

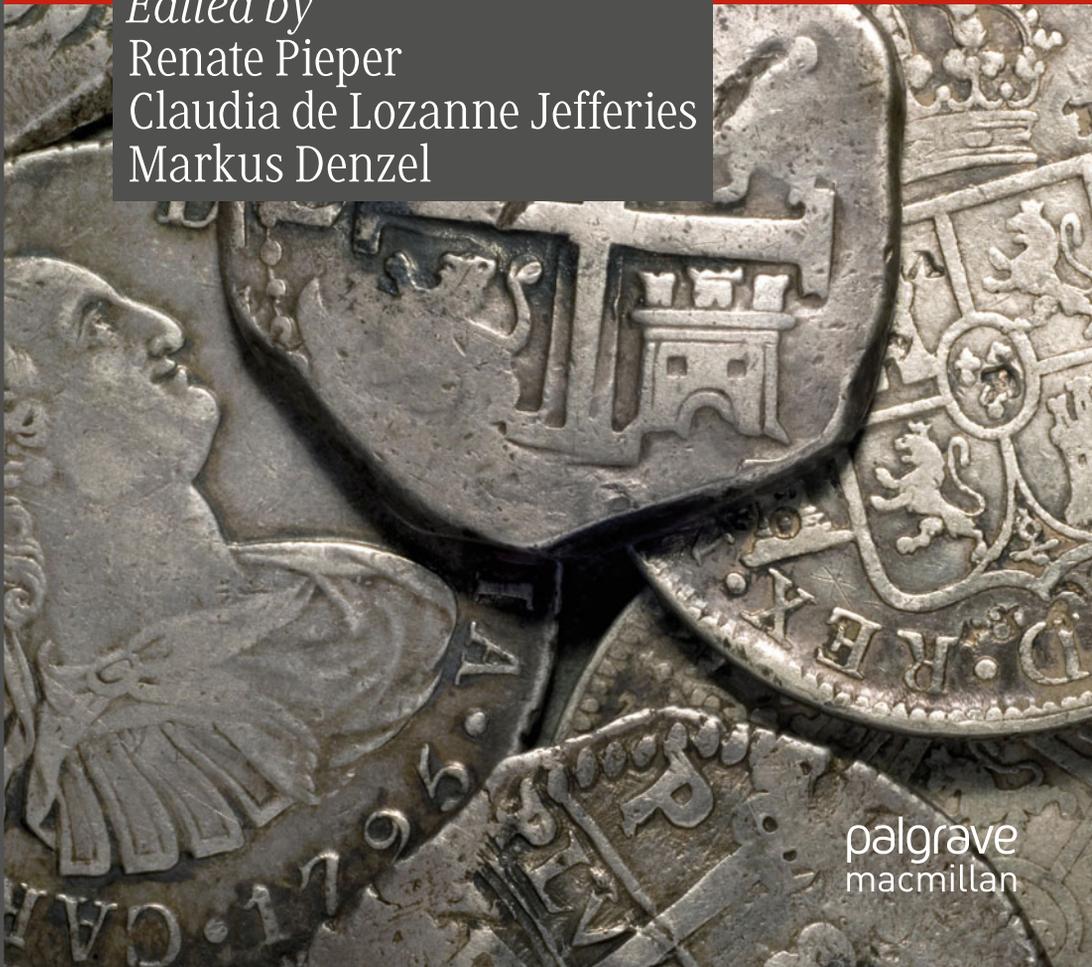


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Mining, Money and Markets in the Early Modern Atlantic

*Digital Approaches and
New Perspectives*

Edited by
Renate Pieper
Claudia de Lozanne Jefferies
Markus Denzel



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Palgrave Studies in Economic History

ISBN 978-3-030-23893-3

ISBN 978-3-030-23894-0 (eBook)

<https://doi.org/10.1007/978-3-030-23894-0>

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Cover illustration: Robert Kawka/Alamy Stock Photo

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The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Acknowledgements

We would first like to thank Professor Ken Deng, editor of *Palgrave Studies in Economic History*, for accepting our book as part of the series.

This volume owes a great deal to Werner Stangl, Harry Vossen and Harald Kleinberger-Pierer for their meticulous editorial input. We are also grateful to Laura Pacey, Ruth Noble, Clara Heathcock, Yuvaraj Krishnan and all the other Palgrave staff engaged in the transformation of our manuscript into a book.

Last but not least, our gratitude goes to the Karl-Franzens University of Graz, the University of Leipzig and the Economics Department of City, University of London for their generous financial support.

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Part I

Introduction



1

Mining, Money and Markets in the Early Modern Atlantic: Digital Approaches and New Perspectives

Renate Pieper, Claudia de Lozanne Jefferies
and Markus Denzel

In 1635, in Antwerp, the Flemish diplomat and court painter Peter Paul Rubens designed and constructed an “Arch of the Mint” (Fig. 1.1) for the ceremonial entry of Cardinal Infante Ferdinand,¹ the new governor

¹Ferdinand of Spain and Portugal (Spanish: Fernando de Austria; 1609/10–1641), the third son of Philipp III of Spain, since 1619 administrator of the archbishopric of Toledo and cardinal, since 1620 archbishop of Toledo, therefore known as Cardinal Infante; 1632–1633 Viceroy of Catalonia, 1633–1634 governor of the duchy of Milan; 1633–1641 governor of the Spanish Low Countries.

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R. Pieper et al. (eds.), *Mining, Money and Markets in the Early Modern Atlantic*, Palgrave Studies in Economic History, https://doi.org/10.1007/978-3-030-23894-0_1



Fig. 1.1 From mining to money (Source Peter Paul Rubens, *The Arch of the Mint*, 1635. (c) KMSKA. Photo Rik Klein Gotink)

of the Spanish Low Countries, who the year before had won a resounding victory at the battle of Nördlingen. For this *Joyeuse Entrée*, Rubens composed a collection of allegorical images linking mining and money on both sides of the Atlantic: miners, resembling those in the woodcuts of Georg Agricola, supposed to represent indigenous workers at the silver-rich mountain of Potosí in modern Bolivia; Vulcan forging coins and medals, fuelling commerce in the city of Antwerp; American parrots and monkeys; and Jason and Medea seeking the Golden Fleece.

Inspired by Rubens, this volume brings together a collection of articles on subjects previously dispersed across the breadth of economic history literature. The resulting mosaic traces the entwinement of mining and money across the transatlantic world. Some pieces hitherto missing from the mosaic will inspire further research on the entanglement between these deeply interrelated fields of craft and economy.

The “Arch of the Mint” bound the European commercial centre of Antwerp into the transatlantic trade network, a key step in the process of globalisation (Flynn 2003; Martínez Ruiz 2018). In the same vein, this book focuses on globalisation and the entanglement of the Americas with Western Europe in a “transatlantic world”. In particular, it focuses on the territories of the Spanish Habsburgs—carriers of the Golden Fleece—as well as some of their competitors in continental Europe: the northern Netherlands, the German territories and France.

Rubens designed his arch in 1635, at the end of a long period of intensive silver mining in Spanish America (TePaske 2010, p. 20; Garner 2007). In order to capture the wide-ranging effects of mining on the transatlantic world, the studies assembled here examine not only that first silver boom around 1600 but the whole period from the beginning of the American mining industry in the early sixteenth century, through its decline and recovery in the second half of the seventeenth century and its zenith in the second half of the eighteenth century to the transformations, driven by the emergence of nation states in the Americas, which took place during the early nineteenth century.

As Rubens’s allegory suggests, precious metals—gold and silver—from the Americas (e.g. Lopezosa Aparicio 1999; Hausberger and Ibarra 2014) played a vital role in pre-modern economies, whether they were traded as commodities in the form of bullion or fuelling merchant

networks as specie. Due to its relative abundance, silver was the most frequently exchanged metal across the early modern Atlantic. This book tracks the trajectory and transformations of silver from its origin in ores on both sides of the Atlantic up to its arrival in the financial centres of Central and Western Europe, where it was traded mainly as currency. As a point of comparison, it also examines the mining and monetary use of copper. Mining and its products entangled both sides of the Atlantic and, as well as economics, heavily influenced the technical, social, political, administrative, theoretical and cultural aspects of early modern society. This volume scrutinises the fluctuations and interrelationships associated with silver and copper mining in the early modern Atlantic world, but excludes gold and the gold-producing regions of Africa and the Americas.

Given the current state of the literature, this book aims to bring the interrelated fields of mining history, minting history and monetary history into a common discourse (cf. Kellenbenz 1981; Fischer et al. 1986, vol I; Van Cauwenberghe 1989, 1991). Recent literature has largely centred on the Pacific, highlighting the connections between Spanish America and the Asian world (e.g. Depeyrot and Flynn 2016; Denzel 2014; Hirzel and Kim 2008; Kim 2013; Flynn 1996, 1997, 2003; Von Glahn 2003). In contrast, this volume focuses on the Atlantic—roughly two-thirds of American bullion exports in the early modern period were shipped east, across the Atlantic (cf. Pieper 1990, 1992; TePaske 2010).

Further, our analysis emphasises the technical, geographical and economic aspects of mining and minting. Recent literature tends to engage with social rather than technical issues (Povea Moreno and Zagalsky 2017; Barragán Romano 2017; Bakewell 1997, 2011; Robins 2011) and those studies which do deal with technical questions are dated or—with few exceptions (Sánchez Gómez and Pieper 2000)—stress a uni-directional European impact on Spanish American mining industries (Brown 2012; Platt 2012; Hausberger 1997; Sánchez Gómez 1995, 2017; Sánchez Gómez and Mira Delli-Zotti 2000; Lacueva Muñoz 2010). In contrast, we investigate how the combination of indigenous and European methodologies led to innovation on both sides of the Atlantic so that, for instance, American mining experts were sought after for European ventures and the extent to which mining in the

Americas drove technical innovation in eighteenth-century Europe. We engage with social and political questions as well, but do so with respect to human geography using digital approaches. In the realm of economic questions, we draw upon recent archival research on prices, interest and exchange rates. Other publications leveraging similar economic indicators rely mostly on time series published some time ago (Munro 2002, 2003).

The impact of American precious metals on European concepts and monetary theories is still the subject of debate which began in the sixteenth century and re-emerged at the end of the twentieth century (Bernholz 1992; de Lozanne Jefferies 1997, 2014; Denzel 2004; Lucassen 2007). This book focuses on the role played by precious metals in the form of specie in the development of early modern state administration and the emergence of theoretical debates in early modern economic treatises, which still persist in modern monetary theory. Finally, this volume also engages with the cultural imaginaries—evident in Rubens's painting—associated with silver, both as bullion and as specie. Up until now, specie, in contrast to diamonds, has not generally been considered a cultural issue worthy of study in itself (Siebenhüner 2018).

The following contributions rely mainly on the methodologies of economics, economic history and history. In the last two decades, economic history in particular has experienced an integration of computerised statistical tools as state of the art, but the implementation of digital geographical tools (GIS) as an instrument for research is still in its infancy. Therefore, several chapters discuss the use of this relatively novel software as a tool for researching and explaining economic histories.

To analyse the trajectory of silver and copper from the mines to their ultimate cultural impact, we cover a broad transatlantic area and time span, from the commercial revolution of the late Middle Ages to the Industrial Revolution. Further, we employ a number of theoretical approaches. Some chapters apply economic theories, and others centre on legal, political or cultural concepts. Given the variety of methodological approaches, geographical entities and political changes, especially around 1800, a common terminology would obfuscate the differences

in approach without aiding in comprehension. Some chapters use terms such as “empire” for the Holy Roman Empire as well as for the Spanish Empire, which encompassed the American viceroyalties, Spain and the southern Netherlands and for some time the kingdoms of Portugal and Naples. Other contributions avoid the concept of “empire”, pointing to post-colonial theories, and prefer to use the term “transnational” even before the existence of nation states. Most texts dealing with Spanish America use “colony” and “colonial” for those territories before their political independence, although such terminology was not employed by contemporaries. They rather spoke of the Viceroyalty of New Spain, encompassing the modern south-western United States, Mexico and Central America north of Panama, and the Viceroyalty of Peru, encompassing Spanish America south of Costa Rica up to the early eighteenth century and then splitting up into three viceroyalties over the course of that century. Spanish American elites stressed this terminology for a long time as it underlined that they were ruled by *viceroy*s like the kingdoms of Naples, Valencia, Aragón and Portugal, not by *governors* like the southern Netherlands. The vernacular only shifted towards the use of “colony” with the independence movement and the emergence of new elites in the early nineteenth century.

Irrespective of their chosen terminology, the chapters of this volume are united in stressing the agency of all the inhabitants of the Atlantic world, whether they resided in a colony or a nation state. This book shows how individuals from both sides of the early modern Atlantic actively exchanged ideas and participated in the mining, minting and marketing of silver and copper.

To ground “from mining to money” with a theoretical approach, Peter Bernholz assesses the importance of precious metals as commodities and as money in the development of complex economies. Arguing from an economic theory perspective, he focuses on money and currency from Antiquity to the Middle Ages, establishing that information, transaction and transport costs would have been much higher without the use of valuable commodity money. It seems obvious that with higher costs, many goods would not have been produced and brought to market, but this does not mean that commodity money was invented for that purpose: rather, with the development of a decentralised

economic system, valuable imperishable objects became an effective means of payment and therefore supported further economic growth. Analysing later European monetary history, Ludovic Desmedt and Jérôme Blanc interpret monetary reform attempts and monetary debates through the lenses of three monetary systems: a dualist monetary system (articulating an “imaginary money” with “real currencies”), a metallic system (fully fledged metallic money with invariable legal tender) and a credit-money system (wherein the issued currency is backed by a real asset in which it can be repaid or is defined with reference to such an asset). These three systems refer to distinct ways of conceiving the quality of money and, thus, what can be “good money”. Finally, Renate Pieper finds that silver was presented in two distinctive ways in still lives and vanitas paintings in the northern and southern Low Countries and in Spain during the Golden Age of the seventeenth century. In the form of bullion, of a commodity for trade or of manufactured artefacts, silver signified wealth and conspicuous consumption, but in the form of coins, it connoted human vice, gambling and warfare. This dichotomous representation underlay contemporary descriptions of the arrival of Spanish silver fleets and the further distribution of silver within Europe in handwritten newsletters and printed newspapers. Money needed to be backed to a certain extent by (American) silver and the real value of bullion, but *as money*, silver was used as a representation of evil in its most tangible form.

Tracing the trajectories of silver and copper, Part II of this book examines specific aspects of mining activity, particularly in early modern Mexico (New Spain) and Spain between the sixteenth and nineteenth centuries. Werner Stangl begins with a geographical approach, using GIS with three different examples to establish how situating our sources in the proper geographic context improves our understanding of early modern mining in the Americas. As a further example of geographical contextualisation, Amélia Polonia and Johan García present a study of copper mining in Michoacán, demonstrating that European cultural patterns were not the only ones responsible for altering landscapes; indigenous techniques, combining both local and European methods, were crucial for the success of the private copper mining industry in the sixteenth century. The situation in private American

silver mining enterprises was similar, as demonstrated in Domenic Hofmann's contribution, and so the Spanish Crown often employed mining experts born in the Americas to promote a precious metal mining sector in mainland Spain. Even though these efforts met with little success, the Crown continued to invest in the Spanish mining sector, because relying on the influx of American silver was deemed too risky. Peter Marckhgott-Sanabria shows that Spanish silver mining ventures continued into the late seventeenth century with the purpose of training officials for the quicksilver mines providing Spanish America with mercury. By then, the Council of Finances had become the central administrative institution of the "public" Spanish mining sector and pursued extensive information on mining-related issues. This section establishes that the transformation of the landscape and local geography was considerable and entangled mining activities on both sides of the Atlantic, regardless of whether they were private or crown-administrated enterprises.

Part III focuses on the transformation and interaction between bullion and specie. Claudia Jefferies investigates the controversy between mine owners and merchants in early modern New Spain. The results suggest that the allegedly high premium charged for exchanging bullion and specie on-site fell within the usual range of charges for similar financial services that linked Spanish colonial mining towns with European financial centres. The story of copper currency in the first decades of nineteenth century-Mexico, told by Enrique Covarrubias, illustrates the problems arising from decentralisation of the minting process, the financial and technical decay of the old Mexico City mint and the failure of contemporary Mexican politicians and intellectuals to establish a monetary order, at least in comparison with their efforts to reorganise and strengthen the treasury. Finally, Harald Kleinberger-Pierer takes a specialised technical approach: technical documentation, expertise and literature were intimately connected to minting. As the methodologies and the scope of technical drawings of minting machines developed, so did the requirements and demands for technical expertise to be met by the court and its administration. This section on minting technologies in early modern times focuses on the costs of minting: the authorities aimed to maximise the seigniorage and minimise

the overheads. When this was finally achieved, it became apparent that minting could be a more profitable affair than selling bullion.

The final section deals with the impact of minted and unminted silver and copper money on commodity and financial markets in Europe and Mexico from the sixteenth to the early nineteenth centuries. Manuel González-Mariscal reopens the debate on the price revolution of the sixteenth century. He presents a new price series, including the prices of accommodation in Seville, the most important and fastest growing transatlantic trading port of the period. His findings show that, when using commodity baskets, the price level for Seville was much higher than previously thought. For some periods, they can establish the impact of American silver on general price levels. Andrés Calderón Fernández, Rafael Dobado González and Alfredo García-Hiernaux explore the main financial market of New Spain/Mexico. With improved series of silver production and outflow, they demonstrate that there was no relationship between silver production and interest rates. Comparing the situation of the credit market before and after Mexican independence in different contexts, such as the profile of creditors and debtors or the average and median size of loans, they establish that interest rates remained almost stable with only small increases after political independence. Nonetheless, the authors identify a structural break in the credit markets, a consequence of the church losing its status as a provider of credit. Focusing on credit and money in Europe, Markus A. Denzel states that a clear distinction must be made between commodity markets, where current money was used and the markets of high finance for bills of exchange, where crown and state financing participated. The commodity markets existed in continuous dependence on the availability of silver and thus on the price of silver at fairs; the financial markets needed silver or gold as security for their transactions and the price of silver interested bankers only in relation to the prevailing money of account. This section analyses the impact of precious metal flows on markets where they could have caused inflationary or—in the case of shortage—deflationary tendencies, accompanied by the emergence of money of account.

To our minds, the results of the studies presented in this book could inspire further research:

- first, the digitalisation and visualisation of mining and minting geographies;
- second, rethinking price revolutions with reference to the combination of mining, minting and prices;
- third, testing the hypothesis of the stability of nominal interest rates in early modern economies based on precious metals and without inflation expectations.

Like Rubens's arch of the *Joyeuse Entrée*, we have composed a mosaic which brings the Atlantic world together, linking mining to minting to money on both sides of the ocean. We conclude with the motto of the Order of the Golden Fleece in Rubens's banderole:

Pretium laborum non vile!

Bibliography

Primary Source

Rubens, Peter Paul, 1635. *Erepoort van de Munt*. Sheat from the rear, Antwerp. Koninklijk Museum voor Schone Kunsten Antwerpen, Inventory 317.

Secondary Sources

Bakewell, Peter, ed., 1997. *Mines of Silver and Gold in the Americas*. Aldershot: Ashgate.

Bakewell, Peter, 2011. *Miners of the Red Mountain: Indian Labor in Potosi, 1545–1650*, 2nd ed. Albuquerque: University of New Mexico Press.

Barragán Romano, Rossana, 2017. "Potosi's silver and the Global World of Trade (Sixteenth to Eighteenth Centuries)." In: *On the Road to Global Labour History: A Festschrift for Marcel Van der Linden*, edited by Karl Heinz Roth. Leiden and Boston: Brill: 61–92.

Bernholz, Peter, 1992. "The Discovery of the New World and the Development of the Purchasing Power Parity Theory." In: *Economic Effects*

- of the European Expansion*, edited by José Casas Pardo. Stuttgart: Steiner: 234–261.
- Brown, Kendall W., 2012. *A History of Mining in Latin America from the Colonial Era to the Present*. Albuquerque: University of New Mexico Press.
- de Lozanne Jefferies, Claudia, 1997. *Geldtheorie und Geldpolitik im frühneuzeitlichen Spanien*. Saarbrücken: Verlag für Entwicklungspolitik.
- de Lozanne Jefferies, Claudia, 2014. “La pensée monétaire en Castille au 17eme siècle.” In: *Les Pensées Monétaires dans l’Histoire. L’Europe, 1517–1776*, edited by Jérôme Blanc and Ludovic Desmedt. Paris: Garnier: 743–784.
- Denzel, Markus A., 2004. “The System of Cashless Payment as a Basis for the Commercial Integration of Europe and the World.” In: *From Commercial Communication to Commercial Integration, Middle Ages to 19th Century*, edited by Markus A. Denzel. Stuttgart: Steiner: 199–248.
- Denzel, Markus A., 2014. “Die Wirtschaftsbeziehungen zwischen China und Europa: Seehandel und Zahlungsverkehr von 1702 bis 1914.” In: *Jahrbuch für europäische Überseegeschichte* 14: 101–152.
- Depeyrot, Georges; Flynn, Dennis O., 2016. *From Underground to End-Users: Global Monetary History in Scientific Context*. Wetteren: Moneta.
- Fischer, Wolfram; McInnis, R. Marvin; Schneider, Jürgen, eds., 1986. *The Emergence of a World Economy, 1500–1914*. Wiesbaden: Franz Steiner Verlag.
- Flynn, Dennis O., 1996. *World Silver and Monetary History in the 16th and 17th Centuries*. Aldershot: Ashgate.
- Flynn, Dennis O., 1997. *Metals and Monies in an Emerging Global Economy*. Aldershot: Ashgate.
- Flynn, Dennis O., 2003. *Global Connections and Monetary History*. Aldershot: Ashgate.
- Garner, Richard, 2007. “Dataset: Spanish-American Silver Registrations.” In: *Inside My Desk: History Data Desk*. <http://www.insidemysdesk.com>. Accessed October 1, 2019.
- Hausberger, Bernd, 1997. *La Nueva España y sus metales preciosos: La industria minera colonial a través de los ‘libros de cargo y data’ de la Real Hacienda, 1761–1767*. Frankfurt am Main: Vervuert.
- Hausberger, Bernd; Ibarra, Antonio, eds., 2014. *Oro y plata en los inicios de la economía global: de las minas a la moneda*. México: El Colegio de México, Centro de Estudios Históricos.