

Wages Unpacked. Remuneration, Negotiation, and Coercion in the Medici Silver Mines*

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ABSTRACTS

Dieser Beitrag untersucht die Arbeitsverhältnisse und die Formen der Entlohnung der Arbeit deutscher Bergleute in den Bergwerken der Medici im 16. Jahrhundert. Er geht davon aus, dass die frühneuzeitlichen Arbeiter nicht ausschließlich Geldlöhne erhielten, die aufgrund klar geregelter Arbeitsverhältnisse berechnet wurden. Ihre Arbeit und die damit verbundene Entlohnung richtete sich nach technischen und organisatorischen Erwägungen der Arbeitgeber. Auf der Basis überlieferter Gerichtsprotokolle und Lohnabrechnungen verfolge ich ein zweifaches Ziel. Erstens stelle ich die historiografischen Erzählungen über die Arbeit im Bergbau in Frage, in denen die Entlohnung der Bergleute zumeist als in das eindeutige Verhältnis der „freien“ Lohnarbeit eingebettet dargestellt wurde. Zweitens unternehme ich eine detaillierte Analyse der Löhne einheimischer und ausländischer Bergleute, um zu zeigen, dass die Löhne von Männern und Frauen im Bergbau Unterkunft, Verpflegung und Kreditbeziehungen umfassten, die sich aus der Überschneidung von Selbstständigkeit, Zeitarbeit und Mehrfachbeschäftigung ergaben. Der Artikel unterstreicht die Notwendigkeit einer neuen Forschungsagenda, die klare Unterscheidungen zwischen „freier“ und „unfreier“ Arbeit im frühneuzeitlichen europäischen Bergbau in Frage stellt und unser Verständnis der vorindustriellen Entlohnung vertieft.

This article investigates the labour relations and the forms of remuneration that characterized the work of German miners in the Medici mines in the sixteenth century. It starts from the premise that early modern workers did not exclusively receive monetary wages calculated through clear-cut labour relations. Their work and its corresponding remuneration shifted according to

* The data used in this article was collected between 2019–2020 in the Archivio di Stato in Florence (Italy) in the framework of my doctoral research on *Transnational Expertise. German Miners in Renaissance Italy*. The translation from German to English is my own.

employers' technical and organizational considerations. By drawing on original court depositions and payroll accounts, my aim is twofold. First, I challenge historiographical narratives of mining labour that have mostly drawn on miners' remuneration as inherently embedded in the univocal relation of 'free' wage labour. Second, I adopt a fine-grained analysis of wages paid to local and foreign miners to demonstrate that male and female miners' wages encompassed room, board, and credit relations that derived from overlapping self-employment, time-waged labour, and pluriactivity. The article highlights the need for a new research agenda that challenges clear-cut distinctions between 'free' and 'unfree' labour in early modern European mining and deepens our understanding of preindustrial remuneration.

In 1551, the smith Bartel Bozweiler and the miner Hans von Nurnberg were drinking wine in the inn of the Medici silver mines. Suddenly, they started to quarrel. They finally settled the night's drunken brawl in a mining court as a debt matter: one of them did not pay for the last round. "I cannot pay you now because I earn far less than you, only a couple gulden weekly", Hans reportedly said to Bartel. "You liar! I have no more than eight *pfundt* per week!", the annoyed smith replied.¹

This widely accepted image of wage receiving miners influences historical and contemporary understandings of labour remuneration. In present and past mining activities, mid-aged male miners employed in capitalist enterprises are mostly assumed to have received monetary remuneration calculated in days, weeks, or months. This long-standing idea of time wages underpinned Marxist historians' conceptualizations of labour commodification in the mines, where mine workers were referred to as 'proletarians' as early as the fifteenth century.²

The aim of this article is to move beyond this paradigm by unpacking wages in early modern European mining. My purpose is double. First, I challenge historiographical narratives of mining labour that have mostly drawn on miners' remuneration as inherently embedded in the univocal relation of "free" wage labour.³ I show that labour relations changed consistently according to economic policies and policy makers' considerations of skills, gender, and ethnicity. In so doing, labour relations mediated by wage reflected how policy makers implemented labour flexibility, introduced debt bondages

1 Eight *pfundt* meant only slightly more than two gulden. The court case is reported in Archivio di Stato di Firenze (hereafter ASF), Miscellanea (hereafter Misc.) 323, IV, pp. 47–48v.

2 See S. C. Karant-Nun, From Adventurers to Drones: The Saxon Silver Miners as an Early Proletariat, in: T. M. Safley/L. Rosenband (eds.), *The Workplace before the factory: artisans and proletarians, 1500–1800*, Ithaca/London 1993, pp. 73–99; J. Köhler, *Die Keime des Kapitalismus im sächsischen Silberbergbau (1168 bis um 1500)*, Berlin 1955; A. Laube, *Studien über den Erzgebirgischen Silberbergbau von 1470 bis 1546*, Berlin 1974.

3 According to Marx's definition of labour commodification, free wage labourers owned their own labour power and sell it to the capitalists. In so doing, they represented the universal characteristic of capitalist mode of production. See K. Marx, *Capital*, vol. I, B. Fowkes (trans.), Harmondsworth 1976, p. 271–272. However, Marcel Van Der Linden has shown that labour commodification "takes many different forms, of which free-wage earner only selling his or her own labour power is only one example". See M. Van Der Linden, *Workers of the world: essays toward a global labor history*, Studies in global social history, v. 1, Leiden/Boston 2008, pp. 18–28.

and forms of spatial im/mobility, and bound the workforce to a single working site, and/or to a univocal/multiple labour relation(s).⁴

Second, I adopt a fine-grained analysis of wages paid to local and foreign miners to demonstrate that early modern wages did not exclusively consist of monetary payments calculated in time or piece rates. Instead, various factors and different forms of remuneration concurred to create miners' incomes.

The study of remuneration in the early modern mines has so far received incomplete attention.⁵ This article contributes to the literature on global labour history with a European case study. This enables long-term and spatially aware comparisons of historical contexts. My aim is to reconsider wage labour by adopting categories of work drawn from non-Western historiographies of labour, such as 'free' and 'unfree' work, paid and unpaid labour relations, and forced spatial im/mobility.⁶ I will ask questions such as: Were categories of 'unfree' labour embedded in wage-earning labour relations? Did wage labour create inequalities in the workforce? How did workers' indebtedness to the employers contributed to immobilize waged labourers? As researchers of European history, we are still to integrate these perspectives into our own analysis.

This article builds on the case study of wage miners in the Medici silver mines in early modern Italy. In terms of production outlays of metal commodities, the Medici silver mines did not compete with other early modern mining industries scattered throughout Central Europe and the Iberian World. Nevertheless, theoretical and empirical analysis of the mobility of German-speaking miners to the mining district of Pietrasanta (Tuscany, Italy) unravel intriguing perspectives for a renewed study of remuneration in early modern European mining.⁷ By analysing patterns of remuneration in the Medici silver mines, I challenge the assumption of European exceptionalism in the use of 'free' wage labour. This approach sheds new light on forms of coercion in labour relations mediated by wages.

This article is organised as follows. First, I focus on how labour history has examined labour relations and remuneration in early modern mining. I challenge this approach

4 For this debate, see C. G. De Vito, 'Labour Flexibility and Labour Precariousness as Conceptual Tools for the Historical Study of the Interactions among Labour Relations', in: K. H. Roth (ed.), *On the Road to Global Labour History. A Festschrift for Marcel Van Der Linden*, Leiden/Boston 2017, pp. 219–40.

5 An important body of literature has focused on how the relationship between the law, technological changes, and capitalist development impacted wages and proletarianization processes of miners across Europe. See K.-H. Ludwig/P. Sika (eds.), *Bergbau und Arbeitsrecht. Die Arbeitsverfassung im europäischen Bergbau des Mittelalters und der frühen Neuzeit*, Wien 1989 and the contributions therein.

6 In his programmatic essay, Van der Linden argues that "the real wage-workers [...] i.e. workers who has free individuals can dispose of their own labor-power as their own commodity [...], are only one kind of way in which capitalism transforms labor power into a commodity." See M. Van Der Linden, *Labour History: The Old, the New and the Global*, in: *African Studies* 66 (2007), p. 176. For more recent developments on this research trajectory, see C. De Vito/J. Schiel/M. Van Rossum, 'From Bondage to Precariousness? New Perspectives on Labor and Social History', in: *Journal of Social History* 54/2 (2019), pp. 1–19.

7 I use court records and miners' depositions reported in the justice book (*Gerichtsbuch*) held by mining judge and general superintendent Cristof Tegler in the years 1546–1555. See ASF, Misc. 323/IV, pp. 1–123v. For a similar approach, see A. Caracausi, *I Giusti Salari Nelle Manifatture Della Lana Di Padova e Firenze: (Secoli XVI–XVII)*, in: *Quaderni Storici* 135/3 (2010), pp. 857–884.

by adopting new lines of inquiry derived from global labour history studies that called for a conceptual and empirical reconfiguration of wage labour in early modern labour contexts.⁸ In the second part of the article, I gesture towards a fine-grained analysis of employment contracts, judicial trials, and institutional correspondence. I claim that employers and mine managers implemented and reconsidered labour relations according to various economic, cultural, and social considerations. Lastly, I explore the multi-layered structure of miners' remuneration. By using judicial sources and workers' testimonies, I unpack monetary wages, and analyse how remunerations were structured, bargained, anticipated, and paid. I argue that monetary wages partially represented miners' remunerations, which consisted of material incentives, incomes derived from pluriactivity, down payments, room and board.

1. Mining, Wages, and Labour History

The study of mining labour in the German-speaking territories of the Old Empire has a long-standing tradition.⁹ In the second half of the twentieth century, social and economic historians of mining have inquired into how miners' wages affected living standards across Central European mines in the early modern period.

In 1974, Adolf Laube published one of the most detailed contributions to the history of mining in early modern Saxony with the title *Studien über den Erzgebirgischen Silberbergbau von 1470 bis 1546*.¹⁰ A few years later, Austrian historian Karl-Heinz Ludwig inquired into the relationship between technological change and economic growth in mining.¹¹ His interests focused on mining activities located in the eastern-alpine regions, such as Habsburg Tyrol and Carinthia, and current Slovakia. The two scholars were strongly influenced by Marxist and liberal ideologies, respectively. It is not surprising that they arrived at symmetrically opposing conclusions about mining labour. Adolf Laube considered sixteenth-century miners as the token category of the industrial work-

8 I hereby refer to J. Hatcher/J. Z. Stephenson (eds.), *Seven Centuries of Unreal Wages: the Unreliable Data, Sources and Methods that have been used for Measuring Standards of Living in the Past*, Cambridge UK, 2018. For a more general overview of wage labour from a global perspective, see J. Lucassen, *Wage Labour*, in: K. Hofmeester/M. van der Linden (eds.), *Handbook Global History of Work*, Berlin/Boston, 2017, pp. 395–409.

9 This literature is immense. For a general overview of the social and economic history of mining, see C. Bartels/M. A. Denzel (eds.), *Konjunktoren im Europäischen Bergbau in vorindustrieller Zeit: Festschrift für Ekkehard Westermann zum 60. Geburtstag*, Stuttgart 2000; C. Bartels/R. Slotta (eds.), *Der alteuropäische Bergbau. Von der Anfängen bis zur Mitte des 18. Jahrhunderts*, in: C. Bartels/R. Slotta (eds.), *Geschichte des deutschen Bergbaus*, vol. III, Münster 2012; A. Westermann/E. Westermann (eds.), *Montanregion als Sozialregion: Zur gesellschaftlichen Dimension von "Region" in der Montanwirtschaft*, Husum 2012; M. Schattkowsky/H. Albrecht, *Das Erzgebirge im 16. Jahrhundert. Gestaltwandel einer Kulturlandschaft im Reformationszeitalter* (Schriften zur sächsischen Geschichte und Volkskunde, 44), Leipzig 2013.

10 Laube, *Studien*.

11 A comprehensive synthesis of his work is in K.-H. Ludwig, *Sozialstruktur, Lehenschaftsorganisation und Einkommenverhältnisse im Bergbau des 15. und 16. Jahrhunderts*, in: *Der Anschnitt. Zeitschrift für Kunst und Kultur im Bergbau* 36 (1984), pp. 118–124.

ing class under early forms of capitalist production; Karl-Heinz Ludwig showed that miners were instead a much more autonomous and entrepreneurial class of workers.

Their divergent conclusions drew on the analysis of two different mining contexts. Laube examined the Saxon silver mines in the Ore Mountains. In this region, silver mines were governed by a single state-driven enterprise from the late fifteenth century. This enterprise had extended its control over mining activities that included the organizational, financial, and technical decision-making process. In this context, miners were salaried workers employed in a state-driven administration.¹² The institutional framework that regulated eastern-alpine mining in the early modern period was different. Ludwig showed that the use of salaried workforce was not an intrinsic characteristic of early modern European mining in this case.¹³ According to Ludwig, miners were employed through outsourcing contracts, used their own means of production, and sold the final products of their work (raw or processed ores) to entrepreneurs.

Laube and Ludwig's contributions provide substantial insights into the empirical and theoretical frameworks of mining labour. Their research integrates mining labour regimes into the study of early capitalist ways of production. This substantive and methodological transformation is the result of investigating a uniform and salaried workforce as an inevitable outcome of the proletarianization process, triggered in turn by capitalist modes of mining productions between the sixteenth and the eighteenth century.

In his work, Laube built on Marx's "double-freedom" theory to examine miners' exploitation in the capitalist-oriented economic system of sixteenth-century Saxon mines. This theory led him to conceptualize miners as free workers selling their own labour power to entrepreneurs, and not owning the means of production.¹⁴ In contrast, Ludwig argued that Marx's theory did not apply uniformly across the German-speaking lands and found a semi-entrepreneurial category of workers that decided autonomously on labour organizational strategies. He took his examples from the Alpine mines, where the presence of private entrepreneurs engineered technological competition and market-economy production processes allowed miners to perform tasks through outsourcing and self-employment contracts.¹⁵

Despite the obvious differences in Laube and Ludwig's work, both historians found that labour was distributed through clear-cut labour relations. In the eastern-alpine mines, labour relations were organized around the concept of "work on lease" or *Lebenschaft*. Miners dug out ores from the mines and sold them to mine owners according to piece-rated payments arranged in advance. While payments were calculated in volumes or

12 See U. Schirmer, *Entwicklung, Ausbreitung und Verfestigung des Direktionsprinzips in der kursächsischen Montanwirtschaft (1470–1624)*, in: A. Westermann/E. Westermann (eds.), *Wirtschaftslenkende Montanverwaltung – Fürstlicher Unternehmer – Merkantilismus: Zusammenhänge zwischen der Ausbildung einer fachkompetenten Beamtenschaft und der staatlichen Geld- und Wirtschaftspolitik in der Frühen Neuzeit*, Husum 2009, pp. 145–158.

13 Ludwig, *Sozialstruktur*, p. 122.

14 Laube, *Studien*, pp. 206–208.

15 In eastern-alpine mining enterprises, self-employment as primary mode of labour allocation lasted until the half of the sixteenth century, when time-waged contracts substituted piece rate employments. See Ludwig, *Sozialstruktur*, p. 121.

length, employers decided on how ores had to be excavated – either cleaned up, sorted out, stamped, or sieved.¹⁶ Between the fifteenth and the sixteenth century, the Schwaz mining area in the Tyrol region represented a textbook example of this type of labour allocation. In 1526, the miners (*Häuer*) employed in one of the most productive pits in the Falkenstein field accounted for almost half of the entire workforce.¹⁷ Although time wages increased consistently by the mid-sixteenth century, entrepreneurs chiefly allocated labour through work-on-lease contracts.¹⁸

The mines that did not allocate labour through *Lehenschaft* or work-on-lease run under the so-called *Direktionsprinzip* (principle of direction). In the silver districts of the Ore Mountains labour was allocated by the centralized body of state officials that controlled and organized working operations in the mines.¹⁹ Miners were employed directly by the general mining administration and were paid every week through time wages. Consequently, miners were salaried workers (*Lohnarbeiter*) and received monetary payments according to the weekly working hours they worked.²⁰

Despite focusing on different social and economic contexts, these analyses shared theoretical and empirical backgrounds. Both studies drew on categories of “free” labour relations – specifically wage labour – that identified miners as wage earners.²¹ As a consequence, monetary wages became the intrinsic element identifying wage earners with “free” labour.²² This theoretical framework allowed the broader comprehension of labour regimes across European mines. But it also created rigid and counterpoising models of labour relations.

According to this approach, we should identify a clear-cut distinction between wages and other forms of remuneration. This has long represented the paradigmatic analytical tool used to explore miners’ wages and working experiences in early modern Europe.²³ The analysis of uniform and standardized wages was the basis for the creation of wage indexes to calculate living standards and economic trends across the early modern world.²⁴ How-

16 C. Bartels/R. Slotta/A. Bingener (eds.), *Das Schwazer Bergbuch*, vol. III: *Der Bergbau bei Schwaz in Tirol im mittleren 16. Jahrhundert*, Bochum 2006, pp. 680–91.

17 E. Egg, *Die Bergleute als neuer Berufsstand im Schwazer Silberbergbau 1450–1550*, in: Ludwig/Sika, *Bergbau und Arbeitsrecht*, p. 213.

18 In 1554, time-waged miners accounted for 580, Gedinghäuer 850 and 1780 autonomous workers out of 7500 workers overall. See *Ibid.*, 213.

19 Schirmer, *Entwicklung*, in: Westermann/Westermann, *Wirtschaftslenkende Montanverwaltung*, p. 147.

20 Laube, *Studien*, p. 118.

21 The organization of labour in the Colonial Andean mines represents an insightful example to challenge this dichotomy. From the late sixteenth century onwards, miners were drafted from the mines’ surrounding territories but could work ‘freely’ over specific periods of time. See R. Gil Montero, *Free and Unfree Labour in the Colonial Andes in the Sixteenth and Seventeenth Centuries*, in: *International Review of Social History* 56 (2011), pp. 297–318.

22 Old and recent contributions to mining labour in central European mines share this perspective. See Egg, *Die Bergleute*; E. Henschke, *Die Arbeitsorganisation im Silbererzbergbau – Der Oberharz im 16. Jahrhundert*, in: Ludwig/Sika, *Bergbau und Arbeitsrecht*, pp. 134–156.

23 See for instance R. C. Allen, *The Great Divergence in European Wages and Prices from the Middle Ages to the First World War*, in: *Explorations in Economic History* 38 (2001) IV, pp. 411–447.

24 Cf. G. Clark, *The Long March of History: Farm Wages, Population, and Economic Growth, England 1209–1869*, in: *The Economic History Review* 60 (2007) 1, pp. 97–135. For a similar approach to early modern Germany, see U. Pfister,

ever, the connection between monetary wages and working activities overlooks the many other various forms of labour relations and remuneration that characterized workers' life in the early modern period.

Mining labour is a textbook example to analyse this complexity. Labour performed in the undersoil and above ground designed multiple and stratified labour relations. Despite being identified with specific tasks and wages, male and female miners carried out various tasks and underwent shifting labour relations throughout their work life.²⁵ Whereas contracts arranged forms of remuneration calculated in piecework and time shifts, this did not prevent miners to carry out a different range of labour tasks in the mines that encompassed diverse schemes of labour remuneration. Miners could also find occupations outside the mines (pluriactivity) and receive multiple incomes.²⁶

Wages did not consist of monetary remunerations alone. Miners were also compensated in kind and could receive room, board and travel expenses as part of their wage. Not least, they could also be given access to credit and debt.²⁷ Multi-layered remunerations were, in fact, so important that they became part of recruitment strategies. Whether remunerated in cash or in other forms, wages were also part of employers' search for labour flexibility.²⁸ When bargained, anticipated, or corresponded, wages entailed forms of spatial immobility that aimed to dislocate skilled labourers across different mining enterprises and tie up general workers to supply activities for the mines.

In what follows, I will examine the ways in which remuneration was bargained and constructed in the sixteenth-century Medici mines. The Medici mining enterprise represented an exceptional case in the broader framework of early modern European mining initiatives. Its activities were reported in multiple archival sources outlining migrant and local labourers' work in extraordinary detail. By the mid-sixteenth century, German-speaking mine managers from Saxony and the Tyrol region governed silver and lead mines scattered throughout the Tuscan territory and oversaw technical and organizational aspects of mining. Between the 1540s and the 1560s, recruiting process and the circulation of mining jurisdictions inspired by German mining customs fostered the migration of approximately 160 German-speaking male and female mine labourers to

The Timing and Pattern of Real Wage Divergence in re-industrial Europe: Evidence from Germany, c. 1500–1850, in: *Economic History Review* 70 (2017) 3, pp. 701–729.

25 Cf. note 24. See also R. Barragán Romano, Dynamics of Continuity and Change: Shifts in Labour Relations in the Potosí Mines (1680–1812), in: *International Review of Social History* 61 (2016), pp. 93–114.

26 For example, the calculation of women's wage in preindustrial economies accounts for pluriactivity, incentives, and non-monetary remunerations. As I will discuss women's wages below, see for now D. Velasco Murillo, Laboring Above Ground: Indigenous Women in New Spain's Silver Mining District, Zacatecas, Mexico, 1620–1770, in: *Hispanic American Historical Review* 93/1 (2013), pp. 3–32 and J. Humphries/J. Weisdorf, The Wages of Women in England, 1260–1850, in: *The Journal of Economic History* 75/2 (2015), pp. 405–47.

27 These aspects have received little scholarly attention from the literature on early modern workers' remuneration. For the relationship between labour recruitment, debt relations, and wage variations, see L. Mocarrelli, Wages and the Labour Market in the Building Trade in 18th Century Milan, in: *Jahrbuch für Wirtschaftsgeschichte* 45 (2004) 2, pp. 89–106 and J. Lucassen, Working at the Ichapur Gunpowder Factory in the 1790s (Part I), in: *Indian Historical Review* 39 (2012) 1, pp. 19–56.

28 See C. De Vito, Labour Flexibility, in: Roth (ed.), *On the Road*, pp. 219–240.

Tuscany. This mobility created different forms of labour relations that allows us to better understand how remuneration was structured in early modern mines.

2. Ways to Work

By the end of the first half of the sixteenth century, Grand Duke of Tuscany Cosimo I de Medici (1521–1574) set up mining activities in the Tuscan territory by hiring mining experts from the German-speaking lands.²⁹ Miners and metalworkers from the Ore Mountains, the Harz region, and the mines of the Tyrol region, Carinthia, and Slovakia were considered to be the most skilled practitioners in setting up and governing large-scale mining enterprises.³⁰ In 1546, the Nuremberg citizen and silver assayer Cristof Tegler (*1557) who previously worked in the Joachimstal districts entered Cosimo's service. After two years, he proposed the duke to publish mining laws inspired by "the orders and statutes of Germany" with the aim to attract more labourers from those mines.³¹ These regulations built on a shared and long-standing legal understanding of mining activities in Europe. They were grounded in the principle of separation between the sovereign's ownership of mineral wealth, and the rights given to private enterprises to exploit resources.³²

In early sixteenth-century Saxony, sovereigns extended their rule over the administrative, technical, and organizational aspects of mining by implementing state-driven economic policies that established highly centralized administrative settings.³³ Tegler's proposal aimed to establish this institutional framework in the Medici mines. He communicated his intentions to the duke in 1546. He argued that "Your Excellency will benefit from granting freedom to mine [...] because new mines will create profits in the form of mining material resources and exacting the tithe."³⁴ He added that, eventually, the transfer of German laws to Medici Tuscany would have benefited miners as well, for "the poor labourers could find new veins and gain some profit by selling it to His Excellency's workshop".³⁵

29 The study of the Medici mining initiative has received little attention. See R. Morelli, *The Medici Silver Mines (1542–1592)*, in: *Journal of European Economic History* 5 (1976) 1, pp. 121–139; M. Fabretti/A. Guidarelli, *Ricerche sulle iniziative dei Medici in campo minerario da Cosimo I a Ferdinando I*, in: M. Ascheri/A. Contini (eds.), *La Toscana in età moderna (secoli XVI–XVIII): politica, istituzioni, società*, Firenze 2005, pp. 139–217; R. Farinelli, *Le miniere di Rocca San Silvestro nella prima età moderna. Organizzazione produttiva, cultura materiale, tecniche estrattive e metallurgiche nell'impresa di Cosimo I*, Siena 2018.

30 For the study of states' interests in German miners' skills, see E. H. Ash, *Power, Knowledge, and Expertise in Elizabethan England*, Chicago 2004, pp. 29–35.

31 Tegler's letter is published in R. Morelli, *Argento americano e argento toscano. Due soluzioni alla crisi mineraria del Cinquecento*, in: *Ricerche Storiche* 1 (1984), pp. 197–201.

32 See Ludwig, *Bergordnungen*, pp. 179–96.

33 Schirmer, *Entwicklung*, p. 175.

34 Morelli, *Argento*, p. 201.

35 Ibid.

The actual implementation of Tegler's proposal did not go according to plan. In practice, labour relations shifted, adapted, and disappeared according to employers' economic needs. Official statutes built extensively on the role of private initiatives and self-employment, but the Medici authorities designed ways to impose a single and uniform labour relation to miners. That arrangement involved the creation of weekly waged workers selling labour force to the Medici enterprise.

The restrictions of self-employed work became more common with the progressive appropriations of new mines by the Medici mining authorities. In the Pietrasanta mines, this shift in labour relations hampered German-speaking miners' activities.

Due to their advanced expertise in ore prospecting, German practitioners discovered six new deposits in the area surrounding the Pietrasanta mines between 1547–1551. Following the indications of mining laws drew from customary labour practices in the Saxon mines, Germans requested mining investitures to exploit new mineral seams and hand over ores to his Excellency's smelting workshops. However, Cosimo progressively acquired shares in new mines with the aim to buy out Germans' positions. Payment registers show that on July 28, 1548, the German-speaking foreman Gherard Bamberg, "factor of the Santo Spirito mine", was paid L. 17.10 "for the expense of 25 shares that his Excellency has on that mine with Master Cristof and other Germans".³⁶ In August 1548 the Medici officials paid Bamberg L. 36.18, because "his Excellency raised to seven shares his participation, it was 25 now it is 32".³⁷ In October, Cosimo bought out another 12 shares owned by "Tomaso Farsetter todesco" for L. 1 each share.³⁸ This progressive acquisition paved the way for wage labour to become the only way to work the mines in Pietrasanta under Cosimo's management.

Shifts in mining labour relations also followed the labour organizational strategies that mine managers and administrators adopted when considering labourers' skills, gender, and provenance. By the mid-sixteenth century, the bureaucratic and administrative apparatus that governed the mines on behalf of the duke was staffed entirely with German-speaking experts hired in Saxony and the Tyrol region, namely the abovementioned Cristof Tegler from Joachimstal, in the Ore Mountains, and the Fugger factor Hans Glöggel from Schwaz, in the Tyrol region.³⁹

Cristof Tegler and Hans Glöggel allocated labour tasks in the undersoil and on the ground according to their previous labour and managerial experiences. They drew on two different legal and institutional frameworks that characterized mining activities in their places of departure. Cristof Tegler introduced the labour regime of the Schneeberg district in the Ore Mountains, he allocated labour through a three-shifts division of the working day. The Tyrolean Hans Glöggel argued for a different organization of labour.⁴⁰ Once he

36 ASF, Miniere Medicee (hereafter MM), f. 5, p. 100r.

37 Ibid., p. 101v.

38 Ibid., p. 106v.

39 G. Marcon, Duchi, Mercanti, Passaporti e Minatori. La Logistica delle Migrazioni di Mestiere nell'Europa del Cinquecento, in: S. Martino/C. De Vito (eds.), *La logistica delle Migrazioni*, Bologna 2020, pp. 75–94.

40 For the analysis of the labour organization in early modern Saxon mines, see Henschke, *Die Arbeitsorganisation*, in:

arrived in Pietrasanta in 1557 and substituted the deceased Tegler as the new head of the Medici mines, he proposed the introduction of piece-rate labour relations, as

*all over the world piecework is used to assign labour in length, in Hungary, Bohemia, Germany [...] and this is allocated from the overseers to the miners [...] and these men [the overseers] were miners before and can evaluate miners' work rightfully because they know what a miner deserves.*⁴¹

Glöggel underscored the profits employers could gain by assigning tasks through piecework. He argued that wages in a timely-waged scheme remained the same regardless of workers' productivity. Miners will always try to work less, he argued, because "as soon as the overseers turn their back, miners stop and work as little as they can".⁴²

His proposal remained unanswered and work in the Pietrasanta mines was allocated through a mixed labour regime. Time shifts predominantly organized work in the under-soil and on-the-ground activities such as smelting, stamping, washing, and sorting out. Piece wages were paid for side activities and prospecting operations.

The alternation of different wage labour relations reflected mine managers' considerations of technical and economic aspects. Mines productivity played a significant role in this sense. The most productive mine of the Pietrasanta district (*Bottino*) employed exclusively weekly waged miners. When outlays decreased, workers were paid in piecework. Piece wages allowed employers to cut costs and enhance mines' productivity, as miners were paid for their work output rather than work time.

Mining officials were highly concerned with lowering expenses and enhancing productivity, as their own contracts often included an yearly commission that depended on mine output. For instance, the *Argentera* mine's productivity decreased significantly in the second half of the 1550s. In 1563 the duke notified his officials that "in the case that nobody wishes to take up work in the Argentera so that we can amortise our expenses, it must be shut down".⁴³ Already in June 1551, out of the 26 miners working in the *Argentera* mine, more than half were paid in piecework.⁴⁴ This number increased by the mid-1550s; in 1560 it became the only form of employment in the mine.⁴⁵

Labour relations shifted according to considerations of skills, gender, and provenance. Foreign experts were skilled in the most important tasks necessary to set up successful large-scale mining enterprises, such as prospecting, surveying, overseeing, and metal-working activities. To attract and bound such expertise to the mines, Tegler and Glöggel drafted longer and better remunerated contracts for German-speaking labourers.

Ludwig/Sika (eds.), *Bergbau und Arbeitsrecht*, p. 312. For the eastern-alpine labour regime, see Bartels et al., *Das Schwazer Bergbuch*, p. 741.

41 ASF, Misc., f. 507, p. 142r.

42 Ibid.

43 ASF, Mediceo del Principato (hereafter MP), f. 219, p. 120.

44 ASF, MM, f. 7, c. 40.

45 See ASF, MM5 (1547–1552) and *ibid.*, MM, f. 20 (1559–1560).

In Pietrasanta, contracts were sealed in the form of oaths taken in front of the *Bergmeister*. In general, contracts mentioned work type, wages, and the length of employment. They were sealed with the employee's physical engagement ("*mit seiner Hannt und Mundt angeloppt*") and the promise to behave rightfully and trustworthy ("*treulich fleysig un ungefehrlich vorhalten well*") over the duration of the employment.⁴⁶ This practice did not exclusively refer to *amptleutt* (mine officials) such as the pit overseers, the silver smelters, and the clerks.⁴⁷ *Knappen* (miners) and *jungiten* (apprentices) had to follow "the German way".⁴⁸

Tab. 1: Piece rates (in lire) in Pietrasanta and Campiglia (1550–1559)⁴⁹

Year	Employer	District	Pit	Employees	Measure	Piece-rate payment (lire)
1550	Tegler	Campiglia	Cava dell'Argiento	4	2 canne*	196
1551	Tegler	Pietrasanta	Argentera	10	1 cento**	6.10/7
1552	Tegler	Campiglia	Cava dell'Argiento	13	1 cento	2
1558	Glöggl	Pietrasanta	Argentera	3	½ canna	90
1558	Glöggl	Pietrasanta	Argentera	3	½ canna	80
1558	Glöggl	Pietrasanta	Argentera	3	½ canna	100
1559	Glöggl	Pietrasanta	Argentera	11	1 cento	11

* Length measure: 2, 30 meters, called *Geding* in Tirol.

** In the Medici territories, 1 *cento* corresponded to 35kg.⁵⁰

Contracts were drafted only for German-speaking miners and showed a clear correlation between skills and provenance. Tegler's register reported 26 oaths taken between 1546 and 1555.⁵¹ While 19 addressed surface skilled labourers such as smelters and washers, three were miners, and four were unspecified labourers. Different types of contracts led to forms of mobility and immobility that skilled labourers underwent throughout their stay. German-speaking miners were bound to the district over the duration of the contract that ranged on average from one to five years and could also be prolonged. In these cases, oaths indicated explicit prohibitions to "*hinweg ziehen*" (move away) over

46 "[...] with his hand and mouth" and "to behave rightfully, diligently, and harmlessly". See ASF, Misc., 323/I, p. 8v.

47 According to mining statutes mine officials were offered contracts through the oath formula. See Ibid., p. 3v.

48 Ibid.

49 Source: Farinelli, *Le Miniere*, pp. 25–94.

50 See F. Diaz, *Il Granducato di Toscana: I Medici*, Bologna 1987, pp. 6–7.

51 ASF, Misc. 323/I, pp. 1v–3v; 7r; 8; 11r; 16v and ASF, Misc., 323/IV, pp. 76v; 82r; 92v.

the duration of the contract.⁵² German-speaking miners could only leave the mines by requesting passports.⁵³

Apprenticeship contracts also show mine managers' interests in tying up German expertise to the district. In 1555, a young labourer swore to serve three years as *Bergschmid* (iron smith), with the additional obligation to work another two years in the mines.⁵⁴

By tying up German-speaking experts to the mines, employers controlled their mobility in the territory of the Duchy of Florence. Mine administrators displaced German-speaking experts throughout the copper, lead, and silver mines scattered across the Tuscan territory according to organizational and technical considerations. In the summer of 1558, Hans Glöggel decided to reorganize the lead production of the Medici mines and transferred crews of German-speaking miners and metalworkers from Pietrasanta to Campiglia in the Maremma region, where the Medici's lead mines were located. Labour displacement followed Glöggel's plan to build stamp mills and washing plants nearby the excavation sites and crush, wash, and process the ores on site.⁵⁵ Consequentially, out of the 26 workers that he had hired in Schwaz, he relocated 13 miners and five high-skilled woodcutters, metalworkers, and ore washers to Campiglia.⁵⁶

The gender of mine workers was explicitly linked to miners' ability to undertake physical effort and carry out skilled labour, thus influencing women's labour tasks and wages.⁵⁷

Recent analyses on women work in preindustrial mines adopted a more inclusive and broader understanding of labour and demonstrated women's role in mining activities.⁵⁸

In Pietrasanta, German-speaking women arrived with their husbands and performed labour tasks alongside them. In 1552, the mining judge settled disputes between male and female washers employed in the laundry plants of the Bottino mines. The three women involved were *washerinnen* (female launderers) and wives to three high-skilled miners who arrived from the Ore Mountains with Cristof Tegler in 1546.⁵⁹ Despite being prohibited from labouring underground, German-speaking women also carried out physically demanding activities similar to male workers.

52 Jorg Schlesinger's oath on 27th October 1548. See *ibid.*, p. 8r.

53 See G. Marcon, Duchi, pp. 69–72. This duty applied also to miners, but they were free to decide whether to work or not in the mines.

54 ASF, Misc., 323/IV, p. 92v.

55 Before Glöggel's arrival, ores excavated in Campiglia were sent to Pietrasanta for processing. See ASF, Misc., 507/I, pp. 306–310v.

56 Farinelli, *Le Miniere*, pp. 34–45.

57 For a relatively long-term analysis of the sex division of labour in the mines, see L. Mercier/J. J. Gier (eds.), *Mining Women. Gender in the Development of a Global Industry, 1670 to 2005*, Washington 2006, and the contributions therein.

58 For a comprehensive analysis of women work, see R. Sarti/A. Bellavitis/M. Martini (eds.), *What is work? Gender at the crossroads of home, family, and business from the early modern era to the present*, New York 2018. For investigations of women work in early modern mines, see S. Karant-Nun, *The Women of the Saxon Silver Mines*, in: S. Marschall (ed.), *Women in Reformation and Counter-Reformation Europe: Public and Private Worlds*, Bloomington 1991, pp. 29–46; A. M. Bigelow, *Women, Men, and the Legal Languages of Mining in the Colonial Andes*, in: *Ethnohistory* 63 (2016) 2, pp. 351–380; R. Barragán Romano, *Women in the Silver Mines of Potosí: Rethinking the History of "Informality" and "Precarity" (Sixteenth to Eighteenth Centuries)*, in: *International Review of Social History* (2019), pp. 289–314.

59 ASF, Misc., 323/IV, pp. 13–15.

In 1560, Barbara, wife to the iron smelter Thomas Feisetter from Tyrol, operated the air bellows of the iron workshop in the midst of burning temperatures and poisoning fumes.⁶⁰ She worked under the same unhealthy conditions that the Pietrasanta Captain and mine practitioner Giovanni Battista Carnesecchi refused to deal with when he first assayed the Bottino ores in 1545, claiming: “I can’t resist this much heat because it seems to me that I should look for health and not for death.”⁶¹

Carnesecchi’s inability to perform metalworking tasks advocated for mine managers’ configuration of a division of labour based on miners’ provenance. German-speaking miners were more experienced than local practitioners, and few practitioners in mid sixteenth-century Tuscany could carry out skilled mining and metalworking activities.⁶² Already in 1546, Tegler labelled Italian miners as “pigs roaming around without order and knowledge [...] damaging the mines more than yielding profits”.⁶³ Tegler decided to allocate general, unskilled, and supply activities to local male and female workers. By carrying out tasks such as woodcutting, charcoal making, hauling, and carpentering, local workers were not offered contracts. They were employed as day- and piece-rated workers who were hired according to mines’ necessity. In 1546, Cristof Tegler argued that side activities were extremely important for the success of the enterprise and claimed that only locals – instead of foreign experts – could perform these activities.⁶⁴ Even more so than German speaking miners, local workers were tied up to the mines and were prohibited geographical mobility.

3. Wages Unpacked

The calculation of wage rates during the early modern period is a complex process. Datasets on wages allowed historians to compare workers’ living standards and purchase power across the globe. However, the association of monetary payments with workers’ wages produced a simplified understanding of remuneration in preindustrial societies.⁶⁵ By outlining the complex framework of remuneration in early modern building sites, Luca Mocarelli recently argued that “speaking of average wages in the San Pietro building factory” makes no sense “unless we want to address this industry as absolutely immobile for the whole sixteenth century”.⁶⁶ This statement also applies to describe wages in the mining sector.

60 ASF, MM, f. 20 (1559–1560).

61 Quoted in Fabretti/Guidarelli, *Ricerche*, p. 187.

62 An example of successful mining initiatives in Tuscany was the flourishing iron industry on the Elba Island. See I. Tognarini, *La questione del ferro nella Toscana del XVI secolo*, in: L. Rombai (ed.), *I Medici e lo stato senese 1555–1609: storia e territorio*, Roma 1980, pp. 239–261.

63 Quoted in Morelli, *Argento*, p. 201.

64 ASF, MP, 656, p. 43r.

65 See, in particular, the alternative methods to the calculation of real wages in econometric modelling outlined in the introduction to Hatcher/Z. Stephenson (eds.), *Seven Centuries of Unreal Wages*, pp. 1–14.

66 Quoted in A. Caracausi, *I salari*, in: R. Ago (ed.), *Storia del lavoro in Italia: L’età moderna. Trasformazioni e risorse del lavoro tra associazioni di mestiere e pratiche individuali*, vol. III, Roma 2018, p. 117 (translated by the author).

Early modern mines were labour-intensive and became im/migration industries where the remuneration of male and female miners revolved around multiple activities, employers' considerations, and in-kind or monetary payment. In what follows, I will unpack miners' wages in the Medici mines and gesture towards the elements that contributed to create early modern miners' remuneration, such as labour incentives, pluriactivity incomes, credit and debt relations, room, and board payments.

Wages varied significantly in the early modern mines because male and female miners carried out a wide array of activities in the district. Employers' request for flexibility designed a variety of tasks that miners performed within a single occupation. This complicates the exact calculation of incomes, as multiple activities were remunerated differently and were not always explicitly addressed in the contracts. For instance, metalworkers had to wait several weeks before smelting furnaces reached the right temperature to process ores. Meanwhile, Alexander Schweinstiger, silver smelter of the Medici mines between 1548 and 1550, had to work as *Knappen* (miner). Whereas his contract specified that his salary of 10 *lire* weekly should not have changed, official payment records show that miners carrying out multitasking activities could increase their wage.⁶⁷

Valentin Kneussel's contract states that he built stamp mills for a weekly wage of 7 *lire*.⁶⁸ However, in February 1547, he crafted bellows for the iron and silver workshops in the Argentera, earning 15 *lire* weekly.⁶⁹ Between 1547–1549, he was employed as smelter for 10 *lire* weekly; between 1548 and 1551 he smuggled silver ores to nearby towns earning approximately 100 *lire* overall.⁷⁰

Skilled workers were not the only ones who could generate incomes derived from different tasks. Serena da Retignano was an aid worker in the Pietrasanta district between 1549 and 1560. Over this period, she sold raw materials such as wooden and chestnuts trees (used to fire up the furnaces). She also prospected for gold veins in the Vezza river. In 1559 she was employed in the smelting workshop as an aid worker for 12 *soldi* daily, as a charcoal maker for a three-day wage of 1 *lire* and 16 *soldi*, and as carpenter in the pits (*manovale*).⁷¹

In the Pietrasanta mines, skills and ethnicity were closely associated. Both influenced remuneration consistently. German-speaking mine managers employed both locals and foreign experts, but paid more the latter than the former. Figure 1 shows that labour tasks that required technical knowledge to process ores were allocated exclusively to German-speaking miners. This emerged particularly in 1546–58/59, when German foremen governed the mines.⁷² When Italian overseers allocated labour, local miners also begun

67 ASF, Misc., 323/l, p. 7v.

68 Ibid., p. 3r.

69 ASF, MM 5, p. 87.

70 Ibid., p. 99.

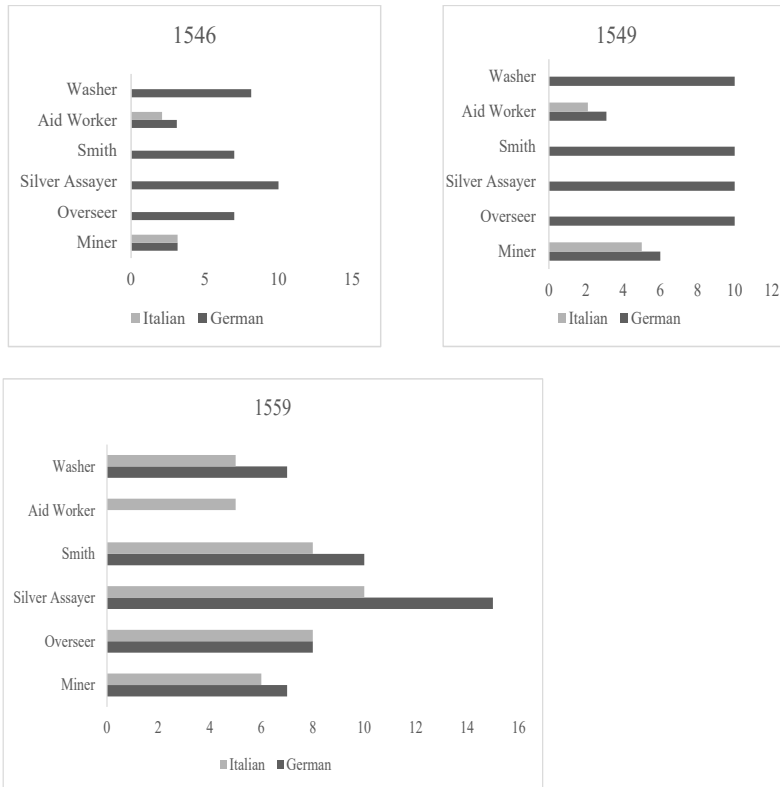
71 In the case of piece-rated remuneration, nominal wages are difficult to calculate because the payment was corresponded to a crew of 4/5 workers. However, if we assume that crew members performed the same activities under the same conditions and were corresponded the same payments, Serena's daily wage was 13 *soldi*. See *ibid.*, p. 57r and p. 147r. See also ASF, MM, f. 20, pp. 142–145.

72 It is not clear yet when Hans Glögg left the Medici mines. See R. Farinelli, *Le Miniere*, pp. 64–66.

to work in those high-skilled positions. However, an analysis of weekly wages shows that foreign labour continued to be paid more.

Under Tegler's supervision, wages ranged from five lire for local miners to six lire to Germans. They increased in 1557 when Hans Glöggl feared that low wages might have pushed foreign miners to leave the mines and return home.⁷³ To solve this problem, he proposed two changes. First, weekly wages had to increase for both local and foreign miners, amounting to six lire for an Italian and seven for a German-speaking miner.⁷⁴ Secondly, and most importantly, Glöggl asked for a complete transition from time to piece rate wages in the remuneration system.⁷⁵ According to Glöggl, piecework encouraged miners to work more and, accordingly, to increase their wages.

Fig. 1: Weekly wages in Pietrasanta (1546–1559)⁷⁶



73 ASF, Misc., 507/I, c. 145v.

74 Ibid.

75 Ibid.

76 I combine data retrieved from payment registers and employment contracts that exclusively take into account forms of monetary remuneration and therefore did not exhaustively represent miners' wages in the Medici mines. See ASF, Misc. 323/I; MM, f. 5; MM f. 20.

Miners could also carry out other activities outside their primary occupation to increase their incomes.⁷⁷ In addition to episodes of ore smuggling, soldiering represented a long-established feature of mining labour and a flexible occupational strategy that characterised miners' mobility patterns.⁷⁸ Military activities and mining labour shared long-established features. The ability to excavate galleries and tunnels and the use of gunpowder to make their ways through mountains, rocks, and walls were skills deployed in mines and war fields.⁷⁹ In the early modern period forced enlisting was thoroughly attested across Europe, but archival sources also show that miners autonomously followed the change of seasons to carry out mining and soldiering activities.⁸⁰

In the Medici mines, the heat of the Tuscan summer and the scarcity of drinkable water influenced miners' decisions to fight in Landsknecht regiments in Cosimo's war against Siena.⁸¹ German-speaking miners had already served in these regiments before coming to Pietrasanta, as shown by the presence of halberds and different swords stored in miners' houses right after their arrival.⁸² As mercenaries fighting in Italy, they generated revenues from plunders and monetary payments, the latter amounting to 4 *gulden reinisch* per month and exceeding a miner's wage.⁸³

The movement of foreign experts to the Medici mines shows that monetary wages were the outcomes of negotiations between patrons, subcontractors, and employees. Down payments and higher salaries became a prominent request in negotiations over German-speaking miners' relocation. Wages represented a legal guarantee that bound both employers and employees when hiring workers from abroad or moving to unknown regions. In 1558, Hans Glöggel based his request for an income of 600 florins yearly (one hundred more than his salary as Fugger factor) on the fact that he moved involuntarily to Pietrasanta, as his mobility was the results of the commercial agreements taken by the Duke Cosimo de Medici and the Fugger family.⁸⁴ He therefore argued that

*[...] for the same salary and employer that I can have in Germany (where everything can be found for a reasonable price) I would unwillingly leave to an unknown and expensive country, with my wife and many children, where I am not able to speak the language.*⁸⁵

77 For pluriactivity in rural areas, see A. Panjek/J. Larsson/L. Mocarelli (eds.), *Integrated Peasant Economy in a Comparative Perspective. Alps, Scandinavia, and Beyond*, Koper 2017.

78 G. Stöger, *Die Migration europäischer Bergleute während der Frühen Neuzeit*, in: *Der Anschnitt* 58 (2006) 4–5, pp. 170–186.

79 For the relationship between warfare and mining, see R. Vergani, *Miniere e società nella montagna del passato: alpi venete, secoli XIII–XIX*, Verona 2003, pp. 76–91.

80 *Ibid.*, pp. 83–86.

81 German-speaking miners working in Pietrasanta joined the Landsknecht regiments of Nicolò Madruzzo (1508–1572), older brother of the prince-bishop of Trent Cristoforo Madruzzo (1512–1578). See ASF, Misc. 323/IV, pp. 84–86.

82 ASF, Misc. 323/I, p. 16v, 17r.

83 For German mercenaries' remuneration, see D. Parrott, *The business of war: military enterprise and military revolution in early modern Europe*, Cambridge 2012, p. 60.

84 See Marcon, Duchi, pp. 77–82.

85 ASF, MP 469, p. 229v.

Moreover, German-speaking miners received down payments on their wages before moving to Italy. According to a widespread legal tradition, workers were paid from the moment they were offered employment, not when they actually began to work.⁸⁶ Anticipating salaries represented a form of workers' guarantee against frauds and their employers' bankruptcy.⁸⁷ The eleven German-speaking miners that arrived in December 1546 from Saxony had been receiving their salaries since October. Down payments were balanced out with travel expenses anticipated by the Medici agents and Florentine merchants operating in Germany.⁸⁸ Once in Pietrasanta, foreign miners settled the resulting debt by cutting up to 30 per cent of their wages.⁸⁹

Tab. 2: Debts incurred (in *lire/soldi/denari*) and paid off (in years/ months) by the first group of German-speaking miners (December 1546)

Miner	Task	Debt	Weekly Wage	Debt Settled (years/months)
Mathei Fister	Washer	125.11.8	8.15	0/10
Valentin Kneussel	Smelter	85.12	7	4
Thomas Brant	Overseer	16.16	7	0/1
Caspar Schaden	Miner	25.15	5	0/3
Balthasar Vetter	Miner	24.12	3.10	0/3
Peter Rotheburg	Aid worker	14.16	3.10	0/3
Lorenz Rauner	Washer	–	6	–
Hans Schmit	Smith	36.10	7	0/3
Andreas Khuen	Overseer	20.10	7	0/3
Johannes Hubner	Washer	10	7	0/2
Gherard Brambach	Factor	12.18	5	0/1

Incurring debts represented another means for policy makers to tie up miners' skills to the district, as they were not allowed to leave the mines even if they changed employers. Moreover, debt established forms of labour exclusiveness that obliged workers to carry out tasks not included in their contractual agreements. In 1547, Cosimo asked Cristof Tegler to fire assay copper ores extracted nearby Genoa.⁹⁰ The request came from the

86 A comprehensive analysis of Zacchia's account is in A. Caracausi, *The Just Wage in Early Modern Italy: A Reflection on Zacchia's De Salario Seu Operariorum Mercede*, in: *International Review of Social History* 56 (2011), pp. 107–124.

87 They also protected entrepreneurs for the quality of work labourers had to perform. See R. Ago, *Economia Barocca. Mercato e Istituzioni nella Roma del Seicento*, Roma 1998 and Caracausi, *I Giusti Salari*, p. 867.

88 ASF, MM 5, p. 6.

89 Ibid.

90 ASF, MP 186, p. 21.

Genoese Doge Andrea Doria (1466–1560) and forwarded to Cosimo's employee and personal mining expert.

Gender chiefly influenced male and female miners' remuneration in early modern mines. Recent studies demonstrated that although women wages rarely appeared in official payment records registering 'productive' activities, their contribution was fundamental for extractive economies.⁹¹ Despite women performed physical exerting work, their exclusion from highly remunerated activities accounted for the gender pay gap in the mines.⁹² In 1560, Barbara Freisefer worked alongside her husband and was tasked to "operate the furnace bellows in the ironsmith's workshop".⁹³ While she earned 1 *lira* and 10 *soldi* weekly, her husband's wage was 10 *lire*.

Local women were also employed in the mines but found occupations only in unskilled activities. In general, unguilded women carried out co-operative labour within crews of female workers and for longer periods of time. This combination significantly lowered women's wages, which could also reach one/two *soldi* daily.⁹⁴ When performing same activities with similar labour outputs, such as transporting raw materials alone for one day, female daily wages were 2/3 of men's salaries (12 vs 18 *soldi*).⁹⁵

Monetary wages did not represent female and male miners' only source of income. Miners' remuneration was partially integrated with labour incentives in kind, such as raw materials. Production shares varied according to the position occupied in the district and were particularly granted to skilled labourers.⁹⁶ In the Medici mines, a German-speaking head of the mines received shares on yearly outputs, reimbursement for travel expenses, nourishment for the household members, and raw materials for fire assay experiments. The employment contract drawn up in March 1545 between the Duke and Cristof Tegler established that the new head of mines received 300 *scudi* during the first year and 200 for the remaining four years.⁹⁷ In addition, Tegler earned the fourth part of the mines' yearly profits, which the duke paid every four months. Food for him and his wife was provided for in monthly instalments.⁹⁸ This consisted of fodder, wine and meat – such as the payment of 3 *lire* for "chicken, birds, and other stuff for his board and besides

91 Among the few examples of women work in early modern mines, see the role of indigenous women in distributing wealth among the members of the mining community and thereby providing financial security to native societies in mining sites under Spanish colonial rule. See Murillo, *Laboring Above Ground*, pp. 3–32.

92 See S. Ogilvie, *Women and Labour Markets in Early Modern Germany*, in: *Jahrbuch Für Wirtschaftsgeschichte / Economic History Yearbook* 45 (2004) 2, pp. 25–60.

93 ASF, MM 20, c. 3–56v.

94 *Ibid.*, p. 138.

95 This estimation is only a first step towards the calculation of the gender pay gap in the Medici mines. Ongoing research will uncover other labour activities performed by men and women in the district, and determine the relationship between in-kind compensations, monetary payments, and acquisition costs. For now, see ASF, MM 20 (1559–1560).

96 Caracausi, *I Salari*, pp. 110–111.

97 ASF, *Notarile Antecosimano* (hereafter Not.), f. 5571, *Atti di Giovanni Gismondo Conti*, p. 169r.

98 *Ibid.*, c. 173.

his ordinary wage". The purchase of "lead, iron slags, wood, and charcoal" that he used for his metal probes also added to his wage.⁹⁹

Travel expenses represented an important incentive as well. In 1557, Glöggl asked the reimbursement of the travel costs for the round trip from Schwaz to Pietrasanta for him, his wife, and their nine children.¹⁰⁰ He also argued that this reimbursement had to be granted "anytime I have to ride to some place", particularly when he had to reach mines scattered across the Medici territory, "as it is used in Germany whenever a head of the mines is sent from one mine to another".¹⁰¹

Although they are difficult assets to calculate, material incentives increased miners' remuneration and represented a significant variable in the structure of wages. Employers and subcontractors provided housing solutions to miners as incentives to settle in the district for longer periods. This emerged in the case of both experts and general mine workers. In 1558, the Tyrolean silver smelter Michael Hummelberg moved out the "cheap room" he was living in and received Tegler's old house located "on top of the mill in the Pietrasanta workshop".¹⁰² Miners working in Campiglia were housed in a "*casa grande*", a "big house", called lately "*Palazzo dei Lanzi*" (the Germans' house).¹⁰³ According to the description made by the Medici officials, the house could host at least 100 men and was provided with a rainwater tank. It was also very spacious and adequately equipped, as the Tyrolean *Bergmeister* Hans Glöggl asked the duke to make four to six private rooms out of a large shared one. The extra space was deemed necessary; many miners arrived with a wife and children. To his eyes it was "not appropriate that women lived among so many people in one single room".¹⁰⁴

4. Conclusions

In this article, I outlined the multi-layered structure of remuneration in the Medici silver mines. I investigated how state authorities and employers decided how labour relations would unfold by following economic and labour organizational needs. In particular, I studied the extent to which mining policies overcame legal norms, and affected miners' wages. In the second part, I integrated mine managers' considerations of skills, ethnicity, and gender into the broader framework of mining labour analysis. I show that miners' wages were not identical, and did not consist exclusively of monetary remunerations. Miners' incomes came from diverse sources, generated by multitasking and pluriactivity. Incomes were integrated within a wide array of material incentives, such as down payments, travel expenses, or room and board.

99 ASF, MM 5, pp. 64, 73, 112.

100 ASF, MP 469, p. 229v.

101 Ibid.

102 ASF, Misc. 507/I, p. 144v.

103 See Farinelli, *Le miniere*, pp. 101–103.

104 ASF, Misc. 507/I, p. 138r.

The investigation of wage distribution patterns provides insights into how economic policies, subcontractors, and workers contributed to create early modern labour remuneration policies. In the sixteenth century, while mining ordinances established normative protocols for labour relations, economic policies and employment practices shaped workers' experiences on the ground. Miners entered different labour relations that corresponded to policy makers' trade strategies and subcontractors' considerations of skills, gender, and ethnicity. Skills were the pivotal elements around which workers' remuneration and employment duration were structured in the early modern mines. Territorial rulers and mine managers remunerated work *"according to workers' personal qualities"*, and designed contracts with the aim to im/mobilize expertise.¹⁰⁵ As foreign expertise monitored the labour quality and held shares in mining outlays, credit relations and incentives fostered the mobility of German-speaking miners, while contracts bound them to the Medici mines.

Wages provide a point of entry into taxonomies of 'free' and 'unfree' labour relations in the early modern period. The study of wages increasingly casts doubts on the clear-cut definition of 'unfree' labour relations with forms of employment in colonial extraction sites as empirically and theoretically separated from Western labour contexts. In the Medici mines, wage-based employment limited miners from engaging in entrepreneurial activities. Nevertheless, miners developed integrated income strategies as they voluntarily carried out different tasks and pluriactivity inside and outside the mines. Still, patrons and mine managers could enforce enlisting and invoke exclusivity rights on miners' labour. These nuances call for renewed and detailed analyses of preindustrial wages that take into account the complex and variegated forms of remuneration and their meanings.

105 "[...] to bring with him those ministers, whom he will think necessary; and those who are particularly adapted, adequate, and qualified to carry out such practice, they will be given a salary according to the mineral habits and his designation to be established for each of them according to their personal qualities." See ASF, Not. 5571, pp. 168v–171r.