendance at evening classes in Britain and no sense that it was inappropriate for a worker to seek to 'better himself'.

In summary, the systems of technical training which were developed in the late nineteenth century can plausibly be arrayed along a spectrum ranging from a concentration on specific training (United States) through systems which tried to arrive at a careful balance between specific and general training (England, France, Belgium) to systems which emphasised general training (Germany). But why should such a spectrum have emerged? Two explanations can be quickly rejected. It is, first, inconceivable that the differences between countries stemmed from lack of information. Technical education was a subject of considerable interest to legislators, scholars and businessmen throughout the developed world, as is attested by the voluminous reports produced which compared national systems and by the newspaper articles, parliamentary debates and other forms of public discussion which those enquiries provoked. Moreover, none of the systems was static throughout the period; the fluidity which makes them so difficult to describe also attests to the fact that they could have been changed if those in charge of them had desired to follow some foreign model. Second, while it may be possible to argue of one system, seen in isolation, that it stemmed from collective irrationality, such as that of the British businessmen who are collectively seen as hostile to technical training (Wiener 1981), such an explanation will not do when the spectrum is seen as a whole. There must, in other words, be reasons why one kind of system arose in one country, another in another.

The human capital approach which has been described above suggests that the explanation should be found in the costs and benefits of each system within the context of the economic development of each country and its social and economic milieu. Analysis of the full range of technical education in the developed countries of the United States and western Europe is a task far beyond the scope of this paper, but it is instructive to take, as a first step, one aspect of the provision of technical training. The provision of part-time educational facilities for the worker varied greatly; in some countries it was common, in other rare, in some it was primarily intended to supplement general education, in others to provide advanced technical and scientific training, in some it was available to all age groups, in others only to immediate school-leavers. Why should this diversity have occurred? Human capital theory would suggest that if very little benefit is likely to accrue to a worker from a period of part-time training, then it is unlikely that there will be much demand for such training and unlikely therefore that educational institutions will arise to supply it. How does such a suggestion help us to understand the provision of part-time technical instruction?

Two countries, of those which we have so far considered, made very little provision for part-time technical instruction of the worker, while in two others a very extensive system was developed. In the first category were Germany and the United States, in the second France and Britain. In the United States, for example, part-time education was extremely important as a means of teaching immigrants to speak English, but was little used in the nineteenth or early twentieth centuries for technical training. As a Report on Industrial Education in the United States put it in 1881-2:

'Evening schools are emphatically for the working people. The wealthy have either received an education in their early years or have gained the training they desire by actual contact with men and things while accumulating and caring for their property. Their children are not driven to the necessity of devoting their evening hours to preparation for coming life. It is only the hope of a future prosperity, to be gained in no other way, that induces anyone to call the currents of life away from the refreshment of the weary body to the solution of problems which contribute only indirectly and after long waiting to comfort and happiness. The studies of these schools are not usually directed to the immediate preparation of a workman for his trade. In this sense they have not often been industrial.' (Report on Industrial Education 1881-2:47).

This neglect of part-time technical training did not stem from the adequacy of formal schooling in giving such training since, as has already been stated, there were few industrial schools in the United States at the time and, as one observer commented much later,

'... the systematic training of craftsmen and technicians and of supervisors of industrial production has been largely neglected.' (Wickenden 1929:8)

This lack of opportunity, and presumably lack of demand, for part-time technical training could stem from the belief, which may be implicit in the paragraph quoted above, that there were easier ways of gaining prosperity in the United States in the late nineteenth century than by attendance at evening classes. This would certainly accord with popular images of the land of opportunity, of the absence of craft or trade union restriction and consequently of the fluidity of the job market which made it unnecessary for an aspirant worker to obtain additional qualifications; advancement would be by skill and enterprise shown on the job. On the other hand, it could be argued that the passage bears witness to a lack of opportunity, a situation in which the upper ranks of industry were normally the preserve of the children of the wealthy, as is suggested here, or, perhaps more plausibly, that the very success of the United States in setting up an efficient system of technical and scientific education, through the land-grant colleges, militated against advancement through the ranks from the shop-floor and consequently diminished the expected value of part-time education.

While the reasons for the lack of part-time technical instruction in the United States are difficult to discern, those for the similar lack in

Germany are very clear and have already been discussed. Since the German system assumed that the place of the worker within the industrial hierarchy was fixed, there was no purpose in providing him or her with the opportunity to obtain further general training after the conclusion of the mandatory continuation school years. This does not explain, however, why the German system of technical training should have been based on such an assumption. An exaggerated respect for formal educational qualifications and thus for an immutable hierarchy determined by achievement at an early age has often been thought of as characteristic of German attitudes to education, but it seems more likely that the German educational system, in many ways like that of the United States, was designed to provide rapid training and encourage integration into the manufacturing labour force of workers predominantly from the unskilled agricultural sector. Thus a high premium was placed essentially on the socialisation of the worker, often the child of recent migrants to the industrial areas; a convenient way of achieving this at low cost was to allocate workers to a particular role at an early age. Like the United States, again, this meant that large resources were devoted to early formal schooling, essentially in what has come to be called a 'screening' or 'sorting' mechanism; once that screening had taken place, educational expenditure could then be concentrated on the elite, which the German system, like the land-grant colleges, was extremely successful at producing.

By contrast, the technical training systems of France and Britain placed far greater emphasis on part-time training, often with the explicit intention of encouraging vertical mobility. Dealing as these countries were with a population much more habituated to manufacturing and service industries, the socialisation and screening roles of German and American education were less important to them. By contrast, the relative absence of a reliance on formal educational qualifications, particularly in the British manufacturing industries which were very slow to demand scientifically trained manpower, gave an opportunity to the individual worker on the shop-floor to aspire to improve himself and to better his condition. This possibility was an essential ingredient in the British approach to the provision of part-time technical education, which had to base its appeal on personal motivation and offer itself as a vehicle for those employees who were anxious to improve themselves. That technical schools were a successful means, at least for some students, of obtaining promotion or higher wages is clear from the report of the Royal Commission on Technical Instruction in 1884; one employer told the Commission that:

'It is generally the studiously disposed and most intelligent of workmen and apprentices who avail themselves of the Science and Art classes. From these foremen, leading workmen and sometimes draughtsmen are selected, in which capacities the knowledge and skill they have then acquired is certainly an advantage.' (P.P. 1884, xxxi:645).

Such support of the evening classes in technical subjects was certainly not unanimous, but it is indicative of the purpose which the classes served. This purpose has sometimes been recognised by historians of education, but it has, curiously, often been regarded as a defect of the system. Cotgrove, for example, writes that the system was:

'... shaped by the examination needs of ambitious students rather than by the needs of industry.' (Cotgrove 1958:15)

and that it did not serve artisans well because of:

'its emphasis on the need for the technical instruction of foremen, managers and proprietors, rather than operatives.' (Cotgrove 1958:44).

Such criticisms are misplaced from the point of view of human capital theory; instead, the conclusion which should be drawn is that the system was providing an incentive for workmen to gain general training outside the workplace, that the ambitious among them were responding to this incentive, and that this was a substantial benefit to the industry in which they worked.

The theory of human capital formation implies that there must be an incentive for employees to seek to improve their value in the labour market through general training, and that, once such an incentive exists, employees will seek such training and educational or other institutions will provide it. The history of the development of part-time education in Britain appears to approach very closely to such a model, with the state providing a subsidiary though nevertheless important initiating and validating role. In Germany and the United States, by contrast, the incentive for part-time education was either weak or non-existent, and it is therefore not very surprising that the institutions to provide it were not developed, at least until the twentieth century. Instead, the industrialisation of Germany and the United States rested to a much greater degree, and with much greater state expenditure, upon formal schooling and a screening process which emphasised the education of an elite, albeit an elite which was immensely important in securing the technological advancement of the industries in which its members worked. It is paradoxical, in the light of this, that economic historians have traditionally seen the expensive, elitist and state directed German system as the model which should have been followed, and have rejected as inefficient and harmful the system which appears to have developed within the framework of the free market in late nineteenth century Britain. Either economic historians should follow the human capital theorists and give greater credit and approval to the British system, or human capital theorists should wonder why the system which seems to follow their ideas so closely has often been regarded as one of the main reasons for the long term decline of the British economy.

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