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Double entry and the rise of capitalism: keeping a sense of proportion?

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ABSTRACT

The paper addresses the debate raised by the reinterpretation of Dean, Clarke, and Capalbo (2016) of the origins of double-entry bookkeeping (DEB) and its implications. It offers a critique based on three aspects: the role of value, the relationship between DEB and algebra, and the historical sequencing of the adoption of DEB, the rise of capitalism and the 'capitalist mentality', industrialisation and the Global Financial Crisis. It reinterprets each aspect and concludes on the implications for teaching, stressing the importance of all aspects of asset valuation.

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Introduction

Dean, Clarke, and Capalbo (2016) have written a thought-provoking interpretation of the relationship between innovation in art and accounting, and its historical consequences. In doing so, they illustrate the importance of researching and teaching the context of double-entry bookkeeping (DEB). They also offer a potentially important interpretation of the origins of DEB and its subsequent history.

That DEB was part of the broader intellectual movement of the Renaissance is unquestionable. Indeed it would be most surprising had the Italian 'many-sided men' of the fifteenth century¹ neglected the study the commercial aspects of mathematics. As Dean, Clarke, and Capalbo (2016) show, there is a clear association between algebraic methods in commerce and Pacioli's presentation of DEB in his *Summa* (1494 [1914]). Then as now, DEB promotes good management and assists decision making. All of these are fair and reasonable speculations; they form a useful basis for further investigation into the nature and origins of DEB, which will surely be of substantial interest to most accounting historians.

Some of that interest will undoubtedly take the form of debate, which at this stage at least, can be centred on some of the more questionable assertions of the paper. These are, first, that the sense of proportion that inspired the discovery and adoption of DEB somehow disappeared in the Global Financial Crisis (GFC). In making this assertion, Dean, Clarke, and Capalbo (2016) only deal implicitly with issues of (mis)valuation, which is, arguably, the defining feature of the GFC. Second, there are claims about the derivation of DEB from the use of algebraic solutions to bartering problems. Although the parallels between these techniques are clear, their historical sequencing is open to question.

In similar vein, the third point of issue is about the origins of DEB and its relationship to the rise of capitalism suggested in the Dean, Clarke, and Capalbo (2016) paper, particularly the implied causes and effects. These issues are dealt with in turn, together with a conclusion that also engages with a further point, which is the implication for the teaching of accounting.

Value, DEB and the GFC

Although it is true that financial bubbles and crises imply some loss of proportionality, their consequences are manifested in disproportionate asset valuations and extraordinary leverage, not in disproportionate applications of the method of DEB. Valuation decisions thus provide input values for DEB, and, because such decisions were crucial in the GFC, Dean, Clarke, and Capalbo (2016) need to offer a more explicit accommodation of the role of value. Only then can we interpret the GFC as an abandonment of the Renaissance principle of proportionality.

We can note that Italian merchants and banks in the GFC both used DEB. The difference in the GFC seems to be that firms using the same rules did not report comparable results. Why not? According to Dean, Clarke, and Capalbo (2016), flexible valuation rules in accounting standards allowed such outcomes to occur, for example fair value accounting (17). Their important critical observation, in making this point, is that rules using expectational input data were institutionalised during the GFC. As a consequence, Renaissance-style balance and proportionality were 'nowhere to be seen' (17). Where the lack of balance occurs in DEB terms is not however made clear in their paper. The adoption of fair value accounting does not in itself undermine balance and proportionality. Changing the value of an asset concurrently changes the value of the residual claims upon it, if normal DEB is applied, and by the same virtue, produces a balanced account. In such fashion, strict DEB proportionality, as defined by Dean, Clarke, and Capalbo (2016), is retained, even at the height of a financial crisis.

The Dean, Clarke, and Capalbo (2016) paper implies, however, that in the GFC assets were valued disproportionately. The exact nature of the disproportion is difficult to ascertain. It could be that the values used in the GFC were disproportionate to some underlying value, but without identifying the nature of that value and how it is captured by Renaissance DEB methods, the disproportion cannot be specified. Alternatively, it may be that there is considerable disproportion in the valuation decisions taken by the cross section of firms, but again, that would be a matter of speculation. Or did Renaissance merchants use accounting in such a way that accommodated the normal subjectivities associated with valuation? In summary, two questions remain to be answered: how does fair value, or any other valuation rule, undermine Renaissance (or modern) DEB, or in the world of the GFC, where there is DEB and disproportion, and how might DEB deal with misvalued assets?

A useful extension to the argument of Dean, Clarke, and Capalbo (2016) would be to consider what Pacioli himself says about valuation. In *Summa* (1494 [1914]), he directly considers the valuation issue and its relation to the accounting entries. For example, he suggests that estimation is needed to determine the value of non-cash inventory items. In his example of the exchange of wool for pepper (1494 [1914], 79), he proposes an estimation of the value of pepper for the purpose of establishing the amounts of the debit

and credit ledger entries. In other words, however, valued, accurately or no, DEB preserves proportionality. However, if in the GFC investors could be misled by AAA ratings on financial assets, by the same token, could the wool valuation in Pacioli's example also be incorrect (for instance by a misrepresentation about the grade of wool)? In Pacioli's wool and pepper example, as in the GFC, the problem of valuation precedes the decision of how values are then accounted for. The method of accounting does not of itself resolve the valuation issue.

Commerce, algebra and DEB

Dean, Clarke, and Capalbo (2016, 18) state that duality is meaningless without the algebraic context provided by Pacioli. Examples are given by Dean, Clarke, and Capalbo (2016, 10) of the type of problem, like bartering, that could be solved using algebra. Here the authors identify a potentially important relationship between the use of algebra in bartering and the development of DEB. However, the one does not necessarily imply the other. In bartering transactions, algebra would be used to establish value equivalence. It would not require DEB per se. As Heeffer puts it (2011, 116): 'There is probably no need for algebra in performing bookkeeping operations but for complex bartering operations or the calculation of compound interest, basic knowledge of arithmetic was mandatory and knowledge of algebra was very useful.'

On this basis, we can conclude and agree that there was an association between algebra and DEB. What Heeffer (2011, 121) however also shows is that Renaissance commercial arithmetic used proportions to arrive at equivalent values for the purposes of barter, incorporating profit margins on the transaction. Once calculated, DEB provided a consistent method of recording these proportions, divided for example into cash, barter value and profit. The evidence therefore seems clear that algebra and DEB shared common principles, but the implied relationship between algebra and commercial practice is less obvious. Heeffer's conclusion also suggests that there is no necessity to teach algebra in association with DEB.

There is a further question mark over the implied chronology. According to Dean, Clarke, and Capalbo (2016) with reference to commercial barter, the proportion puzzle was solved by della Francesca (11). By contrast, Heeffer (2011, 123) dates the application of algebra for the solution of bartering transactions to Mazzinghi in the 1380s. Even at that date, the requirement to compute exchange ratios between commodities of different quantities and qualities was long standing, giving rise to labour-based theories of value and prices determined by custom and practice.

DEB, accounting history and the rise of capitalism

Having established and contextualised the development of DEB in the intellectual climate of Renaissance Italy, Dean, Clarke, and Capalbo (2016) then go on to describe how a platform was thus created for the capitalist mentality, to some extent based on the interpretation offered by Bryer (2000a, 2000b, 2005). However, an alternative sequence of events could also be suggested. Ancient societies rely solely on barter, and therefore require rules to determine the exchange equivalence of different combinations of goods and services. Such requirements lead to the institutionalisation of trading rules and prices, such as the notion of the 'just price', that can be subjected to arbitration (De Roover 1958). The

idea of just price relies upon proportionality by equating value to the labour required to produce a particular item and can be viewed as an extension of the use of barter-based ratios. Algebra then provides a mathematical solution to the need for fair valuation of combinations of commodities, like ginger and sugar, which require exchange in ratios that also accommodate cash elements and transaction-based mark-ups. Finally, recognising that transactions might be split between cash, barter and profit elements, and feature contra entries, DEB emerges as the logical solution.

In such a version of events, the development of mathematical proportion was a necessary condition for economies based on bartering. This logic follows because understanding of proportion is required for the equation of value in a transaction, for example two hides equal five loaves of bread. Plato and the ancient Greeks understood this, and by deduction so did earlier, barter-dependent societies. Mathematical understanding of proportion then necessarily predates both Renaissance art and Pacioli's description of DEB. Pacioli's DEB of course goes beyond barter-based ratios, but given the long history of proportionality in financial transactions, it is not clear why proportionality in art is necessary for the development of DEB interpreted as a system of proportionality.

Returning to the GFC, we can now pose the counterfactual question: would the use of Renaissance-style methods and sense of proportion have prevented it? Certainly an appealing feature of medieval business practice in this respect was that custom and practice evolved such that Catholic Thomist and feudal principles of fair or just prices were well known and the methods of establishing value equivalence were similarly based on customary profit rates at transaction level (Toms 2010; see also Grassby 1969; Tawney 1926). By contrast with such regular trades, evolving over long periods, in observable commodity-type products, at the centre of the GFC were newly devised, thinly traded, complex and difficult to value assets, which were often traded over the counter, most notably, collateralised debt obligations. In the absence of established market prices, valuations were based only on the estimated cash-flow-generation capacity of the assets themselves. In short, few of the institutionalised trading mechanisms and norms of Renaissance Italy were present. Similarly there was often no mechanism for establishing third-party price equivalence, and no reference point as to what represented a fair profit on the transaction, and so on. The only mechanism actually used was DEB, suggesting the conclusion that of all the senses of proportion abandoned in the GFC, the proportion implied in DEB was not one of them.

In the intervening period between the Renaissance and the GFC, Dean, Clarke, and Capalbo (2016, 16) argue that DEB's new representation of proportionality promoted the 'capitalist mentality' through the development of commerce and then the industrial revolution. The accounting-specific view suggested here, in line with Bryer (2000a, 2000b) is that DEB promoted profitability-style calculations. However, as Toms (2010) demonstrates, none of the examples provided by Bryer cite a return-on-capital-employed-style calculation in the modern sense. That would include the type suggested by Dean, Clarke, and Capalbo (2016, 15): 'to evaluate the amount and profitability of their business investment...'. The other source mentioned in the quote, Stephens (1735, 4), does refer to the 'Value and Condition of his Estate', but the purpose of such a computation, when the passage is read in context, is not to calculate profitability. Rather it is to monitor the separate components of assets and liabilities and their inter-relationship such that default risk can be ascertained and perhaps avoided. Stephens's

concern arises from the character of barter-style transactions (in this case equivalents of cash obligations, sugar and tobacco) similar to those addressed by Pacioli and it is for this reason, as the subsequent text illustrates, that he finds Pacioli's approach useful. In both cases it is true, as Dean, Clarke, and Capalbo (2016) argue, that DEB is an innovation that promotes good management and facilitates decision making. As they suggest (16), there is a need for reliable periodic reporting as a result of ownership changes. It is worth noting that Pacioli (1494 [1914], 41) also stressed the need for such reporting. He related the advantages of his method for the purpose of custody and institutional scrutiny of merchants' books of account. However, the anachronistic use of words like profitability to infer 'capitalist mentality' is a step too far when merchants were actually using DEB to promote the objectives described by Pacioli, and thus to facilitate transactions arising from the trading rules and customs that prevailed in early modern Europe.

Such trading rules, and their evolution, should be borne in mind when reading the account of Dean, Clarke, and Capalbo (2016) of the history of accounting as communication from the sixteenth century to the first half of the nineteenth century. Here they suggest that it is DEB itself that 'encourages' the 'capitalist mentality' because of its *'potential to show how to increase capital through profitable activities'* (16). However profits were, as Crosby (1997) points out, embedded in individual transaction prices (see also Dean, Clarke, and Capalbo 2016, 12; Heffer 2011), and as the examples given by Grassby (1969) illustrate, with the rate of profit on any given transaction governed by the feudal norms and customs of the just price and restrictions on usury (Tawney 1926).

The argument that DEB promotes the capitalist mentality also does not sit well with the logic or evidence of the industrial revolution. Dean, Clarke, and Capalbo (2016, 16) do acknowledge that the development of industrial technology gives rise to new problems and poses new challenges that go beyond DEB. Accordingly, there are now the seeds of 'modern capitalism', but this would suggest that the 'capitalist mentality' is not a sufficient condition for capitalism per se, or that it mutates through time. It might seem a nuanced point, but do we conclude that DEB gives rise to capitalism as suggested by Sombart (1902) and Bryer (2005), or that it is down to the factors that Dean, Clarke, and Capalbo (2016) point out that were identified by Adam Smith as defining characteristics of capitalism, like the division of labour? Or might it be the case that accounting methods reflect the organisation of production as much as the capitalist mentality? It is an important question to evaluate, if the conclusion of Dean, Clarke, and Capalbo (2016) that, '[W]ithout the consequential financial order (provided by DEB), capitalism may have failed ...' (18) is to be supported.

Dean, Clarke, and Capalbo (2016) may thus speculate about comparisons with profit and capital being facilitated by DEB. There is, however, no evidence that calculations using ratios of the business's total profit to its total capital occurred much before 1800 or even 1850. Indeed, economists like Scrope (1833) and Ramsay (1836), only began to theorise the notion of a general rate of profit on capital in the 1820s and 1830s, again as a response to industrialisation.

A counter argument that accommodates the dimensions of capitalist mentality and industrial organisation introduced by Dean, Clarke, and Capalbo (2016) is the view that accounting and accounting change are the effects, rather than the causes of capitalist, or indeed any other form of economic development. According to this view, accounting evolves in response to the development of the asset base and changes in capital

ownership (Toms 2010; Toms and Fleischman 2015), and in that sense could be described as a proportionate phenomenon in history.

Conclusions

In summary, the development of aggregate financial profitability ratios was not closely integrated into the development of DEB as a system of proportional relationships. Moreover, given the long history of proportionality in financial transactions, it is not clear why proportionality in art is necessary for the incorporation of proportion into DEB.

To conclude definitively on the relationship between DEB and capitalism is beyond the scope of the present discussion, but certainly Dean, Clarke, and Capalbo (2016) have raised an interesting new angle, which should be the subject of debate. As their paper illustrates, the story of DEB and capitalism is an important bridge between the Renaissance and the GFC. However, the interpretation suggested by Dean, Clarke, and Capalbo (2016) of the relevance of Pacioli and proportion to the mistakes of the GFC depends very much on the similarities and differences between the two eras.

In my view, the key difference lies in the nature of the rules that applied in the two eras. The accounting standards that are critiqued by Dean, Clarke, and Capalbo (2016, 17) could certainly be contrasted with the rules about limited transaction-based profits and associated social condemnation of excess profits that prevailed in the Renaissance. Other matters, such as the use of estimation to ascertain asset values, the use of accounts for monitoring and control, or the algebraic equality upon which they are predicted seem common, if not perennial, features of accounting.

Taken together, these issues raise question marks about how our teaching should be modified. Certainly understanding the context in which accounting techniques are devised and modified is absolutely crucial. Achieving this outcome would better equip students with the technical aspects of DEB and a deeper understanding of events like the GFC. How the teaching of DEB itself should be changed, however, is unresolved. Certainly the tone of my critique above is that valuation issues should be emphasised, philosophically, historically and technically. The better the understanding of that issue the more the accountants of the future will be sceptical about models suggesting values that although 'fair', are nonetheless disproportionate. In that sense, the issues raised by Dean, Clarke, and Capalbo (2016) can be guaranteed to have a lasting contribution.

Note

1. For Burkhardt (1860 [2010], 85), 'The fifteenth century is, above all, that of the many-sided men.'

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