

Quinn, Martin; Kristandl, Gerhard

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Accounting Controls at the Kelheim Brewery in the Seventeenth Century—Single Entry Accounting as Fit for Purpose

Martin Quinn (corresponding author), Queen's Management School, Queen's University, Belfast, martin.quinn@qub.ac.uk

Gerhard Kristandl, University of Greenwich, London, G.Kristandl@greenwich.ac.uk

Abstract

Prior to the arguably superior double-entry system of accounting, single-entry accounting was used widely. Extant literature on single-entry accounting suggests it remained in use well after the advent of double-entry, with ease of use cited as a key reason. However, there may be other reasons which have not been revealed in the literature. This study explores how single-entry accounting was utilized at the Kelheim brewery in Bavaria, Germany during the seventeenth century. It finds an organizational field in which single-entry accounting was fit for purpose. Single-entry accounting provided sufficient information and accountability, implying the more sophisticated double-entry accounting system was not used although it was known in Germany at this time.

JEL Classifications: M10, N80.

Keywords: Seventeenth century; brewing; accounting controls; organizational field.

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Introduction

Single-entry bookkeeping (SEB) is a broad term used to describe accounting records which capture only one part of a business's transactions—for example, often only cash receipts and payments are recorded and reports such as a balance sheet do not typically feature. As noted by J. Richard Edwards (1989), the SEB system, which includes charge/discharge accounting, was typically utilized by individuals reporting to a higher authority in the accounts of manors and estates or monasteries—see, for example, Edwards (2011), David Oldroyd and Alistair Dobie (2009), and Sally Schultz and Joan Hollister (2004). SEB contrasts with double-entry bookkeeping (DEB), the predominant system used today and arguably a more complete system of accounting. DEB is used to inform both external users and provide decision-making and control information to managers within an organization. While the DEB system was first written about by Benedetto Cotrugli in 1458 (see Basil Yamey 1994), Luca Pacioli's 1494 book—*Summa de Arithmetica Geometria Proportioni et Proportionalità*—is more widely known. Its origins have been the subject of much research in the accounting history literature—see, for example, Alan Sangster (2012, 2015, 2016), Sangster, Greg Stoner, Paul De Lange, Brendan O'Connell and Giovanna Scataglini-Belghitar (2012), Stoner (2011), Robert Emmett Taylor (1956) and Yamey (2010a).

The benefits of DEB have been noted, often as a contrast to SEB (Edwards 2011). For example, Yamey, Harold Edey and Hugh Thomson (1963) provided an excellent summary of texts on accounting written in the English language from the sixteenth to nineteenth centuries. The following two extracts from Yamey et al. (1963) give a flavor of what was being written about SEB: “the method by Single Entry claims, in a certain sense, a preference: as that by Double Entry, being more complex and obscure” (Edward Jones 1796); “the methods by single entry is often, but erroneously, supposed to be the plainest and most concise of the two” (John Fulton 1800). These examples suggest SEB was more simplistic, and as the age of mercantilism gave way to industrial capitalism, the more complex DEB method was more suitable (see Edwards, Graeme Dean and Frank Clarke 2009)—indeed, scholars have also noted the beginning of cost accounting systems around this time (Trevor Boyns and Edwards 2013). In contrast, Sybil Jack (1966) suggested SEB continued to be useful up to the mid-nineteenth century as the expense and effort of “drawing up a balance sheet and analysing costs” (157) associated with DEB could not be justified, particularly when “a pattern of fairly fixed income and unavoidable expenditure” (158) existed.

In the context of the subject of this article (a German brewery), Oldroyd and Dobie (2009, 106) cite Yamey et al. (1963), who noted that German merchants preferred SEB due to its simplicity. What research there is on accounting in Germany in a historical context in English is, as per Lisa Evans (2005), limited to events of more recent times (see for example, Michael Brandau, Christoph Eendenich, Robert Luther and Rouven Trapp 2017; Hans-Ulrich Küpper and Richard Mattessich 2005; Carmen Martínez-Franco and Martin Quinn 2015; Utz Schäffer and Christoph Binder 2008; Schäffer, Alexander Schmidt and Erik Strauss 2014), although books on historical topics in the German language are more common. This article provides evidence of the use of SEB in a German brewery, the Kelheim brewery, in the seventeenth century (1607-1690) and explores some likely reasons for its longevity. As will be revealed, the accounting system at the Kelheim brewery was one with narrow accountability, similar to a charge/discharge accounting system used in the accounting of manors and estates. The system's design focused on recording cash flows, and data such as inventories were reported at the end of each accounting period. Amounts owed by customers, owing to suppliers and/or other assets and liabilities did not appear to have been captured by the system—or potentially did not survive.

As a theoretical lens, the study draws on the concept of an organizational field (see later) from institutional theory to offer potential explanations why the brewery continued to use SEB methods to capture data for use in the management and control of the brewery, whereas DEB could be viewed as more useful for this purpose—see Edwards et al. (2009). It seems prudent for a business organization (i.e. brewing)—which on the face of it seems more complex than running an estate or manor—to have adopted DEB. Knowledge of DEB had indeed reached Germany during the time period covered by our research (seventeenth century), as books on DEB had been written in the German language—see, for example, Christophorus Achatius Hagerl (1654). Additionally, while much extant research on brewery accounting stems from a later time period, this study also offers insights into the management and accounting from a much earlier period in the history of breweries, and organizations in general (Edwards et al. 2011). Finally, this study adds to the relatively small number of papers in English on business, management and related histories in a German context.

The remainder of the article is structured as follows. The next section presents an overview of the literature on accounting and brewing, accounting in the seventeenth century and on the concept of an organizational field. This section also provides some background on Germany and the Bavarian state during the research period. Then, the next section describes the data sources and methods used. Following this, the empirical data are presented and then discussed. The article concludes with mention of the limitations of this research and some thoughts for future research.

Literature and Context

History and Brewing

According to Gerhard Kristandl and Quinn (2018, 207) “the brewing industry [...] has much potential value to accounting history researchers”. Existing literature on accounting in brewing tends to focus on the period from the late 1800s onwards. A brief review of this body of literature provides useful context for this article.

Several works on the Guinness brewery in Dublin have been published by Quinn and colleagues. For example, Quinn (2014) revealed how the Cooperage maintained detailed cost information and how Guinness utilized departmental accounting in a broad sense around the turn of the twentieth century to control and manage various departments. Quinn and William Jackson (2014) similarly noted an extensive cost accounting system at the brewery. Martin Hiebl et al. (2015) and Martínez-Franco, Orla Feeney, Quinn and Hiebl (2017) provided an overview of the Chief Accountant’s role in the early twentieth century, suggesting the role was similar to that of a present day Chief Financial Officer. Martínez-Franco and Hiebl (2018) also provided some insights on the introduction of new technology to the accounting function at Guinness in the 1920s.

There are of course studies of other breweries. David Higgins and Shraddha Verma (2009), although focusing on the Bass brewery trademarks (1870-1914), provided some accounting data such as profit and capital. They also noted various costs incurred, including the costs of acquired businesses and defending trademarks, suggesting good record keeping. Philip Talbot (2008) investigated the malt costing practices of (brewing) maltsters in Staffordshire from 1700 to 1939, concluding that cost and management accounting systems were relatively primitive and did little to inform management control or decision-making. Quinn and Desmond Gibney (2018) reported on the accounting records of an Irish maltster, Bennetts, in the 1920s, also highlighting a lack of management accounting information. Kristandl and Quinn (2018) reported on the accounting practices at the Whitbread brewery from 1890 to 1925. They noted that although there was an increasing interest in cost accounting around this time, Whitbread’s accounting practices focused on bookkeeping, although external auditors provided reports at each year end which could be useful for management decision-

making. Finally, a study by Alonso Moreno and Macario Cámara (2014) focused on the El Alcázar brewery in Spain from 1928 to 1993. While the focus of this study was the content of the Chairman's Letter to Shareholders, there were indications that this brewery maintained good accounting records from the 1920s, again reflecting the key focus of accounting practices was bookkeeping.

While not exhaustive, the above does highlight that apart from the Guinness brewery (see Quinn 2014), brewery accounting around the turn of the twentieth century fulfilled mainly a bookkeeping function. The literature mentioned shows that brewery accounting had advanced to the double entry system, but cost accounting—which is a key source of management information—was not a common feature of brewery accounting. While this is interesting, the focus of this study is seventeenth century accounting, and we now give a brief overview of literature on this.

Seventeenth Century Accounting

At the beginning of the seventeenth century, mercantilism was the predominant economic policy in Europe (Oldroyd and Dobie 2009). An increasing complexity in trade relations and money flows brought increased demands on accounting systems of the time (ibid), which were unable to reflect the pecuniary impact of the intricate trade processes. Although DEB had existed since the thirteenth century (Edwards 1989; Geoffrey Lee 1977), Luca Pacioli's *Summa* in 1494 was the first publication disseminating DEB across Europe with adaptations made from Italian to English, German, and French (Giuseppe Galassi 1996). The focus of the accounting described by Pacioli was in "tracking exchanges and establishing accountability" (Oldroyd and Dobie 2009, 105), but costing and decision-making was also considered (Edwards et al. 2009). As Oldroyd and Dobie (2009) highlighted, over more than 200 years since Pacioli's seminal work, interest in the technique appeared mainly academic, although it was used by sixteenth century Florentine manufacturers for example (Richard Goldthwaite 2015). Others such as George Ramsey (1956) observed a prevalence of SEB in seventeenth-century Britain. In the Germanic countries, the situation was similar with SEB preferred for its simplicity. The purpose of such accounting records was typically not for use in decision-making, but to avoid errors, prevent fraud, establish business value (Oldroyd and Dobie 2009; Sidney Pollard 1965), keep track of credit dealings, inventories, capital (Michael Chatfield 1977; Oldroyd and Dobie 2009; James Winjum 1972), serve as a memory aid (Thomas Lee 1990), and provide evidence in a court of law (Ramsey 1956).

There is some research describing accounting practices of the seventeenth century. Massimo Sargiacomo (2006) revealed how the Commune of Penne (Italy) recorded expenses paid in cash in extensive detail from 1664 to 1690. Sargiacomo (2006) did not reveal whether the records kept followed DEB, but his description suggests it was likely not utilized. Stefano Zambon and Luca Zan (2007) detailed a more complex (double entry) system of accounting at the Venice Arsenal during the period 1586-1633, maintaining records in enough detail to report on the cost of building a ship and fitting it with armory. Yamey (2010b) described the account books of Daniel Harvey and Company during the period 1623-1646. The ledger maintained was *alla veneziana* (Venetian-style), used DEB and included a profit and loss account (Yamey 2010b, 166). Linda Newson (2013) detailed the accounting books of a Portuguese slave trade (Peres) from 1613-1619 which used the double entry system—although it recorded barter (not monetary) values, based on cotton cloth. In this case "although Peres drew up lists of his assets, he did not attempt to calculate the profitability of his ventures" (Newson 2013, 353). The latter two examples can be contrasted to the former two in that they were not state organizations. In summary, the literature discussed suggests that double entry

was in use in the seventeenth century, but not universally—see also Edwards et al. (2009). It also shows some signs that DEB was used to track and control costs.¹

Weißes Brauwesen in the Seventeenth Century

An outline of the history of the German brewing sector up to the seventeenth century is also useful to set the context of this article. Astrid Assél and Christian Huber (2012) noted that beer has been brewed in what is present-day Germany since about 1500 BC. Bohemia (part of the present-day Czech Republic) and Bavaria (southern Germany), by virtue of their climates, are ideal for growing hops used to produce beer (Johan Swinnen and Devin Briski 2017). By the thirteenth century, beer was being brewed in monasteries (Assél and Huber 2012; Karl Gattinger 2007). In Bavaria, the first “commercial” breweries had appeared by the end of the fourteenth century, regulated to a degree by the Duke of Bavaria at the time. By 1516, the German Purity Law or *Reinheitsgebot* had been enacted by Wilhelm IV. As Frank van Tongeren (2011) noted, the *Reinheitsgebot* served three purposes: 1) to keep beer free from unhealthy ingredients, 2) to regulate price and, 3) to direct agricultural policy, particularly regarding wheat production for bread-making (see also Lutz Depenbusch, Malte Ehrich and Uwe Pfizenmaier 2018). It also acted as a barrier to entry, as quality control implied increased costs. This, according to Swinnen and Briski (2017), gave advantage to existing larger brewers as they had the necessary resources to comply (see also Richard Unger 2011). Thus, by the seventeenth century Germany had a well-established and regulated brewing sector.

Weißbier (wheat-beer) brewing operations (*Weißes Brauwesen*)² in Bavaria in the seventeenth century were administered by the Bavarian ruler of the time, Maximilian I. A closer look at this regent is useful, and we draw on Karl Gattinger’s book (2007). Maximilian I reorganized Bavaria’s financial administration between the births of his first and second children. He did this—in foresight—to facilitate the work of a possible future interim government in the event of his untimely death before his sons (as heirs) had reached the age of majority (Gattinger 2007). Ultimately, the continued use of SEB in the Bavarian breweries appeared to be a (albeit indirect) result of Maximilian I’s view on principles of financial administration.

Maximilian I, a member of the House of Wittelsbach, ruled Bavaria as a Duke from 1597 until 1623, and as a Prince-Elector (German, *Kurfürst*) from 1623 until his death in 1651.³ Most of his reign overlapped the Thirty Years’ War (1618-1648), considered one of the most destructive conflicts in European history, with impacts on society and economy. Maximilian I’s belief system was deeply rooted and influenced by mercantilism, the dominant economic policy in Europe at the time, and *Kameralismus*, its German variant.⁴ From an anti-machiavellian perspective, the ruling classes maintained that influencing economic developments and generating cash for the state strengthened their political power and benefited public welfare. Maximilian I stated on several occasions that only a country that possessed a lot of money was a wealthy country and considered an equal on the international stage (Gattinger 2007). Accordingly, the purpose of all state-owned operations was driven by the fiscal interests of Maximilian I, as he aimed to increase the amount of money within the state’s borders. The eventual success of the *Weißbier* brewing operations thus supported Maximilian’s fiscal ambitions.

¹ For more information on the use of accounting systems for costing and decision making in Britain in the sixteenth and seventeenth centuries see Boyns and Edwards (2013), chapters 4 and 5.

² This term is used to refer to the entirety of the processes, activities, and facilities set up for the purpose of brewing beer.

³ The House of Wittelsbach existed from the twelfth century, and ruled Bavaria until 1918.

⁴ A detailed discussion of the historical background of mercantilism and *Kameralismus* is beyond the scope of this article. For more detail on the latter, see for example Rüdiger Vom Bruch (1992).

Both *Weißbier* brewing and salt-mining operations were monopolies of the Bavarian state.⁵ The latter was the dominant cash source (Gattinger 2007, 7; see also Swinnen and Briski 2017, 88) at the beginning of Maximilian I's reign, but was later surpassed by cash from *Weißbier* brewing operations (Gattinger 2007, 14). *Weißbier* found its way from Bohemia to Bavaria around the early 1400s (Swinnen and Briski 2017). Its brewing eventually met an obstacle in the form of the German *Reinheitsgebot* in 1516 (only allowing water, hops, and barley) and legislation prohibiting the brewing of *Weißbier* dating from 1567 (Gattinger 2007). The *Reinheitsgebot* however did not affect privileges already granted to the Houses of Degenberg and Schwarzenberg by Wilhelm IV and Wilhelm V, two of Maximilian I's predecessors, in 1548 and 1586, respectively. These privileges were granted, however, under the contractual condition that all *Weißbier* brewing operations had to be transferred to the House of Wittelsbach when the Degenberg and Schwarzenberg male lineages ended. This occurred with the deaths of Ottheinrich von Schwarzenberg (1590) and Hans VIII Sigmund von Degenberg's (1602).⁶ Interest from the ruling House of Wittelsbach in state-run *Weißbier* breweries increased from 1586 onwards due to their aforementioned higher growth potential (and stagnant growth from salt-mining), and the ever-increasing need for cash to finance the state and court. Driven by his desire to end the then-financial crisis, it was Maximilian I who finally shaped that interest into tangible outcomes after the ending of the House of Degenberg's brewing privileges in 1602. Maximilian I's court chamber (*Hofkammer*) reacted quickly and analyzed the potential of the three Degenberg breweries in Schwarzach, Linden, and Zwiesel (Gattinger 2007), transferring them into state ownership.

The swift expansion of the state-owned breweries⁷ was met with heavy criticism from the landed gentry⁸, who were concerned about their waning influence over economic policies in Bavaria. Maximilian I countered such resistance and built an infrastructure of state-owned breweries over the following years. The expansion of this infrastructure used four different levers, namely 1) reclaiming the brewing privileges of the three former Degenberg-owned breweries; 2) acquiring existing *Weißbier* breweries; 3) establishing new breweries; and, 4) establishing cash-sharing schemes with communal breweries. The third and fourth levers can be seen to benefit from, or indeed require, a good and detailed accounting system to, for example, control construction costs or ensure calculation of correct cash surplus figures. Whilst the first three levers resulted in state-owned and -run breweries, nine communal breweries owned by cities or market towns (see Appendix I) had produced *Weißbier* before Maximilian I's reign without privilege (Gattinger 2007). This comfortable situation changed once Maximilian I began to focus on developing the *Weißbier* brewing monopoly in Bavaria, giving them the choice to either share their cash surpluses with the court (typically half to two-thirds), or risk having their operations ceased. Between 1599 and 1642, 24 breweries were added to the state brewing monopoly. Figure 1 shows this rapid expansion in the number of breweries⁹, whose beginning coincides approximately with the 1602 return of brewing privileges from the House of Degenberg (see Appendix I for details on category, location, and

⁵ "State" here does not equate to today's political definition of the Free State of Bavaria. Under Maximilian I, Bavaria was a duchy (until 1623), succeeded by the Electorate of Bavaria (until 1799).

⁶ In Schwarzenberg's case, this transfer was contracted as a direct one. The transfer of the Degenberg privileges occurred due to their inability to pay off a "mortgage" of 20,000 fl to the House of Wittelsbach.

⁷ For simplicity, "breweries" means "wheat-beer breweries" for the remainder of the article.

⁸ The German term is *Landstände*, which is similar to the British notion of the landed gentry.

⁹ In Figure 1, each dot indicates a single brewery location, plotted against a timeline indicating the date of their foundation, acquisition, or contract, respectively.

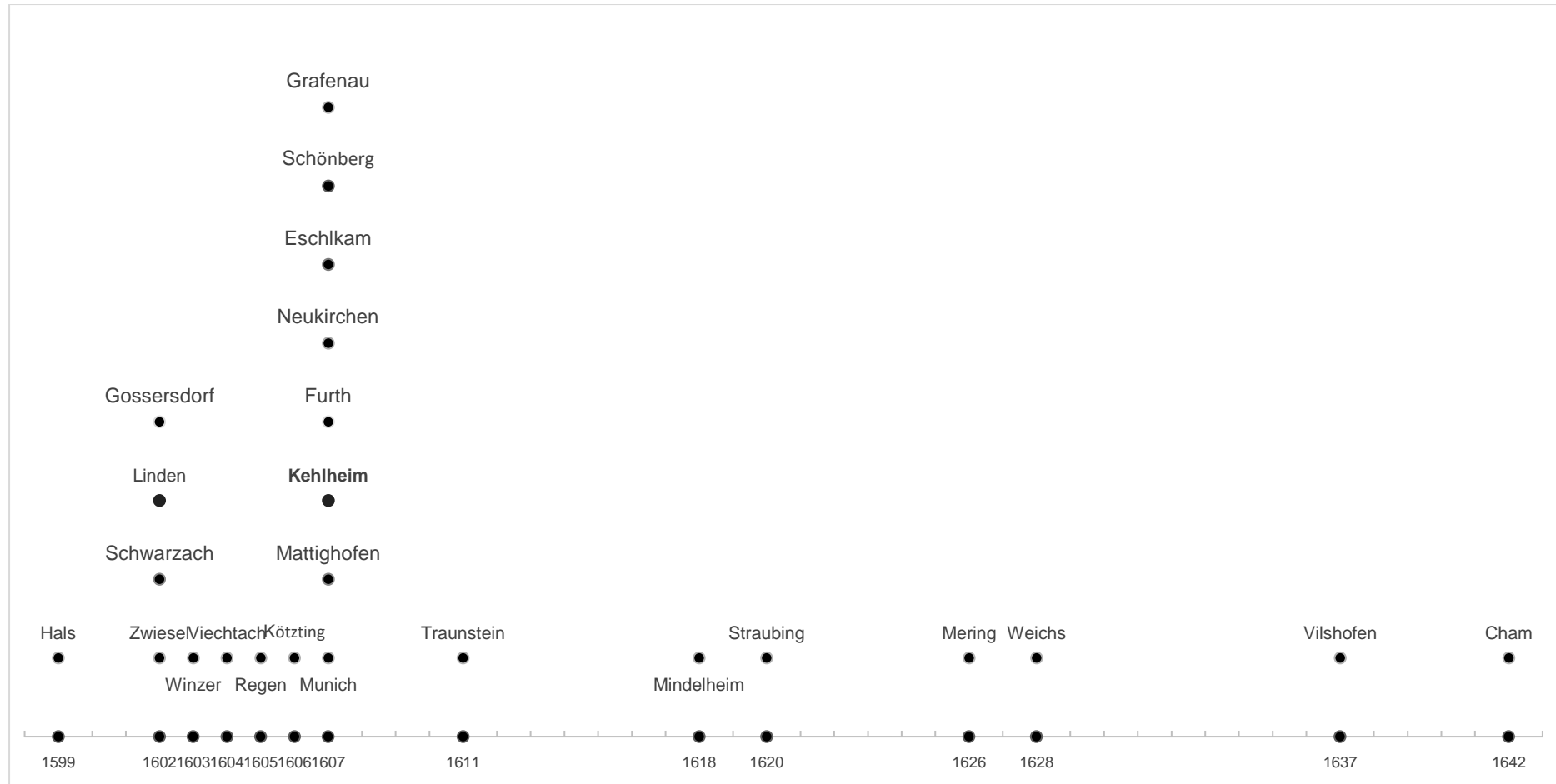


Figure 1

Expansion of the Bavarian *Weißbier* Monopoly during Reign of Maximilian I

year of foundation or acquisition). Maximilian I also ordered the addition of *Weißbier* brewing to the brown beer brewing operations at the main brewery in Munich¹⁰ the same year.

As Figure 1 shows, Maximilian I expanded the *Weißbier* monopoly quickly between 1602 and 1611, followed by a phase of slower expansion until 1642. Such expansion of the brewing sector was typical from the fifteenth to seventeenth centuries, as technologies improved and brewing expanded when funds and political influence permitted (Unger 2011)—both applicable to Maximilian I. Most notably, no fewer than eight breweries¹¹ were added in 1607—five communal and three newly-founded breweries, one of which was the brewery in Kelheim,¹² the subject of this article. Now a Schneider Weisse brewery, this was built in 1607 after a local inspection by the president of the court chamber, Johann Schrenck, and by April 1608, its first *Weißbier* was brewed. The perceived (future) importance of Kelheim was evidenced by a delegation of high-ranked court chamber officials who tried to speed up construction efforts—the president, secretary, a selection of other council members, the ducal chief architect, as well as a brewmaster (Gattinger 2007). The brewery was expanded between 1643 and 1655 by adding a second brewhouse. Figure 1 also captures how the seventeenth century saw growth of the *Weißbier* sector in Bavaria; its popularity declined by the end of the eighteenth century and by the early nineteenth century only two breweries remained. In 1872, the Wittelsbachs sold the brewing rights to Georg Schneider, and anyone could now brew *Weißbier*. For the purposes of this article, the Kelheim brewery serves as an exemplar of a *Weißbier* brewery of the time.

Organizational Field

Concepts and approaches from institutional theories have been widely used to explore accounting and management control, in both contemporary (see for example, John Burns and Robert Scapens 2000; Quinn 2014; João Ribeiro and Scapens 2006; Umesh Sharma, Stewart Lawrence and Alan Lowe 2014; Mathew Tsamenyi, John Cullen and José María González 2006) and historical accounting literature (see for example, Ana Caria and Lúcia Rodrigues 2014; Salvador Carmona and Marta Macías 2001; Pierre Gervais and Quinn 2016; Moreno and Cámara 2014; Quinn and Jackson 2014; Gary Spraakman 2006). Such institutional studies explain change or stability in accounting/control practices taking into consideration how institutional arrangements affect social action. Neo-institutionalism emphasizes how normative, regulative and cultural-cognitive systems provide impetus and/or meaning for actions within organizations. A key concept of neo-institutionalism is the organizational field (Melissa Wooten and Andrew Hoffman 2008), which is utilized in this study.

To paraphrase Richard Scott (1995), an organizational field is a collection of organizations who have a common system of meaning and who interact frequently with each other. Interactions with organizations outside the field are typically less frequent. An organizational field may include government organizations, funders, professional/trade associations, the public, customers and suppliers. To give an example, in accounting, the organizational field could include professional accounting bodies, the public (through public interest), the state (through legislation), clients, educators and accounting firms. An organizational field is not limited to a discrete list and could include any “constituent that

¹⁰ Founded by Wilhelm V, the position of the Munich brewery (German: *Münchner Brauhaus*) appeared to have been on equal terms with all other breweries in Maximilian I's infrastructure, including Kelheim. The Munich brewery is today the world-famous *Hofbräuhaus*, although its location was moved in the 1890s.

¹¹ Whilst most of these breweries produced wheat beer only, Mindelheim also produced smaller quantities of brown beer (Gattinger 2007).

¹² The Kelheim brewery was organizationally part of the Straubing administrative district (Gattinger 2007).

imposes a coercive, normative or mimetic influence on the organization” (Wooten and Hoffman 2008, 56). Through the influences and actions of the various constituents of a particular organizational field, firms within the field become similar, and over time, practices become accepted and institutionalized. However, as with all concepts of institutions, while stability may seem to be a focus, change is possible—see for example, Christine Oliver (1991) and Myeong-Gu Seo and Douglas Creed (2002).

Earlier research on organizational fields tends to emphasize similarity, assuming a field remained relatively static and used similar technologies (Walter Powell and Paul DiMaggio 1991) and various regulative, normative and cultural cognitive forces resulted in homogenous firms within the field. More recent work places a greater emphasis on processes of change—changes in technology, methods of production and pressures (such as regulation) from the state. The time period and context of this present study may be expected to exhibit more stability than change, as if brewing is considered an organizational field, the general process of brewing beer did not change dramatically until the early to mid-twentieth century with the advent of sterile brewing processes (Terence Gourvish and Richard Wilson 2008). This does not mean change did not happen, or was not possible, and both the notion of change and stability in the field—as suggested by Wooten and Hoffman (2008)—are considered in our examination of the accounting records of the Kelheim brewery. While work on institutional sociology has in more recent times developed into concepts such as institutional work (see Thomas Lawrence and Roy Suddaby 2006), given the historical nature of this study the notion of an organizational field is more readily applicable. From historical records, it is possible to reconstruct relationships between for example, the state and business, businesses and their suppliers and customers, businesses and the professions, without necessarily studying individual actors or actions of individual organizations. The resulting view of the organizational field can, in turn, be utilized to offer potential explanations for change and/or stability in particular organizations or organizational practices within the field—such as accounting in the context of this study. The organizational field relevant to this study is described later.

Methods

This study draws on two main data sources, namely 1) available archival records of the Schneider Kelheim brewery and insightful annotations thereon, and 2) textbook sources on brewing in Germany and on Germany in general during the timeframe of this study. The latter sources are useful to provide background and context for interpretation of the archival data. Before describing the Schneider archival sources, a brief outline of the company itself is useful to understand and place the Kelheim brewery against its historical background within the infrastructure of Maximilian I’s *Weißbier* operations. As we noted earlier, the present-day Kelheim brewery dates from 1607 and was founded by Maximilian I in the Bavarian town at a time when *Weißbier* was the beer of the noble classes. The brewery was a result of Maximilian’s wishes to make *Weißbier* more widely available and was thus a brewery by appointment of the royal court. It remained so until 1872, when Georg Schneider I took control. By this time, beer consumption patterns had changed with less *Weißbier* consumed (Assél and Huber 2012). Schneider viewed this declining consumption as an opportunity and was granted the *Weißbierregal* (the right to brew *Weißbier*), the first commoner to have such rights (Schneider 2018). Other *Weißbier* breweries followed, such as the Lobenhoffer (1879), Schramm and Sedlmayer (both 1880), and Kirchner (1887) breweries (Assél and Huber 2012). The Kelheim brewery remains in the ownership of the Schneider family to the present day,

functioning as a *Brauhaus*, serving food and beer. The Schneider company today has annual sales of approximately €25-30 million.¹³

The archival data used here have been obtained from the company's historical archive, which is available at <http://www.schneider-archiv.de/>. We utilized a total of 41 years of the account books (*Rechnungsbücher* plural, *Rechnungsbuch* singular) from 1607/08 to 1691/92. The series is unfortunately not complete (see the list of sources), but each decade in this period is represented by between two and seven years of books. We describe the *Rechnungsbücher* in greater detail later but it suffices to say here that each volume is a summary of activities for the business year—in effect, a record of the year's financial and other transactions. Four *Kassenbücher* (cash books) are also available for four years during this period, showing the cash in and out of the brewery and totalled bi-monthly. Given their limited availability, we have not explored these books in detail. Each *Rechnungsbuch* is available as a digital download in its original state, together with a transcription and a historical commentary document (see list of sources). These latter documents proved very useful and an expression of thanks goes to Matthias Gabler for this excellent work. These source documents and commentary allowed us to assess the type of accounting records maintained at the Kelheim brewery, and, given a period of 84 years, also allowed us to examine changes in methods and records over time. The historical commentary also provides context which was very useful in providing information on the organizational field. Additionally, we used Gattinger (2007), which draws on holdings in state and city archives to provide a detailed account of the financial and political reasoning for royal involvement in *Weißbier* brewing. The text was useful in providing a broader view of the brewing sector in Bavaria at the time and supplemented the archival sources. It also allowed us to build a picture of the various actors in the organizational field, which we depict graphically in Figure 2.

Accounting and Control at the Kelheim Brewery

The Organizational Field

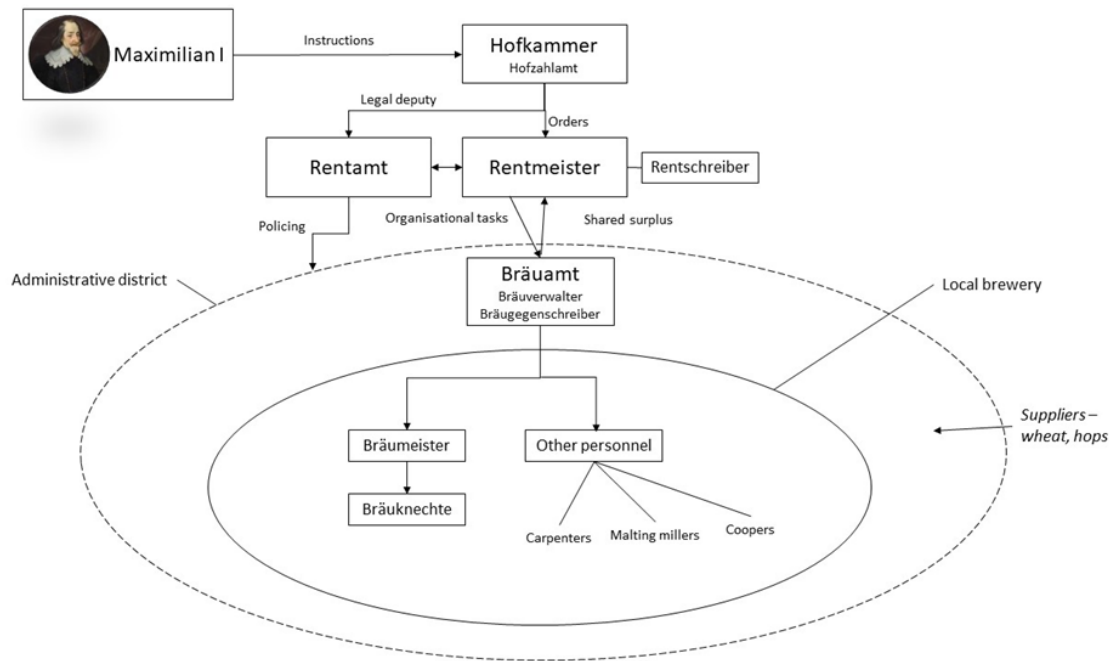
Scott's (1995) definition of an organizational field as a collection of organizations who have a common system of meaning and who interact frequently with each other, provides a useful theoretical lens to describe the organization of the seventeenth century Bavarian *Weißbier* sector. Figure 2 below depicts the field as described by Gattinger (2007) and shows Maximilian I as the main constituent, imposing a clearly coercive influence (Wooten and Hoffman 2008) throughout. For convenience, we show only one brewery within the administrative district.

Figure 2 relates mostly to state-owned brewing, but can be applied to the administration of communal breweries. The entire infrastructure set up by Maximilian I—upheld by his successors—was driven by his views on financial administration. These views were expressed by a set of 20 official instructions issued in 1607 and detailed further (but not added to) in 1617 and 1640. These remained largely unchanged during his reign and thereafter (Gattinger 2007) and required (coerced) all organizations in the field to follow rules, laws and orders issued by Maximilian I—which were executed and sanctioned by the court chamber,¹⁴ the highest fiscal authority of the State. These orders and instructions issued on behalf of Maximilian I aimed to find ways to improve cash flows generated by state properties and industries, such as *Weißbier* brewing. The court chamber's tasks were several—ensuring sufficient resource supply (including cross-border trade in case domestic supply was running low), new brewery

¹³ Based on data from 2016 and 2017 available at <https://www.bundesanzeiger.de> for G. Schneider & Sohn GmbH.

¹⁴ The first instruction established the sovereignty of Maximilian I and the court chamber by emphasizing the exclusive dependence of the *Brauwesen* on the sovereign and the chamber (Gattinger 2007, 139).

Quinn & Kristandl: Accounting Controls at the Kelheim Brewery



Explanation of terms		
German		English
Hofkammer/Hofzahlamt		Court chamber/court office responsible for duties of a treasury
Rentamt		Office responsible for the collection/calculation and monitoring/policing of levies by breweries in a specific administrative area
Rentmeister		Head of the Rentamt
Rentschreiber		A clerk at the Rentamt
Bräuant		Brewing administration office (regional)
Bräuverwalter		Brewing administrator (regional)
Bräugegenschreiber		Brewing administration “counter-scribe”, who kept brewing records from the owner’s perspective i.e. Maximilian I
Bräumeister		Head brewer
Bräuknechte		Brew hands (laborers)

Source: authors, based on Gattinger (2007).

Figure 2
Bavarian *Weißbier* Organizational Field

builds and extensions of existing ones (including budgeting and financing), compliance with regulations regarding brewing procedures, monitoring and control of state officials, human resources and allocation of brewing permissions (Gattinger 2007). The court chamber was thus the central hub of dealings between the State and its breweries—decisions were made there to ensure overall compliance and maintain a focus on increasing the cash surplus to the State. As Figure 2 shows, the court treasury (*Hofzahlamt*) appointed a *Rentmeister* who received and recorded the cash surplus of the breweries. The *Rentmeister* was in turn a member of the *Rentamt*, a governing institution responsible for an administrative district

containing several breweries.¹⁵ *Rentamt* and *Rentmeister* denoted an intermediary level between the court chamber and the local brewing administrations (*Bräuamt*; see below). The *Rentamt* served as a governing body of the administrative district and was a legal deputy of the court chamber; its responsibilities lay in swearing in new personnel, regulating beer-serving permissions, policing *Weißbier* import restrictions, policing the start of the brewing season, and policing wheat sales to foreign governments (Gattinger 2007). The *Rentmeister* was the main financial administrator of all brewing operations within an administrative district, supported by the *Rentschreiber*, a scribe. The local brewing administrations (*Bräuamt*) were instructed to deliver the cash surplus on brewing to the *Rentmeister* on a regular basis (or collect them if breweries were tardy in doing so, but only under prior instructions by the court chamber), as well as examine the *Rechnungsbücher*. Regular visitations to the breweries to inspect their operations and finances were part of the role as well as providing loans to breweries that wished to purchase resources but were low on cash.¹⁶ However, the *Rentmeister* could not decide on the latter as such instructions came solely from the court chamber. In fact, all instructions from the court chamber came via the *Rentmeister*, supporting the court chamber's role as coercive force in this organizational field. In turn, the *Rentmeister* had to provide reports on all (decision-)relevant aspects in his area of responsibility to the court chamber (Gattinger 2007). Finally, it was also the *Rentmeister's* responsibility to supervise, control, and sanction personnel on the local brewing administration level (*Bräuamt*), the lowest level of Maximilian I's brewing infrastructure. Administered by the brewing administrator (*Bräuverwalter*) and supported by the brewing scribe (*Bräugegenschreiber*), each brewery employed operational personnel such as the brewmaster (*Bräumeister*), brew hands (*Bräuknechte*), and other personnel (for example, coopers, malting millers, carpenters, etc.). Attached to the local brewing operations were suppliers of wheat, hops, brewing water, and other resources (for example, firewood) that required well-planned and organized transport to keep costs down (especially tariffs when borders to towns or bridges were crossed; Gattinger 2007).

The above paints a picture of a well-run, organized field where all decisions and instructions came from Maximilian I and—by proxy—the court chamber. All actors within the field were required to act according to strict instructions, and breaches were followed up swiftly and unmistakably (Gattinger 2007). The drawing of boundaries of organizational fields is often arbitrary (Scott 2014, 232), as there are often complex interconnections in the social world. In terms of Figure 2, while we depict a brewery and an administrative district as “bound” by lines, they are components of the organizational field. Suppliers however, while depicted, are “outside” the boundary of the field and are not subject to analysis in this article. Scott (2014, 232) suggests boundaries serve the analytical focus of a study, which here is accounting within breweries. As ultimately the brewing operations were driven by Maximilian I's goal to increase the wealth of the State, to monitor and control this endeavor the court chamber required reporting of cash surpluses and the brewery *Rechnungsbücher* assisted in this matter.

Kelheim's *Rechnungsbücher*

Gudrun Gleba and Niels Petersen (2015) suggest that although *Rechnungsbücher* had been maintained by monasteries and churches since the Middle Ages, there were no accepted norms, rules or handbooks to guide their structure or content. Gleba and Petersen (2015) also provide evidence of *Rechnungsbücher* in use in trade—such as the silk trade—and that by the

¹⁵ Kelheim was part of the *Rentamt* Straubing. Further *Rentämter* at the beginning of Maximilian I's reign were Landshut and Burghausen, with Amberg joining in 1623/24 (Gattinger 2007).

¹⁶ An additional responsibility arose during the Thirty Years War, where the *Rentmeister* had to ensure the safe custody of the often large amounts of cash present at his office (Gattinger 2007).

seventeenth century, they were being used to produce summaries of business performance on a periodic basis.

To monitor cash surpluses from the breweries (via the *Rentmeister*) to the treasury, accounting records were a pillar of Maximilian I's agenda (Gattinger 2007). In this regard, the *Rentmeister* was responsible for monitoring accounting principles as set by the court chamber and for ensuring that the local brewing administrators provided required information on time. These principles were satisfied by flows of information from the breweries via the *Rentmeister* to the court chamber. The first level of mandatory reports was the brewing extracts (*Brauextrakte*), which the court chamber monitored closely (Gainger 2007). These were typically one or two pages, and were submitted by the local brewing administration to the court chamber every 14 days—likely a reason for the twice-monthly totalling of the *Kassenbücher* mentioned earlier. These set out the current state of brewing operations, how much beer had been brewed, sold, and how much of the resources/materials (hops, malt, wheat, wood, cash, etc.) had been used (Gabler (notes) 1642; Gattinger 2007). The court chamber based its orders on a comparative analysis of these reports, and brewing administrators were required to sign these reports to ensure their accountability (Gattinger 2007).

The next aggregated level in the accounting system was the *Rechnungsbücher*, generated annually by the *Rentmeister* and *Rentgegenschreiber* after 15 May (Gattinger 2007), a date uniformly enacted throughout all breweries¹⁷. By that date, all outstanding debt had to be settled, and on 16 May, all brewing materials were measured and weighed. The *Rentmeister* was tasked to close all books by the time dedicated officials from the court chamber visited each brewery and audited the accounting records and any supporting documentation (Gattinger 2007). The court chamber also inspected buildings and facilities to authorize or order repairs and maintenance (Gabler (notes) 1642). To ensure the efficiency of these visitations on specific pre-scheduled dates, the *Rentmeister* coordinated the brewing administrators so that all documentation was readily available (Gattinger 2007). The role of the *Rentmeister* was viewed as an important one, and Gattinger (2007, 159) notes, for example, how the *Hofkammer* placed its “*letzte Hoffnung*” [last hope] of recovery of once missing funds in Munich with the *Rentmeister*. Before detailing the nature of the *Rechnungsbuch*, it is important to acknowledge the seamlessness of the information flow to the court chamber and the treasury. The latter would keep its own records and ultimately send some or all the revenues received to Maximilian I's *propria cassa* (Gattinger 2007), his personal stockpile of money that was kept in vaults.¹⁸

The *Rechnungsbücher* at Kelheim provided an opportunity to investigate the original source of Gattinger's (2007) claims about their importance to the court chamber in monitoring brewery operations. Starting in 1607, the year of its foundation, Kelheim's *Rechnungsbücher* followed a specific structure that was prescribed in both content and format¹⁹. Their format and structure were set by the court chamber directly (Gabler (notes) 1607; Gattinger 2007), adding to its sole decision-making authority and coercive nature of cascading orders down to the local breweries. As the governing body for accounting/bookkeeping on behalf of Maximilian I, the court chamber enforced specific standards in accounting, books, reports (Gattinger 2007), and standardized and unified measurements²⁰ (Gabler (notes) 1607). These were also

¹⁷ Gattinger (2007) does not offer any reasons for this end date but does note it was previously May 25th.

¹⁸ As Gattinger (2007) states, the magnitude and uses of this private treasure (*Hausschatz*) remain a mystery, as no official records seem to have been kept, or have not survived.

¹⁹ However, the books in Kelheim were only adapted to the format required by the *Hofkammer* in 1614/15 after the brewery got its own brewery administrator (*Bräuerwalter*), Hans Penderrieder (1607_ha, 28, fn 130).

²⁰ This is important to note, as measurements, especially weights and lengths, often differed between city states in Germany in the seventeenth century.

monitored on a regular basis through visitations by the *Rentmeister* and court chamber officials to ensure compliance (Gattinger 2007).

Table 1
Basic Structure of Kelheim *Rechnungsbuch* 1607/08

Materials/Resources	Wheat in
	Wheat out
	Malt in
	Malt out
	Hop in
	Hop out
	Firewood in
	Firewood out
	Tallow candles in
	Beer in
	Beer out
Cash	<i>Cash in from</i>
	Beer sold
	Brewer's grains sold
	Empty casks sold
	Sales of old buildings
	<i>Cash out for</i>
	Wheat purchased
	Hops purchased
	Firewood
	Unclenched candles
	Salaries/wages
	Cooper and the brewing equipment
	Breaking the malt
	Wheat and malt handling
	Lumberjack wages
	Building measures and other expenses
	Cash balance at year end

The Kelheim brewery was founded on January 18, 1607 (Gattinger 2007) but did not begin operations until April 1608. The structure of its first *Rechnungsbuch* from 1607/08 is shown in Table 1. There were two main parts. The first part listed the amounts of materials/resources acquired and used for the brewing process, measured by quantity, not value. In later years, this basic structure remained unchanged, with the main ingredients (wheat, malt, and hops) presented first in this part of the *Rechnungsbuch*, with auxiliary materials (for example, firewood) or by-products (for example, brewer's grains) following. The positions/line items were often detailed—for example, “firewood” was broken down into beech and spruce (1607). For each material/resource, the amount was given at year end (the “*Resst*”)—the inventory at the end of the brewing season. As this was SEB, there was no corresponding inventory account present. Notably, this part did not close with an overall *Resst*, as the measurements of the various materials were not reconcilable. The second part of the *Rechnungsbuch* was a cash summary, and partially linked to the preceding material/resource statement. It was in essence a summary of the *Kassenbücher* for the year as far as we can establish. As Table 1 shows, this cash-based second part showed monetary values (cash received and cash paid) associated with the earlier material/resources, but also included further costs such as labor costs and building costs, as well as cash from sales of beer, grains and other items.

The cash summary section typically recorded much detail of each cash transaction. Using salaries/wages of brewhands as an illustration of the detail shown (see Figure 3) each recipient of cash was named, and how much they earned (in bold) was detailed. For example, in Figure 3, the brewhand Georg Reindl was paid for 34 weeks of work pro rata; an apprentice named Wölfl was paid on a per brew-basis. The same level of detail can be seen for payments to suppliers of services/materials, such as coopers, millers and lumberjacks. For some suppliers, the origin of the materials was also named (for example, the forest origin of firewood). As opposed to the materials/resources statement, this part was concluded with a

Original Text	Authors' Translation
Michael Aschenbrenner, Preykhnecht, thuet gebürendt jährliche Besoldung 27 fl.; dieweil er aber dz Jar nit vellig, sonnder vmb 13 Wochen weniger gedient, ist für seinen Tail pro rata bezalt worden	Michael Aschenbrenner, brew hand, due an annual income of 27 fl.; as he did not work the full year, but 13 weeks less, his wages were paid pro rata
20 fl. 1 ß 2 d	20 fl. 1 ß 2 d
Georg Reindl, Preykhnecht, thuet sein gebürendt Besoldung 27 fl.; dieweil er aber allain 34 Wochen lang gedient, ist ime pro rata bezalt worden	Georg Reindl, brew hand, due an annual income of 27 fl.; as only worked 34 weeks, he was paid pro rata
17 fl. 4 ß	17 fl. 4 ß
Dem Wölfl, Mithelffer alls Lehrnknecht, ist von ieder Sudt, deren, wie hieuer gemellt, 48 gewesen, 8 kr. bezallt worden, thuet	Wölfl, brewing apprentice, paid for each brew (which were 48 of this year, as reported) 8 kr.
6 fl. 2 ß 24 d.	6 fl. 2 ß 24 d.

Source: BRG 1607/08.

Note: fl - florins, the major currency unit.

Figure 3
Detail on Wages for Brewhands

net cash position (*Resst*), (see Figure 4, item in bold). This *Resst* was due to Maximilian I and had to be delivered to the *Rentmeister* (see earlier). Figure 4 depicts examples from the first Kelheim *Rechnungsbuch*, which does not cover a full year's operations. For later years (which are not consecutive due to the gaps in the records described previously), the *Resst* is shown in at least two components—cash and the value of inventory of materials at the year end. After the *Resst*, a statement such as “*Damit werden dise voreingeraite verblibne Ressten völlig erstatt vnnd bezalt*”. This translates to “herewith, the calculated balance will be fully reimbursed and paid”, which confirms the cash balance due to the *Hofkammer*.

Original Text	Authors' Translation
Einnemen vnnd Ausgeben gegen einander gelegt vnnd aufgehebt, befindet sich, dz gegen Abzug der hieuorn gesetzten Gellteinnamb mer außgeben dan eingenumen worden, restirt derowegen vber solchen Abzug herauß 4853 fl. 1 ß 22 d. 1 hl	it is found that—after subtracting this year's cash surplus—more was spent than earned, leaving a closing cash balance 4853 fl. 1 ß 22 d. 1 hl
Alweilen aber, wie hieuorn zuersehen vmb erkhauffte 100 Claffter Piechen Holz 33 fl. 2 ß 10 d. in Außgab eingefiert, dieselben aber nit bezallt worden, sondern von ir Durchlaucht Gehilzen zum Vort gehabt, so wirdet solches von obgemelter Summa abgezogen, bleibt allsdan noch per Resst herauß 4819 fl. 6 ß 12 d. 1 hl	However, the value of 100 klafters of timber, 33 fl. 2 ß 10 d. provided by His Majesty's Forestry but not paid for, is subtracted from the figure reported above, 4819 fl. 6 ß 12 d. 1 hl

Source: BRG 1607/08.

Note: a klafter was a historical unit of volume of timber used in Central Europe.

Figure 4
Net Cash Surplus Kelheim Brewery, 1607/08

There were no major changes in this general structure of the *Rechnungsbuch* in the early years.²¹ However, as mentioned earlier, the court chamber put a great emphasis on a common structure and form of their accounting across the various brewing operations. The Kelheim *Rechnungsbücher* may have initially been maintained according to their own rules, but the court chamber expected similar standards from 1614/15 (Gattinger 2007). As the Kelheim books available are not continuous—the years 1613/14 to 1622/23 are missing²²—we can only speculate about the precise changes in format and structure in this time. The *Rechnungsbuch* for 1623/24 shows an interesting change, with a considerable improvement in the detail provided. Figure 5 shows wheat usage as an example—amounts of wheat used are shown on a daily basis, as opposed to in total as before. This greater detail is in line with

²¹ Minor changes such as additional materials accounted for—brewer's yeast (1612), distilled spirits (1612)—or the usage of materials detailed occurred throughout the period. For example on the latter, the *Rechnungsbuch* in 1623 showed in-out line items added for barley (following wheat), followed by a breakdown of malt in and out from wheat and barley, respectively.

²² The reason for this is unknown (Gabler 2007).

Ausgab an Waizen zum Vermolzen in die Waiggen				
Monat Anno [1]624		Schaf	Schaf	
Tag (Date)			Tag (Date)	
24.		7	23.	7
28.		7	24.	7
29.		7	25.	7
Monat	Octobriß		26.	7
(Month)	(October)			
4.		7	27.	7
5.		7	28.	7
6.		7	Monat	Decembris
			(Month)	(December)
7.		7	3.	7
8.		7	4.	7
9.		7	5.	7
10.		7	6.	7
11.		7	7.	7
12.		7	8.	7
13.		7	9.	7
14.		7	10.	7
15.		7	11.	7
16.		7	12.	7
17.		7	13.	7
18.		7	14.	7
19.		7	15.	7
20.		7	16.	7
21.		7	17.	7
22.		7	18.	7
			19.	7
Huius 22 Waiggen thuet		154 Schaf	Huius 23 Waiggen thuet	161 Schaf

Source: BRG 1624.

Figure 5
Wheat Usage in Kelheim, 1623/24

Gattinger's (2007) comments that such a day-to-day breakdown of material usage is found in the *Rechnungsbuch* for the Munich brewery in 1613/14. It is therefore likely this way of showing the root of the summative figures was prescribed by the court chamber and enforced by the *Rentmeister*. As before, a *Resst* (balance of inventory) for each material was calculated, but with no indication of a corresponding inventory ledger or similar indicating any form of DEB. This greater detail increased the length of the *Rechnungsbuch* in page number terms.

A similar level of detail can be seen in the second part of the *Rechnungsbuch* in 1623/24. For example, cash receipts from sales of beer, empty casks, spirits, beer yeast, and toll grains are detailed. For most of these, the date, name of the customer, their location, and the amounts sold are stated in detailed tabular form, providing relevant detail to the court chamber. Notably, such detail was not provided for beer sales—here, the total amount of beer sold was merely multiplied by various per-measure prices. Similar detail was provided for suppliers of materials and services, listed by date and amount purchased. This structure was retained

throughout 1623/24 to 1641/42.²³ For the 1642/43 brewing season, an addition was made to the *Rechnungsbuch* in the form of a more detailed inventory. It showed the contents of the brewery, malting house, grain stores, house of the brewing administrator, mills, cooper's materials, building materials etc. Figure 6 shows the inventory of the brewing administrator's house for 1642/43 as an example. This more detailed inventory was not a novelty in the brewing infrastructure overall. The Munich brewery added this type of statement in 1626, and included it on a regular basis from 1628/29 (Gattinger 2007, 284), indicating that its inclusion in the Kelheim books was likely ordered by the court chamber. We cannot be certain if this change in the *Rechnungsbuch* had been trialled in Munich before other breweries, but given the court chamber's focus on efficiency, it likely was.²⁴ Inventory as well as the previously established structure continued to be a part of the *Rechnungsbücher* beyond the end of the Thirty Years' War in 1648 and to Maximilian I's death in 1651.

Original Text	Authors' Translation
Preuverwalterhauß mit desselben Zuegehör, darinn vnd in der Zallstuben 1 mit Eisen beschlagne Geltcassa 2 Schreibtafeln 1 stainener Tisch 3 Stüell 1 zünnene Aichel sambt 1 kupferenen Handbeckhen 1 Geltwaag mit 2 kupfernen Schisslen	Equipment in brewing administration building and payment office 1 iron-studded cash register 2 writing boards 1 stone table 3 chairs 1 tin bowl with 1 hand basin made of copper 1 cash scale with 2 copper bowls

Source: BRG 1642, 222.

Figure 6
Content Inventory of Brewing Administrator's House

A second major change to the *Rechnungsbücher* was introduced under Maximilian I's oldest son and successor, Ferdinand Maria.²⁵ In 1666/67²⁶, a section accounting for costs of building materials was added (*Baumaterial-Rechnung*) and located between the cash in/out and inventory sections. The building materials were formerly part of the inventory (Gabler (notes) 1642). Notably, this "account" was not monetary, with the material/resources expressed in quantitative measures. The brewery recorded lime, bricks, and lumber to be used in repairs and maintenance of brewery buildings (main and auxiliary buildings, BRG 1667/68). Such positions were previously part of the original materials/resources statement in the first part of the *Rechnungsbuch*, but as of 1666, the court chamber seemed to have mandated that the building materials warrant their own statement. As an example, Figure 7 shows the (transcribed) summary of bricks used (*Summa diser Abgab*) by type, and the closing inventory

²³ We reiterate that not all *Rechnungsbücher* were available (see Primary Sources at the end of this article). Also, as Gabler notes in his transcriptions for the books available between 1628/29 and 1638/39, the originals were lost, so he used prior transcriptions provided by Heinrich Letzing to the Schneider brewery.

²⁴ It would be interesting to see when this inventory had been added to the *Rechnungsbücher* of the other breweries during Maximilian I's reign.

²⁵ Ferdinand Maria was still a minor in 1651, so his mother, Maria Anna of Austria, served as his guardian until 1654. The *Rechnungsbücher* until 1653/54 were addressed to her rather than Ferdinand Maria.

²⁶ The *Rechnungsbuch* for 1666/67 is not available, but this new section's inclusion is clearly indicated in the available *Rechnungsbuch* for 1667/68 (see also Gabler (notes) 1667, 30).

Original Text	Authors' Translation
Vnnd zu Außbesserung der hohen Taschentaschentachung [sic] verbraucht worden 141 Taschen	Due to the high amount of roof repairs 141 roof tiles were used
Summa diser Abgab thuert Ganze Zieglstain 2400 Halbstain 100 Tachtaschen 141	Total of material used Whole bricks 2400 Half-bricks 100 Roof tiles 141
Verbleiben daryber noch im Vorrath Ganze Zieglstain 1400 Halbstain 300 Gefierte Pflaster 520 Rünenstain 330 Tachtaschen 99	Closing stock therefore Whole bricks 1400 Half-bricks 300 Paving stones 520 Ornamental bricks 330 Roof tiles 99

Source: BRG 1667/68.

Figure 7
Extract from Building Materials Statement, Kelheim Brewery

(*Verbleiben*) of bricks by type. Interestingly, the costs for these materials are not stated initially in the earlier cash section of the *Rechnungsbuch*. In the *Rechnungsbuch* for 1669/70, materials costs were stated in the building materials section, but not linked to the cash payments in any way. In contrast, some labor costs in connection with the usage of these materials (most notably labor associated with lumber) were linked to the cash payments by a folio number. This seemingly disjointed way of showing acquisition and usage of building materials in quantities, but without costs in some instances, remained stable for the years up to and including 1691/92. The details provided on “standard” building materials (lime/bricks/lumber) had increased considerably by then, with some additional materials (for example, nails) added. Considering the otherwise strong stability of the books’ form and structure, there was likely strong reasoning to introduce these two changes. We can speculate that the amount of building materials and work to repair and maintain the Kelheim brewery and its attached facilities had increased due to its age by 1667/68, and that the court chamber requested a separate statement on which to base decisions on such expenses. In 1670, a fourth brewhouse was added to Kelheim, with the construction costs fully accounted for in the *Rechnungsbuch* for 1670/71 (BRG 1670, 167-202). In this instance, the *Rechnungsbuch* refers to extraordinary “*Haubtbau-Ausgaben*” (167), or extraordinary main-build payments. Detail is given of both the building materials and cash paid, with all items being cross-referenced to the earlier cash summary by folio numbers. While not DEB—it was more detail, not a sub-ledger—this does demonstrate an emphasis on the accuracy and disclosure of the costs of the brewing infrastructure, and implies a requirement from the ruler and court chamber that such costs be monitored and controlled.

Ferdinand Maria reigned until 1679 and except for the section on building materials and the new brewhouse as noted, neither format nor structure of the *Rechnungsbuch* changed after Maximilian I’s death, depicting stability of the accounting records/system over many decades. This long-established structure and format remained quite stable under Maximilian II Emanuel’s reign from 1679, with no further major changes observable until and including

1691/92, the last year a *Rechnungsbuch* is available from the archival records used. Maximilian I's initial objective to have control of the *Weißbier* monopoly, to exercise coercive forces across the entire infrastructure with the court chamber as the executive decision-making entity, was enabled and supported by the system of upward information and downward order flows. Maximilian I's wish to generate wealth in this manner could be achieved without a major change to a more complex accounting system, and SEB as conveyed through the *Rechnungsbuch* prevailed as the accounting method, a point we discuss in more detail in the next section.

Discussion and Concluding Comments

As noted in the introduction, Oldroyd and Dobie (2009, 106) suggested that German merchants preferred SEB due to its simplicity. However, literature exploring German businesses or the German context is lacking, and this article therefore expands the relevant evidence base. We now address the accounting practices of the Kelheim brewery in relation to the relatively complex organizational field represented in Figure 2.

As we have discussed, Maximilian I added 24 *Weißbier* breweries to Bavarian state control. A modern organization with 24 branches would likely have some formalized management control and reporting system²⁷, with the accounting system as an important component. Our earlier descriptions of the *Rechnungsbücher* and the organizational field indicate that the accounting records fulfilled a control function at the Kelheim brewery. The Kelheim books recorded cash in and out, as well as surplus cash to be remitted to the State coffers. The books also ensured the State and the brewery itself had an account of materials within the brewery, including building materials. Such records of the movements of materials also suggest control of inventories.

As mentioned, an organizational field consists of constituents that impose a coercive, normative or mimetic influence on an organization. Coercion was a key feature of the *Weißbier* organizational field. Coercive influences (Scott 2014) provided a legally-sanctioned basis for the legitimacy of the breweries, with instructions stemming from Maximilian I through the *Rentmeister*—including the format of the accounting records to be kept. To draw an analogy to the present day, the court chamber of Maximilian I was similar to a regulator within the organizational field. Thus, through these coercive influences, the *Rechnungsbücher* remained quite similar in format over time, with some detail added in the later period of analysis. Such centralized setting of the general format of accounting books has similarly been reported in religious organizations. For example, Lorenzo Maté, Begoña Prieto and Alicia Santidrián (2018) noted a standard form of accounting at Benedictine monasteries in the sixteenth century; the Jesuits prepared an instruction on temporal administration in 1646, including a basic format for an annual statement to show cash in and out as well as inventories of goods such as wine (Carmona and Mahmoud Ezzamel 2009).

Gattinger (2007, 69) noted that Maximilian I was aware of the financial gains to be made by building a brewery and built his first *Weißbier* brewery in Munich in 1602, some years before the Kelheim brewery. Gattinger (2007) also mentioned that changes were visible in the *Rechnungsbücher* of this Munich brewery, suggesting mimetic forces may be at play—other breweries may have mimicked the accounting as done in the Munich brewery. Gleba and Petersen (2015) report *Rechnungsbücher* of other organizational types similar to those at Kelheim, showing similar flows of materials by quantity (if applicable to the organization) and a cash surplus. This suggests broader mimetic influences in a Germanic setting, although the evidence from Kelheim suggests a greater emphasis on coercive forces. In summary thus far,

²⁷ Indeed, the centralized controls described here were typical of 1980s UK conglomerates e.g., Michael Goold and Andrew Campbell 1987.

it is reasonable to suggest that accounting in the *Weißbier* organizational field was similar mainly due to the coercive influence of the *Hofkammer* as a vehicle for the interests of Maximilian I.

DEB had been written about by the mid-1600s in the German language. For example, a text by Hagerl dating from 1654 is titled *Schatzkammer Italienischen Buchhaltens*. The title is interesting, as the latter two words are genitive case, implying a literal translation of “the treasure chest of Italian bookkeeping”. This suggests that Italian bookkeeping offered riches and wealth, a metaphor for having everything one would need. A more useful translation is “compendium of Italian bookkeeping”. The text, a copy of which is available at the *Württembergische Landesbibliothek* in Stuttgart, provides a summary of DEB covering daily business transactions, cash in/out, interest and discounts, foreign trade and accounting for assets and liabilities. It was published in Hamburg, a large port city, and includes examples and templates and places much emphasis on cross referencing entries in various books of account. It also has an introductory heading which reads *Memorial ueber ProperHandelung* or “journal of proper trade”, suggesting the book extolls a “correct” method. This book would have been available to Maximilian I and his *Hofzahlamt*. The Kelheim *Rechnungsbücher*, however, contained cash in/out, records of materials in/out and a periodic cash surplus accounted to Maximilian I, typical features of SEB (see Edwards 1989).

As noted earlier, literature suggests German merchants continued to use SEB due to its simplicity. While the period of analysis of this article is within the “merchant accounting” period, to classify the organizational field shown in Figure 2 as a mercantile one may be oversimplistic. For example, Oldroyd and Dobie (2009) stated a key function of merchant’s accounts was to safeguard property rights, which did not require DEB. In the case of Bavarian *Weißbier* brewing, Maximilian I appeared to want to protect his property rights and receive amounts due to the treasury from the brewing operations. Hence, the yearly *Rechnungsbuch*, showing the *Resst* (surplus cash) due to him, was a control mechanism. The organizational field (Figure 2) was similar to the relationship between lords and tenants as captured in manorial accounting. That is, at the end of each brewing year, an account of all the monies and materials in and out was calculated, and the balance due to the “Lord” (Maximilian I) was paid (Oldroyd and Dobie 2009). As stated earlier, this was the main purpose of the *Rechnungsbuch*, and anything more complex (i.e. DEB) was unnecessary. No profit was calculated, nor was there a list of assets and liabilities with monetary values attached. Although the book provided much detail, its reliance on SEB principles fulfilled the purposes of Maximilian I. Thus, at least in the case of the Kelheim brewery, the use of SEB was most likely not due to simplicity, rather it was fit-for-purpose in terms of the needs of Maximilian I. This resonates with Jack’s (1966, 139) words on SEB, “the sorts of accounts that were kept were adequate to meet [the] needs”. The summary detail of each brewery provided through the *Rechnungsbuch* (see Table 1) allowed the *Rentmeister* to easily prepare a summary of cash receipts, cash expenses and materials/resources for the entire district (Gattinger 2007, 171). Given Maximilian’s ultimate objective of enriching his treasury, these summaries provided the *Rentmeister* with information to, for example, reduce costs or material use (ibid). While this could be deemed decision-making information, the objective of any such initiatives was to increase the wealth at the *Hofzahlamt* and not to measure the performance of a brewery per se. Edwards et al. (2009) suggested that writings on the use of DEB during the 1600s reveal an interest in its use as a basis for performance and control. In the case of Kelheim brewery, and likely the *Weißbier* sector under Maximilian’s control, detailed performance information was not required. However, accountability was required for the cash surplus to be remitted to the *Hofzahlamt*—and the SEB system as captured in the *Rechnungsbuch* fulfilled this task.

This study has some limitations. While it is one of few to explore the historic accounting records of a German brewery in the seventeenth century, two factors limit the discussion. First,

the article is based on records of a single brewery, limiting generalization. In particular, the accounting records described here are not necessarily of a merchant and thus the findings cannot be generalized to the accounts of German merchants. Second, the sequence of years of the Kelheim *Rechnungsbücher* is incomplete. Thus, there may be some changes which we cannot recount here. However, as explained, the general structure of the account books remained stable in the years analysed. For future research, it would be interesting to explore more Germanic accounting records from the timeframe of this article, including those of merchants. It would also be very interesting if studies of other Bavarian breweries were possible, to add weight to some assertions here, for example the influence of the *Hofkammer* on accounting. The work of Gattinger (2007) suggests archival data on other breweries are available, although it may not be digitized as the Kelheim records are. Studies of breweries in other parts of present-day Germany, or Europe more widely, from this timeframe could also add to the findings presented here.

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Primary sources

Corporate archives of Privaten Weissbierbrauerei G. Schneider & Sohn GmbH, available at <http://www.schneider-archiv.de/>.

For years ended 15 May, 1608, 1612, 1613, 1623, 1624, 1625, 1628, 1629, 1636, 1637, 1638, 1641-1649, 1651-1656, 1661-1665, 1667, 1669, 1670, 1671, 1674, 1675, 1680, 1687, 1690, 1691—represented as [Year] below:

BRG [Year]—Transcribed *Rechnungsbuch* of the Weissen Brauhauses Kelheim [Year] from the corporate archives of Privaten Weissbierbrauerei G. Schneider & Sohn GmbH, Kelheim, prepared by Matthias Gabler.

BRG Original [Year]—digitized *Rechnungsbuch* of the Weissen Brauhauses Kelheim [Year] from the corporate archives of Privaten Weissbierbrauerei G. Schneider & Sohn GmbH, Kelheim, prepared by Matthias Gabler.

Gabler, Matthias. Historical comments on *Rechnungsbuch* for year (notes) [Year], Kelheim.

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Appendix I: List of Breweries Added/Founded under Maximilian I

Category	Brewery location	Foundation/Acquisition/ Contract
Taken over from House Degenberg	Zwiesel	1602
	Schwarzach	1602
	Linden	1602
Acquired existing wheat-beer breweries	Gossersdorf	1602
	Winzer	1603
	Vilshofen	1637
	Cham	1642
Newly founded/built breweries	Munich	1607
	Mattighofen	1607
	Kelheim	1607
	Traunstein	1611
	Mindelheim	1618
	Straubing	1620
	Mering	1626
	Weichs	1628
Communal breweries with profits shared (not owned by state)	Viechtach	1604
	Regen	1605
	Kötzting	1606
	Furth im Wald	1607
	Neukirchen bei Heiligen Blut	1607
	Eschlkam	1607
	Schönberg	1607
	Grafenau	1607
	Hals	1599
Planned, but not built	Schärding	
	Eberhardtsreuth	
	Kösslarn	
	Ingolstadt	
	Rauhenlechsberg	