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## **A genealogy of myths about the rationality of accounting in the West and in the East**

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### ABSTRACT

Goody (1996: *The East in the West*) contests the arguments of Weber and others that Western accounting developments—and in particular double-entry bookkeeping ('DEB') which first appeared in Italy around the end of the 13th century AD—provided a new calculative rationality that drove the economic transformations of early capitalism. Recently Gleeson-White's (2012) best selling *Double Entry: How the Merchants of Venice Created Modern Finance* attempts to re-establish the myth while a further variation on this theme appears in Padgett and Powell's (2012) *The Emergence of Organizations and Markets*. Here we explore how arguments relating to the form of DEB are frequently confused with arguments about its content—and how historically differing modes of its actual use have been treated as 'the same'—and why the various claims for its crucial significance in focusing economic rationality continually re-emerge. We suggest that the wider issues can now more fruitfully be debated in the broader context of parallels and contrasts with the development of the economy in late Imperial China and of its bookkeeping and accounting systems. We explore how the myth of an indigenous 'Chinese double-entry bookkeeping' ('CDEB') appears to have emerged as a counterweight to the power of the perceived rationality of Western DEB.

**Keywords:** Double-entry bookkeeping, China, myths, economic rationality

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# **A genealogy of myths about the rationality of accounting in the West and in the East**

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## ABSTRACT

Goody (1996: *The East in the West*) contests the arguments of Weber and others that Western accounting developments—and in particular double-entry bookkeeping ('DEB') which first appeared in Italy around the end of the 13th century AD—provided a new calculative rationality that drove the economic transformations of early capitalism. Recently Gleeson-White's (2012) best selling *Double Entry: How the Merchants of Venice Created Modern Finance* attempts to re-establish the myth while a further variation on this theme appears in Padgett and Powell's (2012) *The Emergence of Organizations and Markets*. Here we explore how arguments relating to the form of DEB are frequently confused with arguments about its content—and how historically differing modes of its actual use have been treated as 'the same'—and why the various claims for its crucial significance in focusing economic rationality continually re-emerge. We suggest that the wider issues can now more fruitfully be debated in the broader context of parallels and contrasts with the development of the economy in late Imperial China and of its bookkeeping and accounting systems. We explore how the myth of an indigenous 'Chinese double-entry bookkeeping' ('CDEB') appears to have emerged as a counterweight to the power of the perceived rationality of Western DEB.

*(204 words 1324 characters [with spaces])*

# A genealogy of myths about the rationality of accounting in the West and in the East

'It [double-entry bookkeeping] is among the finest inventions of the human mind'.<sup>1</sup>  
Goethe, *Wilhelm Meisters Lehrjahre* (I.10)

'The pound of flesh which I demand of him is dearly bought. 'Tis mine, and I will have it.'  
Shakespeare, *The Merchant of Venice* (IV.i.98–99)

## 1. Introduction

Goethe has often been quoted in praise of double-entry bookkeeping ('DEB').<sup>2</sup> But do we correspondingly believe that Shakespeare was personally inclined to sadistic forms of precisely calculated revenge? In both cases these are the words of dramatic characters and in both cases they are 'anti-heroes': so these are surely not these famous authors' own views.<sup>3</sup>

In this paper we explore how and why the myth of Western (originally 'Italian') DEB has become so powerful and how it appears to have engendered a need either to claim its invention for other countries (from whom it was supposedly imported to Italy) or to create a 'counter-myth' that other countries developed an equivalent form of bookkeeping of their own which enabled the same kind of 'economic rationality'. On the evidence available, the former claims are easily dismissed (e.g. Macve, 2002); the latter are more subtle and we shall focus in particular on the claims that have been made for the development in later Imperial China of a form of 'Chinese double-entry bookkeeping' ('CDEB').

In the next section we review the arguments in Goody (1996) with regard to the widely held beliefs about the respective 'rationalities' of Western and Eastern accounting systems for business management, and suggest how these need to be modified (in particular with regard to Chinese accounting). Then we look at the more extreme claims for Italian DEB recently made by Gleeson-White (2012) in what has become a 'best-selling' book, while in the following section we examine

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<sup>1</sup> *Wilhelm Meisters Lehrjahre*, I.10: 'Welche Vorteile gewahrt die doppelte Buchhaltung dem Kaufmanne! *Es ist eine der schonsten Erfindungen des menschlichen Geistes*, und ein jeder gute Haushalter sollte sie in seiner Wirtschaft einfuhren' (our *emphasis* added).

<sup>2</sup> For example, Waymire & Basu (2007, p. 87) appear to accept what Goethe had Werner say about DEB. But, along with many others who have quoted this including Goody (1996, p.80), they overlook the significance of the fact that Werner is an anti-hero to Wilhelm and is the equivalent of a modern day 'computer nerd' (see e.g. [http://www.101funjokes.com/nerd\\_jokes\\_2.htm](http://www.101funjokes.com/nerd_jokes_2.htm) (accessed 28.10.13))—so Goethe's intention was surely ironic (Macve, 1996). This illustrates clearly the dangers of doing history without re-checking original sources (cf. Funnell, 2007), which is not to say that the texts must be privileged over other historical evidence (e.g. MacGregor, 2010).

<sup>3</sup> It may be noted that the play, albeit set in Venice and focussed on overseas merchant ventures and a commercial debt, makes no mention of DEB. It is believed to have been written between 1596 and 1598 (when DEB had been utilised in Italy for about 300 years). The first book published in England on DEB was Hugh Oldcastle's in 1543, titled *Here ensueth a profitable treatyce called the instrument or boke to learne to knowe the good order of the keyping of the famouse reconyng, called in Latyn dare et habere, and in Englyshe debitor and creditor*. (No copy now survives: <http://www.oxforddnb.com/templates/article.jsp?articleid=56444&back=> [accessed 28.10.2013].) Note that Oldcastle considered DEB already 'famouse'. For early mentions of DEB in various authors see Macve & Yamey, 2013.

the thesis recently advanced in Padgett & Powell (2012) that the ‘invention’ of the important new ‘partnership system’ form by the Datini firm in 1383 depended, *inter alia*, on the contemporaneous adoption of DEB. Following our argument that all these approaches, in different ways, make it clear that the rationality of DEB is a ‘rational institutionalised myth’ supporting the confidence needed to undertake ‘action at distance’—but that they misunderstand the historical context in which DEB was invented—we investigate how a countervailing ‘myth’ of CDEB appears to have been engendered and gained hold.

What is DEB? It can be used to cover a range of accounting procedures that involve entering transactions ‘twice’. Some aspects now seem wholly natural. So if I sell £1000 of goods on credit to customer A, I will ‘debit’ customer A (and ‘credit’ my accumulating sales record) as A now owes me (is a debtor for) £1000. If I deposit £20,000 in a bank, the bank will credit my account £20,000 (and ‘debit’ its own cash holdings). But ‘full’ DEB (as described in print for the first time by Luca Pacioli in 1494, e.g. Macve, 1996) goes further and links all transactions into a completely integrated system of ‘doubled’ entries, one precipitate of which is a periodic ‘trial balance’ of all the accounts that generates the production of summaries that show both ‘profit and loss’ and a ‘balance sheet’ of the current net assets, equal to the ‘capital’ (de Roover, 1956, p.114). And while de Roover (1956) there shows that a variety of layouts to contrast ‘debits’ and ‘credits’ can be found in early accounting records, it is the ‘bilateral’ Venetian layout<sup>4</sup> that came to dominate in handwritten books, whereby the debits and credits are arrayed in columns on opposite sides of the page or on opposite pages (e.g. Illustration I from C19th)<sup>5</sup> so that the current balance of an account can easily be inserted. It is this most advanced *form* of DEB for which the strongest claims have been made by leading economic sociologists (e.g. by Sombart, Weber and others—cf. Yamey, 1949), namely that it was essential to the development of Renaissance capitalism, and later to the development of the ‘rational’ cost accounting of the Industrial Revolution (cf. Hoskin & Macve, 2000). We shall therefore be careful in the following sections to clarify the important differences between the *form* and the *content* of different levels of DEB (and how differing modes of *use* are often not noted) and ask how important have been the influences of each respectively.

Our genealogy of these myths therefore traces how significant beliefs about the present strength and potential futures of different modern economies have become embedded through constructions of their past—a past that in fact reflects a constellation of different beliefs and practices at different times, within a variety of economic, political, religious and social systems and their respective cultures, institutions and forms of business organization. They have thereby become intertwined with loci of power such as large businesses, professions and government agencies.

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<sup>4</sup> *alla veneziana*, as described by Pacioli in 1494, and nearly 200 years earlier referred to in Genoa as being *ad usum banchi* or *ad modum banchi* [after the manner of banks] (de Roover, 1956, p. 131/133).

<sup>5</sup> What today’s textbooks on DEB refer to as a ‘T’ account.

There have indeed been significant discontinuities in the histories of both Western and Eastern development but they cannot be reduced to the emergence / adoption of DEB: but rather to seismic shifts resulting from a constellation of related factors, of which we would give primacy to changes in how in different historical eras humans learn ‘to think and act’, echoing Michel Foucault’s observation (Foucault, 1997: 200-1) that thought is ‘what establishes, in a variety of possible forms, the play of true and false, and consequently constitutes the human being as a knowing subject. In this sense, *thought is understood as the very form of action*’.<sup>6</sup> Following in this vein Foucault argues that in thinking how even the largest entities such as the state operate (and so *a fortiori* how such increasingly complex entities as medieval trading entities or the modern transnational corporations operate), we should see them not as some form of the Nietzschean ‘cold monster’ but should instead ‘do the history of the state on the basis of men’s actual practice, on the basis of what they do and how they think...analyzing the state as a way of doing things and a way of thinking’ (Foucault, 2009: 358). Here, pursuing the possibility that *where* humans learn to think in formal ways may have significant impacts on how, in a particular era, the powerful and sophisticated learn to think and act, we argue that education and its associated practices of examining and credentialing knowledge attainment play a particularly significant role in general in generating new discourses of ‘power-knowledge’ (Foucault, 1977a). Furthermore they are particularly significant for understanding what is new about not just accounting as DEB or indeed new ways of ‘doing economic work’ in businesses but a whole series of connected new ways of thinking and acting which can be seen emerging in the 13<sup>th</sup> and 14<sup>th</sup> centuries in western Europe.

Meanwhile in China the development of formal learning was focussed on the long-established (since 650AD) Imperial Civil Service examination which created both the central Civil Service elite itself (the successful graduates) and the ‘gentry’ (those who took some or all of the examination stages but did not perform well enough to enter the top grade official positions) who formed unofficial elite groups that effectively implemented governmental administration within the provinces. But the Confucian focus of the examination left commerce outside this world of classical learning. Over succeeding centuries Chinese entrepreneurs developed what is now regarded as a successful market economy for the distribution of agricultural and related products (and including of course tea, silk and porcelain) both domestically (e.g. along the Yangzi and through the Imperial canals) and internationally (e.g. through the open port of Guangzhou (‘old Canton’) and along the Silk Road) and successful merchant families increasingly aspired to reach higher status among the gentry (Elman, 2009; Brandt *et al.*, 2012).

It cannot therefore be assumed, just because the East did not have the same kind of institutions of learning that helped to formalize significant developments in thinking, writing and calculating in the

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<sup>6</sup> Our emphasis added.

West, that their different approach to business organization was any less 'rational', 'capitalistic', 'systematic' and 'efficient'.<sup>7</sup> Which brings us to our discussion of Goody (1996) in the next section.

## 2. 'The East in the West'

In his chapter on 'Rationality and *ragioneria*: the keeping of books and the economic miracle', Goody (1996), the social anthropologist, argues 'unless one could identify particular features of rationalising procedures as unique to the West which required, for their development, a special form of cognitive operation, to isolate a form of rationality of world mastery and identify it with Europe [is] an instance of circular not to say ethnocentric reasoning. In this chapter I claim that in the case of double-entry the second of these criteria does not hold, and that there must be considerable doubt about the first'. In other words, Goody argues a) that it is doubtful that Europe / the West had unique 'features of rationalising procedures' and b) that this required the development of Western DEB as 'a special form of cognitive operation'.

Goody's demolition embraces a number of arguments and sources of evidence. With regard to proposition a) Goody observes that one reason that the advances in the European Renaissance, and in particular in commercial activity, appear so spectacular is that Europe had long fallen behind the Middle East, India and the Far East in its level and sophistication of business organization and international trade. Indeed, it was this backwardness that made it easier to 'leapfrog' over others in inventing and creating some new business forms and practices (just as later England's financial backwardness enabled it then to overtake Amsterdam in inventing discounting of bills—p.60).<sup>8</sup> But these developments were not completely 'new' and inherently special to the West and unattainable by other societies. The famous Italian *commenda* partnerships that arose in the C13th and which de Roover identified as the embryo of the joint stock company<sup>9</sup> had earlier analogues in other countries that traded with the West. Moreover the *commercial* Renaissance was itself part and parcel of a wider return to earlier levels of attainment, in particular in the sphere of education with the establishment of the new European universities that rediscovered, after the European 'dark ages', the classical, mathematical and medical learning that had been preserved in the Arab world.<sup>10</sup> We would summarize this part of Goody's argument as maintaining that it may be possible to argue that

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<sup>7</sup> Further collaborative archival research on international comparative accounting and business history is a clearly now a priority in exploring the nature of 'business rationality' and how significantly it may (or may not) have differed between East and West (Yuan *et al.* 2013)

<sup>8</sup> Perhaps as having inherited and embedded the QWERTY keyboard now prevents us moving to a more rational layout (e.g. Macve, 2013).

<sup>9</sup> See also our section 4 below

<sup>10</sup> So we would see this 'invention' of universities as promoting, through a new rigorous examination of knowledge, a freedom to question traditional religious and cosmological beliefs (albeit not without frequent fierce opposition), that would culminate in later centuries in the scientific revolution and the Enlightenment—and thence its offspring 'postmodernism' and the questioning of the limits of rationality itself (Gellner, 1992). At the same time their examinations of their students produced the new power elites in a variety of spheres (Hoskin & Macve, 1986). This 'network domain' does not receive attention in Padgett & Powell (2012)—cf. sections 4 and 5 below.

some Western features are ‘more rational’ but these are developments from the existing rationality of non-Western practices, discourses, organizations and institutions, not the emergence of a unique ‘Western rationality’.

Moreover, with regard to proposition b), Goody examines three ‘cognitive operations’ that have been argued (e.g. by Weber, Sombart, Schumpeter and others) to be crucial to the West’s development of ‘rational capitalism’: Arabic numerals; abandoning the abacus; and DEB.<sup>11</sup>

The gradual adoption of Arabic numerals in the West and the related abandonment of the abacus (as the positional value of the former allowed ‘working it out on paper’ by writing numbers in columns) are clearly interrelated. However, as Goody, like others (e.g. de Ste Croix, 1956), argues it is not clear that this gave computational superiority. While both Chinese and Roman numerals lacked the positional value that made quick written calculation feasible this was more than compensated for by the speed of the abacus (de Roover, 1956, p.119) as can still be seen in the East (e.g. in Japan and China where a well-trained abacus operator can still outperform calculation by a ten-key user today). Indeed Roman numbers continued to be used in Europe (particularly as they were regarded as less easy to fraudulently alter) long after the appearance of DEB (Durham, 1992).<sup>12</sup> An Eastern business’s set of ‘account books’ therefore included both the written pages and the abacus on which the related calculations were done.<sup>13</sup>

While Arabic numerals and the abacus were not essential to Western commercial advance, they are clearly interrelated with the visual appearance of DEB in the ‘Venetian’ bilateral method (as described by Pacioli) where the ‘debit’ and ‘credit’ entries appear in opposing columns (on the same or opposing pages) (e.g. Illustration I from a C19th ledger)—columns that enabled ready addition and balancing. Here Goody, like Gardella (1992), largely follows Yamey (1949) in arguing that Western merchants did not need DEB to make the advances in commercial practice and organization that characterise the Italian and wider European Renaissance.<sup>14</sup> DEB was not needed beyond the basic keeping of accounts of debtors and creditors as a record of the balances due or owed (which might also prove useful in a dispute as evidence in Court). The emphasis placed on DEB by Sombart and others in explaining capitalism’s origin is misplaced. Even Weber’s observations about the need for ‘capital accounting’ to provide focus for the spirit of capitalistic profit seeking are countered by the evidence from Yamey and others that merchants were often lazy in computing their profits or in tracing the reasons for apparent errors (even when they kept DEB

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<sup>11</sup> Note that paper and printing, which also assisted the rapid spread of books and the dissemination of learning in the Renaissance West, had been invented much earlier in China.

<sup>12</sup> Similarly, even today, Chinese character-based numerals continue to be used precisely because they are hard to forge.

<sup>13</sup> Chinese merchants developed special numerical characters, the *Sūzhōu mǎzì*, which incorporated positional value. But these appear primarily to assist in more speedily locating the necessary positions to be used on the abacus (Yuan *et al.*, 2013).

<sup>14</sup> This and many of Yamey’s other sceptical discussions of the economic usefulness of DEB are collected in Yamey (1978) and Yamey (1982).

books). de Roover's (1956: 152, 174) discussion of the Medici bank's DEB ledgers emphasises that the focus of management attention was primarily on the detailed account balances in the 'balance sheets', in particular to ascertain how good was the prospect of repayment of the debtors' balances. In any event, computation of profit and accumulation of capital could be (and was) accomplished by single entry books recording inflows and outflows together with a period-end 'inventory' of relevant assets and liabilities (see also Macve, 1994; 1996; 2002).

However, Goody's final argument is that, even if DEB was significant to some degree, it was in fact not unique to the West, as the history of Chinese accounting shows that a form of DEB (which we will call 'Chinese double-entry bookkeeping' ['CDEB']) was claimed to have fully developed there by the late Qīng period (if not earlier).<sup>15</sup> We shall challenge this view in section 6 below, and argue that so-called CDEB appears to be largely a 'counter-myth' to the widely adopted myth of the importance of Western DEB in demonstrating economic 'rationality'. But in examining how this counter-myth was established we shall also argue that this does not affect Goody's main thesis as to the relative rationality of the East and the West.

### **3. 'Double Entry: How the Merchants of Venice Created Modern Finance'**

Gleeson-White (2012)<sup>16</sup> has quickly become a 'best-seller' and widely recommended as a key source for understanding the history and significance of DEB.<sup>17</sup> Although there are various caveats within the text the running headlines are simple and dramatic. The Venetians—who were of course extraordinarily successful in their overseas trading ventures—invented the 'bilateral' form of DEB, and their method was expounded by Pacioli in his 1494 treatise. DEB, with its monetisation of all transactions and assets and its focus on 'profit' and 'capital accumulation' (e.g. as argued by Weber, 1947, pp.191-3) enabled them to 'create modern finance' (*sic.*). Its dissemination through Pacioli's work first to the rest of Italy and then—through the work of his successors who translated and

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<sup>15</sup> Although he appreciates that there is a lack of evidence cited in the main Chinese sources (p.79, fn.103).

<sup>16</sup> It was first published in 2011 with the even more ambitious title *Double Entry: How the Merchants of Venice Shaped the Modern World and How their Invention Could Make or Break the Planet*, Sydney: Allen & Unwin; there is now also a paperback edition which incorporates some revisions which we have not yet seen, the Amazon blurb for which goes: 'Filled with colorful characters and history, *Double Entry* takes us from the ancient origins of accounting in Mesopotamia to the frontiers of modern finance. At the heart of the story is double-entry bookkeeping: the first system that allowed merchants to actually measure the worth of their businesses. Luca Pacioli—monk, mathematician, alchemist, and friend of Leonardo da Vinci—incorporated Arabic mathematics to formulate a system that could work across all trades and nations. As Jane Gleeson-White reveals, double-entry accounting was nothing short of revolutionary: it fueled the Renaissance, enabled capitalism to flourish, and created the global economy. John Maynard Keynes would use it to calculate GDP, the measure of a nation's wealth. Yet double-entry accounting has had its failures. With the costs of sudden corporate collapses such as Enron and Lehman Brothers, and its disregard of environmental and human costs, the time may have come to re-create it for the future.'  
[http://www.amazon.com/Double-Entry-Merchants-Created-Finance/dp/0393346595/ref=la\\_B001JP0WAS\\_1\\_1\\_title\\_0\\_main?s=books&ie=UTF8&qid=1385569800&sr=1-1](http://www.amazon.com/Double-Entry-Merchants-Created-Finance/dp/0393346595/ref=la_B001JP0WAS_1_1_title_0_main?s=books&ie=UTF8&qid=1385569800&sr=1-1)  
(accessed 27.11.13).

<sup>17</sup> Despite his critical academic review, which identifies many shortcomings both in the main thesis and in the historical details, Sangster (2012) strongly recommends it for its readability and overall accessibility, as have a number of non-academic reviews; while it is given as the sole reference for further reading in [http://en.wikipedia.org/wiki/Double-entry\\_bookkeeping\\_system](http://en.wikipedia.org/wiki/Double-entry_bookkeeping_system) (accessed 26.10.2013).



extended his treatment—to other countries accompanied their success in reaping the advantages of the rapid development of capitalism (even though DEB was not actually widely used in practice until much later). But as with other aspects of capitalism's benefits we are now understanding its limits. DEB she argues underlies our National Income Accounting system, which focuses only on GDP and ignores other aspects of economic welfare. And it also leads us to ignore the environmental issues which are now the most serious facing us. A new DEB accounting is needed that refocuses our attention from merely money profit to these wider concerns: if it does so it can save us.

This story clearly resonates with many widely held beliefs. But its main deficiencies as a 'history of the present' are that it largely equates (as many others have, see e.g. Macve, 1994; 1996) accounting for profit and capital with DEB; and its historical detail conflates—most importantly among the many errors that can be identified (e.g. Sangster, 2012)—the distinction between the integrated *accounting system* that constitutes DEB and the method of presenting the *layout* of the DEB accounts, where what 'the Venetian method' developed was the 'bilateral' layout of the debit and credit entries being set out in columns on opposite sides of a page or on opposing pages (e.g. de Roover 1956; Lee, 1977) This was indeed the layout that came to dominate, and form is indeed important and can have important effects (de Roover, 1956, p. 114: cf. our discussion of Powell and Padgett (2012) below). But bilateral layout first appeared independently of DEB and DEB appeared in different places with other layouts (e.g. de Roover, 1956) so it remains unclear just what element Gleeson-White thinks was the important driver.

Rather than attempt to analyse and debate each of Gleeson-White's major claims we will instead focus in the remainder of this paper on outlining our own alternative view of the history of the invention and significance of DEB.<sup>18</sup> But first we must address another recent exposition making claims for the importance of DEB in the economic and social history of organizational invention.

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<sup>18</sup> We do not cover below three other important stages in Gleeson-White's argument. The first is that DEB has led to the myopic focus on GDP in National Income Accounting. Given that generally GDP is not articulated with a statement of national 'wealth' (although it could be made consistent with it given Keynes's formula  $Y=C+I$ , i.e. that 'income = consumption plus investment (capital accumulation)') its calculation does not in fact involve DEB (see e.g. Edey *et al.*, 1967 and Sangster, 2012, p.502). The second is that DEB has consequently led to the myopic focus on private economic profit and wealth to the detriment of environmental and social capital and urgently needs reforming to embrace those now even more important dimensions—and thereby 'save the planet'. Again, while the argument can be made for a new focus on the *content* of accounting (e.g. the Prince of Wales's project <http://www.accountingforsustainability.org/> [accessed 27.10.2013] : cf. Macve, 1997) it again has nothing to do with its DEB *form*. The third is that since DEB created the accounting profession in the 19<sup>th</sup> century, the convoluted 'accounting principles' the profession has developed have been largely responsible for the 'accounting scandals' that it has thereby helped to conceal—while it has also benefited from the resultant calls for more sophisticated accounting standards and auditing procedures (as e.g. Power, 1997, argues). Yet again, while the *content* of what make accounting profit calculations (and the nature of their audit) may be challenged, these do not require DEB's *form* to operate, although it is true that the profession adopted and promoted DEB as a hallmark of its specialist professional (or in the US, 'scientific') status (McMillan, 1998; Macve, 2013). And major accounting scandals predate the arrival of the accounting and auditing profession (e.g. Sangster, 2012, p. 510).

#### 4. ‘Transposition and refunctionality: the birth of partnership systems in Renaissance Florence.’

Padgett and Powell (2012) (hereafter ‘P&P’) have quickly been widely recognised as offering major theoretical insights for social science into how—beyond the level of ‘innovations’—‘inventions’ take place that *significantly* change social and economic systems (‘tipping points’). They do not rely on breakthroughs from ‘great men’, ‘new ideas’ or ‘the spirit of the age’ (such as Weber’s ‘spirit of capitalism’ [P&P, p.194]) but rather focus on the ways in which networks of individuals find new functionalities as they cross existing structural domains. Building on previous sociological work on ‘path dependence’ and the importance of structures’ histories, and on the understanding of society as interlocked institutions that borrow from and transform one another, they focus on ‘network autocatalytic mechanisms’. Their theory draws on the biochemistry of modern evolutionary biology<sup>19</sup> to show how spillovers across newly, or now differently, intertwined network domains can ‘tip’ the creation of newly reproducing productive flows, which by autocatalysis<sup>20</sup> quickly establish new structures within which individuals and social groups operate in new ways. ‘In the short run actors make relations but in the long run relations make actors’.<sup>21</sup>

To illustrate and support their theory they provide a number of historical case studies using both qualitative analysis based on existing literature and also their own formal modelling and exhaustive quantitative empirical investigations. And in two of these cases they consider the role of DEB.

de Roover (1956, p.115) had argued that the ‘three factors which, in the early days, contributed most to the progress of accounting were, without any doubt, partnership, credit and agency. Of the three, partnership is perhaps the most important, since it led to the recognition of the firm as an entity distinct from the owners.’ But was there autocatalysis in the sense that these developments in the accounting that was adopted, and in particular the ‘bilateral form’ of accounts and the integrated system of DEB, themselves spurred the extension of Renaissance Italian partnerships, credit and

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<sup>19</sup> Waymire & Basu (2007) draw on advances in neuroscience in support of their evolutionary explanation of accounting’s development, and their experimental work has been taken up in evolutionary psychology and anthropology (e.g. by Mullins *et al.*, 2013 in exploring how recordkeeping, bookkeeping etc. help overcome the unique computational problems for humans in large groups that reciprocity and reputation formation pose (pp. S144-6.)). For a preliminary sketch of a critique of their method see Macve, 2013 (including that the experimental subjects are already familiar with writing and record-keeping and cognitively unlike those who would historically have previously only had orality—which can produce its own, often what seem to us prodigious, feats of memory (e.g. Clanchy, 1979; Ong, 1982)).

<sup>20</sup> In chemistry, a catalyst is a substance which speeds up a reaction, but is chemically unchanged at the end of the reaction. When the reaction has finished, there is exactly the same mass of catalyst as there was at the beginning. <http://www.chemguide.co.uk/physical/basicrates/catalyst.html#top>. With autocatalysis, the reaction is catalysed by one of its products. As more and more catalyst is produced the reaction speeds up—getting faster and faster as more and more catalyst is formed. Eventually, of course, the rate falls again as the ingredients in the reaction get used up. <http://www.chemguide.co.uk/physical/catalysis/introduction.html>

<sup>21</sup> Walter Fontana on the jacket blurb re-expresses this as: ‘multifunctional social actors and the heterarchical networks they induce coconstruct each other, yielding emergent organizations that shape structural and functional innovation in response to shocks’. As P&P do not cite, for example, Foucault or Hacking, it will require considerable further analysis to identify how far P&P’s theory adds to previous ‘genealogical’ insights about the constellations of causes that at crucial moments come together so that people invent new transformative practices, discourses, and roles in powerful new organizations and institutions (cf. Hoskin & Macve, 2000; Chapman *et al.*, 2009; Morley, 2011; Hoskin, 2013).

agency? In places de Roover appears to think so, e.g. p.160: 'Outside Italy...unsystematic records put severe limitations on the size of the business unit...this situation partly explains why banking and other techniques remained backward in the Baltic region where the Italians did not penetrate.' Or again, p.166: 'The mobility [of Hanseatic merchants in the 14<sup>th</sup> and 15<sup>th</sup> centuries] was to a large extent due to surrounding institutional and economic factors, but it was also the produce of unsystematic methods of book-keeping. These methods prevented extensive delegation of power and made it necessary for the business leader to maintain personal contact with his subordinates...Because of these limitations, the growth of large companies with permanent branches in foreign parts, such as existed among the Italians, was precluded among German merchants from the Hansa towns, and economic progress was slowed down as the inevitable result'. And he argues that the situation was the same in the neighbouring Dutch towns whether or not they were actually members of the Hanseatic League (p.169).<sup>22</sup> And in his conclusion (p.174) he states that 'Double entry developed in Italy in response to the needs of nascent capitalism. Italian business was already so complex that merchants could not get along without an efficient system of book-keeping.' In P&P's terms this would seem to be equivalent to saying that DEB was an autocatalyst that speeded up the change that had initially produced it.

However we must remember that Yamey (1975), while recognising that frequent business correspondence between 'head office' and branches/agents was obviously important, has long challenged the argument that DEB was a necessary instrument for administering the new, far-flung international business outlets of the 'sedentary' merchants and supplied the means whereby they could control the honesty and efficiency of their distant agents, factors or partners, pointing out, *inter alia*, that DEB does no more than confirm that the books balance (but not that their contents are complete and accurate). Furthermore, he argues (p.721) that the balance of probability from the available evidence is that the Fuggers of Augsburg in Bavaria, who in the 15<sup>th</sup> and 16<sup>th</sup> centuries replaced the Medici as one of the most powerful international merchant banks in Europe, did not use DEB. And nor did the Rothschilds' bank until the 20<sup>th</sup> century (much to the historian Ferguson's surprise).<sup>23</sup> One can have a disciplined process of bookkeeping (essential in a large organization) and, if one wants to, calculate profits and losses without invoking DEB.

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<sup>22</sup> de Roover (p.166, fn. 8) cites with approval the view of the German economist, Walter Eucken, that where knowledge of DEB was lacking or slow to penetrate, as in the Hansa towns, economic development was delayed. Cf. Yamey (1964) and Robertson & Funnell (2012) discussed below.

<sup>23</sup> ' "It is quite astonishing," writes Ferguson, "that a firm with the resources of N.M. Rothschild was still using the single-entry system [of bookkeeping] in 1915" and had "only one typewriter." So much for the "pure spirit" of capitalism' (Skidelsky, 1999). But while this is taken as symptomatic of the banking conglomerate's later decline, it also leaves unanswered the question of how the bank's previous success had been achieved despite not having DEB.

Again, as Yamey had also pointed out (1964, p.126),<sup>24</sup> Robertson & Funnell (2012) have recently shown in detail that ‘although the 17th century Dutch were preeminent in Europe in their knowledge of the capitalist form of double-entry bookkeeping, at no time during the period covered by the first charter (1602–1623) of the Dutch East-India Company (‘VOC’), or thereafter, did the domestic operations of the Company use this form of bookkeeping across all chambers’. In other words the Hanseatic accounting, of which de Roover was so critical for its lack of DEB in relation to the 14<sup>th</sup> and 15<sup>th</sup> centuries, in fact, when other conditions were right, did not hamper the growth of one of the world’s largest overseas trading companies in the 17<sup>th</sup> century.

P&P’s own chapter (chapter 7) on the Dutch inventions of the Amsterdam stock market, of the joint stock company—and in particular the ‘economic colonising’ VOC (pp.226-30)—and of the central bank, analyses (albeit only from secondary sources) the overlapping networks of the Dutch Reformed Church and the new federal state, which were in turn reshaped by these autocatalytic inventions. But here P&P do not consider bookkeeping and accounting, even though it is clear from the discussion above that it cannot be taken for granted that DEB was now firmly embedded and could have had no more potential to contribute to change.<sup>25</sup>

Against this background we can consider the arguments that P&P make in relation to the impact of bookkeeping and accounting in the Italian Renaissance. We shall see that it will be important to keep in mind the distinction made above between DEB as an integrated system and the practice (originated from Venice) of laying out the accounts in bilateral format, since, at various times and in various places, as de Roover (1956) shows, either could be present without the other.

The first case that P&P examine (in Chapter 5) is ‘the corporate merchant banks’ that were invented in Tuscany the ‘long 13<sup>th</sup> Century’ and which were often larger than what would be the largest ‘partnership system’ bank of the 1400s (the Medici bank). P&P argue that they were invented initially through the interaction of travelling Tuscan merchants with the Church at the Champagne fairs. The French Pope in the 1260s mobilized them from his hometown (Champagne) ‘into the papal administration as the fiscal wing of his Italian crusade against the Holy Roman Emperor. Transient mercantile credit arrangements from the fairs thereby were combined with administrative letter-writing techniques and stationary physical locations from the Church’ (p.116). The chain reaction from this ‘religious incorporation’ (p. 122) into a ‘dual functionality of private merchant and papal administrator...embedded in two worlds at once’ (p.124) then involved loans to the King of England (with repayment under English law having to be in English wool which thereby diverted wool previously going to Flanders—controlled by the English customs service

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<sup>24</sup> Yamey there also lists the examples of the Sun Fire Insurance Office of London, the Whiting Machine Company in the US, and the Capital and Counties Bank in England.

<sup>25</sup> The 1948 work of de Roover is cited at fn.112 with regard to the Bruges banking collapse in late 1400s, but that was a hundred years before, and there is no mention of any bookkeeping aspects.

established in 1275—and so building the textile industry in Florence); and the decline of the Champagne fairs as trade in luxury goods moved to the sedentary offices of the new Tuscan merchant-bankers. Their new status, as they gradually detached from their primary involvement in Church finance, was cemented socially by evolving ‘into noble patrilineages through their financial success’ (thereby becoming involved also in military functions) and creating ‘family out of company’ (p.116). These new corporations ‘effectively invented international finance, with sedentary branch offices, bills of exchange, complex single-entry accounting, and ongoing loans for state leaders...through a mechanism of “incorporation and detachment” ’ (p.116).

Their historical argument is reinforced by extensive data from papal registers, the Liberate Rolls of the Kings of England and other records to build case studies of four of the largest banks of this period; and P&P argue that the administrative techniques they employed reflect those of Church administration (p.140). Further, quantitative examination of measures of kinship connections among partners supports the thesis of the building of noble patrilineages out of these corporations. In conclusion, ‘[u]ltimate extinction notwithstanding, the Tuscan unitary merchant-bank was an amazing organizational invention, especially for its time. Bills of exchange and account books changed banking forever, and the Commercial Revolution moved Europe out of its economic backwater’ (p.145).

But as stated by P&P, with regard to accounting, it was the administrative technique of *keeping complex accounts* that was the important factor in the emergence of this new unitary and corporate form of banking, and this did not involve DEB. ‘Fragments of a cash book from the large Salimbene company of Siena in 1277-82 document, through references to missing books, the existence of a complex accounting system of at least half a dozen interrelated account books...Such as accounting system was very sophisticated but it does not imply the existence of [DEB]’ (P&P, p.122, fn.4). de Roover (1956 pp122-3) is referred to—but he is far less dogmatic about exactly what was or was not taking place. He says the cash book is probably, albeit not certainly, the Salimbene company’s and notes that ‘receipts are recorded on the front pages and expenditures in the rear’ (i.e. the intermediate stage between the then more common ‘paragraph’ form and the bilateral format introduced from Venice).<sup>26</sup> He concludes ‘How well these books were co-ordinated

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<sup>26</sup> For example de Roover (1956, p.127) notes that single-entry Siense books of the 1320s of the del Bene company split receipts/debits and payments/credits into the front and back half of the books and states (fn. 20) that ‘[t]his division of the cash book was common in Tuscany even into the sixteenth century’. Similarly he finds (p.129-30) that the Peruzzi company in the 1320s and 1330s used the same layout as the del Bene company although in the section of the *libro segreto* containing the partners’ accounts these accounts are still in paragraph form (with the credits underneath the debits). (Despite the presence of income and expense accounts he doubts they were in full DEB.) He similarly finds (p.140) that in the single-entry ledger of Datini’s business in Avignon (1367-1372) the accounts are split into debits in front and credits in the rear. While in a later ledger of Datini’s Pisan branch in 1383-6 ‘the personal accounts of receivables and payables are in bilateral form, but merchandise expense, and profit-and-loss accounts continue to have the credit beneath instead of beside the debit’ (i.e. in paragraph form). It is probable that these Pisan books are in DEB but nevertheless this is not clear (as Corsani has identified other Datini branches outside Florence (where DEB was

into a system is impossible to tell without more information than is available. Whether we are in the presence of double entry is even more conjectural.<sup>27</sup> However, one point is clear: the organisation of the Sienese banking companies had become so complex that they needed several books and that they had to divide the work among several book-keepers.’

P&P’s second medieval invention (in Chapter 6: Transposition and Refunctionality) examines the birth of ‘partnership systems’ in Renaissance Florence in the later 1300s. These were a set of legally autonomous companies (with at least one owned by a partnership rather than an individual) linked through one person or through a small set of controlling partners. ‘This new “network-star” ownership structure largely displaced earlier legally unitary companies, often built collectively by patrilineage families, which were common in the late 1200s and early 1300s’ (i.e. those analysed in Chapter 5 as above). This decentralization ‘allowed various branches and business markets to be managed separately through legally independent account books’ and among the first, if not the first, was Francesco Datini’s, for whom we have extensive records, as we do for the slightly later Medici bank. ‘The new partnership system was also generalist in ensemble [*i.e. doing a range of merchant and banking business like the earlier unitary companies*], but each component company was more specialized than before... which required a more abstracted system of articulation among branches than before. This... was the organizational driver for the rapid diffusion of [DEB] in the Florence in the late 1300s’ (p.169).<sup>28</sup>

These new ‘network organizations’ also created the dramatic growth in intercompany credit in the late 1300s and early 1400s: ‘[o]ngoing relations of business credit were recorded primarily in the bookkeeping device of current accounts, tabulated in bilateral format’ (p.170).

Consistent with their theoretical framework P&P plot the ‘multiple-network ensemble’ of relationships in the economic, kinship and political domains and how these interacted, following the violent upheavals of the ‘Ciompi revolt’ of 1378 and its repression, to produce, through ‘transposition, refunctionality and catalysis’ the new activities and interrelationships within the invention of these new business organizational structures. In the majority of cases (although not

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adopted in the 1380s, and used bilateral form—although he thinks from 1386 not 1383: cf P&P Ch 6 discussed below) as not adopting DEB until the 1390s) (de Roover, 1956, p.141). Meanwhile, de Roover (1956, p. 127, fn.2) notes that ‘In Genoa, the bilateral form was already used by the bankers in 1313... however there is no evidence that [they] already kept their books by [DEB]’. We shall return to these points.

<sup>27</sup> On p.118 de Roover recognises that the Fini account book (kept from 1296-1305 at the Fairs of Champagne), as analysed by Castellani, represents the strongest, albeit not conclusive, case that the first surviving example of DEB could have originated in Florence by 1296 rather than in Genoa in 1340 (where the case that they are in DEB is clear (pp.131-2)). Another possible candidate is the Gallerani company of Siena in 1305-8 (p. 123) for which Nobes (1982) has made a stronger (albeit still not conclusive) case that the books of its London branch exhibit DEB, while Lee (1977) demonstrates that the records kept by Amatino Manucci (a partner in Giovanni Farolfi & Company, a merchant partnership based in Florence) for the firm’s branch in Salon, Provence, which survive from slightly earlier (1299-1300), are in DEB. This claim to be ‘the first’ (albeit we must remember of what records have chanced to survive) is accepted by Sangster (2012). So we cannot firmly rule out the use of DEB at this time in Tuscany.

<sup>28</sup> They see an analogue here to the 19<sup>th</sup> century shift in American manufacturing from the functional to the multidivisional form of firm, as analysed by Chandler (P&P p.169).

Datini himself) the originators were Florentine *cambio* bankers who, while being elevated into political life and then higher social status, now fused domestic banking organizational forms and accounting practices into international trading (pp.172-4; 187; 191). ‘Specifically the Florentine invention of the partnership system was a hybridization of the two relational logics of patrilineage and guild through the means of political republicanism’ (p.202).

P&P’s empirical investigations have now pinned down the precise date of formation to 1383 in order to ‘to narrow down causality’ (p.173). Here we focus on two of the organizational features employed by these new businesses—like those of the Datini and the Medici (as it is their business records that survive)—that they emphasise: DEB in bilateral format; and current accounts both among partnership-system companies and with major trading partners (P&P p.173 [citing de Roover 1956, pp.139-45]).

P&P examine these aspects more closely in their section on ‘bookkeeping’ (pp.193-4), emphasising the connection between the new partnership systems and the bilateral format bookkeeping labelled *alla veneziana* (as it had first been developed in Venice). As we have noted, one can have bilateral format without DEB, but in places DEB also becomes merged into their argument: e.g. ‘Datini’s first adoption of bilateral format *and [DEB]* was in his new Pisan branch in 1383, where he initiated his partnership system’ (p.194: our *emphasis* added). Again: ‘The final example of the microconnection between partnership system and bilateral *[DEB]* is...a ninety page fragment of Averardo [di Francesco de’ Medici]’s<sup>29</sup> account book [that] has survived from 1395, two years after Averardo in Florence formed a partnership system with his father, Francesco, in Genoa...which is in bilateral format *[DEB]*’ (p.194: our *emphasis* added).

P&P’s ‘interpretation of the causal linkage is as follows: Bilateral format and [DEB] were useful in managing centrally the heterogeneous companies that the partnership system created because bilateral format lumped dense and recurrent flows with clients into easily visible current accounts. Cross-branch, within system transfers were the densest flows that required such inspection and central approval. Heavily used current accounts among inside partners and employees, called conti interni, existed in older unitary companies...[while] conti esterni with outside clients were transactionally specific with little recurrent use. Partnership systems...took conti interni and turned them into conti esterni...Intrasystem transfer of credits among branches was the transitional step towards intercompany transfers of credits across systems’ (p.194). P&P’s detailed analysis of documents relating to external credit shows that, by 1427, ‘[a]mong international merchant-banks, large domestic merchant-banks, and wool- and silk-manufacturing companies, extensive, deep, and recurrent commercial credit relations developed, all of which were managed through current accounts in bilateral accounting format...The densest and most high-volume flows of Florentine

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<sup>29</sup> Related to, but not part of the famous Medici banking family (de Roover, 1956: 146).

commercial credit and business coursed through personal and political ties, precisely measured and documented in bilateral current accounts' (p.195).

So far the argument stresses the use of bilateral format which visually captures the ongoing relationship with another party and makes tracking the up-to-date situation (the 'balance') straightforward. It is not clear what the DEB that is also referred to adds. However in the conclusion linkage is made to the Florentine development of perspectival art which draws the viewer's eye along a line to the focal (or 'vanishing') point, creating the illusion of a third-dimension on the two-dimensional surface, and inviting the viewer to move into the painting. P&P 'believe that the partnership system, with its array of account books at its base had a similar effect on the perceptions of Florentine businessmen.' The new complexity of 'keeping track of complex cross-flows of goods finance and credit, necessitated systemization and abstraction analogous to the arrangement of space in in a linear-perspective painting. Current accounts, which really were reified people and customers, were arrayed mathematically, with [DEB] used to calculate the financial flows and the businessman's own line of movement, called profit. Businessmen always want to make money in some loose sense, as well as do other things. But the precision involved in "maximization of profits" over multiple streams of transactions is inconceivable without the array of cross-connected account books that lies at the base of the partnership system. In the sense of perception, the account books themselves induced the Florentine businessman to walk into this line of movement. More generally...goals are our cognitive perspectives on the trajectories of flows, financial and biographical, to which organizational networks subject us in their processes of reproduction' (p.203).<sup>30</sup>

So we need to unpick the different threads in these lines of argument. In this we are hampered by not ourselves having seen the primary bookkeeping sources cited by P&P and de Roover; nor do

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<sup>30</sup> Foucault (1970) uses perspective as representative of the 'double sign' which is a reflectively involved combination of signifier and signified: it is the sign as perfect reflexive representation, the 'duplicated representation doubled over upon itself' (1970, p.65). The extreme example he analyses (in Chapter 1) is the perspectival painting to end all perspectival paintings, Velázquez' *Las Meninas* painted in 1656 where the painter puts himself, realistically depicted, within the pictorial frame painting a picture (whose back alone we see) of the King and Queen who are reflected in a mirror behind him and who stand outside the picture, on the spot where the painter was in actuality himself standing to paint (and where we also stand to view). So author, subjects and reader of the picture are all doubled representations within the overall frame of a picture which is itself a double sign—a representation of representational painting (Hoskin & Macve 1986). So we also see a link to the development of DEB but primarily in the way 'doubled representations' begin from the middle of the 13<sup>th</sup> Century to develop a new kind of literacy through a general rewriting of textual layouts, and including bills of exchange and money of account where it produced a system of bilateral written exchanges (see section 5 below). So the Florentine partnerships may indeed likewise have naturally 'seen' their new organizational structure through the perspective provided by DEB: but this does not in itself imply a focus on the calculation and maximisation of profit. It is in such detailed settings that the question of how the accounting techniques were used must not be assumed to be answerable in anachronistically modern use-terms.



P&P cite any of the extensive correspondence surviving in the archives that could illuminate how the partners themselves approached the use of the information in their accounts.<sup>31</sup>

First, bilateral current accounts. While the new Florentine partnerships would indeed have found this form of layout more convenient in tracking continuing credit relationships (as compared to earlier systems in which each transaction created a separate debt),<sup>32</sup> their argument that by contrast Genoese banking remained ‘strongly transactionalist’ (p. 203) sits oddly with de Roover’s observation (1956, p. 127 fn.2) that ‘[i]n Genoa the bilateral form was already used by the bankers in 1313...However there is no evidence that the Genoese bankers already kept their books in [DEB]’.<sup>33</sup> So Genoese bankers already had the running conti esterni with outside clients that P&P regard as part of the causal chain in creating the Florentine partnership system.<sup>34</sup>

In relation to DEB, while it is clear that the Datini partnership had both bilateral accounts and DEB, there are some complexities. As we have seen, P&P claim (p.194) that ‘Datini’s first adoption of bilateral format and [DEB] was in his new Pisan branch in 1383 where he initiated his partnership system’. But de Roover (1956, p.141) notes that in the Pisan branch ledger 1383-6, while ‘the personal accounts for receivables and payables are in bilateral form ...merchandise expense, and profit-and-loss accounts continue to have the credit beneath instead of beside the debit’ and although de Roover thinks it is probably in DEB there is an issue raised by Zerbi about the integration of the cash account so that de Roover judges that ‘the argument is not decisive’ (see also Macve, 1996, fn.16). Again, P&P’s claim that the contemporaneous accounts of Averardo di Francesco de’ Medici were the same as Datini’s does receive support from de Roover (1956 p.146, who is here supporting Ceccherelli’s against Zerbi’s view about the presence of DEB), but given the extant fragment of the accounts themselves is inconclusive this is more on the grounds that it ‘is improbable that one of the most prominent banking houses in Florence would not be using the most up-to-date methods’. This may well be so, but we should not forget the later banking counter-examples of the Fuggers and the Rothschilds that we have already discussed.

Moreover, P&P’s invocation of ‘the precision involved in “maximization of profits” over multiple streams of transactions’ seems to imply the need for interrelated DEB accounts that would enable the identification of the profit contribution of different lines of business. But, although de

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<sup>31</sup> It can often be difficult to tell from just from accounts themselves what they were used for (e.g. Hoskin & Macve, 2000). What, for example, does the surviving business correspondence of the Datini and Medici imply were their primary concerns (cf. de Roover, 1956, p.140; p.152)?

<sup>32</sup> As had also been the case in classical Athenian banking (Macve, 2002). It is not clear from P&P’s treatment whether there had been any concomitant change in the law creating freedom to offset payments received from debtors against their overall ‘balance’ rather than as settling some specific item (compare the separate mortgage, loan and current (overdraft) accounts that may still be held with the same bank today).

<sup>33</sup> He gives a later Genoese example at p.133.

<sup>34</sup> Of course we have to accept that a core feature of P&P’s argument (albeit in a different way from Foucault’s observations about ‘conditions of possibility’) is that causation comes in the formation of particular combinations of causes across network domains so that an individual ingredient may be necessary but remained insufficient in other contexts to trigger the reaction (see e.g. the discussion in Morley, 2011).

Roover gives an example of venture accounting in Milan in the 1390s where an attempt is made to allocate overhead and find the net profit or loss on each venture (1956, p. 138), this has to be essentially arbitrary and while DEB can maintain the arithmetical accuracy of the process it cannot guarantee an economically meaningful result that would assist rational decision-making in a multi-activity business (e.g. Yamey, 2000).

Yamey (e.g. 1964; 1975) has consistently challenged the notion that the use of Renaissance accounting was for the purpose of focusing on profit to help in its ‘maximization’. That is an ahistorical transposition of a modern set of ideas and practices. And, as noted above, de Roover’s (1956: 152, 174) discussion of the Medici bank’s DEB ledgers emphasises that the focus of management attention was primarily on the detailed account balances in the ‘balance sheets’, in particular to ascertain how good was the prospect of repayment of each of the individual debtors’ balances. ‘Only in the analysis of financial statements did the merchants of that time make little progress’ (p.118).<sup>35</sup>

In summary, our review suggests that we can accept that the new Florentine partnership systems adopted bilateral format, at least for personal accounts, and this would be helpful in keeping track of their relationships with partners and credit clients. But the Venetians and Genoese had already been using them too. And with respect to DEB, it is not clear what particular features of the new structures and their business activities would have required it for efficient economic management, although they clearly needed a well ordered system of bookkeeping and DEB would fit the bill—as well as already having the power of being the ‘modern way’ and resonating with developments in other spheres of writing that we will discuss in section 5 below. P&P’s analysis of all the other overlapping conditions and networks that produced this new invention is indeed painstaking and impressive on both the theoretical and empirical levels: but the bookkeeping and accounting aspects to us remain less than convincing, and the questions concerning how bookkeeping techniques were used in practice remain insistently ‘in play’ for further scrutiny.

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<sup>35</sup> The continuing conceptual and practical limitations of accounts and financial statements as a basis for financial analysis of ‘profit’/‘income’ and financial position, even today, are explored further in Bromwich *et al.* 2010; Macve, 2013.

## **5. Education and examinations—not business—as the origin of DEB...and its new power?**<sup>36</sup>

In following P&P's encouragement to trace out the effects of interactions between networks in different domains, in order to understand how inventions occur in the economy and in society, we see the need to consider a wider question of the relationship between the domain of academic learning and academic institutions and that of business developments.

Here a major feature of the emergence of Europe from the 'Dark Ages' is the focus on new ways of writing and interpreting texts in the newly established teaching institutions—the 'universities'. In particular one may see new patterns of 'doubling', based on writing, emerging in both the academic and commercial spheres. By the eleventh century (four hundred years before Pacioli's exposition in 1494) layouts of texts exhibit new techniques such as alphabetical ordering; subject indexing; and marginal indexing symbols. By 1200 such systematic ordering and gridding of texts is endemic in the academic world (Hoskin and Macve, 1986, p.108), and during the twelfth and thirteenth centuries further innovations in the layout of pages of texts (e.g. of the Bible), to provide systematic division, indexation, cross-referencing and commentary, both internal and external, were creating a new 'visually oriented layout for book and page'. The basic elements for writing words and numbers—the letters of the alphabet and arabic numerals—are deployed in an 'alphanumeric' system, with the alphabet used for indexation, and different letter sizes used to stratify text; and with arabic numerals superseding Roman numerals and letters for use in page numbering (foliation) and line numbering (Hoskin and Macve, 1986, p.111).

Such techniques made reading into silent reading (Saenger, 1982) and scholarly work into an 'examination' of and 'commentary' on texts, by re-writing them. The book became a 'mirror'—a reflexive work or interconnected series of works. Commentary, by writing the 'same thing' twice, became a way of saying something new (Hoskin and Macve, 1986, p. 121-2, citing Foucault, 1981). The new textuality was to be given a vital impetus by the invention of printing (i.e. in Europe) in the middle of the fifteenth century which brought both a further visual ordering of layout and a new approach to books as a depersonalised and, through the cheapness of paper, more widely accessible source of knowledge (Thompson, 1991, pp. 588-94).

The importance of the new universities, however, was not just in relation to knowledge—but also in creating powerful new elites—the 'magistri' or Masters (as Pacioli was a Master) who had 'passed' the formal examinations first introduced in Paris and Bologna in the twelfth century, which gave a new dimension to learning—'success' and 'failure'. The new 'graduates' used the techniques by which they had learned—such as archiving, cross-referencing and examination—as techniques of power in the service of the Court or the Church (as an extreme example, in the Inquisition)

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<sup>36</sup> This section is largely drawn from Macve, 1996.

(Hoskin and Macve, 1986, pp. 111-2). In the English context, Clanchy (1975, pp. 685-6; 1979, p.68) notes of these 'modern men' that by the mid-thirteenth century 'the great majority of clerks and accountants were trained at universities'. Thus Thomas Becket, destined as Archbishop of Canterbury to argue fatally with his King as to who was the more powerful, began his career, after study at Paris, as a clerk-accountant (*clericus et rationalis*) in London in the 1140s.

A genealogical interrelationship of power and knowledge emerges, 'power-knowledge', whereby new knowledge and skills learned in educational institutions both create new potential for achievement and become the means of access to power, while those who thereby have become newly powerful promote and privilege the use of the knowledge and skills they have learned. Extending from the traditional arenas of power—the Court and the Church—the new power-knowledge was also to colonise, through men such as Pacioli, the new European arena of power—banking and commerce—in which Italy was leading the way.

The new learning spread beyond a new textuality and new approaches to numeration and computation. For example, developments in art and architecture also portray the new concerns with visual presentation—with a focus on proportion and symmetry (another 'doubling') and on the role of perspective in transforming painting into a more 'realistic' representation of reality. Leon Battista Alberti, Pacioli's early patron, was the author of the first manual on geometrical perspective (and also in his *de Statua* constructs the first normalised set of measures of the ideal proportions of each part of the human body, excluding extreme cases); and Pacioli's hometown of Sansepolcro was also the birthplace of Piero della Francesca, whose work on perspective Pacioli was to 'popularise' through his *De Divina Proportione*, assisted by the illustrations of Leonardo da Vinci.<sup>37</sup> Pacioli himself related art and writing through his interest in designs of geometrically perfect 'proportional' letter forms for printing (Eisenstein, 1979, p.540).

Whatever the linkages may have been, alongside the developments in the world of learning and art were the important new developments in the writing of the economic and commercial world. Of those the most significant new re-writing was the re-writing of money into new forms, in particular the development of the 'bill of exchange', involving, in its early form, the 'doubled' writing of two bills, in order to create bilateral written exchanges, and from which was to develop later the 'double writing' of endorsement, and then discounting, on one bill, leading to the creation of paper money (Hoskin & Macve 1986, p.116-20). In parallel<sup>38</sup> was the new writing of debit and credit entries in account books which was to lead to DEB.

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<sup>37</sup> See section 4 (fn.30) above for comments on P&P's reference to perspective (p.203) in relation to 'partnership system' accounts.

<sup>38</sup> The connection between bills of exchange and DEB is suggested in the historical preface to Kelly's popular treatise *The Elements of Book-keeping* (1801), which also mentions insurance (Yamey, 1980, p.87).

To explore these interrelationships fully requires the knowledge and skill of a medieval scholar, which we are not. But without going to the extremes of *Zeitgeist* pilloried by Lopez (1962), who cites a student's examination answer which claimed: 'Double-entry book-keeping in the Medici Bank goaded Michelangelo to conceive and accomplish the Medici Chapel; contemplation of the Medici Chapel in turn spurred the bankers to a more muscular management of credit' (quoted by Yamey, 1981, p. 135), one can see that important developments in the spheres of learning, teaching and art, alongside those in commerce, created conditions in which there could emerge a new, disciplined form of ordered, self-referential, alphanumeric texts, constituting an interrelated system of books for business accounts. Such a system would in turn seem, to a university teacher like Pacioli, to be a legitimate topic for exposition, and one to which he could apply his own knowledge in popularising and promoting its practical application.

De Roover (1956, p.174) concludes his study by observing: 'The fourteenth and fifteenth centuries were perhaps the most brilliant and progressive period in the history of accounting. It was followed by a long period of stagnation that lasted until the nineteenth century'. This is not the context in which to explore in detail those later developments, of which the most significant until recently in the West would be the British Industrial Revolution and the American managerial revolution (Hoskin & Macve, 2000 give an extended treatment). However we would note that, in line with their argument for the influence of Church organization on the emergence of the 'long 13<sup>th</sup> Century' corporate merchant-banks of Tuscany, P & P (2012, p.140, fn.101) refer (albeit only in a footnote) to Chandler (1977) having pointed 'to military antecedents of the revolutionary nineteenth-century industrial organization of the railroad', although this era (indeed the whole development of modern capitalist business organization from the British Industrial Revolution prior to the 'invention' of communist organization in Russia and China) does not in fact provide any of their historical case studies.

In fact Chandler rejects the alleged importance of business leaders with a military background in shaping US railroad organization. But in doing so he misses a more important connection, namely to the revolution in *military education* at the US Military Academy at West Point, which became in 1817 the most advanced educational institution in the US as a result of importing the textbooks and pedagogic practices of the French *École Polytechnique*, then the pre-eminent scientific and technological institution in the world.. Again, as in Pacioli's time, the key element can be seen to be changes in educational practices—both in terms of what was learned (maths, science and engineering) and in ways of learning to learn; in examination—in ways of measuring human performance (now for the first time graded by marks as units of account); and in the re-writing of organisational structures and rules to construct a fully 'centripetal' entity with clear circumscribing

of each sub-part of the entity and marking off the limits of the entity from other entities and the world beyond.<sup>39</sup>

So what we have here are new methods of knowledge production which in turn became embedded in new relations of power as 'graduates' of the new kind increasingly occupied the strategic positions in the development of industrial business practice: and the 'graduates' who turn out to be the 'pioneers of modern management' in Chandler's designated first sites where management is found—at the US Armory at Springfield, Massachusetts in the single-unit case, and on the US railroads in the multi-unit case—all also turn out to be graduates of West Point (Hoskin & Macve, 1988; 2000).

Through the agency of West Point's engineering graduates comes the revolutionary effect on business practice of a new means of accountability for human performance through establishing norms and measuring deviations. Accountability is extended from the individuals 'memorialised' in early account books to the masses of workers and managers who are now the 'statistics' in the exploding nineteenth century populations; and while the seminal institutions are not private businesses, nor always using DEB accounting (Ezzamel, Hoskin and Macve, 1990), the impetus of this powerful new discourse colonises and transforms the available DEB accounting technology and secures its universal dominance within a hundred years, whereas the preceding three hundred years since Pacioli had only seen slow and sporadic advances. Indeed, rather than characterising the centuries after the emergence of forms of DEB as being wholly an era of 'stagnation', this kind of analysis indicates that there is instead a new way of thinking and acting internalised by those who learn under the new pedagogic regimes of writing, examining plus grading, developed variously in European higher education settings from the 1760s on, which in knowledge terms leads to the formation by such graduates of first versions of modern knowledge disciplines, and in the particular setting of the 'economic', leads, through the interventions of the West Point graduates, to the change in 'power-knowledge terms' that we now recognise as 'managerialism' or 'managerial capitalism' or 'globalisation', including a focus on 'cost' and 'profit' as measures of *human* performance.<sup>40</sup>

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<sup>39</sup> This of course is the kind of textual centripetal and circumscribing structuring found so much earlier in fully articulated double-entry books, or in the *Summae* of Aquinas, but not found fully articulated in 'organizations' before: it is that re-structuring, combined with the circulation across all sub-units from bottom to top of 'accounting and statistical information' via what Chandler identifies as the new 'staff function' that constructs both the single-unit and multi-unit entities coordinated by managers running each sub-unit and the entity as a whole, which he identifies as constituting the new managerial 'modern business enterprise'.

<sup>40</sup> As we shall argue in section 6 below, it is correspondingly important to note the rise of a modernization paradigm in East Asia from the late-19<sup>th</sup> century to 'catch up' with the West. This paradigm is connected with a massive importation of Western learning. The myth that Western style DEB had made the West strong constituted one of the most important parts of this importation. Later, a somewhat nationalist reaction to this phenomenon was to search for an indigenous equivalent to Western style DEB in China's own history, thereby serving to perpetuate further what had started out originally as a myth about the West.

de Roover (1956, p. 114) comments, in the introduction to his painstaking survey of surviving accounting records from 1157 to 1494 (the three hundred years before Pacioli), that 'the new approach to accounting history...places greater emphasis on accounting as a tool of management and control', while 'the older writers...(e.g. Besta in 1909)...attached much importance to the matter of form and procedure'. de Roover states 'while I fully sympathise with this new approach to accounting history, I also believe that form and procedure are not completely devoid of significance and should not be entirely overlooked'.

In the last three decades we have again had yet newer accounting histories that have stressed alternative theoretical foundations and deployed new social and critical theories to understanding the development of accounting's modern role (Miller *et al.*, 1991; Chapman *et al.*, 2009). But as the history of DEB and of the work of its first and most famous exponent shows, it is precisely in the interrelationships of new practices, and in particular in new ways of learning and writing ('form and procedure') that one sees the emergence of new ways of thinking about and understanding the world (new 'discourses'), with immense consequences for changing relations of power in the 'real' world outside the cloister walls.

The power of new knowledge techniques such as DEB therefore goes beyond a simple economic justification and requires a bottom-up focus which considers the interplay of individuals and institutions, but without thereby necessarily subscribing to an 'institutionalism', even of P&P's 'neo-institutional' kind, which translates these extraordinary changes in human thinking and acting into non-human science metaphors. As Yamey (e.g. 1975) has argued, the traditional views of the 'economic necessity' of DEB either as a basis for capitalist entrepreneurship, or as an instrument for administrating the far-flung international business outlets of the 'sedentary' merchant, do not stand up to historical analysis. But their exponents believed in its importance—thus Pacioli argues in his first chapter that, of the three things which are 'necessary for those who wish to trade with due diligence', the first is the availability of money and other assets (*substantia*); the second is to be 'a good reckoner and a quick calculator' (and in the preceding parts of his *Summa* Pacioli has 'presented rules and canons relating to each arithmetical operation'); while the third is 'that all transactions are recorded in good order so that information may be had quickly concerning debits and credits which are the basis of trade' (von Gebattel, 1994, p.42).<sup>41</sup>

At first sight, Pacioli's *De Scripturis* seems a universe away from the latest jargon-filled book on strategic international marketing, suitable for today's (if not 1494's) aspiring businessman. But for the successful exploitation of 'substance' (the first of his three 'necessities' for carrying on business), his imposition of rule and order through something as systematic as DEB may be more significant

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<sup>41</sup> *La 3<sup>a</sup> e ultima cosa oportuna si e che con bello ordine tutte sue facende debitamente disponga, a cio con breuita possa de ciascuna haver notitia quanto a lor debito e anche credito, che circa altro non s'atende el trafico.*

than it is now fashionable to suppose. It is at the beginning of the line of those disciplinary systems which modern man has now internalised—'the systems that quietly order us about' (Foucault, quoted by Megill, 1979, p.493). Moreover, while Pacioli did not invent DEB, he was the first published exponent of the system, and by writing it down he articulated and made visible in printed form the rationale of the procedures of business practice. By intellectualising it, he gave the mass of detail a simplicity and reproducibility, so that the knowledge could be transmitted and refined into a basic idea that non-accountants can now be taught to appreciate in just a few minutes.

We have only been able to sketch out briefly here our own history of the role of accounting and DEB in shaping 'business rationality' both in the Renaissance and during these later momentous changes: we see the *myth* of its rationality as constituting the most significant element.

## 6. A Chinese counter-myth—or a double mistake?

Here is the chain of deduction that has led to what we see as the birth of the myth of an indigenous Chinese double entry booking ('CDEB'). The *Lóngmén zhàng* [龙门账] type of account books were regarded as the earliest form of indigenous CDEB, allegedly originated in the late Míng / early Qīng dynasty in the 17<sup>th</sup> century. The historical legends had it that this system was invented and developed by the Shānxī bankers or *piàohào*. The founding of *piàohào* was associated with two well-known anti-Manchu intellectuals by the names of Gu Yanwu 顾炎武 (1613-1682) and Fu Shan 傅 (or 富) 山 (1607—1684). But the only surviving evidence to show that *Lóngmén zhàng* accounts were used by the Shānxī bankers comes from the early 20<sup>th</sup> century. Nonetheless, a conclusion based on this discontinuous chain of deduction led to the myth that CDEB—the use of *Lóngmén zhàng*—was born in the 17<sup>th</sup> century.

Here are the three logical and historiographical pitfalls in this myth:

1. It has not been clearly established that *Lóngmén zhàng* represented a Western style DEB. It could just be a more sophisticated variation of the long-standing Chinese four-column system for keeping individual accounts, coupled with a periodic reckoning of profits (e.g. as often happened in the West even after the invention of DEB (Yamey, 1964; 1975)). Further investigation is needed of some of the accounts (mostly 20<sup>th</sup> century accounts, like those of the Zigòng brine-wells which are argued by Auyeung *et al.* 2005 to illustrate traditional practices) which have been claimed to be examples of *Lóngmén zhàng*.<sup>42</sup>

2. All the pieces of evidence cited so far only show that Shānxī bankers may have used *Lóngmén zhàng* book-keeping in the early 20<sup>th</sup> century. The claim that *Lóngmén zhàng* had

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<sup>42</sup> An indigenous system which does seem closer to Western DEB is that adopted by the Nakai family in Japan from the early 18<sup>th</sup> century (Ogura, 1982).



originated from the 17<sup>th</sup> century was a speculation based on the mere fact that Shānxī bankers may have originated in the 17<sup>th</sup> century.

3. As it has turned out, the above point (point 2) can now also be dismissed almost entirely. Although Shānxī merchants had been long-standing, the Shānxī bankers or *piàohào* (票号), who constructed a nationwide network of banking and remittance activities, only started in the early 19<sup>th</sup> century. More specifically, the first Shānxī *piàohào* was probably founded in 1823. This dating is important as the allegedly double-entry style of the *Lóngmén zhàng* was connected with the banking aspect of the Shānxī *piàohào*.

The above is a summary of research done by Shi Yuqian (1985) who showed the origin of Shānxī *piàohào* had no connection with Gu Yanwu and Fu Shan in the 17<sup>th</sup> century and research by Zhang Lishen (2006) who showed that *Lóngmén zhàng* also had nothing to do with Gu and Fu.

Both articles<sup>43</sup> cited a variety of sources in China today that continue to perpetuate the myth. Most of these sources they cited were written in the 1990s and 2000s. The paper by Chen Shenshu (cited in Guo Daoyang 1988) published in 1980 is the earliest piece that we have seen that speculated on this origin, and made the claim that *Lóngmén zhàng* began with the Shānxī bankers who had originated some time in the 16-17<sup>th</sup> centuries, but the paper gives no references in support of this claim. A similar claim was then made in Guo Daoyang's book published in 1988 (pp. 114-123), a book which has been the most influential treatment of the history of Chinese accounting. Guo himself admitted that the dating of the origin of Shānxī bankers was controversial but he was inclined to believe that it originated in late Míng early Qīng. Both in his 1988 book and in his later works with others, the fact that *Lóngmén zhàng* originated in 16-17<sup>th</sup> is taken as given with almost no reference at all.<sup>44</sup> Guo's 1988 work did not cite the work by Shi Yuqian published in 1985 who disputed the late Míng early Qīng origin of Shānxī bankers. His book did cite works by Zhang Taiyan (n.d), Zhang Yilin (1914) and others who were writing in the 1910s and 1920s. But both these Zhangs only wrote about the relationship between Gu Yanwu and the Shānxī *piàohào* with no mention of *Lóngmén zhàng* as far as we can see.<sup>45</sup>

Guo Daoyang's interpretation of *Lóngmén zhàng* as a form of CDEB relied largely on a series of articles published in the *Accounting Journal* in the 1930s, especially the articles by Zhang Xindeng (1934) and Li Mengbai (1935). These did discuss the method behind *Lóngmén zhàng*, but they made no mention of the claim that it originated with Shānxī Bankers in the late Míng / early Qīng period.

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<sup>43</sup> Both are in Chinese

<sup>44</sup> As noted by Goody (1996) p. 79, fn.103.

<sup>45</sup> Both Zhangs were eminent historians and politicians but had no background in accounting. As mentioned earlier, even their tale of the linkage between Gu, Fu and the Shānxī *piàohào* was written as newspaper articles or notes rather than serious academic works. Hence, their tale was highly influential with the public even though it was not credible as research, as argued by Shi (1985).

It is out of these disparate traces that we see the ‘myth’ of CDEB having been generated. More importantly, the *Accounting Journal* published in the 1930s was part of the movement initiated by Xu Yongzuo that campaigned for adapting and reforming Chinese traditional accounting methods rather than completely abandoning them in favour of the Western style DEB method. So all these authors had a natural bias towards showing that supposedly ‘traditional’ Chinese accounting practices such as *Lóngmén zhàng* already contained the crucial elements of Western DEB and, with some reform, could continue to constitute an adequate CDEB system for modern times.

But it is important to note, in relation to our discussion in section 4 of the uses of Renaissance Italian DEB, that even if there was no fully integrated system corresponding to DEB, Chinese ‘merchant-bankers’ also kept current accounts for customers similar to those in the West, albeit in ‘bivertical’ form instead of ‘bilateral’ form given the different method of reading Chinese text (compare Illustration II with Illustration I).

If CDEB is a myth then Goody’s praying-it-in-aid (1956, pp.77-81) as evidence that the West did not have a monopoly on ‘rational’ accounting does not stand up. Instead we need to rely on his and others’ arguments, that we have summarised above, that the rationality of Western DEB is itself a myth. In this light, given the strength of that myth of DEB and its continuing regular reappearance in histories of bookkeeping and accounting (as in Gleeson-White and in P&P discussed above), it is understandable that CDEB still appeals as a ‘counter-myth’ to challenge that perceived Western rationality, and this has now given it wide currency in a series of articles in English on CDEB.<sup>46</sup>

## 7. Conclusions

Statements about the putative role of DEB have often proved to be the Achilles heel of otherwise learned and insightful expositions and explanations of historical developments in economic and business organization.<sup>47</sup> It has acquired a mythical status that goes beyond what the evidence will generally support. This myth continually recurs and fascination with DEB can still produce best-selling books (e.g. Gleeson-White, 2012). Clearly the myth must satisfy some deep need: perhaps the need to find a ‘rational’ way of believing that ‘action at a distance’ in an ever increasingly complex world of multiplying impersonal interactions is ‘under control’ (Macve, 2013). Moreover it is now constitutes the vested interest of the accounting profession’s intellectual capital, as well as of all those others who have been trained in it,<sup>48</sup> and has become embedded in so many aspects of the ‘rationality’ of different organizations’ procedures that is now ‘taken for granted’—which is one

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<sup>46</sup> These are reviewed in Hoskin & Macve, 2012.

<sup>47</sup> As another example, Chandler’s classic work on the ‘managerial revolution’ in the US (1977) describes the early 19<sup>th</sup> Century Springfield Armory in Massachusetts as having DEB. Examination of the archive has shown that, although it used bilateral layout (and with the opposing pages headed ‘Dr.’ and ‘Cr.’), it was employing traditional public sector ‘charge and discharge’ accounting (Hoskin & Macve, 1994).

<sup>48</sup> Compare the QWERTY keyboard (Macve, 2013).

of the hallmarks of a ‘rational institutional myth’ (e.g. Miller, 2008). But the strength of the myth of the historically transformative power of Western DEB has in turn engendered its counter-myths from those who want to claim precursors or competitors in other parts of the world—with the focus now being especially on the East and in particular on China.

Claims that Western DEB was in fact invented elsewhere and then imported into Italy are relatively easily dismissed from the available evidence (e.g. de Ste Croix, 1956; Macve, 2002). But the more subtle claim that *equivalents* to DEB were invented elsewhere are more difficult to assess, especially in the case of China where the sources have generally only been secondary and only available in Chinese and then merely copied in previous English-language treatments (e.g. Hoskin & Macve, 2012). On balance the primary evidence now emerging from Chinese archives (e.g. Yuan *et al.*, 2013) suggests that the supposed development of CDEB in the 16<sup>th</sup>/17<sup>th</sup> century is indeed also a myth: but a myth that now resonates with the increasing interest in both the East and the West in understanding how successful was the Chinese economy—where were the ‘springs of capitalism’—before the ‘great divergence’ came, first from being unable to compete with the Western powers’ dominance, sealed by the Industrial Revolution and reinforced by military intervention and the quasi-colonisation of the Treaty Ports, and then followed by China’s own retreat into state-socialist planning in the Mao era (Brandt *et al.*, 2012; cf P&P, 2012, 267-8).

A better historical understanding will come from identifying the counter-myth as unnecessary, once the myth underlying the veneration of Western DEB is better understood. Accountability, record-keeping, accounting and audit continue to be important in understanding the ‘rational’ evolution of economic and social organization everywhere: but they are a ‘rational institutionalised myth’ (Miller, 2008; Macve, 2013). The particular *form* of record-keeping that is Western DEB has commanded so much attention—especially now that it has become embedded in the ‘apparatus’<sup>49</sup> of the accounting profession, textbooks, management degrees and courses, along with its adoption in multiple spheres of activity and its appearance in mainstream history and in literature more widely, etc. (e.g. Macve & Yamey, 2013) where it has been taken up presumably because its mathematical precision lends an additional layer of apparent rationality to that accounting and auditing myth. So Datini (along with, presumably, the other contemporaneous founders of the new kind of Florentine partnerships) thought he needed it in 1383; and now everyone ‘needs’ it.

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<sup>49</sup> ‘Apparatus’ is the normal translation of Foucault’s term ‘*dispositif*’. ‘What I’m trying to pick out with this term is, firstly, a thoroughly heterogeneous ensemble consisting of discourses, institutions, architectural forms, regulatory decisions, laws, administrative measures, scientific statements, philosophical, moral and philanthropic propositions—in short, the said as much as the unsaid. Such are the elements of the apparatus. The apparatus itself is the system of relations that can be established between these elements’ (Foucault, 1977b).

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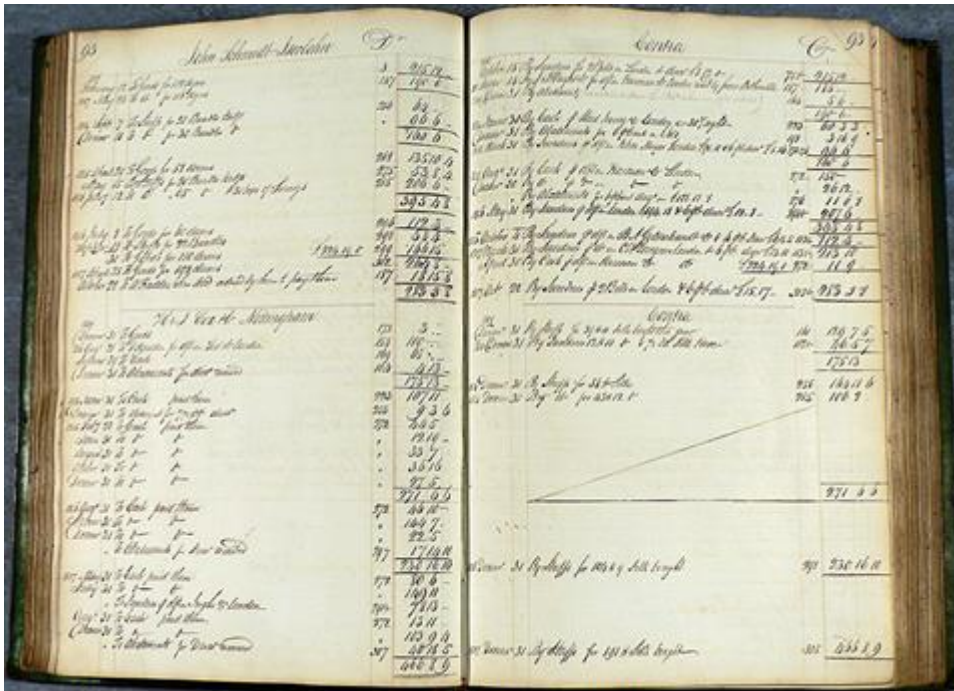
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**ILLUSTRATIONS:**

**Illustration I:** a 19<sup>th</sup> century ledger (1815-17) DEB ledger folio showing, in ‘bilateral’ format, a customer’s account (from whom cash is periodically received) and a supplier’s account (to whom cash is periodically paid), with cross-references to relevant page numbers of the journal/cash book/corresponding account, and with the ‘Dr.’ and ‘Cr.’ columns periodically added and balanced.



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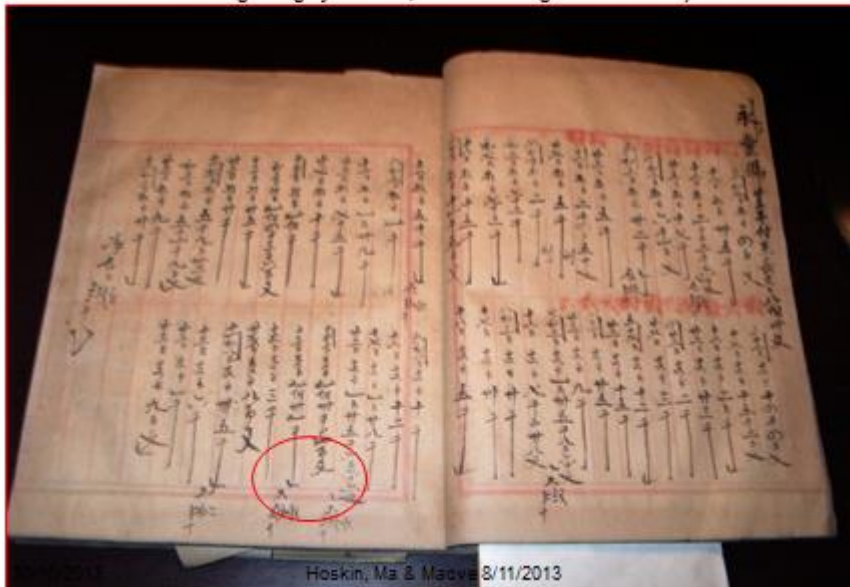
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**Illustration II:** Account book of Tǒng Tài Shēng showing customer's account (probably for loans: Yuan *et al.* 2013). [Some numbers written using *Sūzhōu mǎzì* [苏州码字] are ringed]

Carefully structured books with 'in' in top half and 'out' in bottom half, anti-fraud 'infill' strokes; red 'chops' for checking/posting; *Sūzhōu mǎzì* [苏州码字] numerals (a customer account for the main TTS store from Dàoguāng year 26, i.e. starting in 1846AD)



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Features of Tǒng Tài Shēng's books:

- Read top to bottom; right to left
- **NB** no cross referencing for 'postings'; no page numbers or numerical index to account pages; no 'place value' numbers so calculations / totalling etc. done on abacus.
- Copper coinage used as *numéraire* (converted from actual silver where needed)
- Have necessary 'functional' dualism for keeping customers' / suppliers' credit accounts in 'bivertical' form; but not clear how far periodic profit and net asset calculations 'integrated' as against 'extracted' using abacus.
- With 'abacus' some of the accounting (especially the 'working it out' of calculating and extracting totals) is *outside* the books...not the integrated 'closed system' of DEB.
- Compare again C19<sup>th</sup> DEB ledger (1815-17) (Illustration I).