

Thomas Max Safley

*Money and its alternatives in early modern extractive industry:  
The many media of exchange in mercury mining*

## 1. Introduction

There's an old song of uncertain provenance, first recorded in the 1940s, that contains the following lyric:

You load sixteen tons and what do you get?  
Another day older and deeper in debt.  
St. Peter don't you call me, 'cause I can't go.  
I owe my soul to the company store (Travis 1946).

The artist who first recorded the song, Merle Travis, explained that the lines, «You load sixteen tons and what do you get? Another day older and deeper in debt», came from a letter written by his brother John, who was a coal miner in Appalachia (Wikipedia, “Sixteen Tons”). Another line came from their father, also a coal miner, who would say: «I can't afford to die; I owe my soul to the company store.» They refer to the scrip system and to the debt bondage it created, which were commonplaces of American extractive industry. Miners received their wages not in cash but in non-transferable credit vouchers – a rudimentary form of fiat money – that could be exchanged only for goods sold at the company store, making cash savings impossible. Many of them also lived in company-owned dormitories or houses, the rent for which was automatically deducted from their pay. The resort by mining companies to scrip and other «alternatives to money» became illegal in the United States under the Federal Minimum Wage Act of 1961.

The scrip system appears to be a linear descendant of the much older truck – or tommy – system, whereby workers received their wages not in the form of a voucher but in a combination of cash and commodities (Aspin 1995; Hilton 1958; Ruegg 1901; Valentinitsch 1981, 226-35). The values assessed for those commodities were often manipulated and could rise so high that many workers received no payment in cash but ended a pay period in debt to their employers. The use of commodity and/or convertible moneys was a customary feature of British industry, including mining, from the mid-15<sup>th</sup> to the early-19<sup>th</sup> century, when its use was gradually prohibited by act of Parliament.

As these examples suggest, alternatives to money take various forms and have a long history in mining. This paper takes up their use in the mines of central and

Thomas Max Safley, University of Pennsylvania, United States, tsafley@history.upenn.edu

Referee List (DOI 10.36253/fup\_referee\_list)

FUP Best Practice in Scholarly Publishing (DOI 10.36253/fup\_best\_practice)

Thomas Max Safley, *Money and its alternatives in Early Modern extractive industry: The many media of exchange in mercury mining*, © Author(s), CC BY 4.0, DOI 10.36253/979-12-215-0347-0.05, in Angela Orlandi (edited by), *Mezzi di scambio non monetari. Merci e servizi come monete alternative nelle economie dei secoli XIII-XVIII / Alternative currencies. Commodities and services as exchange currencies in the monetarized economies of the 13<sup>th</sup> to 18<sup>th</sup> centuries*, pp. 27-45, 2024, published by Firenze University Press, ISBN 979-12-215-0347-0, DOI 10.36253/979-12-215-0347-0

eastern Alpine Europe from the mid-15<sup>th</sup> to the late-17<sup>th</sup> centuries – especially the mercury mines at Idrija in the former Habsburg Duchy of Carniola, present-day Slovenia – to examine how alternatives to money emerged and functioned in public and private manufacturing.

Alternatives of all sorts were ubiquitous there, present even in its political economy. The regents considered the mineral riches of their realm to be regalian rights. To exploit them, they granted mining privileges in the form of shares (*Kuxen*) to loyal supporters, merchant entrepreneurs and aristocratic landlords, who became mine stakeholders and operators (*Gewerke*). In return for the opportunity to profit from the mineral trade, they rendered taxes on their production in cash and kind, the so-called *Fron und Wexel*. Commercial mining at Idrija required more than privilege and interest, however. It required international connections and commercial savvy to bring the minerals to market. Foreign merchant-financiers could provide both, but they needed the protection of the state in the form of considerations and regulations that lowered transaction costs, prevented competition and limited uncertainty. In return for monopoly rights and tax exemptions that increased profits from the sale of mercury, they advanced credit, shared intelligence and performed services for the state. Local agents or factors (*Vermeser*) represented the interests of capital, whether the operators or the merchants, and saw to the running of the mines. Like factors in all branches of premodern commerce and finance, their salaries took the form not only of money but also of opportunities to seize whatever gainful enterprise came their way. Mining also required highly skilled, experienced labor. Recruited from established mining regions and proudly self-conscious, the miners extracted and refined the saleable commodities, laboring for wages of various sorts, but exercised little control over production or remuneration. At Idrija, therefore, alternatives to money took many forms at all levels: financial instruments and commercial commodities, economic opportunity and social status, legal privilege and political preferment, cash and commodities.

Taking the extraction, production and sale of mercury as a test case, with particular attention to the miners and their wages, this paper seeks to demonstrate that «alternatives» in whatever form they may take – tangible or intangible, fixed or moveable – have less to do with shortages of hard cash or the inhumanity of hard hearts, though these can and often do play a role, than with what I have elsewhere referred to as the «ecology of work» (Safley 2019a, 2). The phrase attempts to suggest how the interaction of physical environments, regulatory systems, market forces, social relations or economic institutions, to name but a few possibilities, shape production in workshops and factories. In the particular context of mercury mining at Idrija, the ecology of work determined the broad reliance on ‘alternatives to money’: their use and abuse, their persistence and intractability.

## **2. *Pfennwert*: its use, abuse and regulation**

As early as the 1530s, alternatives to money had become a source of contention and conflict at the mercury mines of Idrija. In 1536, the council of state for the

Archduchy of Inner Austria, which included the territory around Idrija, assigned a commission to examine the operation of the mines there. Its report, issued in 1537, noted among other things irregularities in the miners' wages:

... the workers complain about the *Pfennwert*; the administrator doesn't pay the workers in cash but instead gives them *Pfennwert* from horseback so that what they might more easily acquire for cash they must accept from the administrator or others at higher cost. Moreover, the administrator offers more or less to the workers without the knowledge of the court, according to his liking, so that the workers cannot purchase goods freely in the marketplaces of Bischoflack or other communities, all of which contributes to the decline and disadvantage of the entire mine.<sup>1</sup>

*Pfennwert*, of which the miners complained so bitterly, involved all the goods required to maintain and operate the mine, including tools, materials and, in this case especially, foodstuffs, clothing and other provisions.

The *Deutsches Rechtswörterbuch* defines *Pfennwert*, or *Pfennigwert*, as a «prescribed quantity of any commodity that is usually sold in small amounts; foodstuffs sold at fixed prices and, accordingly, permitted to use in place of a monetary payment; as replacement for or part of a wage» (*Deutsches Rechtswörterbuch*, “*Pfennwert*”). In specific relationship to wages and as an alternative to cash, *Pfennwert* finds early use in legal documents from the 14<sup>th</sup> century: «a penny-worth of a moveable good should be paid to a man for a penny» (Scendes 1986, 120). It appears with increasing frequency in mine ordinances (*Bergordnungen*) from the beginning of the mining boom in late medieval Europe, that is, from the 15<sup>th</sup> century. (Chmel 1845). The Schwaz Mining Ordinance (*Schwazer Bergordnung*) of 1449 used more specific language:

When the lords and operators pay the workers, which is set at the beginning [of this ordinance, tms], that is, every 14 days, although when the workers agree, the operators pay at the longest every four weeks and immediately with cash, so that they can obtain their food; no operator should oppress the workers with *Pfennwert*, but rather only when the workers want it should they offer it for an honest penny and not overcharge (Jaschik, “*Bergordnung für Schwaz*”).

---

<sup>1</sup> Österreichisches Staatsarchiv Wien (OeStA), Finanz- und Hofkammerarchiv, Innerösterreichische Miscelle und Briefe, 134/1. Bericht der Kommission zu Idria vom 25. April 1536 zum 2. Februar 1537. «... die Arbaitter hiemit den Pfenwarten nicht wenig beshwerdt, die Verweser den Arbaittern nicht Pare bezallung, sonnder jnen die Pfenwarten auf die Rosh geben, also was sy sonsten umb Pargellt leichtlicher erzeugten, dz muessen sy also von den Verwesern oder anndern auf die Rosh teurer annemen, auch die Verweser die Arbaitter jrs Gefallen ausserhalb Willen und Wissen des Gerichts ab unnd an ablegen, sambt dem so will man die gemellten Arbaitter auf den Margkhten noch bey alls zu Bischoflack unnd anndern Orten nicht frey khauffen lassen, des dann dem ganntzen Bergkwerch wie wir Bericht zu Hinderslag und Nachtaill raicht.»

A 1553 mining ordinance, issued by Emperor Ferdinand I for all mines in Lower Austria (*Niederösterreich*), used almost the same language to admonish mine operators and administrators to honest application of *Pfennwert*: «In our ... lands, lordships and regions, where mining occurs or in the future will occur, an orderly accounting should be undertaken seven times a year – namely at Lent, Easter, Pentecost, St. Jacobs Day, St. Michaels Day, St. Martins Day and Christmas – by the *Bergrichter* and the foremen of all the mines in the presence of the operators or their representatives, and each worker should receive notice of the wages he has earned within 14 days thereafter and payment in a month's time in cash and not encouraged or forced to accept *Pfennwert* against his will ...» (Entzelt, Kirchmaier 1698, 182). The 1580 Mining Ordinance, promulgated specifically for the mercury mine at Idrija, repeated this regulation verbatim (Valentinitsch 1981, 360). In every instance, these directives sought to protect miners from disadvantage and damage, as Angelika Westermann put it, «because fair wages and punctual payment secured the existence of the workers, kept them in the mines and preserved social peace» (Westermann 2009, 149). The dissemination of similar ordinances suggests that the practice became commonplace in extractive industry across the Holy Roman Empire (Westermann 1993, 49-66).

*Pfennwert* was not universal in early modern mining, however. Westermann argues that the provisioning of mines and miners «appears ... to have been of marginal interest» to mine operators in the Vosges Mountains and Black Forest regions (Westermann 2009, 169). The 'free market' would provide such necessities, meaning that miners had to seek their own supplies in the marketplaces of surrounding communities. This changed during the crises of the 17<sup>th</sup> century, when mine operators began to pay miners in kind, that is, in *Pfennwert*, providing them necessities they could no longer acquire or afford on their own (Westermann 2009, 188-89). It was also advantageous for the operators, because they could purchase goods in large quantities below-market prices and profitably resell them to their employees, a form of speculation widely practiced and condemned as *Fürkauf*, the purchase of mass quantities of goods to create artificial scarcity and higher prices. For this reason, it offered limited comfort to the miners, who had no control over the price, quantity or quality of the goods they received as payment.

Under private entrepreneurship, manipulation of the *Pfennwert* trade provided mine operators or merchant-entrepreneurs with an additional, and irresistible, source of income. Scholars have reckoned it as high as 10,000 to 15,000 *rheinische Gulden* per annum at Schwaz (Isser-Gaudenthurm 1905, 96). As early as 1485, this led to worker unrest, «because the operators and mine lords pressed them hard and cheated them of their pay» (Isser-Gaudenthurm 1905, 301). In an attempt to pacify them, the Tyrolean State Council in Innsbruck ordered not that *Pfennwert* wages be discontinued but that they henceforth be offered to miners at values comparable to those found at local marketplaces.

This appears to have been the problem in Idrija as well. The *Verweser* arbitrarily withheld cash wages from the miners, replacing them with food and clothing, which he valued at far higher rates than those for similar goods at local marketplaces. It is not yet possible to calculate the profits from the *Pfennwert* trade at Idrija, but the miners there complained regularly, beginning in the 1530s, as we have seen

(Valentinitsch 1981, 30). In 1575, the Inner Austrian State Council bought out the *Genwerke* and assumed direct operation of the mines in an effort to generate a more consistent source of revenue from the sale of mercury.<sup>2</sup> Like his predecessors in the private sector, the state-appointed *Verweser* controlled the *Pfennwert* trade himself and exploited the workers ceaselessly. They responded with more direct action: work-stoppages occurred in 1579, 1580, 1601-02, 1607, 1615-18, 1630-31 and 1636. The intensified pace reflects the crisis conditions of that time. Yet, the complaints remained the same, centering on corruption in the value of *Pfennwert* and the award of subcontracting work, known as *Lebenschaft*, of which more later. Remedies usually took the form of short-term responses, such as forgiveness of miners' debts or provision of cheaper foodstuffs, not fundamental changes in wage or work regimes. The continued resistance of workers, who received substandard goods at above-market prices, when they received anything at all, led to continued efforts to regulate this trade. These efforts had no effect; officials and merchants on site simply ignored them.

The question is why. If fair wages and regular payment assured a stable workforce, regular production and social peace, to paraphrase Westermann, then regents and operators – state and capital – had a common interest in avoiding the use of *Pfennwert* or, at the very least, not misusing it. Regulations suggest that the state recognized this logic but, as complaints and strikes indicate, could not follow it. Capital, it seems, saw things otherwise. In the eyes of merchants, operators and their representatives, control of the *Pfennwert* trade was a perquisite of the privilege granted by the regent, an «alternative to money». Miners accepted it as an essential alternative to monetary wages, though they clearly preferred cash for the freedom it offered, rejecting only the practices that kept them at the level of subsistence.

### 3. The ecology of work at Idrija

The «ecology of work» in the mines at Idrija helps explain the multiplicity and intricacy of «alternatives to money» and appears prominently in the legend of its origins. A local peasant placed a barrel in a spring, located near the present site of the town's Church of the Holy Trinity (Ferbbers 1774, 63). When the peasant returned to collect it, he found mercury pearled at the bottom. The color and weight of the mineral were such that he traveled six hours to the nearest town to sell it. A teamster with the Germanic name of Cazian Aenderlein tricked the peasant into revealing the mineral's source. Together they formed the first mining company to dig for mercury. Lacking both the capital and the labor to make their venture a commercial success, they sold their rights to entrepreneurs, who established the region's extraction industry.

---

<sup>2</sup> OeStA, Finanz- und Hofkammerarchiv. Innerösterreichische Miscelle und Briefe, 135, fol 557f. At that time, 43 operators at Idrija held 144 shares (*Kuxe*) for which the state negotiated a purchase price of 170,000 *Gulden* to be paid in three annual installments. Attempts to operate the mine quickly revealed, however, that the state possessed neither the capital nor the organization to do so profitably. In consequence, it contracted with private companies (*appaltatore*) to advance funding for the mines in exchange for exclusive concessions to receive the mercury it produced. Cf. Valentinitsch 1981, 34-5.

All of this supposedly transpired in the 15<sup>th</sup> century. At that time, Idrija was nothing more than a remote corner of Europe. Located in the Kars, a spur of low, wooded mountains extending southeast from the Dinaric Alps, the area is marked by limestone ridges with numerous caves and underground rivers that separate dry valleys. Surface water is scarce, though the town of Idrija stands at the junction of the Idrijca and Nikova Rivers. The rugged topography had several effects. First, it limited agriculture to herding and forestry. Local peasants could produce very little grain, so that it and other foodstuffs had to be imported from outside the region, initially from the Ljubljana Basin to the northeast just below the Julian Alps and eventually from the Pannonian Plain that extends further northeast from Carniola into Styria and Hungary (Valentinitch 1981, 236). Second, in combination with a lack of local agricultural productivity, it constrained population density. This meant that settlements and, more importantly, marketplaces did not exist in the immediate vicinity of Idrija. The community of Bischoflack/ Škofja Loka, mentioned by miners in 1536, lies 42 kilometers away across rugged countryside. Third and last, the topography constrained local access. There were two trade routes linking Idrija to the rest of Europe: one led north via Villach to Salzburg, the Holy Roman Empire and the Low Countries; one led south via Loitsch/Logatec to the road from Laibach/Ljubljana to Trieste and from there to Venice, the Mediterranean, the Levant and Iberia (Hassinger 1976; Tremel 1954). These routes were so rudimentary that wagons and oxcarts could not travel on them.<sup>3</sup> All goods had to be carried in and out by pack animals or porters, a situation that would not begin to change until the 18<sup>th</sup> century due to the fiscal conservatism of the neighboring estates.<sup>4</sup> The legend suggests as much through its reference to impecunious peasants and distant marketplaces.

The discovery of mercury in its pure form – Idrija is the only location in Europe where the mineral seeps from the ground as a liquid – collided with these circumstances, creating both opportunity and opposition. Many local peasants were drawn away from agriculture, as the legend implies, by employment in the mines. Others supplemented their incomes by offering occasional services as teamsters, hauling supplies in and products out of Idrija. Yet, mining is an expert craft, and the need for skilled, experienced hands soon drew an immigrant population to Idrija as it did to most other mining centers in Europe and the New World. Only rough estimates of the size of the mining community exist before the 17<sup>th</sup> century and none for the local population. The commission report of 1537 recorded 60 miners, not counting other workers employed at the time. By the end of the 16<sup>th</sup> century, those numbers had risen to around 150 and to around 400 workers in total by the 1630s.<sup>5</sup> Extrapolating crudely to entire families, this might suggest a total mining community

---

<sup>3</sup> To this day, only two routes connect Idrija to Ljubljana. Though both are now paved for automobile and truck traffic, travel time remains high, 60-90 minutes on average to cover 60 kilometers.

<sup>4</sup> Steiermärkisches Landesarchiv, Graz (SLA), Hofkammer-Registraturbücher und Kammer- und Exemptbücher (1570-1690), 1580, fol. 47. Cf. Valentinitsch 1981, 217-18.

<sup>5</sup> SLA, Repertorien und Akten der IÖ Hofkammer, chronologische Reihe (1570-1690), 1633, VII, 125. Cf. Valentinitsch 1981, 157-61.

that grew from 240 to 1600 souls, creating social tensions that increased miner dependence on *Pfennwert*.

The indigenous population of Idrija was Slavic; the immigrant community that directed mining operations and drew larger salaries were Germanic for the most part. These groups stood on opposing sides of a divide that was economic and legal as well as cultural. Drawn to isolated regions by the promise of employment and compensation, miners existed in a legal vacuum until they swore an oath of obedience to the regent and his mining ordinance, which gave them not only the right to work underground in a given region but also privileged access to the region's markets and resources (Westermann 2009, 171). At that point, they went from being distrusted outsiders to hated competitors (Preisner 1982, 34-38; Westermann 2009, 177-78). Moreover, the state penalized local communities for hindering or exploiting the newcomers: wrack-renting for housing; price-gouging for food; obstruction of mining operations; refusal to serve, trade or even associate (Hensche 1974, 161). Decades after settlement, strange languages and cultures, social discrimination and exclusion all hindered the miners' efforts to obtain basic goods and services from local farms or settlements.

Their predicament resulted not only from the difficulties posed by topography and culture but also from those arising from the wage and work regimes that characterized extraction before the emergence of what E. A. Wrigley once called a «mineral-based energy economy» (Wrigley 1988; Levine, Wrightson 1991, viii). As at other Central- and East-Alpine mining centers, miners at Idrija earned their wages under three distinct regimes: *Herren-* or *Zeitlohnarbeit*, *Gedinge-* or *Akkordarbeit* and *Lebenschaftsarbeit* (Valentinitsch 1981, 358-64; Mitterauer 1974, 234-315; Westermann 2009, 63-99). The sources refer to the majority of wageworkers as *Knechtslöhner*, or as *Herren-* or *Zeitlohnarbeiter*, who engaged in a variety of tasks for a basic, weekly remuneration. The *Gedinge-* or *Akkordarbeit* resembled a piece-rate rather than a time-rate of payment. This wage regime appears to have applied to the more essential tasks, such as hewer (*Häuer*), lumberman (*Holz-knechte*) or smeltery-worker (*Brandstättarbeiter*), and it tended to pay them more than 50 percent better than their colleagues involved in *Zeitlohnarbeit* (Valentinitsch 1981, 191).<sup>6</sup> In both categories, nominal wages proved remarkably 'sticky' (Safley 2019a). Between 1495 and 1660, nominal wages for workers were increased only twice, despite the continually rising cost of living: in 1575, when the state assumed direct control of the mines; and in 1627, when it instituted a temporary wage reform (Valentinitsch 1981, 185). In consequence, workers seldom earned enough to cover the price they were charged for *Pfennwert*, forcing them to assume debt or to seek by-employment.

The *Lebenschaft* offered exactly that. It took the form of a subcontracting arrangement usually applied to those processes that were particularly labor-intensive, less skilled and poorly paid (Valentinitsch 1981, 177). A miner would collect a group of workers, often family members or disabled colleagues, and pay a fee to the *Verweser* for the privilege of extracting mercury and cinnabar from a specific slag heap or mine shaft for a specific period of time. The *Lebenschaft* provided the tools and labor and

---

<sup>6</sup> A *Gedingbauer*, for example, earned more per week than a *Lohnbauer*, 1 fl 33 kr 3 d per week, as opposed to 1 fl or 52 kr respectively.

committed to sell whatever it produced exclusively to the *Verweser* for a contractually fixed price. This arrangement thus allowed the *Verweser* to expand the mine's production and enabled underpaid miners and their families to supplement their incomes.<sup>7</sup> For that reason, miners complained bitterly about the corrupt assignment and high price or *Lebenschaften*, another «alternative to money» that should have been available to all.

Inconsistent – not to say unjust – earnings had to do with work- as well as wage-regimes. Miners at Idrija labored irregularly, moving from task to task, according to the length of their shift, their resistance to toxicity, the time of year, and the batch to be produced. The 1580 Mine Ordinance established maximum work periods of 8 hours per day and 44 hours per week, a limit that rose to 48 hours in the mid-17<sup>th</sup> century without a corresponding increase in pay (Čar, Pelihan, Dzdarevič 2014, 161-68; Valentinitich 1981, 360). By contrast, the number of the miners' legal holidays decreased from more than 100 holidays per year in the 16<sup>th</sup> century to six in 1609 (Valentinitich 1981, 195-99). Yet, not the law of the land but the toxicity of mercury set the real limit at Idrija. According to a report submitted to the State Council in 1561, the mine could be operated «no more than 18 work-weeks out of the year, and a miner could not work underground for more than 14 days but had regularly to be shifted from one form of labor to another».<sup>8</sup> Moreover, «... the deeper a shaft or the farther a gallery travels, in which the evil weather the more accumulates, the more workers will weaken and sicken, so that many of them can tolerate little more than a week or two and do not last the period».<sup>9</sup> Hence, miners could not work at a single task for a long period of time but had to shift regularly to avoid the permanent effects of mercury toxicity. The seasonality and marketability of production also influenced the type and period of work performed. Because refining was done in the open air, where wet weather could affect the distillation process, and because mining occurred in enclosed spaces, where the sun could not provide light, miners changed between work aboveground in summer to belowground in winter, the specific tasks of which were remunerated at their own rates and in their own forms, over time, by piece or at risk and could alter earnings as much as 30 percent per week (Valentinitich 1981,

---

<sup>7</sup> OeStA, Finanz- und Hofkammerarchiv, Innerösterreichische Miscelle und Briefe, 136, fol. 1500, 137, fol. 167. Indeed, the State Council repeatedly insisted that *Lebenschaften* be awarded exclusively to «arme, erlebte» miners, an order the *Verweser* obeyed only in the breach, it being far more productive – and, therefore, profitable – to set before able miners the prospect of a premium earned at piece-rates. Cf. Valentinitich 1981, 182.

<sup>8</sup> OeStA, Finanz- und Hofkammerarchiv, Innerösterreichische Miscelle und Briefe, 134/2. Bericht der Jdrianischen Amtsleut, 20. Augusti 1561. «Verer das die herrn Gwerckchen melden, das sy pesses und geferliches Wetters halben auf dem Artzt ein ganzes Jar nit uber 18 Wochenarbaitten mugen und wie ain Arbaiter uber 14 Tag jn der Teuff am Artzt nit bleiben sunder dieselbigen abswechseln und anndere an die Stat legen und doch die ersten nichts minder unnterhalten, damit man am Volgkh nit Mangle hab.» This resulted in a far less extensive period of uninterrupted extraction than was common for colliers, tanners or miners of base or precious metals.

<sup>9</sup> OeStA, Finanz- und Hofkammerarchiv, Innerösterreichische Miscelle und Briefe, 134/2. Bericht der Jdrianischen Amtsleut, 20. Augusti 1561. «Darauff sagen wir das gleich woll, die Schacht vill tieffer ferth und Stollen weiter verfahren sein, darinen sych das posse Wetter hefftig enthalt die Arbaitter fast schwecht und krenghkt, das jr vill manicher Kaumb ein Wochen oder zwo mocht und jr wenig ein Raittung ubersten mugen».



166). Regardless of the season, they worked more intensely when the *Verweser* had orders to produce specific amounts of mercury and cinnabar for sale and delivery at a specific time. The result was batch production, which could impose periods without any pay whatsoever.

Miners did not work according to the regular rhythm of a fixed number of hours per day and days per week but according to the season of the year, the state of their health and the demand for their product. This irregularity did not help them to attend weekly retail markets that occurred at fixed times on fixed days, such as the one at Bischoflack, regardless of the distances to be traveled. Indeed, they could afford none of the “leisure preference” Hatcher noted among Lothian colliers (Hatcher 1993, 386-90). How were they to know what they earned, apart from what the administrators and foremen told them? Unless they kept detailed accounts of their own work – how long at which tasks – miners were completely in the dark. So, their dependence on the *Pfennwert* trade – and the opportunities for chicanery – grew.

#### 4. Futility of reform

That those opportunities were seized frequently does not, however, prove that predatory capitalists and indifferent officials were free agents. They, too, were caught up in an ecology of work over which they had only partial control.

They could not completely rely on laborers who were not completely dependent. Apart from the difficulties posed by topography, those peasants who volunteered their services as teamsters occasionally proved unwilling to work. They soon learned that the volume of *Pfennwert* they transported to Idrija far exceeded the volume of mercury they transported away, but the rates they received for *Pfennwert* were far lower. In 1602, the tariff for a *Saum*, roughly 160 kg, of grain from Triest to Idrija was 18 *Kreutzzer*, while that of a *Saum* of mercury from Idrija to Triest was 1 *Gulden* 33½ *Kreutzzer*, more than five times as much.<sup>10</sup> Moreover, those earnings proved ‘sticky’, like the wages paid to workers at Idrija (Valentinitsch 1981, 218-19). The peasant-teamsters responded by demanding increases and, when these were not forthcoming, by refusing to work and withholding their pack animals. All attempts by local landlords, merchant capitalists or state agents to compel them, whether by defining haulage as *corvée* labor or setting a minimum number of days or animals to be committed to the service of the mines, yielded no permanent solution. Indeed, landlords often connived in this resistance. Hans Georg Ainkhürn, for example, the son of an infamous Idrijan *Verweser* Urban Ainkhürn ordered the peasants on his estates to refuse this service, refuse shipments bound to Idrija from Trieste and to load his goods instead.<sup>11</sup> The peasants hid or consumed cargoes, delaying deliveries for weeks at a time or falsified weights by wetting grain with water (Valentinitsch 1981, 221). This resulted in frequent food shortages in Idrija and sharpened conflicts surrounding the *Pfennwert* that owners and operators provided.

<sup>10</sup> SLA, Repertorien und Akten der IÖ Hofkammer, chronologische Reihe (1570-1690), 1604, II, 37.

<sup>11</sup> SLA, Sachabteilung der IÖ Hofkammerakten, Karton 85, Heft 14.

That capital and state proved unable either to cajole or to compel consistent compliance on the part of local peasants signals in turn the limitations of their powers and ambiguities of their interests with regard to mining at Idrija. Until the middle of the 17<sup>th</sup> century, mining attracted taverners, butchers and shopkeepers to Idrija, but the settlement had no local marketplace of its own and, therefore, no merchant engaged in wholesale commerce. Various proposals to create a weekly commodity market for the provisioning of miners and other wage-earners fell on deaf ears for a number of reasons. The state council decided that a regular market would not sustain itself, given the geographic isolation of Idrija, and supply issues would be better addressed by reducing transportation costs.<sup>12</sup> It suggested lowering customs duties in and out of Idrija, but it refused funds to improve the routes leading to and from it. It also encouraged the creation of a dedicated supply zone for the mine, such as had existed to support other mines in other parts of Austria since the 15<sup>th</sup> century, but it proved unable fully to execute the plan (Dimitz 1875, 234). The regent had mortgaged the right to collect taxes – and therewith a portion of the harvest in those regions – to private interests, often the same interests that operated the mines. What is more, he feared that a regular market would create unwanted competition and threaten his revenue; those private individuals or companies that offered credit for the right to operate the mine or sell its mercury were often the same companies that profited from their sole control of the *Pfennwert* trade.<sup>13</sup> In every instance, the state demonstrated greater concern for the profits generated by mercury mining than for the long-term well-being of its miners and therewith the economic development and social stability of the region. Throughout the 16<sup>th</sup> and 17<sup>th</sup> centuries, the mine and its miners received their supplies not on the open market but through the *Pfennwert* monopoly (Koch 1942; Menzel 1891; Mitterauer 1974, 256).

Not that the regent and his government gave no thought to the stable provisioning of its miners. When the state assumed direct control of production in 1575, it took the trade in *Pfennwert* out of the hands of the mine operators and their *Verweser*. Up to that point, their corruption had led to repeated protests by the miners, such as that of 1536, and to regulatory interventions by the state, such as the 1557 decree of Emperor and Archduke Ferdinand I that miners at Idrija be paid in cash not kind.<sup>14</sup> The operators and their *Verweser* had simply ignored all such admonitions and regulations. The seat of government in Graz was too distant from Idrija for effective regulatory enforcement, resulting in relative impunity for violators. Moreover, many of them were themselves substantial landowners, political favorites or high officials, enabling them to defeat or deflect state initiatives with regard to Idrija. The situation did not improve under state control. The governing council merely re-appointed the operators' long-term *Verweser*, Urban Ainkhürn, who continued decades of predation by raising the value of *Pfennwert* so high that the miners were driven finally to stop work in 1579.

---

<sup>12</sup> OeStA, Innerösterreichische Miscelle und Briefe, 135, fol. 584. Bericht des Verwesers 1575. Cf. Valentinitich, *Das landesfürstliche Quecksilbergwerk Idria*, 226.

<sup>13</sup> SLA, Repertorien und Akten der IÖ Hofkammer, chronologische Reihe (1570-1690), 1625 May, 45, 1633 July, 78.

<sup>14</sup> OeStA, Innerösterreichische Miscelle und Briefe, 134, fol. 703. Cf. Valentinitich 1981, 227.

Ainkhürn illustrates the difficulties posed to capital and state by «alternatives to money», given the ecology of work at Idrija (Valentinič 1981, 369-71). Descended from a lineage of servants to the Duchy of Bavaria and the Wittelsbach dynasty, his father appears as a *Gewerke* at Idrija as early as 1510 and may have received a title of nobility in 1540 (Von Frank 1967, 9). Urban grew up in Carniola and assumed the role of *Verweser* at Idrija in 1549, a role he would hold uninterrupted, first on behalf of the *Gewerke* and from 1575 for the regent, until his retirement in 1586. His knowledge of mining operations made him invaluable to both, enabling him to work seamlessly with capital and the state, executing tasks and currying favor with both. His responsibilities as private employee and state official did not, however, prevent him from pursuing his own business interests. He was himself a *Gewerke* at Idrija, having inherited shares from his father, and sought opportunities to buy out other stakeholders (Valentinič 1981, 369). Yet, his profit from the *Pfennwert* trade overshadowed his earnings from mercury. He regularly engaged in *Fürkauf*, buying large quantities of provisions well below market rates only to offer them to miners at artificially inflated values. In consequence, many fell into debt bondage. He purchased shares in the ironworks near Idrija, where mining tools were produced and repaired, and received the privilege of transporting these goods tollfree.<sup>15</sup> To his increasingly diversified holdings, he added a number of landed estates, including Loitsch/Logatec at the intersection of the main transit route to Idrija and the route connecting Laibach/Ljubljana with Trieste, which he received in 1578 in exchange for assuming nearly 20,000 *rheinische Gulden* in debt on behalf of the regent.<sup>16</sup> He came thus to control not only the purchase and sale of provisions but also the transportation of goods to and from Idrija. Multiple accusations of corruption had no effect on his career, his wealth or his reputation. The ability of individuals, of which Ainkhürn is a signal but not singular example, to hold multiple offices and pursue individual opportunities without apparent conflict of interest indicates the social, political and economic conditions that influence «alternatives to money».

The work-stoppage of 1579 did not end Ainkhürn's career, but it prompted the state finally to undertake structural changes, creating a separate office for the purposes of supplying the mine and its miners and by issuing a *Reformations-Nottl* on 7 April 1580.<sup>17</sup> The reform limited the influence of the *Verweser* over the traffic in *Pfennwert*, and prescribed the keeping of exact accounts, but it failed to end corrupt practices. Though no longer involved in the purchase of supplies, he remained responsible for the value assessed miners for them. Thus, Ainkhürn continued to profit and provoke to the end of his career in 1586.

The records of the first, official trader in *Pfennwert*, Hans Ebner, a former customs official, confirm the impression. Although his term of office left few traces, he appears to have been no less willing to exploit his opportunity and the miners'

<sup>15</sup> SLA, Repertorien und Akten der IÖ Hofkammer, chronologische Reihe (1570-1690), 1573, II, 18.

<sup>16</sup> SLA, Repertorien und Akten der IÖ Hofkammer, chronologische Reihe (1570-1690), 1578, I 72; 1580, V, 31.

<sup>17</sup> SLA, Hofkammer-Registraturbücher und Kammer- und Exemptbücher (1570-1626), Reg. 1580, fol. 134f.

situation. When he died in 1585, his accounts revealed that the miners at Idrija had become indebted by virtue of over-valued *Pfennwert* to the amount of 6,367 *rheinische Gulden*. His successors were no more competent or less corrupt (Valentinitsch 1981, 228-30). Miner complaints continued; miner indebtedness increased. Finally in 1610, the state disbanded the 'independent' *Pfennwerthandel* and again prescribed cash wages only.

Yet, even cash did not entirely protect miners from the predations of merchants and officials, often one and the same person. Rather than leave the provisioning of the mine to the operators or place it in the hands of one of its own agents, the state turned to yet another commercial operator. Beginning in 1610, it placed the *Pfennwert* trade in the hands of a series of Venetian merchant companies to which it had offered monopoly concessions (*Appalt*) to sell Idrijan mercury in exchange for loans of investment and operating capital, a practice that began when it first assumed control in 1575. At the time, this seemed the only means to obtain the funds necessary to maintain and improve the mine as a state enterprise as well as arrange the sale of its product on international markets (Tremel 1954, 67; Valentinitsch 1981, 35-6). The so-called *appaltatore* soon came to resemble the directors of a *Verlag* or putting-out system, in which they controlled operations by providing essential supplies and capital to the mine and its miners and received in return exclusive rights to take and sell their products. Not only did the *appaltatore* charge inflated prices for the supplies, forcing the miners who paid cash further into debt, but they also advanced money to the state's *Verweser* against the value of further deliveries of mercury (Valentinitsch 1981, 230-33). The *Verweser* then misappropriated the funds, purchasing foodstuffs and other supplies, which they then provided to miners in lieu of cash wages. The pattern of misuse and malversation continued until 1629, when the bankruptcy of the current *appaltatore* provided the state with another opportunity to reorganize the *Pfennwert* trade. It excluded the next *appaltatore* from trafficking in foodstuffs and placed responsibility for supplies once again in the hands of its *Verweser*. As happened in the past, however, it turned a blind eye to the corruption that ensued. The *Verweser* undertook the purchase of the most essential foodstuffs but provided these to the miners at inflated prices in lieu of cash wages. Worse still, in the eyes of the miners, what cash they received took the form of worthless Venetian copper coins. The *appaltatore* limited himself to the delivery of mining supplies but in less quantity and higher prices than had his predecessors. Only when the time came to renew his contract, in 1648, did the state finally refuse his request to place the entire trade in *Pfennwert* under his control (Von Srbik 1907, 4). This enabled the few local retailers who had settled in Idrija to provide cloth and tools to miners. A local market in foodstuffs and other necessities began gradually to emerge in Idrija in the mid-17<sup>th</sup> century, breaking the long-term monopoly provided by the state to single suppliers and ending the use of *Pfennwert* as an alternative to monetary wages. Henceforth the miners paid cash for their necessities and become indebted to local retailers rather than a foreign capitalist or mine administrator.

Reliance on the *Pfennwert* trade, whether operated by private or public enterprise, arose from the necessity of supplying miners who worked in isolated, impoverished regions. The resulting exploitation was intrinsic to the situation and not easily avoided. As organized and controlled by the state or by capital, the *Pfennwert* trade

robbed the miners of control over the value they were charged or the quantity and quality they were given. Yet, in nearly two centuries of frequent protest, some of it violent, they never called for an end to the trade but only for its fair application, because they were utterly dependent on it. The state offered temporary remedies but never effectively prevented abuses. It suffered fiscal limitations, arising from internal as well as external factors, that prevented the creation of an adequate system of supply. Internalities, such as the chronic insolvency that forced the state to function from one loan to another, combined with conflicts of interest, in which the creditors were also major landlords and state councilors, to prevent funds from being raised or reapportioned for the purpose of improving routes and fostering markets. Externalities in the form of the disruptions caused by border warfare, crop failure and epidemic disease frequently redirected the attention of the state away from the problems at Idrija and further limited the resources at their disposal. Beyond such constraints, the state proved unable to contend with principal-agent problems. Lacking expertise in mining and marketing, it had to rely on foreign capital and its representatives. These local managers, Urban Ainkhürn being but one example among many, could defy both workers and authorities as either too dependent or too distant to intervene effectively in their manipulations of work or wage regimes. Even capital, intent on extracting maximum profits with maximum efficiency, confronted constraints that it could not easily overcome. Peasant teamsters refused haulage. Inadequate infrastructure increased costs and uncertainty. Product markets experienced extreme volatility. Even monopoly contracts were fixed-term. Under these circumstances, a take-what-you-can-get mentality seems understandable if not excusable.

None of the parties involved in mercury extraction at Idrija – the state, capitalists, agents, miners, peasants – wished to see the use of *Pfennwert* as an «alternative to money» abandoned. It relieved miners of the arduous, sometimes impossible task of provisioning at marketplaces that were too distant, occasionally hostile and frequently untimely. It stabilized the workforce and fostered a degree of order that generated revenue and lowered enforcement costs to the state. And, of course, it provided capitalists – whether landlord producers, merchant middlemen or state agents – with opportunities for profit. From the early-16<sup>th</sup> to the late-17<sup>th</sup> century, whoever controlled the *Pfennwert* trade consistently sought to maximize profit through *Fürkauf* and price gouging, instrumentalizing it as an alternative to money wages. As ruthless and self-interested as this practice appears, however, it was also a rational consequence of the local ecology of work that had certain advantages for all.

## 5. Conclusion

This paper has concentrated attention on *Pfennwert* – foodstuffs, textiles, tools and other supplies—offered in lieu of cash wages. In an age of commodity money, it makes sense that any «alternative to money» would likewise take the form of commodities. As prominently as such tangibles figured at Idrija and most other mining centers in central and eastern Alpine regions, however, they were not the only

alternatives in use. Mining involved different forms of interlocking and interacting alternatives that functioned at all levels of the political economy.

Almost as frequently as miners complained about the corrupt distribution of *Pfennwert*, they objected to the misuse of *Lebenschaften*. These were part of the complex wage- and work-regimes of preindustrial mining. *Lebenschaft* (or *Lebnschaft*) refers to «a contractual relationship, according to which the person who possess a mine, transfers to another person the right to extract minerals from it or a part of it; it also applies to a group (*Genossenschaft*) of miners that assumes [operation of] a mine in this manner; it can be applied to the mine itself, the operation of which is transferred in this manner, finally it includes the group of people to whom the right to operate a mine in this manner is transferred» (Veith 1871, 232). In the case of Idrija, as noted, it resembled a subcontracting or *Verlag*-style labor relationship, in which the *Verneser* assigned working rights to a portions of the mine, usually one deemed to be less productive and therefore unlikely to yield the quantities of finished product that would cover the costs of extraction and refinement. In essence, he and the operators he represented paid only for that which the *Lebenschaft* produced. The members of the *Lebenschaft* bore all the costs of production and, therefore, all the uncertainty of work that might yield little or no profit.

The miners of Idrija and elsewhere valued it nonetheless, because it provided a form of by-employment, a means of increasing earnings in times of stagnant wages or full unemployment. Those earnings were by no means guaranteed, so that the *Lebenschaft* offered opportunity as an «alternative to money». More, in so far as the holder of a *Lebenschaft* became an entrepreneur and foreman in his own right, working part of a mine to which he had exclusive, contractual rights and providing employment for whomever joined him, he gained status as well as opportunity. Accordingly, even in an age of commodity money, intangibles as well as tangibles, fixed as well as variable capital, served as alternatives.

As this paper has tried to suggest, the use of alternatives to money penetrated all levels of the political economy of mercury extraction at Idrija. A cash-strapped state offered alternatives as an inducement to service. It provided secure tenure to peasants in return for their agricultural productivity and labor services. It offered gainful employment and financial inducements to miners in return for their skilled artisanship. It offered political autonomy to landlords in return for their political and military services. It offered legal privilege and economic advantage to merchant capitalists in return for the financial and commercial services. All of these inducements functioned as «alternatives to money» in situations where cash might otherwise have changed hands, and all of these inducements, whether in the form of privileges or opportunities, status or authority, incomes or interests, generated monetary value for the parties involved. At Idrija, an entire exchange economy can be said to have functioned on the basis of alternatives to money.

Indeed, they made that economy possible. Abused, they could serve as an instrument of exploitation and a cause of inequality, but, used, they enabled transactions that could not otherwise have occurred. As the name implies, alternatives find use in those moments when different media of exchange and different metrics of value become essential, because money will not serve. To return to *Pfennwert* for a moment, no evidence exists to suggest a shortage of cash in Idrija.

Rather, the miners lacked opportunities to spend it. Capitalists lacked adequate assurance of profit from minerals alone. The state lacked other means to provide it. None of these parties demanded that it or any other alternative to money be abandoned, because they all drew advantage from them, albeit in different ways and to different extents. The existence of alternatives indicates that, even in a monetized economy, money is neither the only nor the best medium of exchange in all circumstances.

Nor is that fact limited to extraction or manufacturing alone. If one looks beyond preindustrial manufacturing, the range of «alternatives to money» broadens further still. Bankruptcy resolutions could involve large quantities of fiat and future money (Safley 2000; Safley 2013; Safley 2019b). It was not unusual for creditors to accept book transfers of accounts payable or goods receivable in lieu of cash payments from their debtor. Nor were title transfers of fixed and variable capital, even equity stakes, anything less than commonplace as payment in default.

Have all these various forms of payment anything in common apart from the replacement of cash? Striking, in my opinion, is their resemblance to a spot market.<sup>18</sup> In all cases, payment and delivery occur immediately, on the spot. They usually involve a face-to-face transaction between buyer and seller, whether in the form of miner and *Verweser*, employee and employer and creditor and debtor. Interestingly, in the absence of institutions that established uniform, fixed and enforceable rules for such transactions, asymmetries develop that affect the perceptions and values attached to it. One of the parties, be it a capitalist, an official or a creditor enjoys greater power and authority and dictates the monetary value attached to the «alternative». Not surprisingly, the disadvantaged party, be it miner or debtor, often finds the valuation unacceptable but lacks the power to alter it. The possibility that «alternatives to money» could take multiple forms and multiple values even within a single transaction suggests that their use transcends the commonly assumed functions of money as medium of exchange, measure of value and repository of wealth. They introduce into economic behaviors factors that are seldom part of economic calculation.

Interestingly, perhaps paradoxically, this range of alternatives not only created long-term problems for the mine at Idrija but also enabled its long-term success. When the state assumed control of production in 1575, it embarked upon a program of technological improvements that increased productivity and production by more than 300 percent through an extraordinary period of crisis in the first half of the 17<sup>th</sup> century (Valentinitsch 1981, 65-88). This despite the constraints of environment, lack of infrastructure, underdevelopment of institutions and stickiness of wages. Capital for these investments came from the *appaltatore*, whose monopoly concessions to supply *Pfennwert* and sell mercury enabled the mine's products to find ready markets, despite trade embargoes on mercury in the old world and the new. Labor came from miners who continued to work almost without interruption, despite the new

---

<sup>18</sup> A spot market, also known as a cash market, is one in which financial instruments or commodities are traded for immediate delivery with settlement, that is payment and transfer occurring immediately or within a mutually agreed, fixed period of time. In modern economies with appropriate infrastructure, they can operate through intermediary individuals or institutions, such as brokers and exchange, but they can also occur over-the-counter, that is, between the trading parties face-to-face.

technology and the intensification of their labor. They did so without a corresponding increase in their earnings, of which the much-exploited *Pfennwert* continued to be a substantial part, in what appears to be flagrant disregard for both their agency and their advantage. The brutality of their work – stone that crushed or poisoned at intervals, depths that threatened drowning or suffocation in an instant, shifts that yielded a subsistence but not a sufficiency – continued at least to the end of the 18<sup>th</sup> century raising the question of modernization and persistence in the face of under-development. «Alternatives to money» suggest how both occurred but not why.

That alternatives have become the stuff of song and legend and are widely prohibited by law suggests that they are archaic, have no place in modern wage systems. That alternatives seem inextricably bound to the exploitation of labor by capital suggests that they are also undesirable, have no place in modern, liberal society. Yet, nothing could be further from the truth. Corporate employers regularly offer – and their employees absolutely expect – various fringe benefits, all of which the employer regularly and dutifully lists in monetary terms as ‘total compensation’ and the state assiduously accounts as taxable income. A brief consideration of preindustrial mining – or any other form of premodern manufacturing – reveals both a resort to and a range of «alternatives to money» that is no more or less present in the workplace but demonstrates every bit as much ingenuity as its modern counterpart. They were and remain a means to suffering as well as survival, to persistence as well as profit. They are not archaic but timeless.

## BIBLIOGRAPHY

- Aspin, Chris. 1995. *The first industrial society: Lancashire 1750–1850*. Lancaster UK: Carnegie Publishers.
- Čar, Jože, Martina Pelihan, and Tatiana Dizsarevič. 2014. “Conditions in the Idria mercury mine at the end of the 16th century and measures for its restoration.” *Geo Alp* 11: 161-68.  
<[https://www.natura.museum/wp-content/uploads/2020/05/GeoAlp\\_011\\_0161-0168.pdf](https://www.natura.museum/wp-content/uploads/2020/05/GeoAlp_011_0161-0168.pdf)> (2023-01-20).
- Chmel, Joseph, ed. 1845. *Urkunden, Briefe und Actenstücke zur Geschichte Maximilians I. und seiner Zeit*. Stuttgart: K. Fr. Hering und Comp.  
<[https://archive.org/details/bub\\_gb\\_b15zUSGcj94c](https://archive.org/details/bub_gb_b15zUSGcj94c)> (2022-11-03).
- Deutsches Rechtswörterbuch, Vol. X: 856-58. <<https://drw-www.adw.uni-heidelberg.de/drw/cgi/zeige?index=lemmata&term=pfennigwert&lastterm=pfennigzins>> (2023-01-20).



- Dimitz, August. 1875. *Geschichte Krains von der ältesten Zeit bis zu dem Jahr 1813*. Laibach, 1874-7. <<https://archive.org/details/geschichtekrain01dimigoog>> (2022-12-18).
- Entzelt, Christoph, and Georg Caspar Kirchmaier. 1698. *Corpus Jursi et Systema rerum Metallicarum, oder: Neuverfaßtes Berg-Buch: Bestehend aus allerhand so alten als neuern Collectaneis von Bergwercks-Sachen*. Frankfurt: Zunner.
- Ferbers, Johann Jacob. 1774. *Beschreibung des Quecksilber-Bergwerkes zu Idria*. Berlin: C. F. Himbürg.
- Hassinger, Herbert. 1976. "Die Handels- und Verkehrsstellung Villachs bis in die Mitte des 19. Jahrhunderts." *Carinthia I: Mittheilung des Geschichtsvereins für Kärnten* 166: 211-82.
- Hatcher, John. 1993. *The history of the British coal industry, Vol. I, Before 1700: Towards the age of coal*. Oxford, UK: Oxford University Press.  
<https://doi.org/10.1093/acprof:oso/9780198282822.001.0001>.
- Hensche, Ekkehard. 1974. *Landesherrschaft und Bergbauwirtschaft. Zur Wirtschafts- und Verwaltungsgeschichte des Oberharzger Bergauebietes im 16. und 17. Jahrhundert*, Berlin: Dunker & Humblot.
- Hilton, G. W. 1958. "The Truck Act of 1831." *The Economic History Review* 10: 470–479. <https://doi.org/10.2307/2591266>.
- Jaschik, Eva. 2022. *Bergordnung für Schwaz von Herzog Siegmund von Österreich*, Dresden. <<https://e-docs.geo-eo.de/bitstream/handle/11858/10364/Bergordnung%20Schwaz%201449.pdf?sequence=1&isAllowed=y>> (2023-02-05).
- Koch, A. 1942. *Arbeitsrechtliche Bestimmungen an steirischen Erzberg im 16. Jahrhundert*. Graz: Steirische Verlagsanstalt.
- Levine, David, Keith Wrightson. 1991. *The making of an industrial society: Whickham, 1560-1765*. Oxford, UK: Oxford University Press.  
<https://doi.org/10.1093/acprof:oso/9780198200666.001.0001>.
- Menzel, Adolf. 1891. "Soziale Gedanken im Bergrecht." *Zeitschrift für das Privat- und öffentliche Recht der Gegenwart* 18: 481-511.
- Mitterauer, Michael, et al., eds. 1974. *Österreichisches Montanwesen. Produktion, Verteilung, Sozialformen*. Munich: De Gruyter Oldenbourg.  
<https://doi.org/10.1515/9783110655759>.
- Preisner, Paul. 1982. *Die Geschichte der Gemeinde Hofgrund (Schauinsland): der Bergbau im Schauinsland von 1340 bis 1954*. Freiburg im Breisgau: Schillinger.
- Ruegg, Alfred Henry. 1901. "Changes in the law of England affecting labour." In *A century of law reform: Twelve lectures on the changes in the law of England during the 19<sup>th</sup> Century, delivered at the request of the Council of Legal Education in the Old Hall*,

- Lincoln's Inn, during Michaelmas Term 1900 and Hilary Term 1901*, ed. Alfred Henry Ruegg, 241-79. London: Macmillan.  
 <<https://archive.org/details/centuryoflawrefo00counuoft>> (2023-02-18).
- Safley, Thomas Max. 2000. "Bankruptcy: Family and finance in early modern Augsburg." *Journal of European Economic History* 29: 53-75.
- Safley, Thomas Max, ed. 2013. *The history of bankruptcy: Economic, social and cultural implications in early modern Europe*. London: Routledge.  
<https://doi.org/10.4324/9780203066836>.
- Safley, Thomas Max, ed. 2019a. *Labor before the Industrial Revolution: Work, technology and their ecologies in an age of early capitalism*. London: Routledge.  
<https://doi.org/10.4324/9781351251082>.
- Safley, Thomas Max. 2019b. *Family firms and merchant capitalism in early modern Europe: The business, bankruptcy and resilience of the Höchstetters of Augsburg*. London: Routledge. <https://doi.org/10.4324/9780429028205>.
- Csendes, Peter, ed. 1986. *Die Rechtsquellen der Stadt Wien*. Vienna: Böhlau.
- Travis, Merle. 1946. "Sixteen Tons." Los Angeles: Capital Americana 48001, 1946.
- Tremel, Ferdinand. 1954. *Der Frühkapitalismus in Innerösterreich*. Graz: Leykam-Verlag.
- Valentinitisch, Helfried. 1981. *Das landesfürstliche Quecksilberbergwerk Idria, 1575-1659: Produktion – Technik – rechtliche und soziale Verhältnisse – Betriebsbedarf – Quecksilberhandel*. Graz: Historische Landeskommission für Steiermark.
- Veith, Heinrich. 1871. *Deutsches Bergwörterbuch mit Belegen*, Breslau: Korn.  
 <[https://archive.org/details/bub\\_gb\\_gUVaAAAAcAAJ](https://archive.org/details/bub_gb_gUVaAAAAcAAJ)> (2022-11-19).
- Von Isser-Gaudenthurm, Max. 1905. *Schwazer Bergwerks-Geschichte: eine Monographie über die Schwazer Erzbergbaue mit Sieben artistischen Kartenbeilagen und einen Anhang "Die Schwazer Bergchronik*. Unpublished typescript.  
 <<https://ulb-digital.uibk.ac.at/download/pdf/1906859.pdf>> (2022-11-19).
- Von Frank, Karl Friedrich. *Standeserhebungen und Gnadenakte für das Deutsche Reich: i.e. für das Heilige Römische Reich und die Österreichischen Erblande bis 1806, sowie kaiserlich österreichische bis 1823, mit einigen Nachträgen zum "Alt-Österreichischen Adels-Lexikon" 1823-1918*. Senftenegg: Selbstverlag.  
 <[https://books.google.dk/books/about/Standeserhebungen\\_und\\_Gnadenakte\\_f%C3%BCr\\_da.html?id=s-dMAQAIAAJ&redir\\_esc=y](https://books.google.dk/books/about/Standeserhebungen_und_Gnadenakte_f%C3%BCr_da.html?id=s-dMAQAIAAJ&redir_esc=y)> (2022-12-02).
- Von Srbik, Heinrich, Ritter. 1907. *Der staatliche Exporthandel Österreichs von Leopold I bis Maria Theresia: Untersuchungen zur Wirtschaftsgeschichte Österreichs im Zeitalter der Merkantilismus*. Wien: W. Braumüller.  
 <[https://archive.org/details/bub\\_gb\\_M4jPAAAAMAAJ](https://archive.org/details/bub_gb_M4jPAAAAMAAJ)> (2022-12-07).
- Westermann, Angelika. 1993. *Entwicklungsprobleme der vorderösterreichischen Montanwirtschaft im 16. Jh.: Eine verwaltungs-, rechts-, wirtschafts- und sozialgeschichtliche Studie als Vorbereitung für einen multiperspektivischen Geschichtsunterricht*. Idstein: chulz-Kirchner Verlag.

- Westermann, Angelika. 2009. *Die vorderösterreichischen Montanregionen in der Frühen Neuzeit*. Stuttgart: Franz Steiner Verlag.
- Wikipedia contributors, "Sixteen Tons." Wikipedia, The Free Encyclopedia, <[https://en.wikipedia.org/w/index.php?title=Sixteen\\_Tons&oldid=1156109620](https://en.wikipedia.org/w/index.php?title=Sixteen_Tons&oldid=1156109620)> (2023-06-12).
- Wrigley, E. A. 1988. *Continuity, Chance and Change: The Character of the Industrial Revolution in England*. Cambridge, UK: Cambridge University Press.  
<https://doi.org/10.1017/CBO9781139168045>.