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NEW INSIGHTS FROM COST ACCOUNTING INTO BRITISH ENTREPRENEURIAL PERFORMANCE CIRCA 1914

Abstract: This article takes issue with economic historians who have tried to rehabilitate the reputation of the late Victorian and Edwardian entrepreneur. It argues that the revisionist attempt to ground their case on cost, profit, and productivity calculations flounders because of an insufficient analysis of the factors involved in arriving at cost, profit, and productivity. The economic historian, preoccupied with recent European economic development could, therefore, improve his analysis by incorporating the science of management accounting into his methodology. A companion piece to this article will be published in the fall issue of the journal.

Few if any problems in British economic history have drawn more attention than that of British economic performance during the late Victorian and Edwardian eras. Optimists have argued that the British economy functioned well, pessimists that it faltered badly, and the pessimists have usually had the upper hand in the debate. Recently a group of younger historians, led by Donald N. McCloskey, has decidedly challenged the pessimists' view. "There is . . .," McCloskey wrote, " little left of the dismal picture of British failure painted by historians. The alternative is a picture of an economy not stagnating but growing as rapidly as permitted by the growth of its resources and the effective exploitation of available technology."[1] Revisionists do not claim that the British economy expanded as rapidly as the American or the German; indeed some, unlike McCloskey, might even concede a relative economic stagnation. But they do not concede that the British entrepreneur can be faulted. Economic facts limited his parameter of action but within that parameter he performed well.

This article rejects the optimists' interpretation of British entrepreneurial performance. It is, however, less concerned with conclusions than with how conclusions have been reached, for much of the revisionism stems directly from the application of a "new" methodology, grounded in economic theory and quantification.[2] The contention is, therefore, that inadequacies in the optimists' conclu-

sions arise, to a considerable extent, from shortcomings in historical method. Ideas taken from cost accounting will be used in this two part essay to establish the validity of the contention.

The first part deals with epistemological problems raised by revisionist econometrics. Macroeconomics is the wellspring of the revisionism, but macroeconomics is not the only science that is concerned with economic activity. Carl Menger pointed this out in the 19th century when he described ". . . the separation of the sciences into historical and theoretical. History and the statistics of economy are historical sciences . . .; economics is a theoretical science." But he added that there is

> still a third [science], the nature of which is essentially different from that of the two previously named; we mean the so-called practical sciences or technologies. The sciences of this type do not make us aware of phenomena, either from the historical point of view or from the theoretical; they do not teach us what *is.* Their problem is rather to determine the basic principles by which, according to the diversity of conditions, efforts of a definite kind can be most suitably pursued. They teach us what the conditions *are supposed* to be for definite human aims to be achieved.[3]

The "third science" is important because it has developed over the past hundred years into business administration, a field in which the cost accounting technology that is now called management accounting finds its place. Cost accounting is an entrepreneurial technology par excellence. As a bookkeeping system which deals primarily with the accurate reporting of internal financial information, it is of interest not only to businessmen but to historians trying to evaluate entrepreneurial performance. Unfortunately, historians have not used the sciences of business administration in general and cost accounting in particular to facilitate their analysis of recent European economic development.[4] This is somewhat surprising considering the extent to which business schools have grown in American colleges and universities over the past eighty years. A significant methodological tool is at hand but because historians have ignored it even the new economic history has suffered scientifically, as this brief study of its use of data on costs, profits, and productivity will show.

The second part of the paper (to be published in the fall issue) will demonstrate how the development of cost accounting theory and practice can itself be considered an index of entrepreneurial

prowess in an economy. There is, of course, no necessary correlation between entrepreneurial excellence and a developed cost accounting technology. Sydney Pollard, in *The Genesis of Modern Management,* has stated, for example, that "[T]he practice of using accounts as direct aids to management was not one of the achievements of the British industrial revolution. . ."[5] Yet if throughout most of the 19th century profit margins were large enough, in Britain at least, for businessmen to be rather negligent about cost factors, with the keen industrial competition of the "great depression" (after 1873) cost consciousness heightened and cost accounting flourished.[6] First only prime costs, i.e., direct labor and raw materials costs drew the owners' and hence the bookkeepers' attention; but, as industry grew in organizational complexity and in plant sophistication and size, a third cost classification, burden (or overhead) occupied people's minds. Accounts for indirect labor costs (including the cost of management itself), for installation charges (lights, power, etc.), and for an ever more diversified inventory, which the new market economy required, were created. Capital equipment replacement, whose costs became progressively higher, had to be provided for in depreciation accounts that integrated depreciation allowances into the cost structure of manufactured products. After 1880, then, an elaborate manufacturing cost accounting system arose. After 1900 sales and distribution accounts were added in order to determine marketings' share of total product cost. And finally, after 1910, historical costs gave way to standard costing and budgeting as management strived to create accounting tools suitable for measuring costs, profits, and productivity in an increasingly complex industrial world. The institutionalization, during the Second Industrial Revolution, of entrepreneurial performance in the form of good accounting procedure became, therefore, in itself a factor in the creation of industrial efficiency. Indeed, a leading accounting historian, A. C. Littleton, has remarked, "It is not too much to say that the formulation of cost accounting procedures can be ranked as an achievement second only to the original development of bookkeeping according to double-entry principles. . ." in management technology.[7]

Although economic historians realized long ago that bookkeeping played an important role in modern European economic development, they have not, like some accounting historians, devoted much attention to cost accounting.[8] A survey of major periodicals shows, for example, that neither *The Journal of Economic History* nor *Explorations in Economic History* has ever published an article on

cost accounting; that *The Economic History Review,* aside from a recent article on "Josiah Wedgewood and Cost Accounting in the Industrial Revolution," only printed one other article on bookkeeping (not cost accounting); and that even the *Business History Review* has neglected the subject.[9] Only the article on the Dupont de Nemours Powder Co., 1903-1914, really deals with the contribution of a cost accounting system to a firm's success, and this firm, of course, was American.[10] Since cost accounting became a "necessary" technology in European as well as American industry after 1880, the second section of the paper will show how the institutionalization of this management technology did not speak well for British entrepreneurship.

First, however, a critique of revisionist quantitative work must be done. In "From Damnation to Redemption: Judgments on the late Victorian Entrepreneur," Donald N. McCloskey and Lars G. Sandberg state that they and others (including Roderick Floud, Charles Harley, Peter Lindert, and Keith Trace) have utilized a variety of analytical techniques to refute the hypothesis of British entrepreneurial failure.[11] Nonetheless, the authors continue

> this gives a misleading impression of heterogenity of purpose in the new work. The various measures used are essentially identical. Higher profits can be achieved if more output can be produced with the same input, that is, if productivity can be raised. The measuring rod for entrepreneurial failure, then, can be expressed indifferently as the money amount of profit foregone, as the proportion by which foreign exceeded British productivity, as the distance between foreign and British production functions, or as the difference in cost between foreign and British techniques. All of these give the same result and each can be translated exactly into any one of the other.[12]

Nothing about this statement would be methodologically foreign to a cost accountant. Although profits do depend on the market, undoubtedly they can be increased if "more output can be produced with the same input," e.g., if the prime costs (material and direct labor) and overhead costs can be reduced in the manufacture of a particular product the profits will be greater. Moreover the factors involved in the calculation of inputs and outputs employed in a productivity index are the same as those used in the calculation of production costs and profits. Still, the idea that a productivity figure, a profit statement, or a cost statistic can be used as a "measuring

rod" for entrepreneurial performance is not necessarily true. Productivity, cost, and profit are not factors in themselves but the result of economic activities that combine a multitude of factors. In some cases the factors which are involved in the calculation of cost, profit, or productivity reveal superior, in other cases poor, entrepreneurial performance even though the actual costs, profit, or productivity figures are the same. Entrepreneurial performance can be evaluated, as the science of cost accounting shows, only after the factors involved in the calculation of productivity, cost, or profit have been isolated and assessed.

Thus, since the revisionist historians work with productivity, cost, and profit figures, the validity of their statements about entrepreneurial performance depends on their analysis of the factors that go into the compilation of productivity, cost, or profit statistics. And in this respect their work is deficient. Three examples of insufficient factor analysis, picked at random from a collection of studies, will be used to substantiate this charge. The first is Donald N. McCloskey's study of productivity in the iron and steel industries of Britain and America before World War I.[13] The second is Charles Harley's analysis of the change from sail to steam power in the British merchant marine.[14] And the third is Roderick Floud's work on the machine tool firm Greenwood & Batley, 1856 to 1900.[15] The three studies are quite different in method and content but all suffer from inadequate factor presentation.

McCloskey, in his well-known quest to save the reputation of British entrepreneurs, claims that productivity in the British and the American steel industries was approximately the same before World War I (in fact Britain might have had a slight edge). This proves, he contends, that America had no technological advantage in this industry and, hence, that American entrepreneurial performance was not superior to British in this industry. Since pig iron was the most significant cost item in steel production he sought to prove his case by concentrating the analysis on comparative pig iron production.[16] McCloskey assumed that the marginal product of the pig iron used in the production of steel rails can be determined by dividing the price of pig iron by the price of steel rails. From this calculation he determined that the marginal product of pig iron used in British and American steel rails did not vary significantly and that the productivity levels (average market price of pig iron divided by average market price of steel rails) were comparable.[17] It is not McCloskey's productivity calculations but the technological conclusion he draws from them which is at stake here. These conclusions are question-

able because relative factor costs in pig iron production must be considered when relative technological performance is evaluated. Some of these factors could represent obsolescent, others progressive technology and the factor mix could be so different in the two countries that a technological gap could exist between their steel industries despite a temporary productivity parity.

Because McCloskey's article does not provide data for this factor analysis, Sydney Pollard's study of British shipyards in 1904 will be used to illustrate this contention.[18] Pollard observed that, since productivity per man in British shipyards was 12.5 tons as compared to 6.8 tons in the United States and 3.3 tons in Germany, Britain had an overwhelming productivity lead. He goes on to remark, however,

> There is little doubt that much of the equipment found in British yards was less advanced than that in America and Germany. British yards had their ancient steam engines to generate power, their lathes and plate-bending machines, but, as far as the installation of hydraulic, pneumatic, or electric power transmission was concerned, or the use of mechanical yard transport . . ., even electrical lights, most of them were years behind their chief foreign rivals, and visiting foreign experts could seldom conceal their astonishment at this backwardness.[19]

Obviously, in this industry, superior British productivity had nothing to do with technological advantages. Pollard's explanation: Britain's lead in fact is not technological. British shippers, who had long dominated world trade, ordered ships at such a rate that British shipbuilders, unlike their foreign competitors, could specialize in production, thereby enjoying economies of scale.[20] Because of the early start, moreover, British yards had been able to train an abundant supply of excellent artisans, boilermakers, shipwrights, and managers to build the ships. British shipyards acquired productivity advantages, then, because Britain's early commercial supremacy gave them a market and a trained labor force that their rivals did not have.

Pollard's article shows why good productivity should not automatically be equated with good technology. Better British productivity in 1904 probably resulted from the last positive effects of an old technology than from the first fruits of a new. As Pollard, referring to Britain's competitors, put it,

> In the absence of a pool of skilled labor, foreign shipbuilders were obliged to install expensive equipment much of

> which could not pay unless and until all processes had become much more mechanized and shipbuilding had become a true mass-production industry.[21]

Unless British entrepreneurs modernized their yards they would, when shipbuilding became a mass production industry in the 20th century, lose their productivity edge. Indeed the advantages of 1904 later would obstruct technological progress, for artisanal labor would fight to keep the old system rather than be replaced by the semiskilled machine operators typical of mass production industry. At the moment British shipbuilding held this productivity lead, then, the industry was already obsolescent.

The technological capabilities of the British, German, or American shipbuilding, iron and steel, or any other industry cannot be divined from productivity figures unless the factors which determined total costs have been scrutinized. Economic historians cannot assume that the cost factors were the same in two industries. It could have been, for example, that in one country industry had invested heavily in new plant and equipment while in another it had not. If that were the case then one overhead cost (depreciation) could be very high in one and very low in another industry. This could mean that the capitalists had kept prices low and profits high through shortsighted investment policy. Any intelligent cost accountant would know that these entrepreneurs were engaging in business folly, even though the stockholders might be taken in by the good dividends, and the economic historians by the low prices. Whether this happened in either the British or American pig iron industry is not known. McCloskey's view that productivity rates correlated with technological performance, therefore, could be right or it could be wrong. The fact that American iron and steel productivity subsequently outstrips British, as McCloskey himself acknowledges, suggests that he is wrong, for superior American technology, which accounts for this subsequent productivity gap, might have existed earlier. But, since no factor analysis was done, there is no way of knowing from the data presented in this essay whether its postulates are true.

The basic assumption in Harley's article is the following: as the steam engine became progressively more efficient coal consumption was reduced to a point where the cost of running steamships equalized and then fell below that of running sailing ships. He concluded, therefore, that a technological factor, engine efficiency, determined when a shipping line shifted from sail to steam. Harley did not prove his case directly by studying fuel consumption costs. Rather he found out which lines converted to steam on which voyages, and

when. His discovery that the time of conversion depended on the length of voyage (i.e., steam was first used on short hauls, then introduced on longer hauls) supported a technological explanation for the shift, i.e., storage space for the bulky engine fuel prohibited profitable longer voyages until more efficient engines reduced fuel consumption.

McCloskey and Sandberg claim that Harley ". . . reconstructed the production and cost functions for sailing and steamship, through which he was able to examine the speed with which entrepreneurs replaced one with the other as their relative profitability changed."[22] This is an extraordinary assertion. Cost accounting affirms that labor, material, and overhead are the principal cost divisions. To have done what McCloskey and Sandberg claim, Harley would have had to look at costs in all three categories for both sailing ships and steamships. He clearly did no such thing. He isolated one cost factor only, fuel, and assumed, since the time of conversion correlated with length of voyage, that engine efficiency determined the pace of change. But one major cost factor cannot be decisive unless it is considered with other major cost factors. It is possible, if improbable, either that sailing ship labor costs increased steadily and considerably, or that coal fuel costs fell drastically over a long period, thereby shifting the cost advantage away from sail to steam. The speculation is, moreover, potentially important. If rising labor costs on sailing ships were responsible for the conversion to steam, it could no longer be directly attributed to a technological factor. Harley's work is to be praised for its originality but it certainly falls short of the methodological thoroughness that has been claimed.

Roderick Floud used Greenwood & Batley's cost accounts to determine the firm's long-term productivity record (1856-1900). He concluded that ". . . Greenwood & Batley were achieving considerable increased productivity" during the period.[23] The question is whether Floud's productivity index is reliable. He preferred to use the capital invested in equipment manufacturing machine tools as one element in his index but was forced, because of the firm's poor bookkeeping, to abandon the idea. Instead he made the metal weight of the machines producing machine tools the input and the metal weight of the machine tools produced the output. If the amount of metal contained in the machine tools produced by a machine tool increased in relation to the weight of the producing machine, productivity improved. The index depends, therefore, on a very important assumption; namely, that the producing machine tool did not vary in weight during the period. If it did then the constant

with which he sought to measure productivity (increase of metal in machine produced in relation to the weight of producing machine) would become unstable and the productivity index would collapse. Floud realized the importance of his assumption.[24] But he did not give much evidence to prove that it was justified. He simply referred to some contemporary observations and moved on. Econometrics seeks to replace the subjectivity of argument-by-example from contemporary literary sources with the objective exactitude of statistical compilation. It seems inadequate, therefore, to produce a lot of statistical evidence to prove that one factor important to a calculation is true (i.e., that machine tools produced more weight in the machines manufactured) but none to show the validity of a second (that the weight of the producing machine tools remained unchanged).

Furthermore, the connection between entrepreneurial capacity and technological progress, which was Floud's ultimate concern, was examined inadequately. The period covered brought the transition from iron to steel construction; metal strengths greatly increased in relation to weights. It is hard to believe that this revolution in metallurgy did not affect the weight of producing machine tools but if it did not that fact must be explained. Floud hinted at the importance of the metallurgical question. He noted that, with the introduction of high speed steel, the machine tools had to be completely redesigned. But he added that these changes happened after 1900. This means, then, that Floud really studied this company during a period of technologically stagnation in the design and manufacture of machine tools. Greenwood and Batley cannot receive kudos for entrepreneurial prowess, despite a favorable productivity record, when world technology was dormant. A more useful question might be: how did Greenwood & Batley respond when the use of high-speed steels induced technological movement in machine tool design and manufacture? Floud does not answer this question. He stated only: "Such steels were introduced in the United States in the 1890s, but there was a delay in their introduction in Britain."[25]

One only has to read the minutes of the discussions which followed the papers printed in the volume from which these examples have been taken to realize the great extent to which the work suffers from methodological insufficiencies. Cost accounting theory emphasizes the complexity of profit, cost, and productivity determination, especially when such factors as depreciation and inflation have to be considered. Cost accounting practice shows the risky nature of generalizations about technological performance from productivity indices, particularly when the factor evidence is contradictory. Cost

accounting history reveals that uniform accounting practices were not followed before 1914, which raises doubts about the reliability of the statistics used in econometric studies. With such evidence no capable cost accountant could talk very confidently to his boss about a firm's comparative profit, cost, and productivity achievements. And economic historians, faced with conclusions about the good performance of British entrepreneurs, should be circumspect when these conclusions are based on incomplete data, collated some seventy years after events, which are subject to very different interpretations. At least the historians should be skeptical when these conclusions run counter to those of experienced contemporary management engineers and cost accountants who found British entrepreneurial and technological performance markedly deficient.

FOOTNOTES

[1]McCloskey, *Did*, p. 459.

[2]The strength of the optimists' case rests, by their own insistence, on the superiority of a methodology. McCloskey notes, for example, that "The route by which this and other conclusions . . . were reached is perhaps even more significant for British economic historiography in the long run than the conclusions themselves." McCloskey, *Essays*, p. 7. Indeed, for McCloskey the cliometric rescue of the British entrepreneur has become an indisputable historical truth. See, McCloskey, *The Achievements*, p. 23.

[3]Menger, p. 38.

[4]Although two influential business historians, N. S. B. Gras and Henrietta Larson, defined business history as "primarily the study of the administration of business units in the past" neither they nor the business history community used the analytical tools being developed in schools of business administration. Certainly they have ignored cost accounting.

[5]Pollard, *Genesis*, p. 288.

[6]An editorial on "Practical Prime Costs" in *Engineering* (1891) said that up to twenty years before "selling prices could generally be fixed at figures leaving good margins, and a 'rough and ready' cost of a certain article or piece work, upon which generally could be fixed a fancy profit, with a liberal contingency allowance, was as a rule found all that was required. . . . It is during the past 15 or 20 years that prime costing has been developed to the elaborate systems in operation in many of our large and well-managed firms." Solomons, p. 19.

[7]Littleton, p. 359.

[8]This point has also been made by H. Thomas Johnson in *The Role*, p. 444.

[9]McKendrick, pp. 45-67.

[10]Johnson, *Management*, pp. 184-204.

[11]McCloskey and Sandberg, p. 103.

[12]McCloskey and Sandberg, p. 103.

[13]McCloskey, *International*, pp. 285-309.

[14]Harley, pp. 215-37.

[15]Floud, pp. 313-44.

[16]See also McCloskey, *Productivity Change*, pp. 281-96. Although, in this work, McCloskey establishes a productivity index on the basis of relative factor mix in

British pig iron production he does not do the same for the American industry. Thus there is no basis for comparing the relative factor mix in both countries. He states that the mix between coke, iron ore, labor, and capital, remained constant in the British industry throughout the period. He also says that British productivity did not grow during the period. What was the factor mix in America? Did it also remain constant? The questions are important because America did achieve productivity gains between 1885 and 1913.

[17]Calculations are given in McCloskey, *International*, pp. 297-98.

[18]Pollard, *British*, pp. 426-44.

[19]Pollard, *British*, p. 437.

[20]Pollard writes, "Of the superiority in skill, labour and management at that time, based on tradition and on an efficient system of apprenticeship, contemporaries had little doubt. American wages were higher than British by a third at least, a difference that more than outweighed any possible higher productivity gained by mechanical equipment (while overheads were, of course, much higher)." Pollard, *British*, p. 437.

[21]Pollard, *British*, p. 437.

[22]McCloskey and Sandberg, p. 103.

[23]Floud, p. 336.

[24]Floud, p. 322.

[25]Floud, p. 343.

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