

Characterization of Subcontracted Human Capital in the Mining Industry in Chile: Subcontracted Workers in the Chilean Mining Sector, Educational Level, Occupations, and Challenges

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Abstract: The objective of the research is to carry out a demographic characterization of subcontracted workers in the Chilean mining industry using primary sources (through a survey that includes 8 dimensions), identifying the educational level and the relationship it has with other aspects such as gender, age range, among others. The results of the project are related to the research objectives. Regarding occupations and educational level, it was identified that workers with only a basic level of education may be limited to more routine and mechanized functions in each of the identified occupations. In the case of the medium educational level, it was found that the percentage of workers associated with this educational level is high and could be directly related to the age range and the difficulty in accessing university education. Regarding workers with Technical Professional Education, their occupations are related to functions that require higher technical skills and, in some cases, enabling licenses. Regarding the Technical Training Center education level, it was found that this level of education has a close relationship with the most demanded technical careers in the job market. In this field, processes of articulation based on curricular convergence have been developed, and the implementation of procedures for recognizing work experience.

Key words: subcontracted workers, Chilean mining industry, educational level, recognizing work experience

1. Introduction

In Chile, during the civic-military coup between 1973 and 1990, the country underwent a transformation of the social and economic system. The military regime aimed to restrict the exercise of trade union freedom through the so-called “Labor Plan” (as well as in other social and political areas), establishing a new set of rules regarding trade unions and collective labor relations (DL 2345, 2346, 2347, 2756, 2758 of 1978). The model was based on economic institutionalization, strengthened by the 1980 Political Constitution, which limited the right to unionize, the right to bargain collectively, and consequently, restricted the right to strike. Regarding subcontracting, Law No. 16,757, which prohibited the execution of works inherent to the main and permanent production of an industry or the routine repair or maintenance of its equipment by contractors or concessionaires, was repealed. This opened the door, in a broad manner, to subcontracting and outsourcing.

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On the other hand, this new labor plan implemented from 1979 sought to generate a flexible labor market through the deregulation of subcontracting (Muñoz, 2012, pp. 26–38). The labor flexibility not only constitutes a condition but also the hallmark of the neoliberal model, because without it, without the disintegration it causes in the organization, and therefore, the power of workers, the principle of microeconomic market adjustments, which complement macroeconomic adjustments.

The regulation of subcontracted labor reveals modalities of progressive precarization in the hiring conditions of mining contractor workers, highlighting significant job instability considering contracts for specific projects and fixed-term contracts, especially due to the disparity in standards between permanent employees and contractors (longer working hours, lower wages, and increasing instability). A trend is observed to reduce labor costs related to the dismissal of workers, transferring them to contracting companies.

Indeed, contracted workers do not have alternatives for unionization and collective bargaining to join or negotiate collectively with workers from the main companies (in the case of subcontracted workers) or user companies (for temporary workers). These subcontracted workers cannot form a company union within the hiring or main company; they can only unionize through an organization of the contracting company, causing a differentiation between first and second-class workers concerning companies that contract services, even though many of them perform tasks in the same physical spaces for extended periods.

The literature refers to subcontracting in Chile with the following definitions: “It is a very ancient form of production of goods and services; however, social forms change meanings as the context and its articulations change. The object, in this case, subcontracting, was not only defined by certain formal characteristics such as the generation of goods and services in an economic unit commissioned by another, or the provision of workers from one unit to another, but also by its articulations with the environment forming a Concrete Totality” (De La Garza, 2012), “It is a business strategy of production decentralization, risk reduction, and cost outsourcing, which relates a contracting company, a contracting company, and subcontracted workers, transferring certain stages of the production process from the contracting company to the contracting company with the aim that this latter company, through subcontracted workers, carries out these tasks at its own risk” (Muñoz, 2017), “It responds, at least, to the following factors of different orders: 1) to the profound change in the technical-productive model from standardized production to flexible production; 2) to the change in the economic organization of companies; 3) to the deregulation of labor relations; and 4) to the search for the disarticulation of unions.”

The research questions are: What is the educational level of subcontracted workers in the Chilean mining industry? What is the status of training and education in contractor companies within the mining sector?

After describing the history of subcontracting in Chile and the problems affecting workers due to the invisibility they have had for decades and continue to have for client companies, the State has created palliative support measures. One of the remedies has been education. The State of Chile, for over 100 years, initiated processes and attempts through organizations focusing on the education of workers. Table 1 identifies various specific milestones that have surrounded training over time, as well as a review and identification of different legal and regulatory milestones that have given substance to the progress of training in Chile.

According to various authors and documents from SENCE, it can be determined that public training programs for workers began around the 1950s with the Technical University of the State (now the University of Santiago), followed by the Technical Cooperation Service (SERCOTEC) in the early 1960s. Then, in 1966, the creation of the National Institute of Professional Training (INACAP) took place (Posada, 2013:32). In those years, the newly created institutions offered workers training courses in trades, apprenticeship programs, courses for

middle managers, and higher-level technical courses. In 1976, agreements were made with universities, serving around 45,000 young and adult low-income workers, which was practically 2.6% of the workforce at the time. During this period, the State played a central role in providing training services.

Table 1 Timeline, History of Training and Certification of Workplace Competencies in Chile

Year	Occurrence
1922	Postal Service creates the Telegraphic Postal School: Its main function is to train applicants for tasks within the facility, with one year of training in telegraphy and postal management.
1950	Technical University of the State: Initial occupational training courses for public sector employees, a government program focused on professional development and training.
1955	Technical Cooperation Service (SERCOTEC): Its main mission is to implement agreements with the U.S. government, promoting productivity across all production sectors by training workers.
1960	Department of Professional Training (SERCOTEC): SERCOTEC creates this department due to the low educational attainment of workers (60% of workers with less than 5 years of education).
1966	National Institute of Professional Training (INACAP): Its main function is to address the shortage of skilled labor by training human capital in careers related to Mechanical and Industrial Electricity.
1976	National Training and Employment Service (SENCE): Its purpose is to promote an optimal level of employment, achieving the growth of both workers and the productivity of companies
2003	Chile-Califica (Continuous Education and Training Program): Development of the articulation of adult education, improvement of training offerings, and quality assurance of Technical Training Organizations (OTEC), as well as a system for certifying labor competencies.
2008	Labor Competency Certification System (Law No. 20,267): The objective is to carry out the recognition of workers' labor competencies.

Currently, Chile is immersed in a labor scenario marked by a strong increase in technology and digitization across various trades, coupled with the growing automation of low-skill functions. This has generated the need for workers to be prepared to meet diverse standards and, consequently, to expand their job expectations to meet the challenge. In this regard, Chile has progressed towards the development of human capital through competency-based management. Since its inception, the Commission of the National System for Certification of Labor Competencies, “ChileValora”, has worked with the conviction that workers’ competencies are a fundamental component for improving productivity, competitiveness, and equity indicators in the country by strengthening people’s knowledge and skills.

In this context, the certification of labor competencies within the National System is a key tool to enhance the development of workers in our country through the recognition of their work experience, knowledge, skills, and abilities, regardless of how they have acquired them. Many trades are learned through practice rather than necessarily in a classroom setting.

ChileValora aims to formally recognize people's labor competencies regardless of their method of acquisition, irrespective of whether they hold a title or academic degree. The goal is also to promote continuous learning opportunities for individuals, their recognition, and valorization. The law of the Republic (Law 20.267, Article 1) mandates this objective. The system's mission is to enhance people's competencies through evaluation and certification processes based on competency profiles that align with competency-based vocational training offerings. In this way, the system benefits both employers and workers through social dialogue. For employers, a competency certification system implies having more qualified workers, increasing productivity and

competitiveness, improving human resource management, optimizing training investments, and considering corporate social responsibility.

2. Research Methodology

The methodology was based on the review of available national data and information that could contribute to the characterization of subcontracted human capital in the Chilean mining industry, involving the selection of data collection instruments to enable integration. Institutional sources include, but are not limited to, SUSESO, INE, Directorate of Labor, ISP, ISL, Ministry of Economy, Ministry of Labor, Ministry of Education, GOREs, ChileValora, private institutions of public interest, and mutualities and insurers.

A survey was designed including eight dimensions of the quality of work life and a Computer Assisted Personal Interviewing (CAPI) system, which allows for more efficient survey administration, reducing typical errors associated with primary data collection.

The instrument adheres to accepted standards in the field. It was necessary to limit the number of questions due to time constraints and the need to balance privacy protection with the effort to collect reliable data. Where possible, wording from previously tested surveys or studies was used.

The instrument was conducted between March 2020 and November 2021. The field survey execution time was affected by the sanitary restrictions due to the COVID-19 pandemic, which affected mobility, capacity, among other factors.

To collect as much information as possible that the stated objectives, a survey with a defined sample of 382 workers will be used, representing the total needed (calculated using the sample size formula for a finite population, with a confidence level of 95%). This survey encompasses eight dimensions (including informed consent), which are identified in Table 2. The table provides an overview of the various dimensions identified and addressed for the purposes of this research.

Table 2 Timeline, History of Training and Certification

I	Informed Consent
II	Non-Monetary Contractual Terms
III	Intrinsic Characteristics of the Job
IV	Occupational Health and Safety
V	Balance between personal and work life
VI	Representation and voice in the workplace
VII	Compensation and bonuses
VIII	Demographics and categories

Informed Consent: Informing the respondents about the purpose of the information collected through the survey and ensuring its confidentiality.

Non-Monetary Contractual Terms: These are aspects related to the role performed by the worker in a mining operation, considering the nature of their employment, the type of contract they have, and their experience or the time they have been working in mining.

Intrinsic Characteristics of the Job: These are the objective aspects (such as skills, autonomy, control, variety, work effort) and subjective aspects (such as meaning, fulfillment, social support, and power) in the world of subcontracted work.

Occupational Health and Safety: Refers to the physical, safety, and psychosocial risks to which workers are exposed in different mining operations. Representation and voice in the workplace.

Balance between personal and work life: Includes provisions regarding working time, such as duration, schedule, and flexibility, as well as the intensity of work and its perception regarding these particularities. It also involves UNDERSTANDING aspects of work commuting and the different municipalities workers come from.

Representation and voice in the workplace: Involves inquiries and representation or participation in decision-making within the development of the workplace and the collection of information on organizational and union-related aspects.

Compensation and bonuses: Includes the income received plus bonuses awarded by the workers, either by the hiring company or by the contracting company.

Demographics and categories: Its purpose is to detect the geographical distribution, migratory phenomena, family, educational, and cultural characteristics of the workers.

2.1 Representative Sampling

The quota sampling technique is the method used for selecting the number of respondents for this research, which is a non-probabilistic sampling that divides the entire population composed of ' N ' individuals into ' x ' different subgroups or strata exhaustively (all individuals are in a group), mutually exclusive (an individual can only be in one group), and of respective sizes $N_1, N_2, N_3, N_4, \dots, N_k$; to finally determine how many sample elements are to be selected from each of the strata, it was assigned proportionally. This implies that the sample size of each stratum is proportional to the size of the stratum from which it originated, with respect to the total population.

In this research, workers whose unions are associated with the Copper Workers Confederation (CTC) were used, therefore, weights were added to the various mining operations where these unions are present. In Table 3, the breakdown of the total survey universe used in this research is observed, with its corresponding probabilistic weight according to territories where the Copper Workers Confederation is present.

Table 3 Spatial and Probabilistic Distribution of the Survey

Territory	Percentage of participation by territory	Subsample
Iquique	13.8%	53
Antofagasta	7.59%	29
Calama	26.7%	102
Chañaral	13.3%	51
Diego de Almagro	5.5%	21
Catemu	4.2%	16
Los Andes	14.9%	57
Rancagua	13.8%	53
TOTAL	100%	382

3. Characterization of Subcontracted Workers in Mining

The Figure 1 shows the results of obtained in the survey conducted on-site at the various mining sites mentioned earlier. The presentation of the results focuses on the context of the education levels of the respondents.

However, before delving into that, the aim is to characterize subcontracted workers in the Chilean mining industry through a series of questions. Therefore, the next question is direct and pertains to how subcontracted workers position themselves and how they can identify their status or the nature of their employment agreement. Thus, in response to the question, “Is the company where you work today...?”, 83% of the workers identify the company they work for as a contractor. According to data from the National Geology and Mining Service (SERNAGEOMIN) in 2020, there were 3,326 companies in the Chilean mining industry under this category.

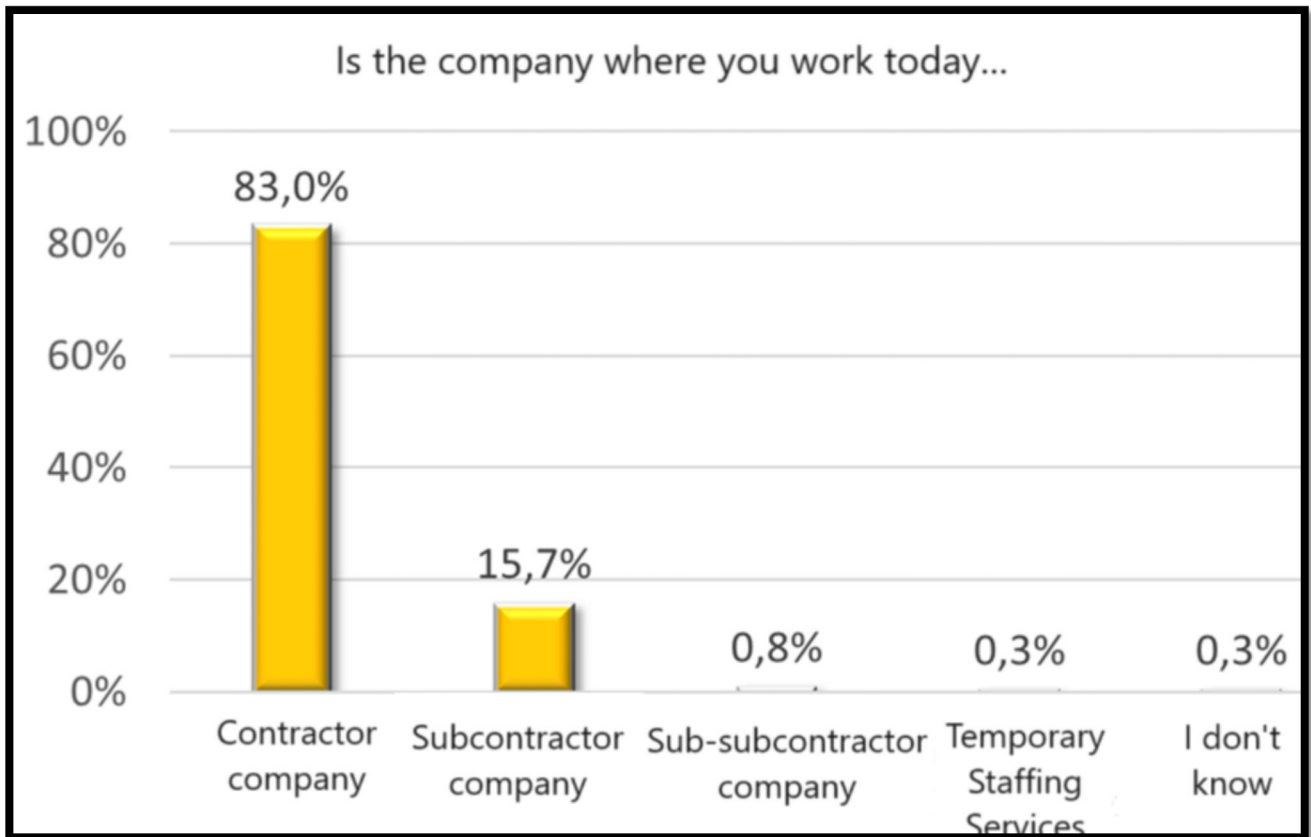


Figure 1 Graph of Identification of the Company Where You Work

From the analysis, it can be identified that, within subcontracted workers, the majority work for contracting companies. This means that these companies carry out tasks that are outsourced by the client company (tasks mostly outside the value chain of the mining process). Additionally, the existence of subcontracting companies is highlighted, which have a direct contract with the contracting company.

The subcontracted workers have different types of labor agreements, with the most common being the indefinite contract. This question aims to identify the employment relationship between the worker and their employer, see Figure 2.

To continue with the characterization of subcontracted workers, the question “Does the company you work for engage in...?” was asked. This question aims to determine the job activities carried out by the workers in order to guide the proposals for educational levelling that this research seeks to establish. In this question, workers had the option to select one or more alternatives. It is found that the highest percentage of workers, at 20.3%, indicate that the company is engaged in Mechanical Maintenance. With a percentage of 19.8%, respondents mention the

option of “other”, and among these activities, we find paramedics, warehouse workers, security guards, programmers, etc.

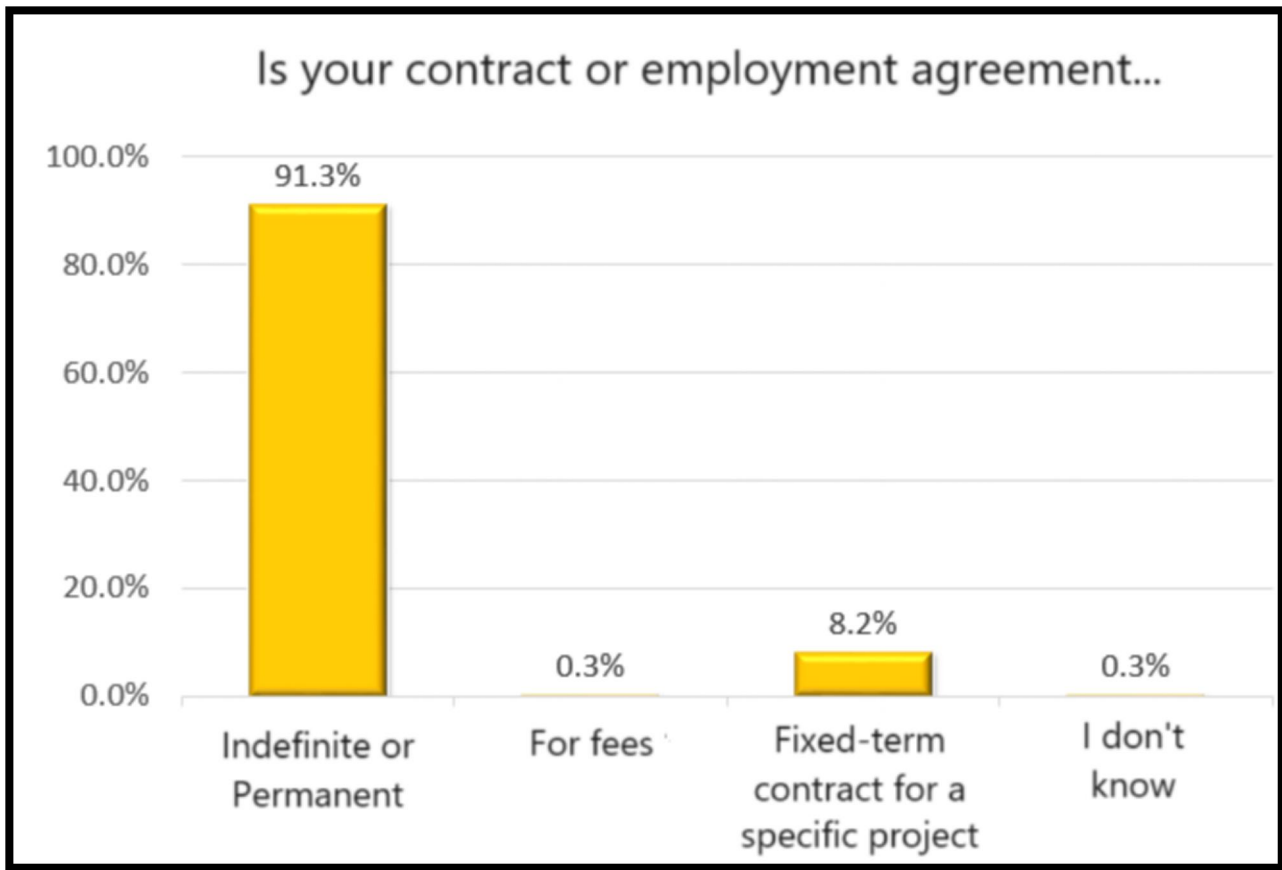


Figure 2 Graph of Identification of the Company Where You Work

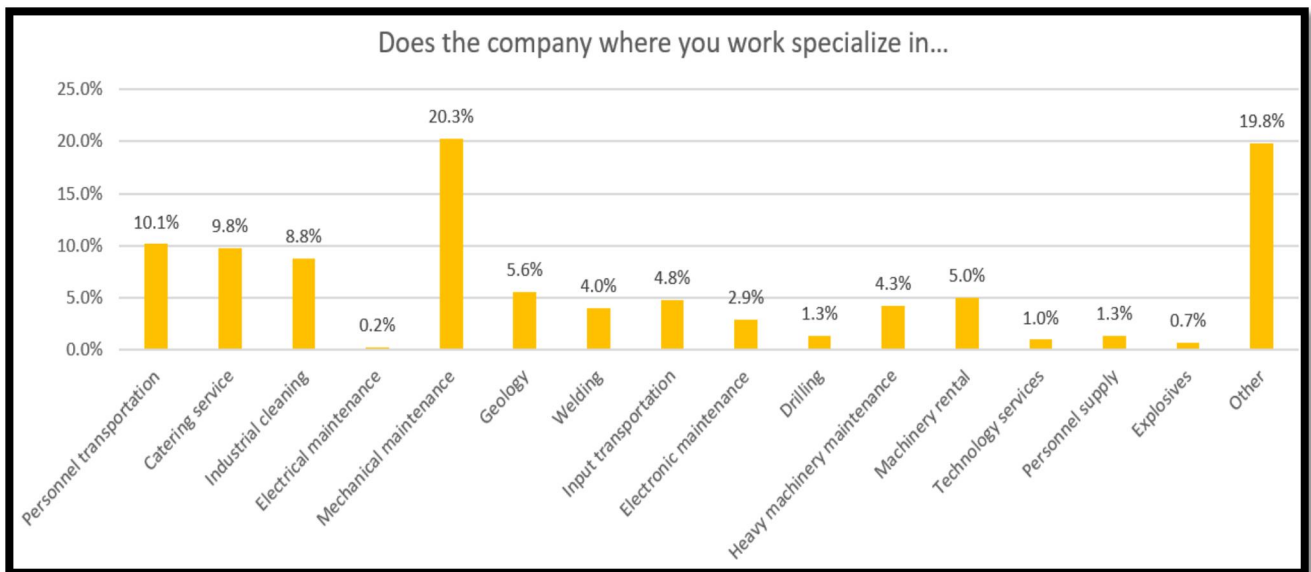


Figure 3 Graph of the Company's Scope of Work

The following question is: How do you perceive the impact on your family nucleus due to your role as a subcontracted worker? This question aims to determine the worker's perception and his/her role in subcontracting companies concerning the family nucleus. 45.8% of respondents consider that the impact of being a subcontracted worker is moderately positive. In addition, in a very low percentage (10.2%), they perceive that working for a subcontracting company is negative because working provides them with financial security.

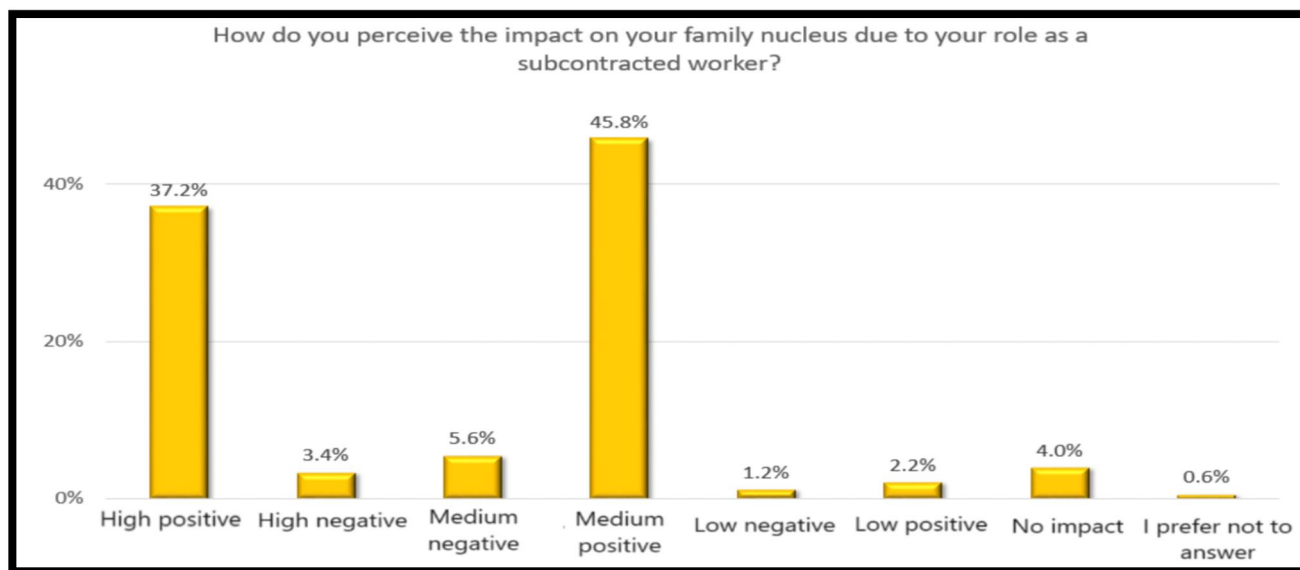


Figure 4 Graph of the Company's Scope of Work

3.1 Education Levels

As observed in Figure No. 5, the majority of workers only completed their secondary education, this means they completed 8 years of primary education and an additional 4 years of secondary education. Consequently, 41.1% of workers have not had the opportunity for higher education. Educational initiatives should be created for these workers, tailored to their reality. One example is the implementation of processes recognizing work experiences, aiming to shorten education times and align with the practical needs of the workers.

It is determined that the occupations of workers who have primary and secondary education are, in their highest percentage, machinery and bus drivers, office and hotel cleaners, cooks, crane and elevator operators. These activities are repetitive and mechanized, it should be noted that these workers are the ones who need to acquire new technological skills for their jobs.

Another topic of analysis is the remuneration that workers have according to their level of education; see figure No. 6, (dollar value 880.62 Chilean pesos, December 13, 2023). It is observed that workers who have an educational level of secondary education (figure 6-a), 76.7% have a monthly net remuneration of less than US\$907. Due to the fact that the tasks they perform are not part of the mining value chain, such as those indicated in the previous paragraph, and therefore, the principal companies outsource these activities to contractor companies, not regulating the remuneration of subcontractor workers.

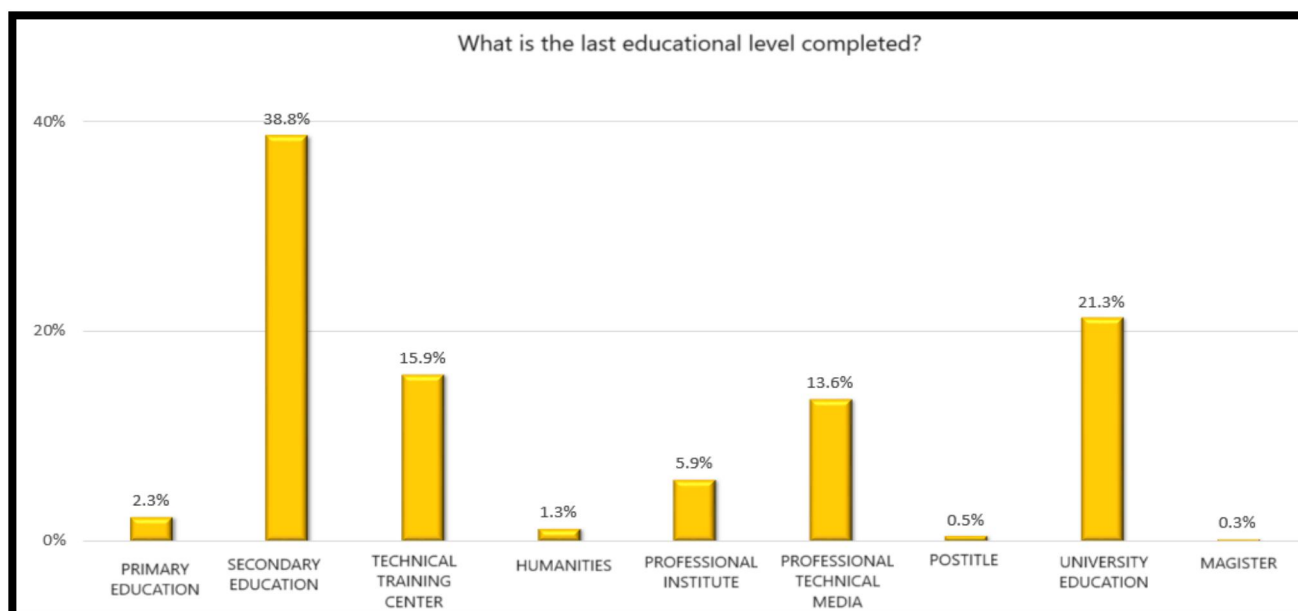


Figure 5 Percentage of Education of Workers by Educational Level

In graph b) of figure N°6, we can see the workers who have an educational level of technical training center, the trend of their remunerations is different, 73.9% have remunerations between US\$567 and US\$1,248. The activities that this group of workers develops are: specialist mechanics, mining and metallurgy technicians, administrative services and earth moving machinery operators (CAEX). In this group, you can find workers who participate in the mining value chain, such as machinery operators and specialist mechanics.

Finally, in graph c), the monthly remunerations are distributed in more homogeneous ways, and those who have a low remuneration are because they are just starting out in the company or their university careers were not related to mining, which is why labour reconversion processes must be analysed for this group of workers. The occupations of this group of workers are mainly administrative services professionals, specialist mechanics, mining and metallurgy engineering, and safety inspectors.

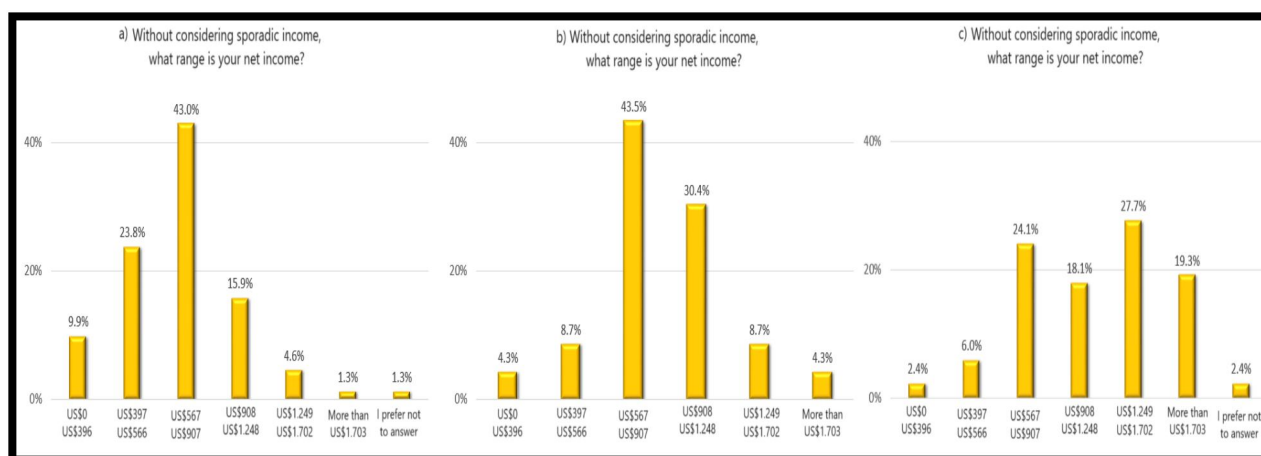


Figure 6 Percentage of Workers According to Net Income and Level of Education. a) Secondary Education. b) Technical Training Center. c) University Education.

3.2 Training and Certification of Labor Skills

As indicated previously, there is a large number of subcontractor workers who have low educational levels and others require reconversion of their original careers, therefore this subchapter will present a series of analyzes of the state of training and labor certifications, of which the workers make use. Chilean mining is in a labor scenario with an increase in the digitalization and automation of machinery and instruments, this has generated needs to develop improvements in human capital through the management of labor competencies, therefore, in 2008 The National Certification System for Labor Skills (Chilevalora) is created, which promotes and enhances the development of workers, through the recognition of work experience, knowledge, skills and abilities, regardless of how they have been acquired, this makes it more vital the development of worker certification processes, so that they have a formal document of their competencies, and allows the mobility of workers within their company or new job opportunities.

The first question asked is the following: Has the company trained you to carry out your functions? (see Figure 7) The highest percentage of workers indicates that they have been trained, but 27.8% indicate that their company has not trained them in the functions that they realized, this result is negative and worrying for the development of the human capital present in the mining industry, since these workers are not entirely in the mining value chain, an inadequate development of their functions can cause an accident or an inefficient productivity.

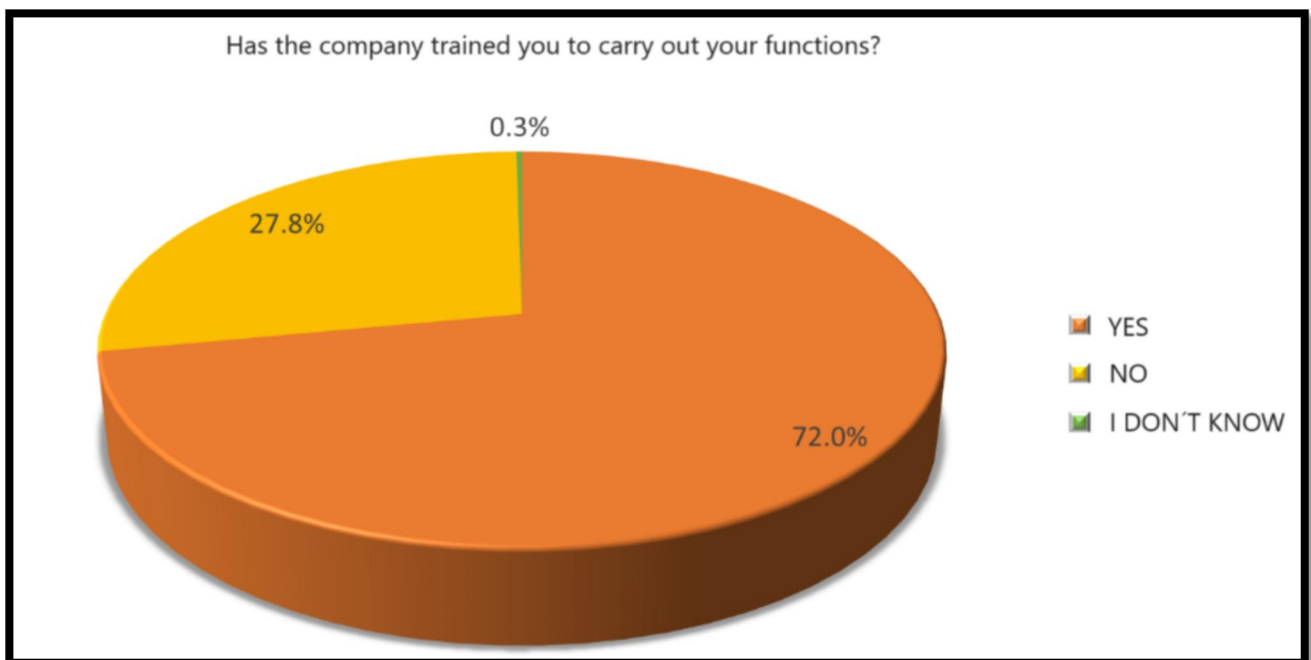


Figure 7 Percentage of Workers Who Were Trained in Their Duties by the Company

In Figure 8, the workers are asked: How long ago did your company last train you?, providing answers such as that 19.3% indicate that their company has never trained them on any type of topics, such as associated to its functions or security, among others. It is also observed that 63.2% of workers have been trained this last year. It is highlighted that for tasks that are significant in the mining value chain, it is vital that workers, regardless of their position or job, must be trained in their functions systematically. The lack of training generates in workers less possibility of movement and job growth in the various careers that each organization has.

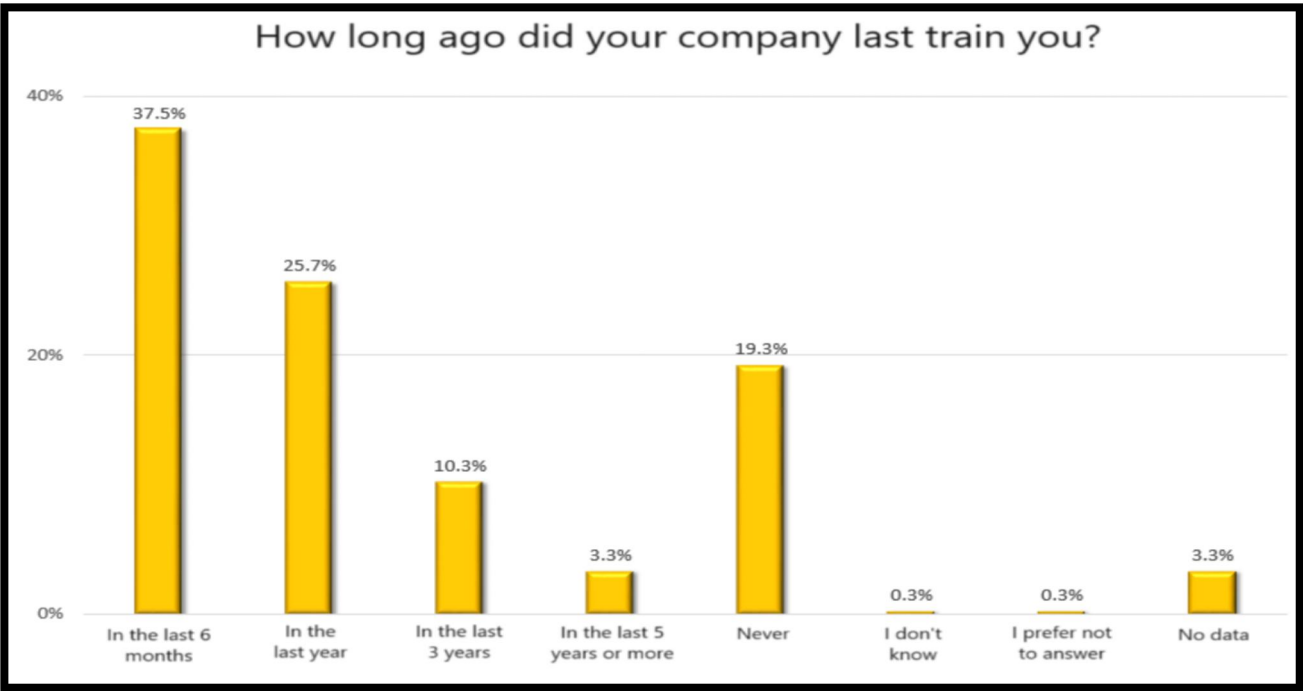


Figure 8 Percentage of Trained Workers According to Last Training.

The labour skills certification processes identify the value chain of a production process and subsequently the occupational profiles associated with the process are defined and developed, then the training plans and routes are developed that guide the trajectories of the workers. Therefore, training processes have the possibility of aligning it with job profiles.

The National System for Certification of Labour Skills existing in Chile, is integrated in a tripartite manner by the State, the workers and the employers, seeks to detect areas of priority development for the certification of skills and training, which presents multiple benefits, but also important challenges. This type of system gives the opportunity to close the gaps between the current skills of workers and the needs of the world of work in a framework that guides career development and supports the people management of companies. Additionally, the participation of different levels in the development of critical aspects of the system, such as the development of competency profiles, with an informed perspective and integrating different visions, allows a constructive dialogue between the company and the unions, ultimately contributing to the productivity and growth of the country.

Among the challenges, it is expected to strengthen the spaces for tripartite dialogue and move towards integrated training systems for work, which allow people to advance in their training under a qualification framework agreed upon by all actors (Salazar, 2017). Therefore, it is essential to characterize subcontractor human capital with respect to its participation in the relevant aspects of training and certification of skills for work, considering not only the occupations of the mining value chain, but also external processes. to these, but which are vital for the continuity of the business, in this way sufficient information could be available about the workers in the different areas that mining in Chile requires and also promote initiatives that allow contributing to improving professional development and well-being of people.

Figure 9 shows the workers' response to the question: Have you participated in any Labor Skills Certification process? Only 32.4% indicate that they have participated in these processes, which is a low and worrying percentage for this group of workers, since it is not possible to determine the skills gaps and thus focus the training.



Figure 9 Percentage of Workers Who Have Participated in Job Skills Certifications.

Finally, Figure 10 is presented. This graph shows the response given by the workers who, if they have participated in certification processes of labor competencies, who were asked the following: Were you able to get certified in the profiles? in which you were evaluated?, the responses in a practically equitable distribution, were 36.0% that they did manage to get certified, 31.3% indicated that they did not manage to get certified, not generating an instance of a training route for this group of workers by organization, the rest of the workers (32.7%) indicate that they do not have information about the results, this is due to lack of communication from the company or the organization that evaluated them, because they were not informed where to look for the results, which were found on the Chilevalora website (www.chilevalora.cl).

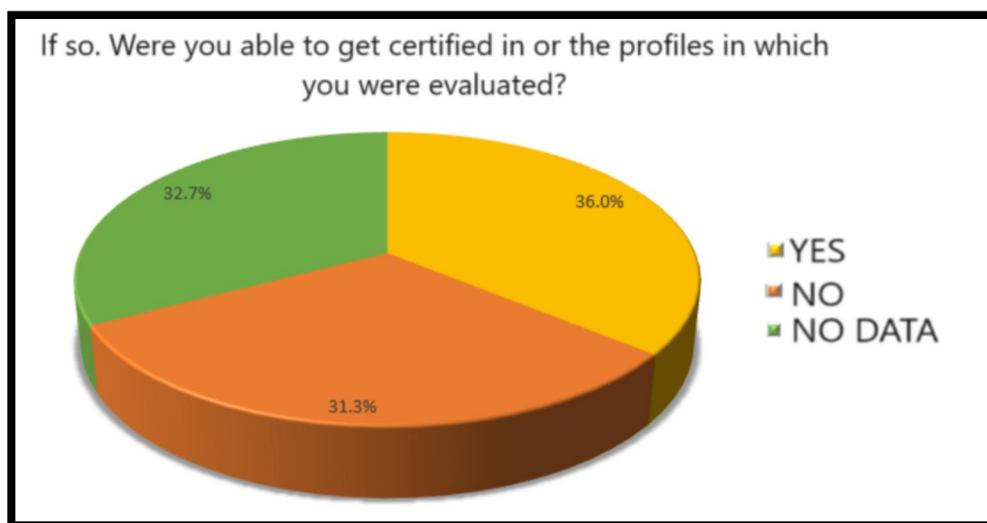


Figure 10 Percentage of Workers Who Achieved Their Job Skills Certification.

6. Summarizing

In summary, the article presents the state of the educational level of subcontractor workers in Chilean mining, it is seen after the development of the study that educational levels have a direct impact on remuneration and opportunities for labor mobility within or outside the company. All this information is based on primary sources, carried out in a survey that included six dimensions, which allowed us to characterize this sample.

It is also clear from this research that 72% of subcontractor workers have been trained by the organization, with a concern being the 27.8% of workers who indicate that their company has not trained them in the functions they perform. In the certification processes of labor skills, the percentages are reversed, where 65.6% indicate that they have not participated in these processes and of those who participate, only 36% indicate that they have achieved certification. Leaving a challenge for the Chilean state and for companies (principals and contractors), given the importance of having certified workers in the functions they perform.

Acknowledgements

We thank the work team that participates in the development of field surveys, fundamental members for developing and obtaining a database that demonstrates the reality of subcontracted workers. A great recognition to the Confederation of Copper Workers, who, with their great support, were able to generate this characterization of the workers and subcontractors of Chilean mining.

In the future, studies will be carried out based on this characterization, focused on gender, indigenous peoples, among others. The implementation of a work experience recognition plan to shorten workers' university careers will also be presented.

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