

# Real Compañía Asturiana de Minas: the usefulness of single entry accounting (1833–1853)

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## Abstract

**Purpose** – This paper examines the accounting system used by the Real Compañía Asturiana de Minas during its purely mining stage (1833–1853). It studies whether single-entry bookkeeping, supported by auxiliary records, could satisfy the information needs of partners and managers in a relatively large firm with few owners and no bank financing.

**Design/methodology/approach** – An explanatory study was conducted using primary evidence from the company's Historical Archive. Accounting books were identified and examined, including the prime entry book, general ledger, letter-copying books and several auxiliary records. Practices were assessed against the requirements of the 1829 Spanish Commercial Code, and the relationships between books and the usefulness of the recorded information for decision-making were evaluated.

**Findings** – The company relied on a single-entry system with a double-page layout in key books and extensive use of auxiliary ledgers for cash control, purchases, wages and coal movements. Despite inconsistencies and incomplete coordination between the prime entry book and the general ledger, as well as the absence of a trial balance and a complete inventory book, the system produced information useful for stakeholders. This included cash control, client monitoring, sales seasonality, product-grade pricing and broad operating results. Evidence suggests that accounting data supported the 1852 suspension of operations following renewed losses.

**Research limitations/implications** – Incomplete double-entry features and missing or partial records limit verification and full financial reconstruction.

**Originality/value** – The paper provides rare archival evidence of early nineteenth-century Spanish industrial accounting. It shows how single-entry bookkeeping remained relevant for decision-making under specific governance and financing conditions.

**Keywords** Nineteenth century, Accounting, Real Compañía Asturiana de Minas, Single entry

**Paper type** Research article

## 1. Introduction

In 1833 the *Real Compañía Asturiana de Minas* (Royal Asturian Mines Company) was established. This company was created with Belgian and Spanish capital, with the aim of dedicating itself to the manufacture of cannons and other weapons for the Navy, a goal that was never achieved (Canel Díaz and Sierra Fernández, 1999, p. 60). Initially, it was dedicated to the exploitation of the Arnao (Castrillón – Asturias) underwater coal mine. However, given the low quality of this coal, the company was reorganized from 1853, with the entry of a new shareholder and the use of bank financing. It was also decided to use the available resources to

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obtain zinc. The aim was to provide a safe destination for the company's coal production, which is why a factory was built in Avilés (Asturias) to exploit the zinc minerals of the Cantabrian coast, mainly calamine deposits in Santander and blende in Guipúzcoa. So, the mining company was converted into a metallurgical establishment.

The purpose of this research is to analyse the accounting system of this company during the period of purely mining activity (1833–1853). For this purpose, we consulted the Historical Archive of the company and compiled all the accounting information available corresponding to the period under study [1]. The applied methodology involved identifying the accounting books from the period, analysing them and examining their compliance with contemporary regulations.

This research is justified because this company can be considered a pioneering one in industrialization in the Principality of Asturias and in Spain, as it is considered the first modern Spanish coal company (García López *et al.*, 2004). It is also a clear example of the foreign financing policy that was adopted in Spain at the beginning of industrial activity.

This research is important because in European countries, very few accounting books corresponding to the first half of the nineteenth century have been preserved (Yamey, 1981, pp. 128–129). Only a small number of accounting books from modern times have survived to the present (Kim Yuryevich, 2024, p. 14). In Spain, historical-accounting studies based on original sources from private companies during this period are uncommon (Ruiz Llopis, 2007, p. 26). In addition, for Spanish industrial companies, Hernández Esteve (2013, p. 744) notes that research on accounting books has not included many firms. Consequently, this paper helps to address this gap and may serve as a case for comparison in future studies of this period.

The remainder of the research is structured as follows. First, Section two provides a summary of the context of the firm, including an economic overview, the legal framework of accounting during the period studied and the background of the company. The next section examines the bookkeeping practices of the company, beginning with a general description of the company's archive and the documentation managed. This is followed by a detailed discussion of the mandatory accounting books and other books maintained by the company. Based on this analysis, the subsequent section examines the relationships between the company's books and their usefulness for decision-making. The final section presents the main conclusions.

## 2. Contextualization of the company

This section provides a contextualization of the company. First, a brief overview of the economic environment of the period is presented. In addition, this analysis is complemented by an examination of the legal framework governing the preparation of accounting information in which the company operated. Then, we explain the origins and foundation process of the company.

### 2.1 Economic contextualization

The origin of the *Real Compañía Asturiana de Minas* dates to the beginning of the reign of Isabel II in 1833. It coincided with a change in the government that caused an acceleration of the industrialization process with investment from abroad, which provided financial and technical resources (García López *et al.*, 2004). Foreign capital became predominant given the weakness and impotence of the nascent Spanish bourgeoisie. This entry of capital made possible, among others, railway construction projects and exploitation of mining resources and urban public services (García Delgado, 2000, p. 15).

The main factors that prevented industrial development in Spain were: (1) shortage of internal demand due to the existence of a small and unstable internal market (Tortella, 1996). This was mainly due to the absence of means of transport to adequately connect the different local markets, even over short distances (Vilela Campo, 2008). (2) Low population density and low level of revenue compared to other countries such as France and England. (3) A traditional subsistence agriculture, with a strong component of self-consumption, which only exchanged scarce surpluses for products from the small local artisanal industry. (4) A permanent public

budget deficit since the end of American silver remittances. (5) Little development of bank financing that would allow the promotion of the industrialization process. In 1830, only one bank was registered in the form of a public limited company, the *Banco de San Fernando* (Bernal Llorens, 1998, p. 906). (6) The level of technology and education in Spain was remarkably low, which is why technical assistance to iron casting and weapons manufacturing was sought abroad (García López *et al.*, 2004). (7) The political instability of the period 1790–1840 was unfavourable for business initiative. During this period, businessmen dedicated themselves practically exclusively to businesses related to supplies to the army, to financing the State and to the purchase of land (García Sanz, 1994; Carreras, 1990). Finally (8) we must highlight the fact that the liberal revolution was carried out under the influence of a moderate faction (*moderantismo*). This meant that economic policy was greatly influenced by the landowners and was interventionist and anti-industrial (Sudrià, 1996).

### *2.2 Legal framework of accounting in the period under study*

In 1829, the First Spanish Commercial Code was approved (Sainz de Andino, 1829). It was the first trade law generally applicable throughout Spain. As antecedents, among other regulations, we can highlight the *Ordenanzas de Bilbao* (Bilbao Ordinances) of 1737 and the French Commercial Code of 1807 [2]. The Code of 1829 meant the generalization of the obligation to keep accounting books for all merchants (Villacorta Hernández, 2023, p. 650). The regulation of accounting, like the rest of the Code, responds to the purpose of unifying the practice among all merchants in the country. This was an essential condition for the protection and legal value of books to be real throughout the territory (Bernal Llorens, 1998, p. 903).

The Code implied the obligation to keep the same books to all merchants. Specifically, article 32 of the Code established three books: the prime entry book, the general ledger (or current accounts book) and the inventory book. It is remarkable that, contrary to the French code, the general ledger was maintained. This book was much discussed by foreign doctrine, despite its notorious usefulness (Cuesta Rute, 1973, p. 22). It is noticeable that a certain connection with the historical line was maintained by establishing that retail traders had to prepare the general balance sheet only every three years (art. 38). Additionally, they were not required to write down in the prime entry book individually all their sales. Rather, they had only to summarize the cash sales of each day and record in the current accounts book those made on credit (art. 39).

The three books had to be bound, covered and numbered and had to be presented by the merchant to the commercial court of his domicile, so that all their pages could be initialled by one of its individuals and the notary of the same court. In the first page it should be placed a dated note, signed by both the individual and the notary, stating the number of pages contained in the book. In towns where there was no commercial court, these formalities had to be fulfilled by the civil magistrate and his secretary (art. 40).

In addition to the mandatory books, the Commercial Code allowed the keeping of others that the merchant deemed appropriate for the best order and clarity of his operations (art. 48). It was also established that books were required to be kept in Spanish language. The Code also included the obligation to preserve correspondence as in case of litigation it had to be presented to court. Merchants were obliged to keep in files and following good orders all the letters they received in relation to their negotiations and business. They had to note on the back the date on which they answered them, or whether they did not give an answer. They were also obliged to literally copy all the letters they wrote about their business in the so-called letter copying book, which had to be bound and foliated (arts. 56 and 57).

No section of the Commercial Code of 1829 made express mention of the double entry method, nor of its mandatory use. However, as Fernández Peña (1991, 61) points out, of arts. 33 and 34 it follows that it should always be used because of two reasons: (1) the prime entry book had to be kept, day by day, and according to the order in which all the operations were carried out. The character and circumstances of each one of them should be designated, as well as the result produced, so that each item stated who was the creditor and who was the debtor

(art. 33). (2) As indicated above, article 34 of the Code established that in the general ledger the current accounts had to be opened. It should be indicated whether they corresponded to debits or credits. The prime entry book entries had to be translated to the general ledger following a strict chronological order. However, these provisions were also included in the aforementioned *Ordenanzas de Bilbao* of 1737. [Hernández Esteve \(2013, p. 498\)](#) suggests that although at a first look they prescribe that accounting books of wholesalers should be kept using the double entry system, this issue is not at all clear [\[3\]](#).

Furthermore, it is noticeable that the Code barely included references to material accounting. Although the French code on which it was inspired did not contain references to material accounting, other codes, such as the German one, provided for certain rules both on the content and naming of the items of the balance sheet and on valuation ([Cuesta Rute, 1973, p. 350](#)). In the Spanish case, [Tortella \(1994, p. 137\)](#) considers that the reason that the Code prescribed an exact description of items but nothing about valuation was mainly because there were monetary difficulties at the time. During the first third of the nineteenth century several monetary systems from different periods and regions coexisted in Spain, none of them decimal, along with abundant foreign and overseas currency. All this caused uncertainty and made transactions difficult.

### 2.3 Background of the company

Mining activity in Asturias had been developing at least since the sixteenth century. Specifically, the first mention to coal exploitation in Avilés and its surroundings refers to a superficial coal deposit in Arancés (Municipality of Castrillón) [\[4\]](#). The first official document of this mining activity dates from November 15, 1625, when His Majesty Philip IV issued a Certificate so that Andrés Martínez Ballesteros could benefit from a series of mines, including a coal mine in Avilés ([Adaro Ruiz, 1981, p. 274](#)). These were small artisanal exploitations without mechanization.

The eighteenth century marked the arrival of the Enlightenment in Spain and, therefore, the impetus for industrialization. The enlightened politician Gaspar Melchor de Jovellanos had already anticipated in 1789 the special importance that coal would have for the development of industry in his “Report on the benefit of coal and the usefulness of its trade” ([Jovellanos, 1858; Volume II, pp. 463–467](#)). This interest was gradually echoed by members of the various Spanish governments throughout the early years of the nineteenth century [\[5\]](#).

Among them, it is worth highlighting the Minister of the Navy, Luis María Salazar. He was interested in providing the Spanish Navy with an industrial establishment in which the cannons, projectiles and other accessories necessary for the fleet would be built. The minister, open to the trends of the century, did not resign himself to the fact that Spain, rich in iron ores and coal, had to depend on foreign countries to satisfy its metal needs ([Rodríguez Álvarez, 2020, p. 12](#)). For this reason, in 1828 he proposed the reconstruction of the Cavada and Liérganes foundries in the region of Cantabria with foreign advice. Technical studies were carried out and it was concluded that significant investments would be required in totally obsolete facilities [\[6\]](#), making this project unviable. Consequently, the project was reoriented and the construction of an iron foundry in Asturias using Asturian coal was proposed.

The promoters of the initiative signed an agreement with the Spanish Government to exploit the coal mines and establish iron smelting in the province of Asturias (Royal Order of Ferdinand VII, dated September 4, 1832). After this, they organized a visit to Spain in the summer of 1833 to examine and recognize the site on which the planned mines were to be established ([García López et al., 2004](#)).

The conclusions of the studies conducted during the visit showed that it was prudent to limit the magnitude of the initial project by renouncing the creation of a steel industry [\[7\]](#). So, it was decided to develop only a project to start a coal mine in Avilés. On November 4th, 1833, the promoters signed a memorandum of understanding with the Spanish Government, which was subsequently granted by Royal Order of the Queen Regent María Cristina dated November

14th, 1833. Some days later, on November 28th, 1833, it was registered by the Chief Notary of Revenue and the General Directorate of Mines, specifying the conditions of the future exploitation (García López *et al.*, 2004).

The Royal Order of November 14th, 1833, established that the company would enjoy the name and title of *Real Compañía Asturiana de Minas*. It could also place the Royal Coat of Arms on its buildings, workshops and warehouses, enjoying the franchises, exemptions and prerogatives that such establishments had. In addition, the company was given the exclusive right to exploit, for a period of 25 years, all the coal mines within the limits defined by the polygon formed by the road from Avilés to Soto del Barco, the Pravia estuary, the coast up to the Avilés estuary and up to Punta del Llampero, and from there to the bottom of the Avilés estuary. This area surrounded the city of Avilés, in the region of Asturias [8]. It was also given the power to stockpile the necessary inputs, mainly wood for shoring, refractory stones and earth for bricks; to establish iron roads and causeways; permission to import steam pumps, machinery and utensils, free of payment of duties; and permission to transport by sea and land and export all coal free of all royal or municipal duties (Adaro Ruiz, 1994, p. 111). As a privileged company, it was exempt from paying the surface fee and the 5% tax on the value of the product during the 25 years of the concession [9]. Preparations for the tillage began in December of the same year, 1833.

Months later, on April 30th, 1834, the previously signed agreements were notarized by the notary of Madrid, Justo de Sancha, constituting a regular collective society with a capital of 450,000 *reales de vellón*. The capital was contributed by three partners in equal parts [10]. These partners were authorized to sign indistinctly, and they were also Directors and Administrators of the Company (García López *et al.*, 2004). In the company's accounting books, the first daily wages appear listed on Friday, December 20th, 1833. This was recorded in the workers' book described below. In January 1834, the collection of wood and other materials began. The purpose was to build the entrance arch to the first mining pit, which began to be dug in February [11]. This indicates the start date of the operations of the company.

On January 5th, 1835, the first shipment of 50 quintals (about 2,300 kg) [12] was made from the Arnao mine to the port of Avilés (Rodríguez Álvarez, 2020, p. 18). During the first years of the company's life there were no major surprises, and the biggest problem was finding a market for the extracted coal [13]. In Asturias, there was no industry that consumed coal, and sales were mainly oriented to domestic consumption [14]. It must be kept in mind that Arnao coal was not suitable for the manufacture of iron, so the iron factories of Guipúzcoa (Spain) used English coal, which in addition was cheaper (Rodríguez Álvarez, 2020, pp. 18–19). However, in subsequent years the mine was depleted, making it necessary to begin extraction work from pits that went under the sea.

At the beginning of the 1850s, the company was in the midst of a financial crisis that required profound reorganization because the high-quality coal extracted from its mines was running out [15]. So, coal extraction was not competitive and the high transport costs due to the difficulty of loading it only allowed consumption for on-site metallurgy. This was the only possibility to continue a profitable exploitation (Chastagnaret, 1985, pp. 109–110). Finally, in 1852, production was suspended to develop a research plan and install new machinery. When the company restarted operations, it would stop exporting coal and begin preparing to produce zinc.

### 3. Bookkeeping in the company

The examination of the Archive allowed us to identify several common aspects in the company's accounting practices. Based on these findings, the company's books were analysed, distinguishing between those required by law and other books maintained voluntarily.

#### 3.1 Issues common to all the accounting books

As already stated in the first section, the purpose of this work was to analyse the accounting systems of the studied period (1833–1853) and the books used. To do so, the accounting books

from the company's Historical Archive were reviewed. As the date of entry into force of the first Spanish Commercial Code was May 30th, 1829, it must be borne in mind that accounting practice had to be governed by the rules contained therein. In this regard, we grouped the books into two sections, the first one corresponds to the mandatory books and the second contains other auxiliary books. However, there are some common aspects regarding bookkeeping. First, the used books have some blank pages and all of them are lined (it seems in pencil) to facilitate the use of rows and columns.

Furthermore, it is also noticeable that some books, such as the general ledger, have index pages at the beginning or at the end of them. These pages contain the names of the accounts or third parties contracting with the company and the numbers of the pages where such information can be located. Most of the pages of the books measure  $300 \times 210$  mm. Thicknesses range from 4 to 5 cm for the thickest books (prime entry book, general ledger and purchases book), as their volume increases with use, to 2 cm for the thinnest ones (current accounts book, letter copying and cash book). Almost all of them are bound in leather-covered cardboard (prime entry book, general ledger, purchases book, cash book and purchase invoice copying book), with and embossed border on the front and back covers and lines on the spines. However, in some cases (current accounts book, letter copying, cash book and workers' book), there is only leather finishing on the corners and spine, or even just on the spine (coal received by land book). Examples of the various types of binding can be found in [Annex 1](#).

It is also remarkable that the monetary units used were the *real de vellón* and as fraction, the *maravedí*, at a rate of 34 *maravedíes* per *real de vellón* (17 *maravedíes* = 0.5 *reales de vellón*). However, some books contain columns for other fractional monetary units which were *cuartos* and *ochavos*. The equivalences in the books mean that four *cuartos* and one *ochavo* equal to half a *real de vellón* (workers' book). Rounding is applied to translate *cuartos* and *ochavos* into *maravedíes*. One *cuarto* is equivalent, by rounding to four *maravedíes* and one *ochavo* to two *maravedíes* (current accounts book). It is also remarkable that in several books, there is still the blotting paper that was placed between two sheets, to prevent what was recently written from staining the adjacent page. Finally, we must highlight that some books show significant deterioration due to the passage of time and storage conditions, mainly humidity. An example of this can be seen in [Annex 2](#).

### 3.2 Mandatory books

As indicated above, the mandatory books according to the Commercial Code of 1829 were: (1) the prime entry book, (2) the general ledger and (3) the inventory book. However, regarding the latter, the existence of complete inventories was not confirmed [16]. We only found loose sheets with partial inventories of stocks. Also, in the mine ledger, inventories of mine material were collected. However, as to be detailed below, this was not its main purpose.

All the books are bound, covered and foliated. However, we found no evidence that they were presented, as was obligatory, to the commercial court of their domicile. The presentation act meant that one of the members and the notary of the court (or the civil magistrate and his secretary in towns where there was no commercial court), signed all the pages of the book. A note, dated and signed by both the member and the notary, had also to be placed on the first page of the book, detailing the number of pages contained in the book.

In addition to these books, the Company also kept a letter copying book. In the Archive there are three from successive periods (from May to December 31st, 1836; from January 1837 to June 1844; and from June 1844 to July 11th, 1854). The following subsections analyse the prime entry book, the general ledger and the letter copying book.

**3.2.1 Prime entry book.** The first entry of this book is dated March 1st, 1836, and the last corresponds to July 26th, 1852. Only 50% of it is used, and the rest of the book is blank, and neither contains horizontal nor vertical lines. The book is kept on a simple entry basis, identifying each account and whether the entry goes to debit or credit. Most of the accounts are personal accounts. The entries are not balanced, that is, a corresponding counterpart is not

indicated. The structure is the following: (1) A heading with the date of the entry. When it is repeated, it simply says *Dicho* (Said). (2) The account name. (3) The corresponding sheet of the general ledger is identified in the left margin. (4) The concept of the entry. It always begins with the expression *Por* (By). In the following lines, a much broader explanatory detail is added, especially when the *Diversos* (Miscellaneous) account is used. Finally, (5) the numbering, which is by entries, starting each year at number one. The number of entries per year in this book is detailed in Table 1.

A noticeable feature of this book is that the years are neither opened nor closed, and every new year begins immediately after the previous one. Furthermore, the accounting system must be understood as a single entry one [17], due to the lack of some of the basic characteristics of double entry: (1) The prime entry book entries are not complete, as a counterpart is not indicated to match the debit side with the credit of the same date. Nevertheless, the debit and credit entries for the year 1836 add up to the same amount (1,359,241 *reales de vellón* and nine *maravedís*). (2) The sum of the debit and credit of all the accounts in the general ledger, to form a trial balance, does not result in the same amount. That is, it is not balanced. (3) No documents similar to a trial balance sheet or a final year inventory were found. Finally, (4) some entries in the prime entry book were not transferred to the general ledger.

**3.2.2 General ledger.** It is a double-page book (debit and credit), with columns that include the date, description and amount. Each page is headed with the name of the account. The part used is numbered up to sheet n. 97. As in all general ledgers, once opened the book, the page numbers on the left and right coincide, so that the debits are placed on the left and the credits on the right. Pages nine, 95, 96 and 98 are blank and two more unnumbered sheets were used, which would correspond to the numbers 99 and 102. That is, the pages were left blank for later use. The dates of the entries range from July 31st, 1836, to August 20th, 1853. Like the prime entry book, it is a blank book, lined for use. The first page contains the index, with the accounts and the numbers of the sheets where the corresponding entries are recorded. This book is a third of the way used and the rest is blank, with unlined pages.

**Table 1.** Number of entries in the prime entry book

Year	No. of entries
1836*	73
1837**	90
1838**	111
1839**	160
1840**	41
1841**	154
1842**	175
1843**	253
1844**	196
1845**	163
1846**	177
1847**	178
1848**	188
1849**	195
1850**	200
1851**	142
1852***	63

**Note(s):** \*The first entry of this year corresponds to March, 1, and the last to December, 31

\*\*The first entry of this year corresponds to January, 1, and the last to December, 31

\*\*\*The first entry of this year corresponds to January, 1, and the last to July, 21

**Source(s):** Own elaboration

It has correspondence with the prime entry book, although this only extends until July 26th, 1852, and the general ledger continues with entries on later dates, as indicated above. Specifically, when analysing the first year, there are some entries from the prime entry book that do not appear in the general ledger: (1) Entries 24 and 26, dated August 12th and 26th, 1836, titled *Diversos por ventas de carbón* (Miscellaneous for coal sales). The first is a debit entry and the second a credit one, both for an amount of 2,224. The general ledger sheet number is indicated, but the entries do not appear in it. (2) Entries 28 and 29, dated August 26th and 28th, 1836, both from D. Mateo Alvargonzález, from Gijón. The first is a debit entry and the second a credit one, both for 700 *reales de vellón* each. Finally, (3) entries 53 and 59, dated October 25th and November 30th, 1836, both from D. Manuel Arias, from this town (Avilés). The first is a credit one and the second a debit one, both for 3,300 *reales de vellón* each.

The accounts recorded in the general ledger have the following characteristics: (1) 62 out of a total of 65 are current accounts (personal). Of these, one is the account of one of the Spanish partners of the company, Mr. Felipe Riera, the Marquis of Casa Riera, 48 were classified as customer accounts, three were agent accounts and 10 correspond to suppliers. (2) The account entitled *Compañía Asturiana de Minas de Carbón* (Asturian Coal Mines Company) acted as an operating account that recorded, among others, purchases, wages and sales. The balances of this account were not carried over from one year to the next, and its entries were settled with the personal account corresponding to the Marquis of Casa Riera. (3) The account entitled *Diversos por Ventas de Carbón en estas Minas* (Miscellaneous for Sales of Coal in these Mines) included sales of retail coal from July 1836 to January 1840. Finally, (4) the account entitled *Compañía Nueva Minera* (New Mining Company) is the last account included in the general ledger, the details of which are presented in Table 2.

A relationship was established between the entries in the prime entry book and the general ledger. In each entry in the prime entry book it is indicated the sheet number in which the entry is recorded in the general ledger. We checked that the amount was the same in both books except in specific cases.

3.2.3 *Letter copying book*. As indicated in subsection 2.2, the Commercial Code of 1829 established the obligation to copy letters and documents. We found in the Archive three books used for this task. The first details in its title the dates from May 1st to December 31st, 1836. This first book, similar to the others, is manual. That is, the correspondence that the company had with third parties was transcribed into a book, writing the letters one by one with a pen, sometimes with little careful and careless handwriting. The first letter is dated May 1st, 1836.

It is noticeable that this book was not used for letter copying until page eight. The first page is blank. Page two contains a heading to detail coal shipments, as follows: Months, Days, Ship, Captain, Nation, Coal (Quintals (qq.) and Arrobas (@)), Price (*reales de vellón* and

**Table 2.** Details of the account entitled *Compañía Nueva Minera* (new mining company)

Debit	Item	<i>Reales de vellón</i>	<i>Maravedíes</i>
August 20, 1853	Amount of expenses and payments made by me according to detailed statement in cash book	60,599	10
	Credit entries made for the value of transfers to Spain	1,130	
Credit	Item	<i>Reales de vellón</i>	<i>Maravedíes</i>
August 20, 1853	Net sales amount according to detailed statement	24,231	26
	Amount of the three credits of 10,000 francs each	113,564	25

**Source(s):** Own elaboration

*maravedies*) and Product (*reales de vellón* and *maravedies*). However, no shipments were indicated as this page only contains a note that corrects an error on the following pages. Page three contains the same heading, and five lines of data that were used and crossed out later. Pages four to seven have the indication *Notoria de los buques que han cargado carbón en estas minas con expresión de los propietarios o consignatarios por cuya cuenta se cargaron del número de . . .* (Notary of the ships that have loaded coal in these mines with expression of the owners or consignees on whose account they were loaded with the number of . . .). The heading is as follows: Years, Months, Days, Ship, Nation, Captain, Owner or consignee, Cargo, Quintals, Arrobas, Price (*reales de vellón* and *maravedies*) and Product (*reales de vellón* and *maravedies*). These pages contain 33 records (one of them crossed out). The first is from March 26th, 1836, and the last from July 15th of the same year. As well as in the case of the books described above, the pages contain horizontal and vertical lines.

From page eight onwards, the first letter copying book was used for copying correspondence. The letters were transcribed consecutively, one after the other, separated only by a horizontal line. A single vertical line was also included, to delimit the margin. 64 pages were used for this purpose. The last letters are dated December 16th, 1836. Like other books, it has a different use by opening it from the back cover, as if it was a different one. In this part, the first four pages are blank. Starting on page five, it includes the payments made by Mr. Nagel [18]. 65 pages were used, ranging from November 1833 to February 1836. The evolution of the use of this book is reflected in Table 3.

The second book is titled *R CARTASA de 837 a 841* (LETTERS from 1837 to 1841). Contrary to what the title indicates, it collects correspondence from January 1837 to June 1844. It is a book with the same dimensions as the previous one, that is, 300 × 210 mm., but much thicker. The letters were also copied manually. The margin, separated using a vertical line, indicates at the beginning of each letter the city of destination. This book was completely used, except for the first pages and the last, which are blank. For the third book, its title is simply *Copiador* (copying book). It collects correspondence from June 1844. That is, it is clearly the continuation of the previous one, and the last letter is dated July 11th, 1854. This book is a little larger than the previous one (315 × 215 mm.), and a little narrower. Likewise, the letters were copied manually, with the same vertical line for the margin and the indication of the city of destination. This book was used two-thirds, with the first and the last page blank. The unused portion of the book has no lines.

### 3.3 Non-mandatory books

The company used other auxiliary books related to accounting, but which are not mandatory according to the Commercial Code of 1829. These are the current accounts book, the cash book, the purchases ledger, the mine diary, the purchase invoices copying book, the coal received by land book, the bills of exchange copying book and the workers' book.

- (1) *Current accounts book*. The exact title is *Libro de cuentas corrientes para el uso del contador de las minas que están a la dirección de D. Armando Nagel* (Current accounts book for the use of the accountant of the mines under the direction of Mr. Armando Nagel). The book opens in March 1836, but there are loose sheets with entries corresponding to the dates from November 27th, 1833, to February 12th, 1835.

**Table 3.** Contents of the first letter copying book (May 1st to December 31st, 1836)

Use	Start date	End date
Current accounts	Nov. 29, 1833	Feb. 3, 1836
Notary of the ships	Mar. 26, 1836	Jul. 15, 1836
Letter copying	May 1, 1836	Dec. 16, 1836
<b>Source(s):</b> Own elaboration		

The last entries are from February 1840, although there are still blank sheets. As well as for the case of the prime entry book and the general ledger, unused sheets have no lines. The book has a double-page layout, *Debe* (Debit) and *Ha de Haber* (Credit). Mr. Armando Nagel was the director and the payer, and was provided with funds for this function, similarly to a cash fund. So, he was given money to control all payments and purchases. We must also mention that, as described in subsection 6.4, in the back sheets of the first letter copying book there are entries containing the payments made by Mr. Nagel, from November 1833 to February 1836.

- (2) *Cash book*. Since June 13th, 1836, the company kept a cash book using a double-sheet system. That is, pages on the left side contain debits (collections), and those on the right credits (payments), with weekly closings. As indicated when describing the prime entry book, this does not imply a double entry accounting. However, a certain knowledge of accounting is evidenced, both in the terms used and in the layout of the books. Finally, we must highlight that it was not possible to make a correspondence between the entries in the cash book with those in the prime entry book.
- (3) *Purchases book*. This book begins on March 1836. It is also a blank book, manually lined for use, with columns for quantities, concepts, prices and totals. It details the purchases of materials made by the company (from miscellaneous) and it also includes expenses. The statements of the different entries are: wood, expenses, iron, lighting, gunpowder, conservation of boats and various effects. The book ends in the 4th quarter of 1839. As for the case of the previous books, the blank pages are unlined.
- (4) *Mine ledger*. This book begins with entries corresponding to November 1840. It is the back of the purchases book, that is, the same book was used for two different purposes. The mine ledger is also a blank book, lined horizontally and with a single vertical line, to collect quantities. In this book, an inventory of mine's material was made, and the actions carried out there were detailed.
- (5) *Purchase invoices copying book*. Although its name, this book is a list of sales, that is, purchases made by third parties to the company. The first entries correspond to March 26th, 1836. It lists all invoices for coal purchases made by the company's clients, with the following data: date, ship, nation, captain, owners, consignees or buyers, quintals of coal, price, amount and observations. This layout lasted until May 1852, when the data of ship, nation and captain disappeared, and the class was incorporated. This feature indicates the quality of the material sold, which implied different prices. This lasted until August 31st, 1855. Starting in August 1854, and extending until April 1861, the book was also used as a copy of invoices for received goods, detailing date, concept, quantity, price and total. Each group of items was headed by the name of the supplier and the total was indicated at the end.
- (6) *Coal received by land*. The exact title of the book is *Carbones recibidos por tierra (y mar) procedentes de las Minas de Arnao y Sta. M<sup>a</sup> del Mar. Año 1846* (Coals received by land (and sea) from the Arnao and Saint Mary of the Sea Mines. Year 1846). It is a slightly larger book than the others, since its dimensions are 315 × 215 mm. It is noticeable that this is the only book with printing lines and is numbered in its entirety, from sheet 1 to 402. That is, it consists of 804 pages. The book has two parts. The first one lists the receipts of coal indicating the date (the first is January 1846), name of the carter, quintals received and destination. The last date is December 1851, and it concludes with a summary of the year 1852 (until June). This part ends on sheet 39 of the book. Data corresponding to December 1851 are on the front of this sheet and the summary for the year 1852 is on the back.  
The second part of the book refers to *Entradas y salidas de los carbones procedentes por mar de las minas de Arnao y S<sup>a</sup>. M<sup>a</sup> del Mar año 1847* (Entry and exit of coal from the Arnao and Saint Mary of the Sea mines by sea, year 1847). This part begins on the back of

sheet 301, with the stocks on January 1st, 1847, and ends on the front of sheet 345, in May 1852. The page on the right was used for coal received and the left for coal sent, with subtotals per month. Finally, we must highlight that it was not possible to establish a correspondence between the information in this book and that in the prime entry book and the general ledger, since it contains information that is highly focused on transport.

- (7) *Bills of exchange copying book*. The dimensions of this book are 300 × 210 mm. It consists of two parts, the main part, titled “WAGES AND EXPENSES”, contains 13 sheets which are completely damaged by humidity. This makes it impossible to obtain information from them. The other part, which is accessed from the back cover, was used to copy the bills of exchange issued by the company from April 1840 to May 6th, 1852.72 sheets were used for this purpose. The copying system was similar to that used to copy letters. That is, manual transcription, one letter after the other and separation using a horizontal line. Due to the use made of this book, there is no feasible comparison with the prime entry book and the general ledger.
- (8) *Workers’ book*. The purpose of this book was to collect the workdays of each employee, to settle salaries. It has a large format (390 × 255 mm.) and is 20 mm thick. It is the largest book in the Archive. It provides evidence of the first days of the company, as its starting date is Friday 20th December, 1833. In that month the company operated on 20th, 21st, 23rd, 24th, 27th, 28th, 30th and 31st. That is, there was no activity on Sundays and on Christmas Day and the following day. This book has vertical columns for each worker with a totalizer for the day. As a final remark to the review of the company’s books, we must highlight that in the *Compañía Asturiana de Minas de Carbón* account in the prime entry book and the general ledger references are made to data from this book, but as these are global entries, a one-to-one correspondence cannot be established.

#### **4. The information system of the *Compañía Asturiana de Minas de Carbón* and its usefulness for decision-making**

##### *4.1 Relations between the accounting books*

An examination of the accounting books reveals that the most important book was the general ledger. It allowed the partners to know the company’s results through the *Compañía Asturiana de Minas de Carbón* account where expenses and revenue were recorded quarterly. However, the technique was simple. Depreciation of fixed assets was not even calculated and the knowledge obtained was mainly related to receipts and payments. For the details, references were made to other auxiliary books such as the purchases book and the workers’ book. These books also served the function of reporting expenses and revenue to the partners. The purchases book was documented with the purchase invoices copier book and, in turn, served as support for the bills of exchange copier book.

The company had two other books for cash control. Specifically, it used the current accounts book (with Mr. Nagel, who acted as the company’s payer) and the cash book. These books were fed with information from the purchases book and the workers’ book. The company also had a mine ledger, in which material from the mine and actions carried out there were recorded. From the point of view of sales activity, it had a book of coal received by land which also contained information about the entry and exit of coal by sea, and a notary of the ships that loaded coal. This information allowed the calculation of stocks, which, together with the information from the balance sheet, allowed the inventory to be drawn up. However, as noted above, only loose sheets with partial inventories were found. Finally, to keep a record of the company’s activity in its relations with third parties and with its own partners, the company had a letter copying book.

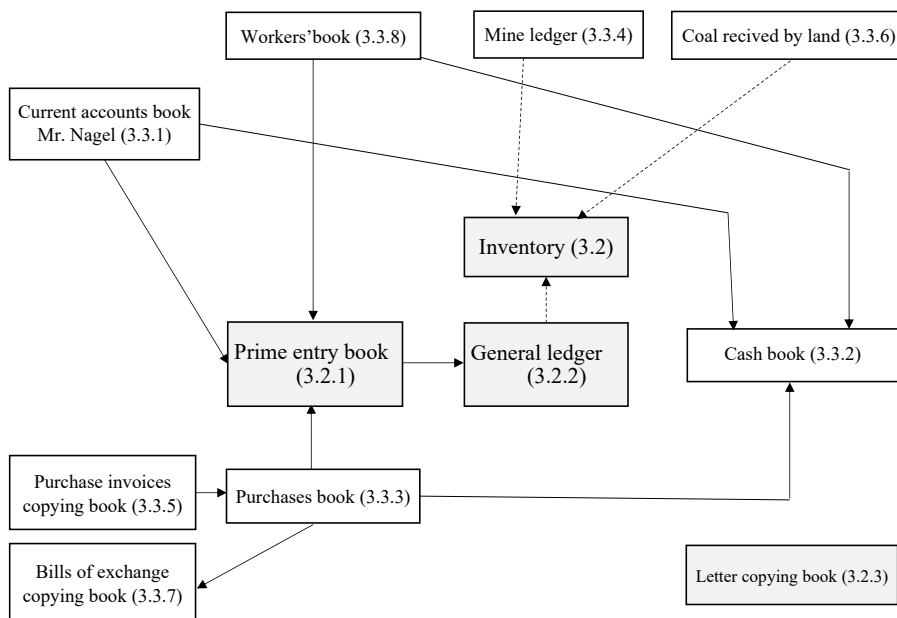
It should be noted that the relationships between the prime entry book and the general ledger were not perfectly coordinated. In fact, in some cases it was possible to identify a lack of

correspondence in the transcription of events from one to the other. The absence of a trial balance means that these circumstances were not detected [19]. In addition, we could not establish a correspondence between the entries in the cash book and the prime entry book. Nor has it been possible to establish a correspondence between the book of coals received by land, the current accounts book and the mine ledger with the prime entry book or with the general ledger. Finally, and as a summary, the relations between accounting books are graphically represented in Figure 1. Each box contains a book and, in parentheses, the number of the subsection explaining such book. Grey boxes represent mandatory books and white ones display other auxiliary books. Flows of information are represented by arrows, which are dashed for the case of inventory because, as explained in subsection 3.2, only partial inventories were found.

#### 4.2 Knowledge of the mine through its accounting data

The analysis of the information in the general ledger lets us gain a fair understanding about the company's operations. Firstly, the examination of the *Compañía Asturiana de Minas de Carbón* account allows us to determine the operating result since it contains detailed information on operating revenue and expenses. However, there are certain limitations since, for example, the amortization expense was not included, and all purchases were recorded as expenses. Table 4 displays these data for each of the analysed years.

It is noticeable that in most years the company incurred losses. It only achieved operating profits between the years 1845 and 1850. Hence, the aggregate operating result for the period is negative. However, a look at the current accounts recorded in the general ledger evidences that there are certain differences in revenue, as shown in Table 5. When analysing coal sales, there is a difference between the entries in the *Compañía Asturiana de Minas de Carbón* account and the customer accounts, both in the general ledger. As the amount of the differences is relevant (249,816 *reales de vellón*) the reliability of accounting records is therefore compromised.



**Figure 1.** Relations between accounting books in the *Real Compañía Asturiana de Minas* (in parenthesis the subsection). Source: Own elaboration

**Table 4.** Revenue and expenses 1836–1852 (*reales de vellón*)

Year	Expenses	Revenue	Operating result	Expenses over revenue (%)
1836*	463,230	200,910	–262,320	2.31
1837	293,793	192,938	–100,855	1.52
1838	232,523	220,934	–11,589	1.05
1839	259,539	215,944	–43,595	1.20
1840	204,519	199,811	–4,708	1.02
1841	154,756	146,117	–8,639	1.06
1842	189,950	157,130	–32,820	1.21
1843	245,654	222,839	–22,815	1.10
1844	205,559	163,213	–42,346	1.26
1845	252,934	263,859	10,925	0.96
1846	214,792	238,615	23,823	0.90
1847	228,353	317,723	89,370	0.72
1848	272,415	367,437	95,022	0.74
1849	286,071	401,753	115,682	0.71
1850	316,823	402,336	85,513	0.79
1851	266,412	249,657	–16,755	1.07
1852**	57,631	57,263	–0.368	1.01
<i>TOTAL</i>	<i>4,144,954</i>	<i>4,018,479</i>	<i>–126,475</i>	<i>1.03</i>

**Note(s):** \*Data from March 1836

\*\*As previously mentioned, production was suspended in 1852 to develop a research plan and install new machinery

**Source(s):** Own elaboration, operating result and the expenses over revenue percentage were calculated by the authors, using the figures in the general ledger

This fact also suggests that transactions were not consistently recorded in the different accounts and/or differing revenue recognition criteria were used (e.g., sales recorded in the general ledger but not reflected in current accounts until collected). To give a detailed example of the differences, we related the credit entries in the *Compañía Asturiana de Minas de Carbón* account with the debit entries in the customer and miscellaneous accounts for the year 1836. The differences are displayed in [Table 6](#).

The most feasible explanation for the lack of concordance between the amounts could be the inconsistency and lack of rigor in the accounting process. However, as indicated above, different recognition criteria could also be used. Ultimately, these discrepancies appear to stem from the lack of a well-structured double-entry system and the use of multiple auxiliary books with unclear connections. The existence of such differences also suggests that neither external nor internal audits were carried out. In a further investigation, the analysis of the figures corresponding to the year 1836 suggests that the *Compañía Asturiana de Minas de Carbón* account acted as a profit and loss account. This is evidenced by data displayed in [Table 7](#).

In addition, it must be highlighted that the company sold two grades of coal: first (1st) and lower (2nd and 3rd), with different prices. It is possible to analyse the evolution of sales of both categories over time, as shown in [Figure 2](#). Sales fluctuated over the years. In the mid-1840s, production began to grow, reaching a peak in 1850. From that year onwards, there was a sharp decline, which led to the interruption of operations in 1852. It is reasonable to think that this decision could have been influenced by the fact that the company incurred operating losses again in 1851 and 1852, after several years of profits, as evidenced in [Table 4](#).

The information included in the general ledger also allows the analysis of the evolution of the price of coal, which was different according to the grade of the product. The evolution over time of the prices of both categories as well as the sales volume is shown in [Figure 3](#). As can be seen, first grade coal was sold at a price of around three *reales de vellón* per quintal, with slight fluctuations throughout the period considered, reaching a maximum price of 3.5 and a

**Table 5.** Revenue according to current accounts 1836–1853 vs revenue according to the *Compañía Asturiana de Minas de Carbón* account (*reales de vellón*)

Year	Revenue according to the <i>Compañía Asturiana de Minas de Carbón</i> account	Revenue according to current accounts
1836	200,910	88,581
1837	192,938	222,383
1838	220,934	160,493
1839	215,944	258,576
1840	199,811	176,143
1841	146,117	156,490
1842	157,130	138,980
1843	222,839	214,175
1844	163,213	133,587
1845	263,859	255,047
1846	238,615	220,813
1847	317,723	297,827
1848	367,437	336,874
1849	401,753	344,671
1850	402,336	387,584
1851	249,657	200,448
1852	57,263	115,681
1853	0	60,313
<b>TOTAL</b>	<b>4,018,479</b>	<b>3,768,663</b>

**Source(s):** Own elaboration

**Table 6.** Differences between the entries regarding coal of the *Compañía Asturiana de Minas de Carbón* account and the customer accounts, for the year 1836

Date	N. of entry	D/C*	<i>Compañía Asturiana de Minas de Carbón</i>		Miscellaneous		Mr. Leoncio Zaldúa	
			<i>Reales de vellón</i>	mv **	<i>Reales de vellón</i>	mv **	<i>Reales de vellón</i>	mv **
7/31/1836	11	C	124,082	27				
7/31/1836	18	D			8,678	4		
7/31/1836	19	D					55,324	31
8/22/1836	24	D			2,224			
8/25/1836	25	D					10,390	20
8/31/1836	33	C	34,330					
9/11/1836	41	D					6,088	8
9/25/1836	43	D			974	4		
9/30/1836	45	C	13,397	12				
12/1/1836	60	D			194	12		
12/4/1836	62	D			171	13		
12/1/1836	64	D					6,759	19
12/31/1836	72	D	29,100	9				
<b>TOTAL</b>		C	<b>200,910</b>	<b>14</b>	<b>12,241</b>	<b>33</b>	<b>78,563</b>	<b>10</b>

**Note(s):** \*D: debit; C: credit

\*\*mv: *maravedíes*

**Source(s):** Own elaboration

minimum of 2.7. In the case of lower quality coal, the company had to reduce its price, given that initially it was almost equal to that of first grade. So, after a few years the price fell to less than half. In this decision accounting figures may also have exerted an influence, as the sales of

**Table 7.** Entries in the *Compañía Asturiana de Minas de Carbón* account, year 1836

Date	No of entry	Item (summarized)	Partial <i>Reales de vellón</i>	mv*	Amount debit <i>Reales de vellón</i>	mv*	Amount credit <i>Reales de vellón</i>	Mmv*
7/31/1836	10	Purchases of various items and goods from March to July	57,447	13				
		Salaries and other expenses due to operations, as recorded in the Book of wages and expenses**	130,859	21	188,307			
7/31/1836	10	Coal sales amount from March to July					124,082	7
7/31/1836	16	Purchases, wages and other expenses incurred in the operations in the months from March to July					188,337	
7/31/1836	17	Amount of coal sales from March to July, according to payments to Mr. Felipe Riera			124,082	27		
8/31/1836	32	Purchases of various items and goods in August	19,730					
		Salaries and other expenses due to operations, as recorded in the Book of wages and expenses	26,786	33	46,516	33		
8/31/1836	33	Coal sales amount in August					34,330	8
8/31/1836	36	Purchases, wages and other expenses incurred this month according to payments made by Mr. Felipe Riera					46,516	33
8/31/1836	37	Amount of coal sales in August, according to payments to Mr. Felipe Riera			34,330	8		
9/30/1836	44	Purchases of various items and goods in the month of September	36,979	19				
		Salaries and other expenses due to operations, as recorded in the Book of wages and expenses	24,201	33	61,181	18		
9/30/1836	45	Coal sales amount in September					13,397	12

(continued)

Table 7. Continued

Date	No of entry	Item (summarized)	Partial <i>Reales de vellón</i>	mv*	Amount debit <i>Reales de vellón</i>	mv*	Amount credit <i>Reales de vellón</i>	Mmv*
9/30/1836	48	Purchases, wages and other expenses incurred this month according to payments made by Mr. Felipe Riera					61,181	18
9/30/1836	49	Amount of coal sales in September, according to payments to Mr. Felipe Riera			13,397	12		
12/31/1836	67	Purchases of various items and goods, last quarter	116,293	9				
		Salaries and other expenses due to operations, as recorded in the Book of wages and expenses	52,900	25	167,194			
12/31/1836	68	Coal sales amount, last quarter					29,100	9
12/31/1836	71	Purchases, wages and other expenses, last quarter, according to payments made by Mr. Felipe Riera					167,194	
12/31/1836	72	Coal sales amount, last quarter, according to payments to Mr. Felipe Riera			29,100	9		
					664,110	5	664,140	5

**Note(s):** \*mv: *maravedies*

\*\*As detailed in subsection 3.3.G, this book was so damaged that it was not possible to extract information from it

**Source(s):** Own elaboration

lower-grade coal were low during the first years of activity of the company, as shown in Figure 2.

It is also interesting to break down the sales based on clients, as recorded in the general ledger accounts. Data corresponding to the main clients of the company are displayed in Table 8. The figures in this table show the high degree of concentration of the company's sales, given that a single client (the Glass factory of La Coruña) accounted for more than 21% of the sales made. It can also be seen that sales to the three main clients were more than 50% of the total sales. In addition, the nine main clients accounted for more than 85% of the total sales. In this sense, it was important the work of attracting clients carried out by one of the Company's partners, the Marquis of Casa Riera, given that he maintained friendly relations with several businessmen. It is also noticeable that the main destinations were in Spain. This fact could have been caused by factors that prevented from selling abroad such as tariffs and transportation costs.

Another interesting aspect is the study of the seasonality of the company's sales. Based on the daily sales data and their grouping by month, Figure 4 displays the evolution of sales in the period analysed. It is evidenced that the majority of the sales correspond to months between May and September.

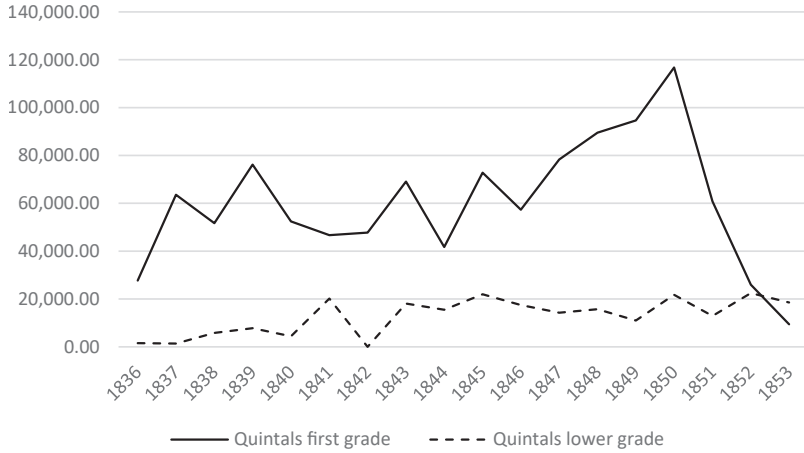


Figure 2. First- and lower-grade coal sales, 1836–1853 (*Castilian quintals*). Source: Own elaboration

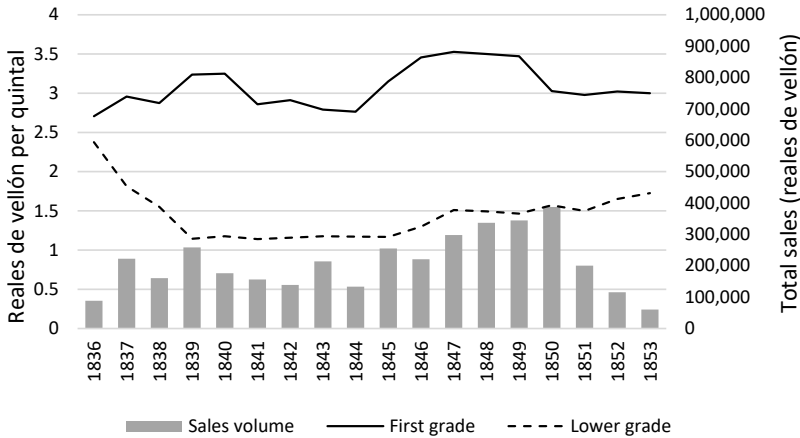


Figure 3. Prices according to the grade of the product, 1836–1853 (*reales de vellón*). Source: Own elaboration

#### 4.3 Usefulness of the accounting information for the company’s stakeholders

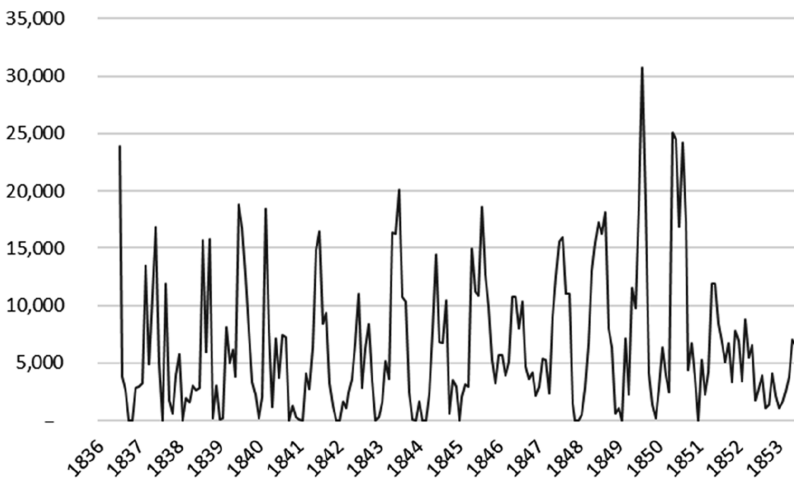
Economic reasons guide the rational choice between accounting systems that is made by a merchant: the costs of obtaining additional information should not exceed the benefits derived from its use (Beaver, 1973, p. 52). The accounting information system involved significant costs at the time, including employees responsible for maintaining the records, physical supports, and the process of collecting information. For example, the *Compañía Asturiana de Minas de Carbón* sought to minimize costs by using a single book as the support for two different ledgers, depending on whether it was opened from the front or the back cover. This section discusses the usefulness of the accounting system of the company for the partners, the director, the tax authorities and the creditors.

First, we must remind that the company had only three partners, so the accountability requirements for management purposes could be met with a relatively simple information system. This function was fulfilled by the general ledger, which allowed the calculation of the results obtained, and by the “Current accounts book for the use of the accountant of the mines

**Table 8.** Break down of sales based on clients, 1836–1853

Client	Sales ( <i>reales de vellón</i> )	%	Cumulative %
Glass factory of La Coruña – Spain	805,540	21.37%	21.37%
Cast iron foundry of Sargadelos – Spain	711,176	18.87%	40.24%
Glass factory of Avilés – Spain	441,294	11.71%	51.95%
Lead metallurgical smelting of San Andrés – Almería – Spain	340,171	9.03%	60.98%
Steamboats of Cantabria – Spain	293,073	7.78%	68.76%
Ironworks <i>La Constancia</i> , Málaga – Spain	261,171	6.93%	75.69%
Mr. Bonifacio de Alas (Mainly for the Lime Burners Company of Avilés, coal of lower quality)	219,733	5.83%	81.52%
Mr. Jaime Ricart	81,159	2.15%	83.68%
SS Ibarra Mier and Company	68,754	1.82%	85.50%

**Source(s):** Own elaboration



**Figure 4.** Evolution of sales, grouped by month, 1836–1853 (*Castilian quintals*). Source: Own elaboration

under the direction of Mr. Armando Nagel,” which recorded the funds delivered to Mr. Armando Nagel and all payments and purchases made by him (note that, in addition to being the director, he was also the payer).

From the perspective of the tax authorities, it should be noted that the company was exempt from paying the surface fee and the 5% tax on the value of the product during the twenty-five years of the mining concession. This reduced the pressure from the tax authorities to monitor the company’s income. If the company had not been exempted from the tax on products sold, it would have had to be more rigorous with regard to sales recording. In fact, the company did not have a sales book; instead, it was necessary to consult the general ledger to determine this amount.

The information system allowed the management to obtain data for decision-making. In this regard, it is relevant to point out that compliance with the formal requirements of the books did not provide significant benefits and did not involve penalties. Although the information system was limited, it allowed the company to: (1) monitor customers’ behaviour and understand the distribution of the company’s main clients. The company was concerned

with expanding its customer base to reduce dependency (Vilela Campo, 2008). In addition, maritime transport problems required setting priorities when fulfilling orders. (2) Determine the results of operations, as shown in section 4.2. (3) Know the distribution of sales throughout the year. This information was important because sales were seasonal due to the difficulty of maritime transport in winter. (4) Determine the contribution of each category of coal sold to total income. (5) To accurately understand the behaviour of labour costs. In this regard, the Workers' book was relevant, as it provided detailed information on each worker's category and daily wage.

Having into account the evidence gathered through the examination of the books, it seems to be that the main concern of management was cash control. This is supported by the fact that the company had two books for cash control: the current accounts book (with Mr. Nagel) and the cash book.

It is also remarkable that the use of single-entry bookkeeping made it difficult to track loans. However, it should be noted that the company did not use external financing, so the accounting information did not serve this purpose (there was no concern with preparing solvency or liquidity statements). In a later period, when the company was restructured by increasing the number of partners and seeking external financing, the need to assess capital profitability increased. Under these circumstances, double-entry accounting is more appropriate (Bryer, 2016, p. 115).

In summary, the company's activity was not very complex. It carried out a limited number of operations and had few clients and suppliers. Therefore, although the accounting information system was simple and contained some inconsistencies, it was useful for the company's stakeholders without incurring excessive costs.

## 5. Conclusions

For many years in Asturias coal was mined by hand, basically by peasants, from the veins that emerged at ground level in the municipalities of Siero and Langreo. In this environment, the creation of the *Real Compañía Asturiana de Minas* represented a significant advance in the attempt to industrialize this activity [20].

In the period analysed (1833–1853) the company's accounting was simple, using a single entry system. Entries were grouped from other auxiliary books into a prime entry book that had some (but not all) of the characteristics of a double entry system. In this regard, it should be noted that the simplicity of the accounting system was so extreme that in some respects it did not fully comply with legislation: (1) there is no record of the legalization of accounting books. The legislation at that time required that they were submitted to the commercial court of their domicile, so that all the pages could be initialled by the notary and another individual from the court, and a dated note, signed by both, was placed on the first page, indicating the number of pages. (2) Certain formalities in the keeping of accounting books were not complied with, since in some cases there are blank spaces in the books. (3) The company used a single entry system, although with a double entry book scheme (limited to the prime entry book and the general ledger). Finally, (4) no inventory book was found corresponding to the years under study. In addition, it is noteworthy that the company obtained additional information by keeping auxiliary books that enabled it to satisfy the information needs of its partners.

The company used an accounting information system that involved minimal costs. As a result, the relationships between the prime entry book and the general ledger were not fully coordinated. In some cases, discrepancies in the transcription of events from one book to the other were identified. The absence of a trial balance meant that these issues were not detected at the time. Nevertheless, the accounting system was sufficient to meet the information needs of various stakeholders. The analysis conducted in this research indicates that accounting in this company served primarily for recording and reporting purposes, rather than as a tool for decision-making. This may be because the company had only three partners, making it relatively easy to address their information requests and provide nearly individualized

accountability at minimal costs. However, the system also met the information needs of other stakeholders, especially the company's management.

A general conclusion is that when an organization has few stakeholders, a simple accounting system is sufficient for management, even if the company is relatively large, as long as its activities are straightforward and it does not conduct many transactions, as was the case of the company studied here. It is necessary to remember that the technological resources available at the time for information processing were limited and expensive. In addition, few people were literate, and writing materials were costly. Therefore, from a cost–benefit perspective, a complex accounting system was not advisable. In this context, as [Beaver \(1973, p. 52\)](#) notes, the rational choice between accounting systems is made by merchants for economic reasons: the costs of obtaining additional information should not exceed the benefits derived from its use.

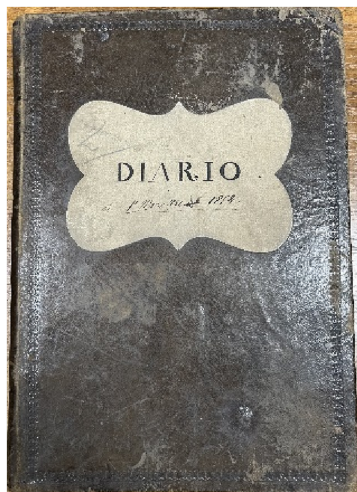
For the *Real Compañía Asturiana de Minas*, single-entry accounting met the information needs of the partners at minimal costs. It enabled management to determine the sales figures and the company's results, to assess the degree of client concentration to set priorities when fulfilling orders, to make decisions related to production activities because of the seasonality of product transport, to implement efficient personnel hiring policy, and, above all, to exercise strict control over cash management. Finally, this information system allowed the company to determine that continuing its operations was not profitable, which led to the cessation of its activities in 1852.

Additionally, we must mention the limitations of this research, which include the fact that, in the absence of a complete double-entry accounting system, the data available for studying the accounting process are limited. Furthermore, we are not sure that all accounting documents were examined, either because some may have been lost over time or because they are stored elsewhere, possibly abroad, given the nationality of one of the partners. Finally, future research should examine the company's accounting in periods after the timeframe analysed here, when it expanded its activities, size and number of partners.

### **Acknowledgments**

The authors wish to express their gratitude to AZSA Company for granting access to the company's historical archive, and especially to its archivist, Mr Alfonso García Rodríguez.

(The Appendix follows overleaf)



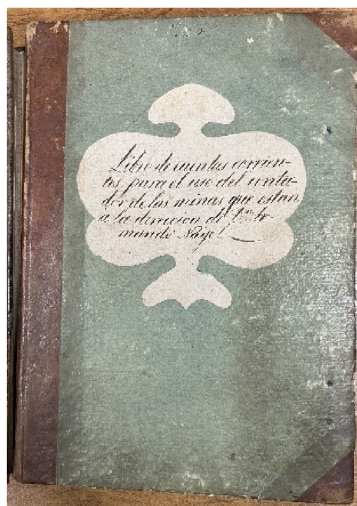
Leather on cover

(Example taken from the Prime entry book, translation of the title: "Prime entry book")



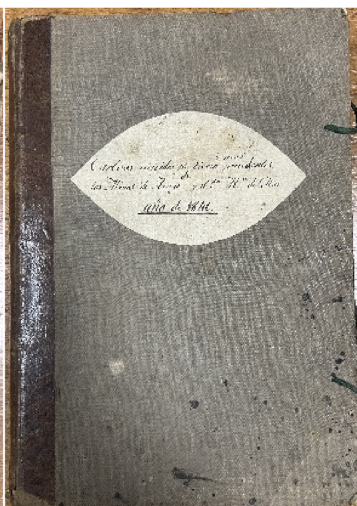
Leather on spine

(Example taken from the Prime entry book)



Leather on the corners of the cover and on the spine

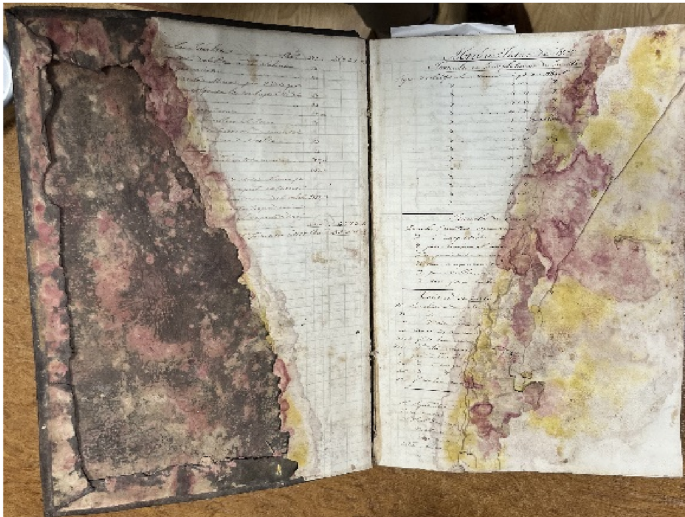
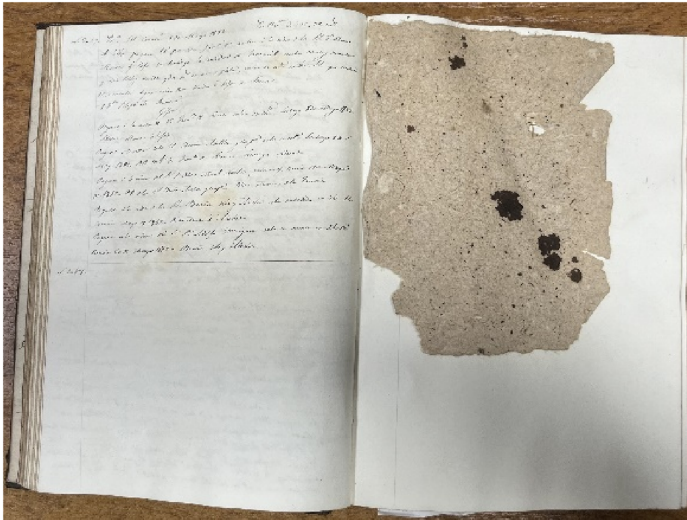
(Example taken from the Current accounts book, translation of the title: "Current accounts book for the use of the accountant of the mines under the direction of Mr. Armando Nagel")



Cover in cardboard and spine in leather

(Example taken from the Coal received by land book, translation of the title: "Coals received by land (and sea) from the Armao and Saint Mary of the Sea Mines. Year 1846")

**Figure A1.** Examples of binding from various books



(Examples taken from the Bills of exchange copying book)

**Figure A2.** Examples of deterioration in some books

### Notes

1. Located in Arnao, municipality of Castrillón (Asturias).
2. [Petit \(2013, p. 109\)](#) suggests that the achievement of commercial codification in 1807 (France) and 1829 (Spain) would be nothing other than the culmination of a process that began, at least, in the Enlightenment. The mere fact of its existence, with the suppression of the regulation of commercial activity by the corporate world that was proper of the Old Regime, was enough to configure a new

framework for the law of the economy. One of the main features of this framework was the establishment of the State as the only centre of power (Petit, 2013, p. 151).

3. Certainly, it is indicated that the accounts opened in the general ledger must be formed with debits and credits, terms that are underlined in the text of the *Ordenanzas*. However, this expression is also contained in the regulation of the book that retail merchants had to keep, in which they only had to record the goods they bought or sold on credit. According to Hernandez Esteve (2013), the term “debits and credits” does not seem to be considered as a synonym for double entry at this time, as was the case in the 16th century. The expression “debits and credits” and the definition of an accounting methodology had been included in Spanish legislation through their incorporation into the Compilation of the Laws of Spain of the regulations issued in Cigales and Madrid in the years 1549 and 1552, respectively. However, it seems that the awareness of its full meaning had been lost in subsequent centuries. In this way, for the Spanish accountants of the eighteenth century it could simply mean that the books had to be kept using bilateral Venetian notation. That is, with the two sides, debit and credit, facing each other, but without such a circumstance necessarily implying a double entry system (Hernandez Esteve, 2013).
4. On September 11, 1593, the monk Agustín Montero, of the Order of *Nuestra Señora del Carmen* of Valladolid, was licensed to operate a coal mine that he discovered in the village of Arancés, jurisdiction of Avilés, Principality of Asturias (Adaro Ruiz, 2003, p. 38).
5. A notably important milestone was the approval of the Mining Law in 1825, which started an important stage of modernity in the mining sector.
6. These were facilities that ran on charcoal.
7. The fact that the steel industrialist John Cockerill had withdrawn from the initial project had a major impact on this decision.
8. It included the mines located at the villages of San Juan de Nieva, Santa María del Mar and Arnao. Before the foundation of the company, the latter was owned by Juan de la Vieska, who lost his rights as he abandoned the mine (Vilela Campo, 2008, p. 23).
9. This aspect was subject to several negotiations in the years following the foundation of the company, since the State subsequently sought to collect taxes (Vilela Campo, 2008).
10. The partners were the Spaniards Joaquín María Ferrer y Cafranga and Felipe Riera y Roses (Marquis of Casa Riera), and the Belgian Nicolas-Maximilien Lesoinne.
11. The Arnao mine began with a vertical pit, as opposed to the classic collection of coal that emerged on the surface. It was the start of the professionalization and industrialization of coal extraction in Asturias (Rodríguez Álvarez, 2020, p. 18).
12. A Castilian quintal was equivalent to approximately 46 kg.
13. Sometimes there were serious difficulties in finding a ship, both to export coal from the port of San Juan (Avilés) and to bring the working tools from Belgium via Antwerp. Further information on the sailing ships used by the *Real Compañía Asturiana de Minas* can be found in the work by Vilela Campo (2008).
14. However, the coal of Arnao mine was sufficient for certain industrial uses, but not so much for coal stoves nor did it allow the manufacture of coke (Adaro Ruiz, 1994, p. 113).
15. This was despite the fact that in 1850 the director of the company estimated that at least 200,000 quintals of top-quality coal could be produced per year, as well as the same amount of lower quality coal (Desoigne, 1850, p. 276).
16. Although the inventory book was required by the Commercial Code of 1829, its use was not very common. For example, Ruiz Llopis (2007, p. 28) also did not find it in the Trenor and Co. company, established in 1836.
17. Until the end of the nineteenth century, most small businesses used the single entry (Kim Yuryevich (2024, p. 13). In France, the simpler single entry inventory version was widely used, at least until the mid-nineteenth century (Leote and Gilbo, 1924, p. 359). In Germany, double entry bookkeeping was not used in the nineteenth century either (Rothschild, 1899, p. 112). In Spain, Oliver Castañer (1885, pp. 6–7) indicated that until the first third of the present century (nineteenth) the double entry

bookkeeping system was not adopted by some commercial houses and that by the end of the century its use was widespread.

18. Armando Nagel was the director of the Royal Asturian Mines Company until October 1838, when he was replaced by Adolfo Desoignie.
19. According to Kim Yuryevich (2024, p. 10) double entry has two advantages: (1) the existence of a profit and loss account and (2) the control of the accuracy of data in the accounts through the trial balance. As evidenced, none of such circumstances were present in the accounting of the company.
20. In this regard, the Inspector of Mines of Galicia and Asturias, the renowned engineer Guillermo Schulz, stated that the *Real Compañía Asturiana de Minas* was a model of perfection and economy. It excelled both for the systematic management of the mines and shoring of the galleries, as well as for the machines and internal and external transport devices on railways (Schulz, 1838, p. 384).

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