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Micro foundations in the Great Divergence Debate: opening up the perspective

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Abstract

Prevailing approaches in historical studies have been dominated by a macro view and placed an overwhelming emphasis on the Industrial Revolution as a major discontinuity in Western development. On the contrary, recent research in accounting, management and business history has suggested a different direction. When opting for a micro level focus, crucial discontinuities in management and accounting in the West can be traced further back to the Renaissance period. This paper thus searches for ‘micro foundations’ in managing and accounting practices to address the ongoing debate on the East-West divergence. Despite the obvious problems with source availability, we outline a new research agenda for the debate.

Key words: Great Divergence Debate; Venice Arsenal; Accounting and Capitalism; China; Proto Industrial Settings; History of Bureaucracies

Introduction

This is a positioning paper tackling a long overlooked area of research: the micro foundation of the Great Divergence Debate. Our starting point is a critique of the Western-centric view in mainstream economic and social historiography. Generally speaking, global history is a broad intellectual movement which questions some of the basic views in historical traditions and searches for alternative explanations within a pluralist and more tolerant view of diversities and varieties in evolution. One episode of this intellectual movement is indeed the “Great Divergence Debate”, revisiting differences and similarities between East and West. For now, it suffices to refer to the main research question that this debate addresses: When, why and how the West overtook the East, despite centuries of Asian supremacy in technological inventions and production (paper, print, and powder, to name but a few)?

To date, this debate has evidenced a macro bias, focusing on macro phenomena, and considering economic and social issues at an aggregate level. To what extent the Great Divergence is linked to divergences at a micro level is rarely addressed, e.g. how practices in accounting and managing at the firm level shaped the distinctive growth and development trajectories in the two contexts. In this sense, there is a huge gap between macro level studies on the Great Divergence and micro level studies such as accounting and management.¹ “Explaining the East” would challenge management and accounting traditions by forcing us to face a completely different context and evolution. Just consider the different role of trust and “counter-role” in management control; or, more widely, possible patterns of modern management and accounting discourse; or again, how this investigation reopens the whole debate on the role of double entry bookkeeping (DEB) in the development of modern capitalism. Huge cultural differences will help address explicitly important elements that are largely unexplored when one focuses on homogeneous contexts. In turn, micro level investigations will help detect the Great Divergence more subtly, considering social and intellectual dynamics that are constitutive elements of practices and changes over time and at the grassroots level. Paraphrasing the well-known expression by Hopwood (1987: 207), “accounting becoming what it was not”, one could refer to accounting becoming what *it is not* in a different context. The investigation of the huge history of public/imperial administration in China – largely underrepresented at least in terms of English publications – could bring new insights to the debate.

To operationalize such analysis, this paper proposes a parallel investigation between the Venice Shipyard Arsenal at the turn of the 16th century and government workshops in China (during the Song, Ming or Qing periods, with difficulties that we will discuss later on). Such a parallel may sound odd to the reader,

¹ Also accounting and management mainstreams have been criticized for their Western bias, or Anglo-centrism to be more precise (see e.g. Zan, 1994, 2004; Zambon, 1995; Engwall, 1998; Carmona and Zan, 2002; Zambon and Zan, 2007), ignoring traditions and historiographies outside what is written in English. Even worse, Anglo-American management studies appear to have no interest in either history or the rest of the world (Kieser, 1994; Thomson, 2001; Zan 2005, 2015; van Fleet, 2008; Rowlinson and Hassard, 2011).

but it will appear less strange when taking into account the structure of trade in the pre-Renaissance period, which is very anti-intuitive in the present day (see Abu-Lughod, 1989). Moreover, such a comparison involves delicate methodological issues. In the Great Divergence Debate circle, the focus is on the national level (Edwards, 2013), yet it would be anachronistic to refer to “Italy” in a context of city-states. There is also an issue of levels of analyses: innovations tend to take place at the firm (or entity) level. Indeed, we are focusing on an individual organization (the Venice Arsenal), based on a detailed investigation in the dialogue between this entity and the governing bodies of the Venetian Republic. The context is very familiar to accounting historians, with the development and spread of the “Venetian method” across Europe.

The structure of the paper is as follows. The next section provides a reconstruction of the Great Divergence Debate. Section 3 briefly revisits the accounting history debate on early examples of modern management and accounting discourse, focusing on recent findings in proto-industrial settings such as the Venice Arsenal. Section 4 develops the research questions about whether the Renaissance roots of the Venice Arsenal shed light on the Great Divergence Debate. Section 5 discusses some major difficulties with a micro level research agenda in terms of archives in China. Concluding remarks follow.

A Short Review of the Great Divergence Debate

This debate began in 2000 with Kenneth Pomeranz’s seminal monograph with the same title. In essence, Pomeranz and his colleagues of the ‘California School’ argue that there existed two parallel growth patterns and trajectories in the world in the past millennium, within which not only East Asia (China) and Eastern Europe once shared a range of similarities, but also in which East Asia led the world in development. Pomeranz’s (2000) thesis challenges the *hitherto* mainstream Eurocentric view, which ranks Western Europe permanently on the top of the league table of growth and development in the world. With recognizable connections across the Old World (see Bentley, 1993; Bentley and Ziegler, 2000), the Great Divergence Debate has opened many perspectives in the understanding of the different evolutionary paths in the East and West.

[The topic] is as old as the social sciences... The most popular approach is still the one that builds on the legacy of Max Weber and his claim that the West underwent a uniquely intense process of rationalisation that resulted in the emergence of capitalist market economies, bureaucratic states and a disenchanted culture that was ideally suited to produce science, technology and a methodical way of living... In this line of thinking the economic ‘rise of the West’ is almost identified with ‘the rise of the market’, a thesis that mainstream economists as well as their increasingly popular ‘institutionalist’ colleagues, enthusiastically support.... Weberians focus on developments in Europe. They regard its history as structurally and fundamentally different from that of the rest of the world. To them, the Great Divergence is the culmination of a long process, not something fairly contingent that could have occurred anyplace. They regard what happens in ‘the rest’ as of no fundamental relevance to the main direction of modern Western history. (Vries, 2010: 732)

The recent development of the debate, however, started with the seminal work by Joseph Needham which has been dubbed “one of the major scholarly enterprises of the [20th] century” (Keightley, 1972: 367; see also Finlay, 2000). Needham’s gigantic research program aimed to reconstruct the contribution of China to technological developments of the world over centuries, something that had been overlooked previously.² The issue emerging from the inversion of this path is that, by importing technologies accumulated in the East for millennia, the West superseded the East and led economic and technological development of the world in the last centuries. One of the major elements of controversy surrounding this is the exact timing of this inversion. Comparing living standards in China’s lower Yangtze Delta and the wealthy part of Western Europe, Pomeranz argues that the two areas functioned very similarly until circa 1750, positioning the China-West dichotomy in developmental paths centuries later than has commonly been suggested.

² According to Joseph Needham, China did not need European knowledge in most areas and developed independently a cluster of technologies that allowed it to lead the world from c. 100 BCE to c. 1550 CE; see Needham (1954–2008).

Pomeranz's thesis triggered such upheaval in the discipline of history that scholars are now forced to choose between the old Eurocentric school and the new "California School". The former has a clear tint of European/Western triumphalism; the latter shows, from a very different angle of consumption and living standards, a universal path and pattern shared by both China and the West. What separated the two was largely the role of historical contingencies or simply one-off "strokes of luck" in explaining the eventual divergence. Indeed, in the past decade the main spin-off from the Great Divergence Debate has been living standards and real wages in global history (e.g. Allen, Bengtsson and Dribe, 2005). Divergence of proto-industrial and early modern examples are highlighted by Goldstone (2002). In our view, Pomeranz's (2000) work still bears the hallmark of macro approaches in historical research and all the consequent debate shows the same propensity.

There are already several reviews of the whole debate that provide detailed insights about the topic (e.g. Deng, 2000; Bryant, 2006; Vries, 2010; Broadberry, 2013). Rather than providing yet another literature review, we can offer some interesting observations on the impact of this debate within the community of Chinese historians. The Great Divergence debate has made inroads to China rather slowly and has been received with mixed reactions, which is somewhat surprising, considering the emphasis on "Chinese civilization" that often characterizes the debate on history and heritage in recent Chinese rhetoric. Since 1949, the fields of historical studies have been dominated by Marxian "historical materialism", which was undoubtedly modeled after Western Europe disguised as the universal truth. Despite the fact that Asia has a longer written history and larger population than Western Europe, Asia (including China) has been labeled as an "exception" (or "abnormal") as with what Marx calls the "Asiatic Mode of Production". So, by 2000, the main concern in Chinese economic history was why China was not another Western Europe (e.g. Wu, 2001; Wang, 2001; Wang and Liu, 2001; Liu, 2001), something that was shared by dogmatic Marxists as well as those who accepted a uni-linear growth path in the world (Hobson, 2004). In this context, the most talked about issues among Chinese historians were "feudalism", "capitalist sprouts" and "undue delay of capitalism" as if China differed from Medieval Western Europe and Tokugawa Japan only in its super-long infancy of capitalism.

Against this backdrop, many scholars in Mainland China, especially those of the older generation, find it hard to accept or accommodate the shock of the "California School" (e.g. Wu and Li, 2003; Li and Jiang, 2005; Ye, 2007; Fu, 2008; Fan, 2008; Cheng and Lan, 2009; Wu, 2009; Fang, 2010). They cannot understand the notion that the best ideology, technology and institutions came once from Asia (Hobson, 2004), and that China's indigenous institutions and economy were rational, efficient and could have continued indefinitely (e.g. Wong, 1997; Hobson, 2012). In this context, to agree with the California School could cause a political and ideological embarrassment. If China functioned so well as to match the West, there would be no need for changes and revolutions in the twentieth century (from Sun Yat-sen to Mao). As a result, the official Marxian version of Chinese history from the Qing Period (1644–1911) until 1949 has remained unchanged.

On China's mainland, there has nevertheless been an emerging undercurrent to join the bandwagon of the California School. For example, a large body of studies of China's landlords claimed that there was no excessive exploitation in the traditional economy of China (Gao, 2005). However, overall, attempts to follow up the new trend in Chinese studies of the West are patchy. The most common approach by far in mainland China seems to have been that of Maddison (1998) who had no stated social-political alignment in the debate other than sets of estimates.

Paradoxically, in China the Great Divergence has been seen as a Western debate. Watching disagreements between Western scholars, Chinese scholars stand suspiciously at the border. The most open-minded scholars of Chinese origin in the Great Divergence Debate have turned out to be those who left China for the West. The most prominent among them is probably Li Bozhong who specialized in economic growth and development in the lower Yangzi Delta from the Tang Period (618–907) onwards (Li, 1990, 1998, 2000, 2003).³ Li's view is that some regions such as Songjiang Prefecture in the delta were and remained advanced in East Asia technologically and institutionally. This made him a natural ally of the California School. He did physically join the school when he took a post at Caltech in the 2000s. Another influential player is James Lee who specializes in historical demography and runs a population research

³ Li's propensity towards agriculture is shared by Pomeranz (1993), whose early research was on China's northern hinterland where the strengths and weaknesses of the Chinese economy were most clear-cut.

center at the Hong Kong University of Science and Technology. Lee treats the issue by researching how a dense population was supported. The Great Divergence Debate has made his group increasingly more comparative across Eurasia (Tsuya, Feng, Alter and Lee, 2011). In offshore Taiwan and Hong Kong where the Marxian influence is traditionally weak, scholars of Chinese economic history have shifted their research attention to the Yuan-Ming-Qing dynasties (1279–1644) when China is believed to have been well ahead of West Europe and Japan (e.g. Liu, 2012; Edwards, 2013).

One important critique to the debate is that so far the California school has 'focused intently on developing quantitative measures of economic performance to test its argument, ...[being] confined to issues and time periods for which quantitative measurements might be feasible. ... As a result, little of this scholarship examines Chinese economic history before the eighteenth century' (von Glahn, 2016: 6).

To conclude, so far historical comparisons have mainly been conducted at the macro-level, i.e. macro regions (e.g. the Yangtze Delta and Western Europe), macro sectors (technology, services, industry, farming, and governance), and macro issues (growth, development, living standards). In addition, '[t]he narrow attention economic historians have focused on the market has obscured the impact of other institutions – most notably the state – in promoting economic development' (von Glahn, 2016: 8; for a similar critique see also Bryant, 2006). Studies with micro approaches have visibly fallen behind. In reality, however, it is very likely that the relatively separated evolution of civilizations in the West and in the East is not only a macro phenomenon, but could be understood as micro phenomena, including ways in which businesses were organized.

The Renaissance link of modern management and accounting: the Venice Arsenal

When comparing development in the East and West, scholars on both sides seem to share a basic assumption that the eighteenth century British Industrial Revolution and the nineteenth century American Managerial Revolution were the main discontinuities in economic and business history.⁴ Without intending to diminish the importance of the Industrial Revolution, things change when a micro perspective is employed. One aspect which characterizes recent developments in accounting history is tracing the emergence of meaningful forms of modern managerial control, even as far back as the sixteenth century. This redefines what constitutes "modernity"; that is to say, elements that are perceived as affecting only present day management and accounting practices (Zan, 2004a, 2015; see also Parker, 1981; Hopwood, 1987, 1992; Mephram, 1988; Fleischman and Parker, 1991; Edwards and Boyns, 1992; Bhimani, 1994; Scorgie, 1997; Zan, 1994, 2004b; Carnegie and Napier, 1996; Fleischman and Macve, 2002). The present study is located within this micro-level arena.

An interesting characteristic of this stream of research is rediscovering the role of state bureaucracies in the development of modern management and accounting discourse, and the development of capitalism itself. A particularly intriguing case is the Spanish Royal Tobacco Company (Carmona et al,

⁴ See for instance the following sentence, none of which will survive the Venice Arsenal's anomaly (emphasis added): 'The modern firm made its first historical appearance when the volume of trade reached a level at which managerial coordination *became more efficient* and profitable than coordination through the workings of the market' (Chandler 1977). And, 'Given the *small size of firms prior to mid-nineteenth century*, specialization would remain confined within the company circle. The business would be run by the proprietors, while the need for the thorough and meticulous internal organization, detailed statistics and *cost-calculation* methods, which were to become such a marked feature of the modern firm, *was not yet felt*' (Chandler, 1980). Also, '*Before the early nineteenth century*, virtually all exchange transactions occurred between an owner-entrepreneur and individuals who were not a part of the organization: transactions occurred in the market and measures of success were easily obtained. As a *consequence of the Industrial Revolution* and the ability to achieve gain through *economies of scale*, it became efficient for ... owners to commit significant sums of capital to their production processes. ... The long term viability and success of these 'managed' organizations revealed the gains that could be earned by managing a hierarchical organization. ... The emergence *more than 150 years ago* of such organizations created a *new demand for accounting information*. ... (A) demand arose for measures to determine the 'price' of output from internal operations, ... owners devised measures to summarize the efficiency by which labor and materials were converted to finished products, measures that also served to *motivate and evaluate the managers*' (Johnson and Kaplan, 1987: 6-7).

1997), where a rather sophisticated discourse about managing and management control existed in a context far from that normally assumed to be the driving force of similar solutions: a monopoly run by the state, before the Industrial Revolution. Another intriguing case is indeed the development of management and accounting discourse in shipbuilding at the Venice Arsenal in the sixteenth century, which we use here as a “benchmark”, for its potential in falsifying mainstream views in accounting, business and economic history, and the identification of major discontinuities (Zan, 2004a).

Employing 2,000-3,000 workers in shipbuilding, the Venice Arsenal was one of the largest factories of the period in Europe, known as the “workshop of wonders”. Recent archival research (Zan, 2004a; Zambon and Zan, 2007) led to the discovery of a periodic set of reports that the Arsenal management had to prepare for the Senate of the Republic since 1580, with particular reference to the achievement of output targets, set by the Senate at 100 light and 12 great galleys.⁵ Analysing these reports in terms of discursive regularities and change, the existence of a sophisticated conversation over the organization of the Arsenal is evident. That is, an on-going discussion on managing issues relating to four main issues: the degree of achievement of the output level; the sourcing of materials; labour force, in terms of availability and discipline; and the conditions under which manufacturing processes were undertaken in terms of both production levels and organization.

A document prepared in 1586 by Baldisserra Drachio is particularly relevant, representing a systematic proposal to reorganize all activity inside the Arsenal, starting from the call for a “common timber” for coordinating the design and construction processes of galleys, then moving to issues of layout, logistics, and labour organization. Serious accounting implications soon emerged in a couple of innovative documents in 1593 and 1594 by Bartolomeo Tadini, the chief accountant of the Arsenal. Tadini was concerned with one of the contradictions in the Arsenal in terms of workforce. According to the rules of the guilds, workers were “enrolled” at the Arsenal, which provided them with the right to come to work, without imposing upon them the duty to actually do so. Whether they were showing up or not, it was largely out of the control of the Arsenal. For these purposes Tadini (1593, 1594) suggested both carrots and sticks. The latter implied control on the workers, in order to reduce material appropriation, and increase the presence of the workers on site. The former involved some suggestions to design what we nowadays will call “incentive mechanisms” to increase the presence and effectiveness of workers – about +10% of the pay (Zan, 2004).

In short, the Venice Arsenal at the turn of the 16th century appeared to be a hybrid organization that internalized labour relationships but was unable to impose control and discipline over workers inside the Arsenal, with a gap between enrolled and active workers which was a major issue for decades. Upon investigating discursive regularities and changes inside the stream of documents, the development of new metrics emerges. The period of 1580-1633 can be viewed as one in which important notions were constructed within a *discorso sul maneggio*, an expression explicitly used by Drachio in 1586.⁶ The notion of work in progress expressed in man-months and the notion of cost itself were nonexistent in the early documents of this period. These “emerged” toward its end with a complex discussion about the goal of the 100 galleys and its feasibility. A logic of resource allocation of alternative ways of organizing and the respective budget were developed (see for instance Drachio, 1586, and Tadini, 1593, 1594, about the design of workers’ gangs).

The construction of a new body of knowledge was made, thanks to the process of recording and reporting. This was something much richer, more profound and more sophisticated than accounting history textbooks tend to describe for this period as a mere diffusion of bookkeeping (e.g. Melis, 1950), where costing and accounting for decision making is seen to have emerged two or three centuries later.⁷

⁵ The streams of documents on “management discourse” at the Venice Arsenal were in a sense already related to West-East relations though the Middle East (see Vries, 2002 on the role of the states). After the victory over the Ottomans at Lepanto in 1571 by Venetians, just 18 months later the Ottomans showed up with a new and more powerful fleet (Lane, 1973). The Venice Senate thus made a decision to produce a reserve of 100 gales plus 12 great galleys for war, though this request was hard to achieve. As a result, to urge and focus the achievement of the reserve, the Senate was requesting a stream of reports from the arsenal officers. The new routine of reporting was in itself driving an important learning process.

⁶ As it is now accepted, *maneggiare* – literally handling – is the verb from which the term management comes from.

⁷ See again the quotation of Johnson and Kaplan in a previous footnote. For sure, the case of Venice itself is quite unusual in its own period: what matters it is a peculiar combination of political/military pressure (the scare of the

If our understanding is correct, there are several elements in this proto-industrial setting that are of interest for a discussion on the East-West divergence. First of all, relevant innovations in management and accounting – here intended as bodies of knowledge, not necessarily already institutionalized as disciplines – can be found *before, elsewhere, for different reasons* compared to what is normally assumed in business history, overcoming some of the limits of mainstream historiography: a view that has been characterized by Anglo-centrism, firm-centrism and economic reductionism (Zan, 2004b, 2005, 2015). The social construction of sophisticated discourse about managing and accounting (in Europe) can be found: a) at the turn of the sixteenth century rather than in industrial/managerial revolutions; b) in some European state bureaucracies more than in private business contexts in the UK and later the US; and c) in contexts where economies of scale are not relevant, and where an issue of cognitive dominance of organizational complexity is crucial.

Interestingly enough, this presents no *direct* concerns with the notion of profit, for the Arsenal was not even a firm in itself: it simply received appropriations from the Republic and faced expenditures without “selling” anything – simply transferring the output and the end of the production process or when needed. In this sense, the whole debate on the role of DEB seems to be misplaced, biased toward the notions of firms and profits, not taking into account that double entry was extensively used inside the state bureaucracy.⁸ This has important implications in terms of a new discourse about managing and accounting. More explicitly, what drives the writers of some important documents on the Arsenal is the substantive notion of the “common good” of the Republic as a whole (Drachio 1586).

Moreover, the cultural environment in which the Arsenal documents were produced was unique. One could argue that the *discorso del maneggio* and the development of accounting discourse were embedded in the Renaissance period: well beyond the time period is normally assumed within the “Sombart/Yamey controversy” over the role of double entry in the development of capitalism; and despite the lack of consciousness about the history of management by scholars themselves.⁹

It is not merely double entry technique that mattered in accounting discourse at Venice. Galileo himself was involved in the Arsenal in this very period, just a few years later than the Drachio and Tadini investigations, and he explicitly recorded how he gained knowledge from the Arsenal’s experts in developing his new science of material resistance (their “inherited experience” and “observations”).¹⁰ Indeed, as Valleriani (2000: 15, emphasis added) puts it, “[t]he representatives of the practical knowledge of

Ottomans) within a complex process of permanent production. The associate decision of the 100 galley reserves made it hard to deal with day to day operations, giving rise to the whole evolution of reports. Other shipyards were in completely different situations, both military and administratively. Genoa only had a reserve of 14 galleys, which were bought from private shipyards. In Barcelona, ships were confiscated from the private sector for war purpose, paying back a rent at the end, considering the degree of use of the ships. The Ottomans were running several shipyards as internal military bodies.

⁸ Interesting enough, there are many criticisms against the Sombart thesis, under different aspects, but none of these criticizes the direct and exclusive reference to the private firm of the analysis. Take as an example the following quotation from Yamey, focusing on ‘the simple question provoked by the thesis, namely, the contribution of double-entry accounting to the solution of problems in business organisation and administration.’ At this stage, one could expect that this applies to all organizations and administrations, including public bureaucracies: but then he continues in a completely different direction, with ‘reference to business accounting records from the sixteenth to the early nineteenth centuries, and more particularly to English records’ (Yamey, 1949: 119). Two other dense statements by Yamey (1949: 119) precede this sentence: ‘I shall try to show that, in the period covered in this study, this contribution not only was small, but also that it was not made by those features of the system or in solving those business problems particularly emphasised by Sombart. I also suggest, incidentally, that, in the context of the solution of business problems, double-entry accounting was not greatly superior to less elaborate methods of accounting.’ While our research on the Venice Arsenal will totally disconfirm the first part of the first sentence (contributions were huge indeed), one could agree on the second part of it (not the contributions expected by Sombart) as a sort of understatement. We leave the second sentence sharing a non-fetishist understanding of DEB.

⁹ Pfeffer, 2009, speaks in terms of the “60 years of management”.

¹⁰ “The constant activity which you Venetians display in your famous Arsenal suggests to the studious mind a large field for investigation, especially that part of the work which involves mechanics; for in this department all types of instruments and machines are constantly being constructed by many artisans, among whom there must be some who, partly by inherited experience and partly by their own observations, have become highly expert and clever in explanation.” (Galileo, 1638)

the Arsenal ... finally offered Galileo *centuries of experience*, constituted of not only qualitative statements, but even quantitative indications, which Galileo integrated into his new cantilever model'. 'Galileo ... found among the masters of the Arsenal the knowledge he needed to determine the ratio between the dimension and weight of a solid body that defines its resistance to fracture' (Valleriani, 2010: 147).

Finally, there is little space in this context for an explanation of managerial and accounting knowledge and practices that were so crucial for current and future economic developments which echoes the "ethic of capitalism" coined by Weber (Fischhoff, 1944).¹¹

The Renaissance roots of management and accounting discourse and the Great Divergence in Eurasian history: some contextual elements

These considerations challenge mainstream economic/business/accounting historiographies for their focus on developments in the West. In a sense, the "Venice anomaly" is part of the internal controversies in economic developments within the West.¹² What happens if we apply the "Venice anomaly" to the Great Divergence Debate in economic history in general and focus on the micro economy? Can these differences at the micro level help explain the timing and patterns of the divergence? Did the West become "more advanced" earlier than normally assumed by mainstream economic history? Or is it simply a question of a bias in perspective due to the lack of micro research into the East, and particularly in China? In short, would the Venice case address issues that are ontological or perspectival in nature?

A similar micro view would also be beneficial in understanding China, given that China was once a maritime power and production power in manufacturing ships and industrial goods, which were once second to none in the world: the Ming Armada sailing across the Indian Ocean with silk textiles, wall-papers, and porcelain for the export markets (Deng, 1997, 1999a). What is certain is that similar archival research is not currently available on ancient Chinese organizations, i.e. extensive reading of archival documents reporting discussions and questions in respect of running a single entity.¹³

Before investigating possible explanations for this lack of archive-based research and in trying to identify suggestions for a possible research agenda, some general elements of the different institutional context that historically characterized the Chinese experience at the micro level need to be taken into account. Here, studies of family structures, household production, consumption, property ownership, and inheritance in China shed some light on micro level uniqueness (Deng, 1999b; Lee and Campbell, 1997; Lee and Wang, 1999) and aid our understanding of similarities and differences in growth trajectories and path dependencies between the East and West.

1. How different was China in micro-business practices? Firstly, Chinese firms were predominantly family ones which were owned and managed within a family/clan. Secondly, genuine joint stock companies emerged very late in China (in the late 19th century). State-run workshops did exist but their number and output were very limited (no more than 10% of China's total GDP) in an overwhelmingly private economy. Only when joint stock companies arose did these two sectors entwine for the first time. Such characteristics almost certainly decided how micro management was conducted in China. The separation between ownership and person was absent, and limited liability was underdeveloped. This made accountability less stringent in China: it proved unnecessary to clearly define the boundaries of the business entity, to give reports, and so on. As family/clan firms in China were built on close personal relationships, a high degree of tacitness removed the need for detailed and transparent accounting (see Tong, 2009; Zheng, 2010). Such striking micro-level uniqueness deserves our attention.

¹¹ Interestingly enough, even the Royal Tobacco Factory innovations introduced under Carlos III have nothing to do with the thesis, for this modernization was led by a Catholic king, in a Catholic country, coming from a previous Catholic kingdom etc.

¹² Usually the term anomaly is used with reference to a specific explanation or theory; here the term is used in a broader sense, contrasting the archival findings of recent research on the management of the Venice Arsenal at the turn of the sixteenth century, compared to that which is normally assumed in accounting history.

¹³ 'It is exceedingly difficult to construct reliable quantitative indices for the economic history of premodern China, given the unevenness and paucity of relevant statistics and quantifiable records on prices, wages, costs, incomes, resources, output, etc. for any period much earlier than the Republican era' Bryant, 2006: 421). On the issue of sources see also von Glahn (2016).

In comparison, in the Venice case there existed the separation between the “principal” (the Senate of the Republic) and the “agent” (the Arsenal), each with its own identity.

2. Our view is that differences in other business institutions, such as guilds, may serve as proxies for micro management. Particularly, the different nature of guilds – sort of state administrative units in China (Aiken and Lu 1993a, 1993b; Fu 1971; Moll-Murata, 2006) vs. free economic entities in Europe (e.g. Epstein, 1998; Epstein and Prak, 2008; De La Croix, Doepke and Mokyr, 2016) – is likely to have played a major role in a micro-divergence process. At a general level, comparing guilds as they were in China as opposed to Europe, the more proactive nature of the latter in the long run seems to corroborate a revisionist position (Epstein and Prak, 2008): indeed the juxtaposition of guilds and innovation was not an oxymoron (MacLeod, 2008). Guilds in the West seem to have played a crucial role in the evolution of economic relationships, while in China, guilds were often the extension of the state apparatus *per se* and whose autonomy was rare (see Kao, 1965; Moll-Murata, 2008).

The modernity of the Arsenal case at the turn of the sixteenth century consisted already in the overtaking of the workshop or guild organization, though the process took time, and the Arsenal was a sort of hybrid organization for a while (Zan, 2004).

In Ming-Qing China, guilds were politically and ideologically overshadowed by the state due to the well-entrenched Confucian bias towards state management (or statecraft), Confucian mindset of social stratification (with the four layers made of the literati, the peasantry, artisans and merchants), and Confucian mistrust of artisans and merchants (Chen, 1911). As a result, guilds were *de facto* official organs to monitor and control artisans and merchants. In this context, it would be in the best interest of the artisans and merchants not to keep detailed accounting records, in order to avoid political and business troubles with the state. If accounting mattered in the past, the possible implication could be that without an accurate accounting technique, micro-level business efficiency suffered, hence accounting formed a micro-root of the Great Divergence.

3. “Writing”, within the administrative decision-making process, is a crucial element. For instance, Chinese businessmen seem to have relatively lower incentives to learn how to read and write, although they had to be numerate in order to undertake business. This lack of literacy was largely the result of the Confucian class stratification. Usually merchants and their sons were not allowed to become officials or join the literati with full membership, even if they were well educated and active in donating to educational institutes (Zhang, Ma and Zhu, 2000; Tang, 2003). On the other hand, well-educated writers may not have been involved in business as professional merchants. In this regard, there might have been a mismatch between a reasonable level of literacy and poor provision of business records in traditional China.

It would be interesting to compare the situation in the West at a more general level. Surely, compared with Venice and its environment, this is one of the huge differences. Writing seems to be a “normal” activity for many of the individuals involved in the Arsenal activity, either professionals or politically appointed figures. As Valleriani (2010) reveals, Galileo himself was able to interact with some people inside the Arsenal about issues addressed by Aristotle on the Art of Navigation; and many people were “writing” in the context of the reports on the Arsenal which are found in the Venice archives, including professionals and technicians.

Indeed, the issue of writing constitutes one of the elements of interest of the Arsenal anomaly in two aspects (Zan, 2004a). First, this is one of the earliest documentations in the West – so far at least – directly and thoroughly addressing issues of management in textual forms to be shared by a community of experts and “writers.” Second, there is a long tradition of extensive writings associated with the Venetian government – the State Archive in Venice consists of 62 km of shelves. Regarding the particular case of the Arsenal for the period in question, there is an additional dimension related to writing about management, that is, the military concerns of the supply of 100 galleys. In a sense, this early example of text about management is almost a byproduct of other needs that dictated the managerial discourse.

Little is known about Chinese managers and how they worked. The reasonable assumption here is that if someone with a merchant background received good education and consequently obtained Imperial Degrees he then joined the gentry class. This was common at least in the nineteenth

century (see for instance Moll-Murata, 2008). With this social mobility-cum-self-selection, the majority of merchants who stayed on were almost certainly less educated. If so, what did a low quality human capital do to micro-level management and its efficiency in China?

4. Numeracy with/without writing. Counting in itself, and technologies of counting have an important impact on the ways of calculating and managerial practices. Why one civilization decided to write and the other did not is one of the most fascinating issues (see for instance the extent of abacus diffusion even today). This can work as a hypothesis. However, with money, the group that cannot write should be able to hire someone who can. Indeed, ordinary members of the Chinese gentry were available for hire to perform a range of tasks (Chang, 1955, 1962). The question then becomes why and how Chinese merchants did not hire them for record-keeping.
5. The role of the state and its administration. Despite the ideology of “laissez-faire”, the role of the state in economic development has been regarded as one of the most important factors that enabled capital accumulation for economic take-off (on the military underpinnings of the UK Industrial Revolution see O’Brien 1999). In contrast, a centralized state in China after the Song dynasty and the invasion of the Mongols and the Manchu was much weaker: a very small bureaucratic apparatus considering the size of the country, with minor impacts on the economic life inside the country (Deng G., 1999a; Deng K., 2011).¹⁴ Interestingly, this continued until the collapse of the Empire. Although characterized as more a commercial than a military power, the governing bodies of the Republic were vast in Venice, and so was the state (Zan, 2004; Zan, Rossi and Zambon, 2006).

Despite the fact that we are unable to provide answers to many of these questions, the issues discussed so far signal serious differences at the “ontological level”: it is likely that businesses were run in significantly different ways in the two contexts. Yet, the lack of historical data about sophisticated management practices could represent a perspectival issue as well. This will not be very different from what happened to the debate on the West, where a huge literature exists in mainstream historiography, yet lacking the specific lenses of organizing and managing as in the case of Venice and the “Venice anomaly”.

The lack of data/evidence is not in itself sufficient to argue that management practices did not show elements of modernity toward a construction of a body of knowledge and management discourses of some kind, whether similar to or different from that which occurred in Venice at the turn of the 16th century. Given the presence of complex activities in China for such a long period ahead of the West across many sectors, as acknowledged by the whole debate on Chinese civilization, it would be beneficial to discover documents that in one way or another represent discussions and controversies about decisions concerning the running of complex proto-industrial businesses.

Adopting a management and accounting history perspective in such research, we are not necessarily interested in actual innovations, revolutionary discontinuities in technology, production or distribution aspects. Rather, following March’s (1978) definition of management as addressing attention – a more sophisticated perspective than defining management as “getting things done” – we are searching for reconstructing episodes, anecdotes, local contexts, all in a micro perspective. Whatever the outcome, for instance in terms of innovations in production, we are interested in the throughput along the process and in the construction of a discourse about ways of organizing things. To achieve that, one needs to find a complex set of documents related to micro-level production activities. This is where our research agenda becomes particularly challenging.

Potential management discourse in economic history of China: ideas for a research agenda

Following the previous discussion, one in principle would ideally like to structure a comparison between Venice and Song China (960-1279), the first documented intensive growth in Eurasia, curiously referred to

¹⁴“During the late imperial era, China’s rulers embraced the neo-Confucian ideological abhorrence (not unlike that of neoclassical economics) to state interference in the private economy’ (von Glahn, 2016: 10).

as the equivalent of the European Renaissance.¹⁵ During the “Song Economic Revolution”, China’s non-farming sectors boomed and their efficiencies improved (Deng, 2015; Hartwell, 1962, 1966; Wagner, 2001). It is largely unknown what sort of micro-level business management made the Song Economic Revolution possible: again, the whole debate seems to share a market driven focus¹⁶, ignoring the institutional, organizational and knowledge base of this development.¹⁷ Unfortunately, the Song growth was ended by the brutal Mongol invasion and conquest, and the following periods did not achieve the degree of development of the Song, especially in relative terms, towards the rest of the world (an ‘involutionary pattern’, as referred by Huang, quoted by von Glahn, 2016: 4). What particularly matters here is that the Song archives did not survive.

In our comparison, a serious informational asymmetry emerges. We have abundant access to micro-level management primary sources for Venice, in its unique situation of high military pressures and internalized permanent production, but not for China. There is also an information asymmetry regarding China: we have some information of China’s macro-level growth and development, but little about how economic agents behaved in an industrial firm, particularly if related to the state bureaucracy.

Undoubtedly, China had official archives. All the dynastic histories serve as the hard evidence (Anon, 1986). However, it was standard practice that once the official history of a demised dynasty was compiled by historians of its succession dynasty, the official archives of that demised dynasty were to be destroyed, apart from “veritable records of emperors” (*shilu*) for political and ideological purposes. The only exception is the Qing Dynasty (1644-1911) because its official history has yet to be published. Yet, through triangulation with existing secondary sources it could still be possible to find some indirect evidence that complex situations, probably not any less challenging than those occurring in Venice in the sixteenth century, existed in China’s firms, too.¹⁸ This suggests that some forms of sophisticated knowledge to deal with managerial complexity must/could have been in place. In terms of internal organization, recording resource allocation and measuring outcomes must have been imperative. At least some empirical evidence exists, which would be worth to draw on.

Organizing people

Referring to Chinese shipyards, according to Yang (1989), the internal division of labour of the Longjiang and the Qingjiang shipyards was sophisticated. During the Ming-Qing Period (1368–1911) these two government-run shipyards developed matrixes for the internal division of labour to address the issue of co-ordination and optimization in production.¹⁹ In Longjiang the emphasis was on vertical synchronization,

¹⁵ ‘Miyazaki Ichisada, in his 1950 book *East Asia’s Modern Age*, linked the Tang-Song transition to the European Renaissance, both of which exhibited the secularization of society and culture and the rebirth of national philosophy on one hand, and the rise of cities, commerce, and the free disposition of property and labor on the other, that have become hallmarks of the modern world’ (von Glahn, 2016: 2)

¹⁶ ‘The increased output at many eleventh-century Chinese enterprises was stimulated by growing demands for ferrous metal products, which made it profitable for ironmasters to increase the scale of their operations and to adopt technological innovations which lowered unit costs’ (Hartwell, 1966: 33).

¹⁷ The Western literature ignores the developments of accounting in China; in turn, unfortunately not that much of Chinese accounting history or research in general is available in English (for a couple of useful reconstructions of debates see Ji, 2000, and Chen and Chan, 2009). According to Aiken and Lu (1993: 163), at the time of Zhou dynasty, ‘accounting practice became more advanced than elsewhere in the world’; on the same line see also Fu (1971). Indeed, accounting during the Tang and Song dynasties is said to have been quite sophisticated (Fu, 2008; Aiken and Lu, 1993a, 1993b). However, the few papers available in English tend to be rather abstract, without entering in details in the functioning of the accounting system. In any case, the contents of reports are rarely discussed in depth (see for instance the references to important reports during the Tang and Song period by Aiken and Lu, 1993a, which would be very beneficial to investigate in depth, sharing the analysis with the international community).

¹⁸ Wagner’s (2001: 177) research strategy is interesting here and is also relevant to our call for a research on the micro-foundations of the Great Divergence Debate: ‘There is no source which gives an overall description of the administration of the iron industry in the Song period, but in the following a number of anecdotal sources will be considered which give glimpses of the industry as it could be seen at the local level’.

¹⁹ Unfortunately, the time reference – as it is common in the Chinese historical debate – generally refers to the Ming-Qing period, while for our research question, understanding the situation at the beginning or at the end of each of the two dynasties would be crucial. We still need better information.

within a divisional structure to organize one hundred artisans in each of them (Rudder and Oar; Cable and Iron; Hull and Deck; Mast and Sail division). In Qingjiang it was rather on the horizontal balance amongst eight departments (Weaving; Bamboo-Processing; Cable; Hull; Blacksmith; Sail; Putty), although the number of workers is unknown. A shipyard would employ several hundred artisans, divided into either four or eight divisions. In the four-division model, artisans belonged to eight departments of carpenters, blacksmiths, coppersmith, cable-markers, weavers, sewers, lacquers, and decorators and were expected to move from one division to another (A to D) to perform various tasks in order to build different parts of the ship. In the eight-division model, workers performed fewer tasks but specialized in making particular parts of the ship. One could speculate whether a Chinese manager would choose the first model if he wanted to produce many ships quickly because his workforce was fluid or the second model if he wanted ships to be of a high quality because his workforce had specialized skills. Discussion and debate about managerial choices must have been a prerequisite of this differentiated approach to organization.

This reflects a change from the previous, more revolutionary period.

“Ferrous-mining and metallurgical activity in eastern Shantung was carried on by local peasants, who were apparently organized into groups that resembled the so-called *Arbeitsgenossenschaften*, or laborers’ associations....[T]he decisive feature of these associations was discontinuity. Bands of workers came together for only a few days or weeks each year for the specific purpose of hunting, fishing, or some other joint enterprise” (Hartwell, 1966: 41). “In eleventh-century China, similarly structured peasant-operated mines and foundries were the normal type of enterprise in eastern Shantung, and this organization characterized most establishments throughout the empire” (Hartwell, 1966: 42).

Similarly, the institutional and social innovation developed in Venice was the overcoming of the medieval form of organization, toward a permanent production entity (Zan, 2004).

Counting production flows

The Chinese management approach also suggests knowledge of input and output control. Different ship types and their production had to be identified and monitored. Table 1 hints at micro-level counting/tracking mechanisms in Chinese firms. For example, the Chinese manager required knowledge of his suppliers in order to source iron components; to construct the hull and tung oil; or lime and fiber from hemp, jute, or ramie for caulking. He needed to know in great micro-level detail where to obtain different types of timber and secure the supply in order to achieve his output.

Table 1 about here

From an organizational point of view, the practice of measuring outputs seems to be rather well developed, suggesting that the Chinese handling of these issues of production management can be traced back to the Northern Song Period. Moreover, the scale and scope were substantive, with thousands of ships built per year (see Table 2).

Table 2 about here

There were similar detailed records as shown by historians of that time (Li in 1370; Xu in 1502). Unless the Chinese managers had a strong sense of production control and management, such calculations were both unnecessary and not possible. It is true that these are merely “physical” metrics, without monetary values. However, the detail seems to be more developed than the Venice reports, at least until Molin in 1633 (Zambon and Zan, 2007).

Other data on the production process

In terms of causal links between ship sizes and ranges of voyages, conceptually more geographic discoveries led to more and larger ships. If one takes the passenger-ship ratio as a proxy for the ship size and hence quality of ship design and shipbuilding, noticeable progress was made between 1284 and 1412.

This progress in ship design and shipbuilding coincided with the Ming multiple voyages to the Indian Ocean. Table 3 indicates expansion in the geographic scope of China's sea-going activities from circa 893 AD to 1432. Before the Ming Period (1368-1644) Chinese fleets were based in coastal China. During the Ming, they began to have their bases in South Asia (Calicut) and Southeast Asia (Sumatra). Routine ship maintenance was very likely to have been undertaken, outside China. This required management over a long distance.

Table 3 about here

Table 4 about here

The point is that along all the changes and achievements in ship design, shipbuilding and sailing abroad there must have been considerable changes and improvements in Chinese management, regarding (1) how to better train and organize the workforce, and (2) how to better allocate and manage its capital, technology and material. Otherwise, the new growth and development in sailing would not be possible; and China's maritime ability would have stalled at the Tang level (Morse, 1926–9; Gordon, 1984a, 1984b; Howard and Ayers, 1981; Mudge, 1986).

The Chinese State bureaucracy: material vs monetary system

In searching and comparing accounting practices in Western Europe and China, it is vital to understand the general management style in the Chinese bureaucracy. What stands out most is the very long-lasting method of taxation through collection in kind (typically textiles, grain, animal fodder, and *corvée* services). This approach began in the Qin dynasty (221–207 BC), the first dynasty of Imperial China, and continued until the later Qing dynasty (1644–1911), even during the alleged centuries of influx of foreign silver to facilitate tax reform during circa 1565–1815 (see Liang, 1980). So, a *material* balance was of paramount importance in the government of finance, despite the fact that money was invented and used by the Chinese many centuries before the formation of the empire (see Liang, 1980). Such a non-monetary approach in government finance was deeply rooted in China's state policy of physiocracy, where farming and food formed the backbone of the economy (see Will, 1990; Will and Wong, 2001; Deng G., 1999b). In practice, huge quantities of food and textiles were collected as government taxes, and then distributed as government payments (including salaries for officials, wages for artisans, living allowance for soldiers, and relief hand-outs to famine victims). The clear advantage of this approach was that the basic needs and income of the state employees were guaranteed, without the shocks and price fluctuations of the market. In other words, the revenues of the state were automatically inflation-indexed. If so, prices were less useful.

The long history of taxes in kind reveals the nature of barter trade in China and how the imperial state and its command economy handled such a trade.²⁰ Moreover, institutionally speaking, China's private landholding property rights (in either freehold or leasehold) and consequent family farms resulted in large numbers of self-sufficient households that produced their own basic food and fabric to making a living. The monetized economy remained primarily an urban phenomenon, which never overtook China's national economy as a whole.²¹ When it came to the micro-level, workers were routinely paid in food and shelter, with a cash payment being optional. So, a worker's wage usually had two components: wage goods and wage cash. The share of "wage goods" was always *higher* than the cash payment. The following data shows the practice during the Ming-Qing Period (Li, Wei and Jing, 1983). Yet, the Ming-Qing Period is commonly regarded as the highest stage of monetization in the history of the empire (Table 5).

Table 5

²⁰ If China had operated an advanced monetary economy and an integrated domestic market, it would have been much easier to tax the public in cash. Of course, the advantage with taxes in kind was government revenues free from inflation and regional price differentiations.

²¹ An optimistic estimate of the monetary proportion of China's total Great Divergence during the late Qing is about half. If true, the use of money was optional especially in the primary sector (Deng, 2003).

In the case of 7,055 workers in the three state-run silk textile factories in the Lower Yangzi Delta (as of 1745), Jiangning (Shanghai), Suzhou and Hangzhou, the same pattern existed. The government paid annually a total of 30,877 *shi* of white rice or unhusked rice (one *shi* white rice = ± 75 kg) as wages to worker in three factories (see Peng, 1963). As a result, a material balance sheet of food and shelter was used in these factories (Table 6).

Table 6

Such an approach seems to have had a profound influence on China's accounting practice: instead of counting monetary value or prices of inputs and outputs, the government and firms in China were likely to count and monitor material inputs and product outputs.²² Later, we come across such a practice in China's government-run shipyards, providing the foundation of how government shipyards in China were managed and monitored: instead of their monetary values, material inputs (timber, nails, tools and so forth) and outputs (ships) were counted. Furthermore, because with the material balance approach all items were inflation-indexed, prices became optional; and because government-run businesses were not profit seeking, prices were infrequently an issue. Occasionally, officials did record prices as one-off records, however their intention remains unclear. In which ways materials quantities were translated into values for accounting purposes is still unclear. Curiously enough, this problem has been overlooked in Chinese accounting history, despite the implications for accounting practices and the functioning of accounting system in the economy. The preconditions for Venice Arsenal – and the learning itself linked to the accounting processes – were not present in the Chinese state bureaucracies, which deeply affected accounting evolution in the two contexts. This represents an important issue in the research agenda for international accounting history emerging from our paper.²³

A final comment relates back to the issue of archive-keeping in pre-modern China (prior to 1644). In addition to our prior points in terms of destruction of archives and the material balance approach, even if all the dynastic archives had been preserved, there would have been a very good chance that there was no archive devoted to monetary accounting. This is supported by the fact that although the Qing state kept records of food prices on a regular basis (e.g. Kishimoto, 1997; Wang, 2013), a material balance was the dominant one in government taxation and granary management (Liang, 1980; Will 1990; Will and Wong, 2001; Liu, 2015). As a result, as most practitioners in the field of historical national income can testify, the vast majority of figures for pre-modern China are yielded from estimation or mere "guestimation" (Maddison, 2007; Liu, 2015).

Concluding remarks

A lack of reference to micro issues in the whole debate on the Great Divergence certainly appears to be a problem of perspective. We do not have evidence so far to argue whether even at the ontological level that relevant differences between the East and the West existed. The lack of interest in managing/organizing/accounting discourse seems to relate to a lack of attitude by historians, no matter what differences may have existed historically

Our current analysis is still unable – for lack of primary sources – to open the "black box" of the internal organization of permanent production in the Chinese context. In conclusion, we are not able to

²² Fu (1971: 41) himself recognizes that 'although money had existed since the Shang dynasty (1766 B.C.-1122 B.C.), funds consisted of both money and produce'. The main exception was China's traditional money dealers (*piaohao*) who ran monetized accounts. This was not because they served a highly monetized economy but because they were specialized with handling money in a small sub-sector of the economy in China.

²³ Of course, in the profit-aiming private sector, the approach needed to be different. For example, Pomeranz (1997) presented a sizeable food-processing company Yutang (400 workers) in Jining City (150,000 residents in 1900), along the Grand Canal in late Qing throughout the Republican periods. Granted, the firm made continuous profit over time. However, even in the case of private business there is no evidence that it kept detailed accounts similar to those by the Venetians, not to mention that fact that the period during which the Yutang operated was already early modern China. Foreign influence must have been already present in society. In other words, the company was likely to be an early modern one instead of being genuinely traditional. Indeed, Pomeranz uses the adjective 'traditional' with reservation.

analytically investigate the specific elements of managerial practices in the Song period at this stage, although our comparison is an initial attempt. While it is likely that there were large differences due to the social and cultural contexts and a different attitude toward a monetized economy, there are signals that the complexity in organizing businesses during that period was a constitutive part of doing business, similar to that which existed in the Venice Arsenal.

Although we are unable at this stage to provide adequate answers to our questions, the relevance of the questions themselves is nonetheless corroborated. We have addressed the issue of internal administrative coordination as an important missing link in the debate on the Great Divergence, opening up a completely new, and hopefully promising, perspective for future research. Even without primary sources, by using triangulation with secondary ones – searching for glimpses, in Wagner's (2001) words – encouraging suggestions are provided of the existence of organizational complexity even in early Chinese eras. The Song dynasty remains the best candidate, particularly for iron production but also for other sectors, including the salt monopoly. More generally, a possible research agenda would be to consider the organization of the state itself and more precise attempts at reforming the state bureaucracy: the fiscal changes of the Song dynasty, and the whole experiment of Wang Anshi's reform (e.g. von Glahn, 2016), including the establishment of examinations and its evolution over time (Hartwell, 1971; Woodside, 2006). In that sense, a refocus of our research agenda could be targeted more precisely on the study of organizing of the state bureaucracy, under the specific lense of micro analysis.²⁴

Further developments in the research agenda (for us or more generally for the scholarly community) could be to investigate individual cases where archival materials could be found, e.g. salt mining, imperial workshops for silk textiles, ceramics, and so on. The recent establishment of the Accounting Museum at the Lixin University of Commerce in Shanghai could provide a very important possibility in discovering historical documents along those lines.²⁵

We are calling for attention to focus on a new research area, the intersection between the Great Divergence and literature dealing with the micro and, in particular, the management and accounting domains. We believe we have addressed a crucial question, though we are unable to provide sufficient answers at this stage. This is consistent with this type of research and the nature of an introductory or exploratory paper, where raising questions – and the questions raised – are more important than providing answers. We hope that we have been able to provide some important elements of the contexts that could play a relevant role in the overall explanation.

A final point in our view deserves further attention in the future. The absence of an archive in China of a comparable value with the West (Venice in particular) in terms of distribution, amount of documents, periods, etc. has been dealt with as a sort of a mere "accident" of history, causing difficult methodological issues for this kind of research. This deserves *ad hoc* investigation: to what extent archiving (and preserving the archives) derived from different attitudes which perhaps underpin some of the differences in the evolutionary paths between the East and West is a further research agenda. Is the existence of 62 km of shelves at the Venice State Archive (as opposed to the lack of archives for China) an accident of history, or is itself part of the explanation of the Great Divergence?

²⁴ There is a curious analogy here with our research on the Venice Arsenal: the starting point was a debate between Venetianists (social historians, historians of architecture), without a specific understanding of administrative science, management and accounting. A need to read the available documents with the lenses of administration is here called for.

²⁵ <http://en.sfu.edu.cn/web/synopsis.aspx?menuObjectId=0D2EA9CB-F7C9-4783-9163-1E8038F88C2B&menuCodeTag=10502>. For a first example of such contribution, see Song and Chan (2016).

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Table 1. Standard Material Inputs in Shipbuilding under the Ming Government Regulations

Type/Material	Amount ^a	Amount ^b	Total
Transport ship (75 metric tons of loading capacity)			
China fir planks ^c	320	67.2 m ³	
Other wood planks ^c	149	31.3 m ³	
Tree logs	20	—	
Elm poles for rudders	2	—	
Chestnut wood planks ^c	2	0.4 m ³	
Unknown wood for sweeps	38	—	
<i>Sub-total of Timber</i>			98.9 m ³
Iron nails/rivets and wires	35,742 ^d	—	
Tung oil	3,012.8 catties	1,798 kg	1.8 t
Lime	9,037.8 catties	5,394 kg	5.4 t
hemp/jute/ramie	1,253.2 catties	748 kg	0.7 t
Warship (27.4 m long, 9.4 m beam)			
<i>nanmu</i> ^e planks (m) ^f	571	55.2 m ³	
China fir planks (m) ^f	865	83.7 m ³	
pine planks (m) ^f	467	45.2 m ³	
<i>Sub-total of Planks</i>			184.1 m ³
China fir poles for masts	2	—	
unknown wood for sweeps	8	—	
China fir poles for main sail frames		5	—
wood poles for small sail frames	2	—	
China fir poles for bars	16	—	
China fir poles for flagpoles	16	—	
elm poles for rudder	1	—	
sandalwood poles for rudder control		2	—

Source: Xu (1502), as quoted in Deng (1999a: 29).

^aQuantity as recorded.

^bQuantity converted.

^cThe standard plank was x by $0.311\text{ m} \times 2.18\text{ m}$, with a minimum of 0.21 m^3 ($0.311\text{ m} \times 0.311\text{ m} \times 2.18\text{ m}$).

^dIron nails/rivets and wires were counted by pieces.

^e*Phoebe nanmu*.

^fTotal length which should be multiplied by 0.311 m^2 to show wood volume.

Table 2. Recorded Outputs, from the Song to the Ming

Period	Year	Total output		Average per year	Average per month
1. Unspecified ships					
Song	995-97	—	3,237	269.8	
	1090-1100 ^a	—	3,000	250.0	
	1114	—	2,500	208.3	
	1165	500	500		41.7
Subaverage for Song		2,309		192.4	
Subaverage unspecified ships (1)		2,300		192.4	
2. Transport ships					
Song	1128	—	2,700	225.0	
	1282	120	120		12.0
Ming	?-1314 ^b	1,800	—	—	
	?-1328 ^b	1,800	—	—	
	1403	525	525		43.8
	1405	1,180	1,180		98.3
	1412	2,000	2,000		166.7
	1442	350	350		29.2
	1451	180	180		15.0
	1460	1,200	1,200		100.0
3. Warships					
Song	1042	500	500		41.7
	1129	200	200		16.7
	1169	270	270		22.5
	1192	100	100		8.3
Yuan	1270	5,000	5,000		416.7
	1273	2,000	2,000		166.7
	1274-92	9,900	550		45.8

	(1274)	(800) ^c (800)	(66.7)
	(1282)	(3,000) ^c (3,000)	(250.0)
Ming	1372	660 660	55.0
	1451	440 440	36.7

Source: Deng (1997: 68, 80) (see there also for original sources).

^aA yearly quota fixed by Emperor Zhezong (AD1086–AD1100) in AD1090.

^bThe starting period is unknown.

^cOne-year figure, which is included in the 1274–1292 period.

Table 3. Passenger-carrying Capacities of Sea-Going Ships

Period	Year	Total passengers ^d	Ships	P-S ratio	Index
Tang ^a	644	43,000	500	86	100
Yuan ^b	1284	15,000	200	75	87
Ming ^c	1412	28,640	63	455	528

Source: Deng (1997: 58) (see there also for original sources).

P–S: passenger–ship.

Table 4. Recorded scope of voyages

Sea/Ocean	Season ^a	Wind	From ^b	To ^b	Day(s)
1. Tang					
East China Sea July	(893)	S.E.	China	Japan	14
South China Sea	–	–	Guangzhou	Sri Lanka	42
South China Sea	–	–	China	Persian Gulf	90
2. Yuan					
East China Sea Jun.	(1281)	S.E.	China	Japan	18
South China Sea Nov.-Dec.		S.	Guangzhou	Banda Aceh ^c	40
South China Sea Nov.-Dec.		S.	Guangzhou	Sumatra	40
3. Ming (Zheng He) ^d					
South China Sea Sep.	(1409)	S.E.	Jiangsu	Vietnam	10
Indian Ocean	–	–	Calicut	Red Sea	28
Indian Ocean Oct.	(1432)	S.E.	Sumatra	Calicut	38

Source: Deng (1997: 58) (see there also for original sources) today, which means that the regions only roughly match those in history.

cln the northwest tip of Sumatra, Indonesia.

dIncluding his detachments.

Table 5. Wage payment structure in China's traditional industries (1).

Period	Value of "wage in food and shelter" (%)	Value of "wagecash" (%)
1573–1619	81.6	18.4
1628–1644	86.5	13.5
1861–1874	71.0	29.0
1875–1908	67.5	32.5

Source: Peng (1957: 97).

Table 6. Wage payment structure in China's traditional industries (1).

Workers' type	Payment in food in value (%)	Payment in cash (%)
Unskilled	75	25
Semi-skilled	67	33
Skilled	43	57

Source: Peng (1957: 107).