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# Dual TEVT education in Chile: Why do companies train students?<sup>1</sup>

José de Amesti – Paola Bordón<sup>2</sup> – Thomas Bolli<sup>3</sup>

## Abstract

This paper analyses the costs and benefits of dual training programmes for companies in Chile. Using an online survey, we estimate that Chilean companies that participate incur net costs of US\$3,200 per student per year in training; however, most companies declared to be satisfied with dual training. We simulate two scenarios under which dual training is cost effective. The first scenario simulates a subsidy equal to the net costs for each student companies receive. The second scenario assumes an increase of 25% in the productivity of apprentices, which reduces the students time in practicing and increases the productivity of the workers in charge, decreasing their time dedicated to train the students by 50%. Public policies to promote early adjustment such that students arrive at companies better prepared and can allocate more time to productive tasks should be considered to decrease the net cost of training.

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## 1. Introduction

The concern regarding youth unemployment and gaps in labour skills has led the international cooperative community (OECD, UNESCO and World Bank) to carefully examine vocational education systems, especially work-based learning models (Zancajo & Valiente, 2018; Lerman, 2014). Encouraged by the good results generated by dual education in the education-employment trajectories of students, many low- and middle-income countries have replicated these models in their high school educational programmes.

Such is the case of Chile, which implemented dual education following the German model in 1994 and, in recent years, experienced a renewed interest in public policy to expand dual models that combine education and training in the workplace. The high numbers of young people who do not study or work along with the growing mismatch in skills render dual education an attractive alternative for offering greater job opportunities to this segment of the population. Furthermore, on-the-job training provides advantages in terms of not only employment, but academic results as follows: students enrolled in dual education have a higher rate of timely graduation and greater access to higher education (de Amesti & Claro, 2021).

However, to provide dual education, companies need to open their doors and take students. Previous literature shows that the availability of companies to train depends on the benefits they can obtain. During the programme, companies can benefit from the value that students add to the productivity of the company through their work, and once the programme finishes, companies can capture the benefits if they hire the students, thereby saving the costs associated with selecting and onboarding new workers. Existing studies show that in countries, such as Switzerland, companies' costs and benefits are balanced during the programme, while in other countries, such as Germany, most companies incur net costs but rely on recovering their investment after the end of the programme (Muehleemann & Wolter, 2014; Lerman, 2014).

However, to date, there are no studies regarding the cost and benefits of dual education for companies in Chile, and policy makers rely on businesses' availability without knowing the conditions that support it. Using a model that has already been applied in several countries, this study is the first to present the costs and benefits of dual education in Chile based on data from 109 companies from different economic sectors.

This study contributes to the literature concerning dual vocational education because it presents findings in a middle-income country that offers a different context than the countries that have pioneered this type of training. Usually, the design of these programmes refers to the results obtained in developed countries despite differences in many institutional and labour market conditions. This study allows us to use our own data to analyse the case of Chile, which is an emerging country where dual education functions within a weak institutional framework in terms of the education-employment linkage but has nonetheless lasted over time and achieved encouraging results.

Our main findings show that by participating in dual training, the surveyed companies incur gross costs of \$3,298,440 Chilean pesos (CLP) per year per student on average. This corresponds to US\$4,650 or about 4.3 monthly wages of a skilled employee in the same area as the dual student.

These gross costs consider four different types of costs: (1) training costs (57%), (2) student labour costs (28%), (3) administrative costs (13%), and (4) educational supplies (2%). Regarding the benefits, companies capture around \$1,180,207 CLP per year per student. The benefits come from three sources: (1) the productive value that students contribute through their skilled and semi-skilled activities (79%), (2) savings in hiring (2%), and (3) savings in adjustment or induction (19%).

Overall, companies that participate incur net costs of \$2,364,030 CLP (approximately US\$3,200) per year to train each student; however, most companies are satisfied with dual training, and 95% will maintain or increase the number of students in the following year, since firms participate in dual training because they view it as an investment in human capital.

We simulate two scenarios under which dual training is cost effective. The first scenario simulates a subsidy equal to the net costs for each student companies receive. The second scenario assumes an increase of 25% in the productivity of apprentices, which reduces the students time in practising and increases the productivity of the workers in charge, decreasing their time dedicated to train the students by 50%. Public policies to promote early adjustment such that students arrive at companies better prepared and can allocate more time to productive tasks should be considered to decrease the net cost of training.

The paper is structured as follows. Section 2 reviews the literature, Section 3 describes the methodology and data, Section 4 provides results, and Section 5 presents the conclusions.

## 2. Literature review

### 1.1. Human capital and training theory

Investment in human capital is a relevant concern for companies and workers because both require increasingly better skills to increase productivity and wages (Wolter & Ryan, 2011). With these benefits come associated costs, and who should assume these costs is not always clear. From an economic perspective, classical human capital theory postulates that employees should pay for any investment in training in competitive labour markets, except for very specific skills (Becker, 1962). However, labour markets are not always competitive, and it is common for companies to invest in training potential workers (Renold, Bolli & Wolter, 2018). Generally, companies can offer training positions and obtain benefits if the value that the apprentices contribute through their work is greater than their salary, although other factors affect the cost-benefit calculation aside from the productive value and salary. For example, if a company's employees spent their work hours training apprentices or if machinery stops being used because the apprentices need to practice, these factors should be added to the costs<sup>4</sup>.

The existing evidence regarding this issue indicates important variation among countries. In Germany, approximately 70% of companies incur net costs when they train apprentices; similar effects are noted in Austria and the United Kingdom, while in Switzerland, the opposite occurs, and

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<sup>4</sup> Employers also detect other hard-to-valuate benefits, such as positive impacts on innovation (Bauernschuster, Falck, & Heblich 2009), increased productivity among other workers and improvements in the labour atmosphere (Lerman, Eyster & Chambers, 2009).

most companies obtain net benefits at the end of the programme<sup>5</sup> (Muehlemann & Wolter, 2014). Beyond Europe, net benefits have been found in Canada, and net costs have been found in Australia (Lerman, 2014), although it is important to consider that the measuring tools are not the same in all these cases, which complicates direct comparisons.

It is also likely that companies hire apprentices seeking a return on investment after the end of the programme. This type of benefit can become especially attractive if there are market frictions, such as a high turnover rate, shortages of qualified applicants and a high chance of committing errors when hiring new workers. In such cases, the training of apprentices is viewed favourably by companies because once the programme is finished, companies can address these problems if they retain talented students who already know the productive dynamics of the company (Autor, 2001). Additionally, hiring the best applicants allows the company to save hiring and adjustment costs for new workers. For many companies, in fact, these long-term economic benefits may become more relevant than short-term considerations, and these companies might even be willing to accept net costs during the programme (Muehlemann & Wolter, 2019).

Nevertheless, the availability of companies is a *sine qua non* condition for dual education (Wolter & Joho, 2018). Therefore, cost-benefit models can provide very informative inputs that provide an understanding of companies' decisions of whether or not to receive students (and how many to receive) and, from a public policy point of view, support conditions that encourage companies to continue receiving students.

## 1.2. Dual vocational education in Chile

In Chile, 37% of students in 11<sup>th</sup> and 12<sup>th</sup> grade are enrolled in vocational education. Compared to academic education, the vocational alternative is mostly chosen by lower socioeconomic status students from families with lower educational levels (Farías & Sevilla, 2015). Regarding access to higher education, students who graduate from vocational high schools are less likely to enter higher education and, when they do, are more likely to drop out (Farías, 2013).

Chile's vocational education structure consists of multiple different institutions that converge, but with little coordination among them. In fact, the connection between the curriculum of secondary vocational education, which is centrally organized, and that of higher vocational education, which is market-oriented, is limited (Valiente, Sepúlveda & Zancajo, 2020). According to the analytical framework described by Rauner and Wittig (2009), the governance of the Chilean vocational system is fragmented and input-oriented rather than coordinated and output-oriented.

Within vocational education, dual training began to be offered in Chile in 1994 as a joint initiative between the government and the German Society for Technical Cooperation (GTZ) with the aim to maximize the learning advantages that schools and companies could provide by working together (Bravo, Peirano, Sevilla, & Weintraub, 2001). Currently, there are 934 vocational high schools in Chile; of these, 177 offer dual education (covering 18% of all vocational enrolment in the country).

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<sup>5</sup> Switzerland's better results are attributed to the facts that students spend more days at the company on average and spend more time engaged in productive work (Wolter & Ryan, 2011).

In schools that offer dual training, students can enter the programme during the 11<sup>th</sup> and 12<sup>th</sup> grades. Therefore, students can spend time at companies for either one or two years. During the school year from April to November, they spend seven months in the companies. Depending on the school, they either spend two days a week at a company and three days at school or alternate weeks between the two locations.

Despite its European inspiration, dual education in Chile occurs in a noninstitutionalized way and depends on the ability of each high school to find companies to team with. In general, the education-employment linkage is weak in the country (Caves et al., 2019), which is evident in the fact that dual education works more on a micro scale via one-to-one relationships than a macro scale in which unions and associations take responsibility. This flexibility is risky because as Muehleemann & Wolter (2014) noted, it can undermine curricular formalization.

Studies that examined the effectiveness of this educational approach in Chile have found that dual students are more employable (CIDE, 2009) and work in better-qualified positions (Bravo et al., 2001). Regarding the academic results, a recent article compared dual students with their peers in school-based-only vocational education and found that the former had better grades, attendance, graduation rates and rates of access to higher education (de Amesti & Claro, 2020). To date, however, evidence of the effects of dual education on companies that train students is lacking, and many receive students based mainly on good intentions.

## 2. Methodology and data

### 2.1. The cost-benefit model

The methodology is adapted from the model developed by Muehleemann & Wolter (2014), which has been used since 1970 in many countries, including Switzerland, Germany and Austria, and adapts the model to the Chilean case. The model has the following three main components: (1) the costs that arise during the programme, (2) the benefits that companies perceive during the programme in terms of the value that students add, and (3) the potential benefits that companies can obtain in hiring and adjustment savings if students are hired after the programme. Each component is constructed as follows.

#### *Costs during the programme*

- Administration and planning costs: Time and materials used for the company's implementation of dual education.
- Costs of training supplies: Courses taught by the company and the purchase of teaching materials for students.
- On-the-job training costs: Time that workers take away from their usual work to train students, and the equipment that was purchased or underused to train students.
- Student labour costs of the participants: Payments to students and allowances for snacks, transfers and personal equipment.

### *Benefits during the programme*

- Subsidies: Sum of money that companies receive from the state per student (in Chile, this item is not considered since there are no subsidies for dual training).
- Productive value of the participants: Students' contribution to the production of the company when they participate in skilled or semi-skilled activities.

### *Potential post-programme benefits if the student is hired*

- Savings in hiring: Savings in time and materials dedicated to searching for and hiring a new worker.
- Savings in adjustment or induction: Savings in the loss of initial productivity when hiring a new worker.

## 2.2. Model limitations

The described model has at least four weaknesses or limitations. First, because the data are self-reported, the responses are subject to under- or overestimation biases. Second, the responding companies might not be representative for the population. Therefore, the results of this study are only representative of the companies that answered and cannot be extrapolated to others. Third, the model focuses only on short-term benefits and does not consider that in the long term, the dual education system can increase the supply of skilled workers in the labour market and, thus, alleviate the negative effects of applicant scarcity (Renold, Bolli & Wolter, 2018). Finally, the survey does not consider non-accounting benefits, such as creating leadership positions in middle management, improving the work atmosphere or increasing worker productivity (all factors that many companies tend to note and value).

## 2.3. Data

In order to estimate the cost-benefits model, we accommodate the survey questions used in Switzerland, Singapore and Serbia. The online survey was originally sent to 950 companies participating in dual training from May through August 2020. Of these companies, 109 answered a sufficient number of questions to be considered in the analyses<sup>6</sup> and therefore constitute the sample in this study. These 109 companies belong to eight different economic sectors and are distributed among seven regions of the country. Therefore, we had a response rate of 11,5%, which was expected due to the extensive length of the survey. Table A1 in the Appendix reports the sample distribution by economic sector.

Of these 109 companies, many chose not to answer some questions (such as those regarding the salary of their workers); in these cases, the values without information were imputed using the averages of companies in the same economic sector. To correct for possible outliers, we followed

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<sup>6</sup> In total, 313 companies answered at least one survey question, but most companies did not complete a sufficient number of responses to be considered in the analyses.



the method used by Renold et al. (2018) and replaced the highest/lowest values with the second highest/lowest values within four sectorial fields<sup>7</sup>.

For the analyses were consider the average length of the programme, seven months per year, and each month, students concur to the company between eight and 10 days<sup>8</sup> depending on the modality of the programme (two days a week or every other week). On average, students work at the company 9.6 days per month.

### 3. Results

#### 3.1. Costs and benefits analysis

In this section, we analyse the costs and benefits of companies who provide dual education training to students.

By participating in dual training, the surveyed companies incur costs of \$3,298,440 Chilean pesos (CLP) per year per student on average. This corresponds to about 4.3 monthly wages of a skilled worker. This amount consists of four different types of costs, which are shown in **Figure 1**.

Training costs are the most important category, representing 57% of the total costs. This item comprises the opportunity costs of personnel and capital. The bulk of these costs is explained by the hours that workers spend training students instead of performing their regular work. For example, on average, workers allocate two hours a day to guiding and teaching apprentices. In Switzerland, apprentices receive about 1.3 and 1.1 hours a day during their first and second apprenticeship year, respectively (Moretti et al. 2017). Hence, instruction is substantially more time-consuming in Chile.

The second most relevant item is student labour costs, which represent 28% of the total costs. Although regulations in Chile do not allow students to receive a salary by regular contract, many companies provide a monetary contribution and allowances for snacks, transportation and personal equipment. On average, the students at the surveyed companies receive \$60,000 CLP per month from the companies and another \$68,000 CLP in non-monetary allowances<sup>9</sup>. The sum of student labour costs amounts to \$128,000 CLP per month. This represents about 17% of a skilled worker wage in the same occupation. However, students spend about half as much time in the company as a full-time equivalent employee. Therefore, the relative pay for a fixed amount of time amounts to 34%. This is substantially higher than in Switzerland, where the relative pay ratio amounts to 13.6% and 17% in the first two years (Moretti et al. 2017).

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<sup>7</sup> The following four fields of secondary vocational education were used: commercial, technical, industrial and agricultural. The maritime field was not considered because there were no companies belonging to that sector.

<sup>8</sup> Based on an average of 20.83 business days per month, the exact number of days per month ranges from 8.33 to 10.42.

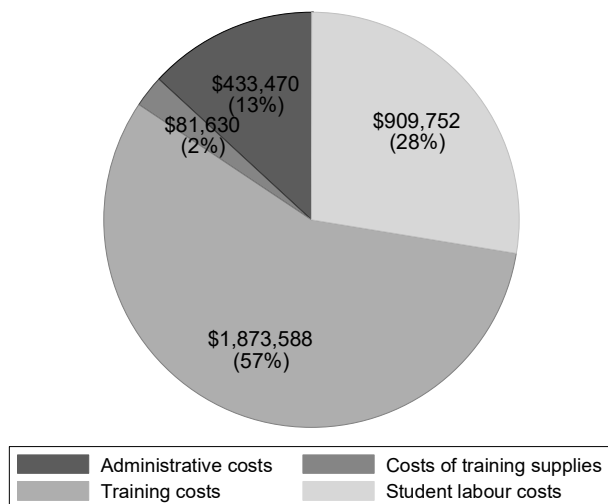
<sup>9</sup> It is necessary to consider that in a significant number of companies, payments and allowances are equal to zero, which decreases the average student labour costs presented here.

Third, there are administrative costs, which total \$433,000 CLP per year or 13% of the total costs of companies. This category includes the costs of materials and work hours necessary to plan and implement dual training in the company.

Finally, there are costs associated with educational supplies, which contribute to only 2% of the total costs. This category is very small because in contrast to other countries where companies must pay for the students' training courses, Chile's dual education system does not require companies to provide specific courses.

Some interesting differences arise when comparing Chile's costs and benefits with those of other countries that applied the same measurement model, especially in terms of the two most important cost categories. Training costs represent a lower share in Switzerland (39%) and Singapore (30%), while student labour costs are more important in both countries: 46% in Switzerland and 52% in Singapore (Renold, Bolli & Wolter, 2018). Regarding payments to students, the differences between Chile and these two countries can be explained by the employment status of students, meaning that contracts with formal salaries are not allowed in Chile, while it is allowed in Switzerland and Singapore. It is important to consider that these three dual education programmes differ in duration. The Swiss program lasts for three to four years, while the Singaporean programme lasts for 12-18 months. They also differ in terms of governance and institutionality. Therefore, these programs are not strictly comparable.

**Figure 1.** Costs of dual training.



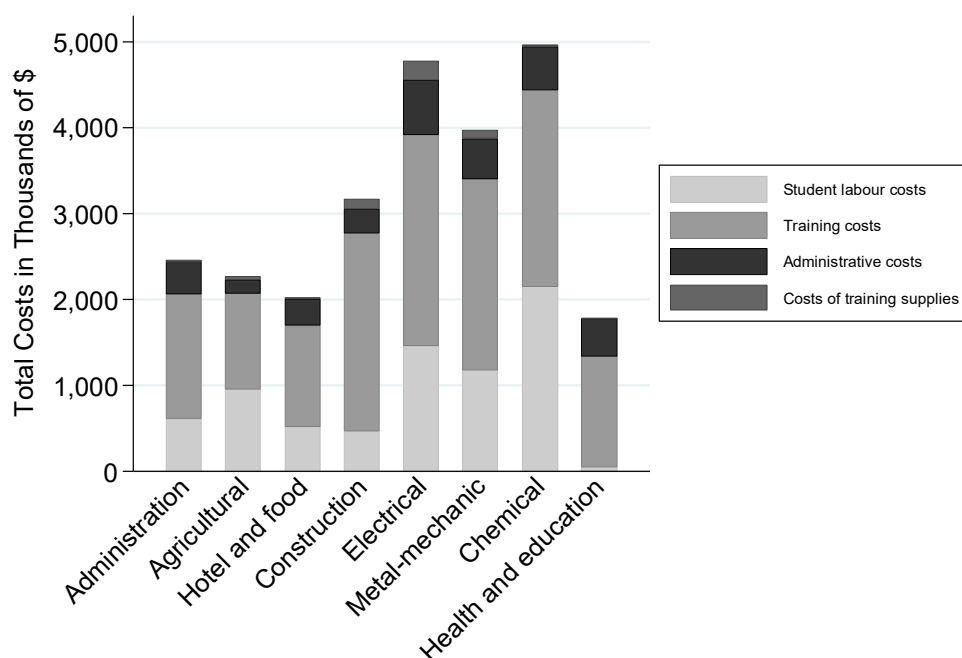
Annual cost to the company per student. N=109.

**Figure 2** shows the costs according to the companies' economic sector. As shown, there is important variability among the sectors, and the chemical, electrical and metal-mechanic sectors report almost double the costs of the other sectors. The three sectors with the highest costs are also sectors that demand higher skills for qualified labour and specific tasks and therefore may require greater investment in training and higher monetary allowances for students. Notably, the health and education sector does not have student labour costs because its companies (health centres and

kindergartens) are supported by the State and therefore are not allowed to provide financial allowances to students. When examining costs according to firm size, there were no observable differences among micro, small, medium, and large companies (see **Figure A1** in the Appendix).

As explained above, companies obtain three types of benefits from dual training (we omitted subsidies because they do not exist in the Chilean dual system). One type of benefit is captured during the programme, and the other two benefits are realized after the programme is finished and only if the student is hired by the company. To examine their real value, these two benefits that occur after the programme were weighted by the probability that students would stay with the company (16% according to the present survey).

**Figure 2.** Costs of dual training by economic sector.



Annual cost to the company per student. N=109.

On average, the surveyed companies obtain benefits equivalent to \$1,180,207 CLP per year per student. **Figure 3** shows the three types of benefits. The first and most important benefit is the productive value that students contribute through their skilled and semi-skilled activities. This benefit is \$934,000 CLP per student per year for the company and represents 79% of the total benefits.

To estimate this value, it is necessary to calculate the amount of time the student dedicates to productive, semi-productive and practice tasks. Throughout their training in the company, students spend most of their time practising. This share of unproductive time decreases from 47% in the first year to 39% in the second year. Comparing this to Switzerland (Moretti et al., 2017) suggests that

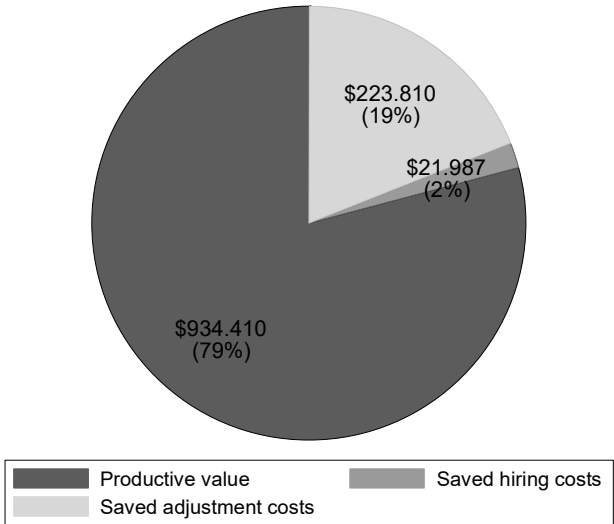
the share of practising is higher in Chile compared to 20% and 15% in the first two years of Swiss students. The share of skilled tasks increases from 22% in the first year to 30% in the second year. The share of skilled tasks of Swiss students is 26% and 42% in the first and second year, respectively. Hence, Chilean firms are relatively successful in training students for skilled tasks, particularly considering the relatively small amount of time students spend in the company.

Another relevant factor is productivity or the amount of time that the student takes to perform a task compared to a regular worker. In Chile, first year students have a productivity equivalent to 33% of the productivity of regular workers, and this productivity increases by almost 10 points by the second year. Swiss students have a similar relative productivity in the first year (35%), though it increases slightly faster to 52% in the second year.

Additionally, the following two benefits occur after the programme: savings in hiring and savings in adjustment or induction. However, only 16% of students stay in the companies after the end of the program. This share is substantially lower than in Germany or Switzerland (Muehleemann and Wolter, 2014).

Due to the low retention rate, benefits in terms of saved hiring and adjustment costs represent a relatively low portion of the total benefits received by the company. The benefit of savings in hiring is related to the costs associated with searching for, selecting and interviewing applicants and is \$21,967 CLP, which is equivalent to 2% of the total benefits. The savings in adjustment, which are understood as a loss of productivity during the installation of a new worker, are \$223,810 CLP and represent 19% of the total benefits.

**Figure 3.** Benefits of dual training.

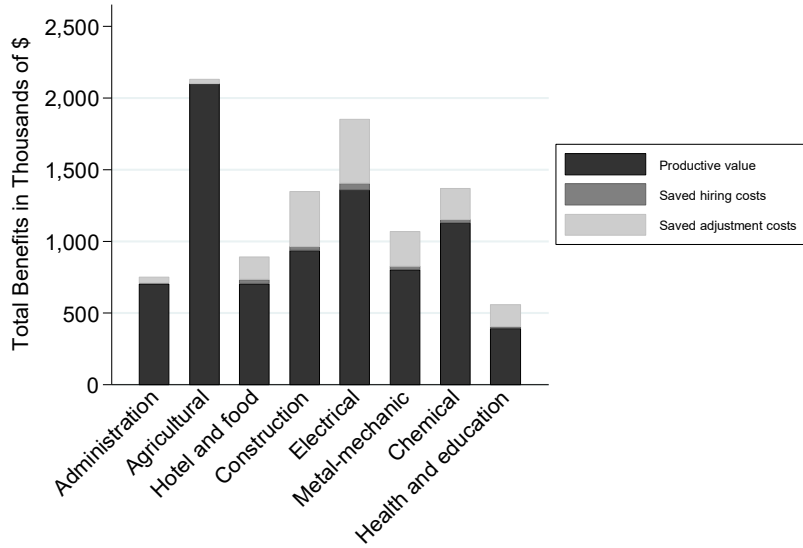


Annual benefit for the company per student. N=109.

**Figure 4** shows the distribution of benefits according to the economic sector of the company. The picture is relatively similar to the costs: the sectors that demand the highest skills also report the greatest benefits. An exception is the agricultural sector, which appears to have the highest benefits. Companies in administration, health and education sectors seem to have the lowest benefits. In the

Appendix, **Figure A2** shows that the benefits do not greatly vary according to the size of the company.

**Figure 4.** Benefits of dual training by economic sector.



Annual benefit for the company per student. N=109.

When comparing costs with benefits, we have that during the programme, companies incur net costs of \$2,364,030 CLP per year per student they receive. Because the retention rate is low (16%), the net costs after the programme do not greatly vary and reach \$2,118,233 CLP. In **Graph A3** in the Appendix, the costs and benefits are contrasted by economic sector, revealing that companies in all sectors incur net costs after the programme, although the gaps in some sectors are wider than those in others.

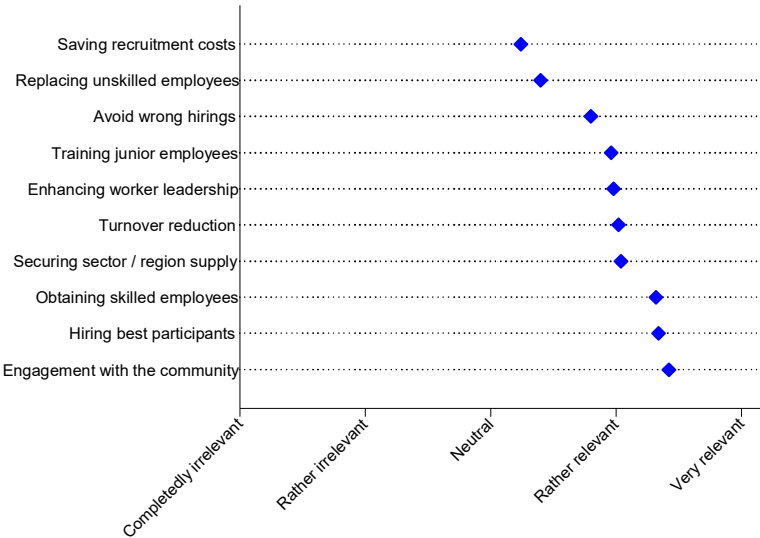
### 3.2. Company satisfaction and reasons for receiving students

In addition to the questions necessary to calculate the costs and benefits, the companies were asked about their reasons for receiving students and their satisfaction with dual training. These types of questions are useful for obtaining information regarding the factors that companies most heavily consider in their decision to participate in dual training.

**Figure 6** shows the most relevant reasons companies report for participation. Engagement with the community emerges as the most prominent reason for companies to participate in the programme. The two subsequent factors are particularly informative for the interpretation of the cost-benefit model in Chile: companies justify their participation in dual training based on the opportunity to attract qualified employees and retain the best students. These reasons indicate that companies are especially appreciative of the benefits that occur after the programme ends.

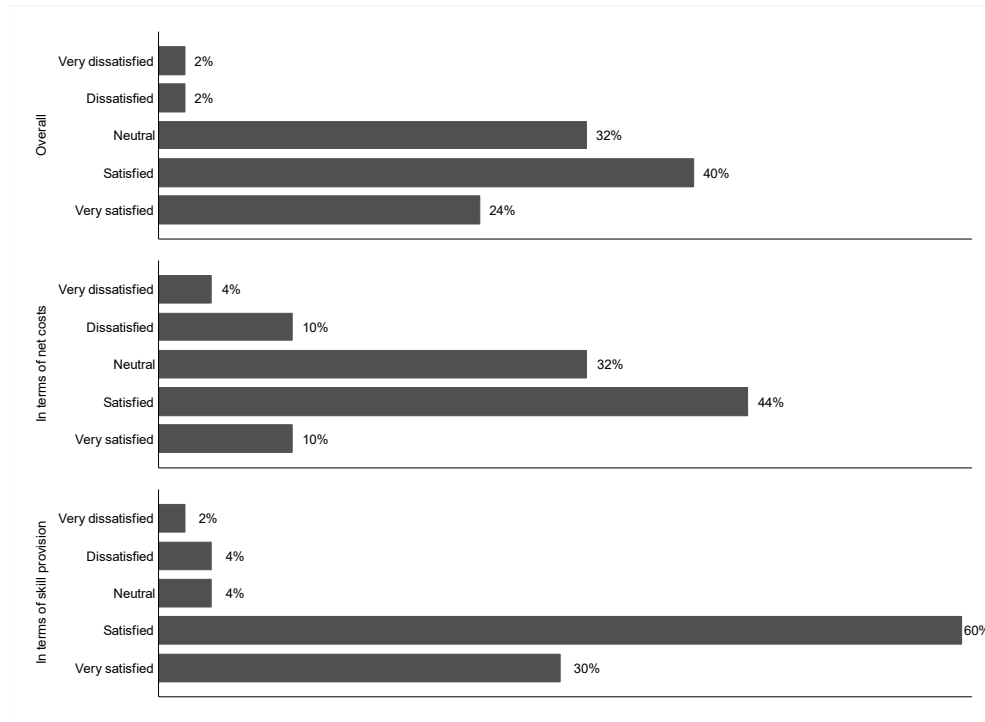
The remaining reasons mentioned are related to ensuring human capital for the sector, reducing the turnover rate and enhancing worker leadership. Reducing hiring costs, replacing workers and avoiding selection errors also arise but are less relevant.

**Figure 6.** Reasons for receiving dual education students.



Finally, **Figure 7** illustrates the degree of company satisfaction. Sixty-four percent of the surveyed companies are satisfied or very satisfied with dual training in general. This proportion decreases to 54% in regard to the costs and benefits of the programme but increases to 90% in regard to satisfying the demand for skilled workers. The finding that satisfaction is lowest regarding net costs confirms the interpretation that the motivation of companies focuses on benefits after the end of the programme.

**Figure 7. Companies' satisfaction.**



### 3.3. Simulations to determine the break-even point

To identify the decisive factors in companies' decision to offer dual training, it is necessary to contrast the surveyed companies with a sample of companies that do not offer dual training (Muehleemann & Wolter, 2019). Without this comparison, this study cannot assert that the costs and benefits are determinants of whether a company participates in the programme. However, it is possible to affirm that companies are more willing to participate when the cost-benefit ratio is more favourable (Strupler & Wolter, 2017).

Thus, simulation analyses are performed by calibrating certain parameters until reaching net costs equal to zero for the programme. We simulate two scenarios under which dual training is cost effective using the real Chilean case values while maintaining all other factors constant. For illustration purposes, we present the current scenario in **Figure 8.0**<sup>10</sup>. This figure assumes linearly decreasing costs. Furthermore, since the program is relatively short, we assume exponentially increasing productive values (see, e.g., Lerman, 2019).

The first scenario simulates the existence of a subsidy that the government grants to companies for each student they receive. Although subsidies to companies are common in several countries, there is no conclusive evidence of their effectiveness in increasing training positions (Muehleemann & Wolter, 2014). Furthermore, subsidies create windfall gains, administrative costs and tend to be politically difficult to undo (see, e.g., Wolter and Ryan, 2011; Euler, 2019). Considering that the net

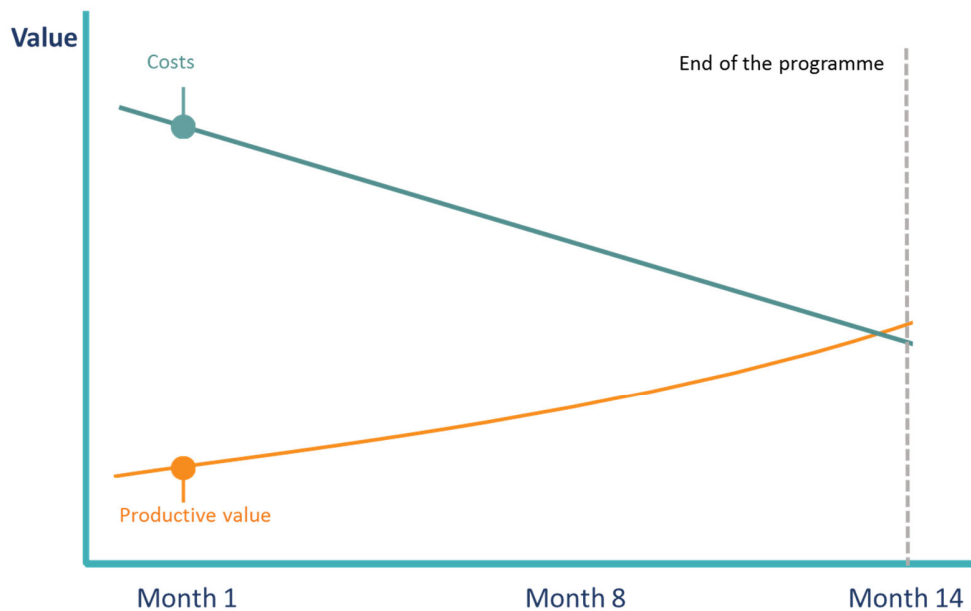
<sup>10</sup> The three figures below were prepared for illustrative purposes and are not based on exact calculations.

costs for companies during dual training are \$2,364,030 CLP per year, a subsidy of equal value would be needed for the programme to have net costs equal to zero. **Figure 8.1** illustrates this simulation.

The second scenario assumes an increase in the productivity of apprentices. In the Chilean case, students arrive at the company with limited preparation and a low capacity to add productive value; thus, the students dedicate most of their time to practice and barely on qualified tasks, which explains why the benefits for productive value in Chile are low compared to those in other countries.

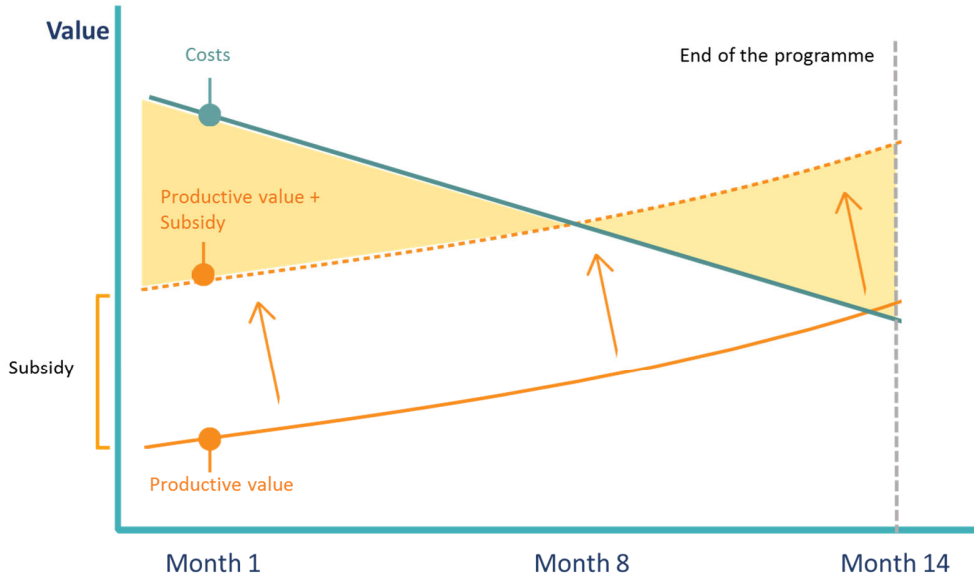
**Figure 8.2** simulates an increase of 25% in the productivity of students relative to a skilled worker and a 25% increase in the time dedicated to productive tasks. Furthermore, we assume that this change reduces the students need for training, decreasing the time dedicated to train the students by 50%. As a result, net costs equal to zero are obtained.

**Figure 8.0.** Current scenario.

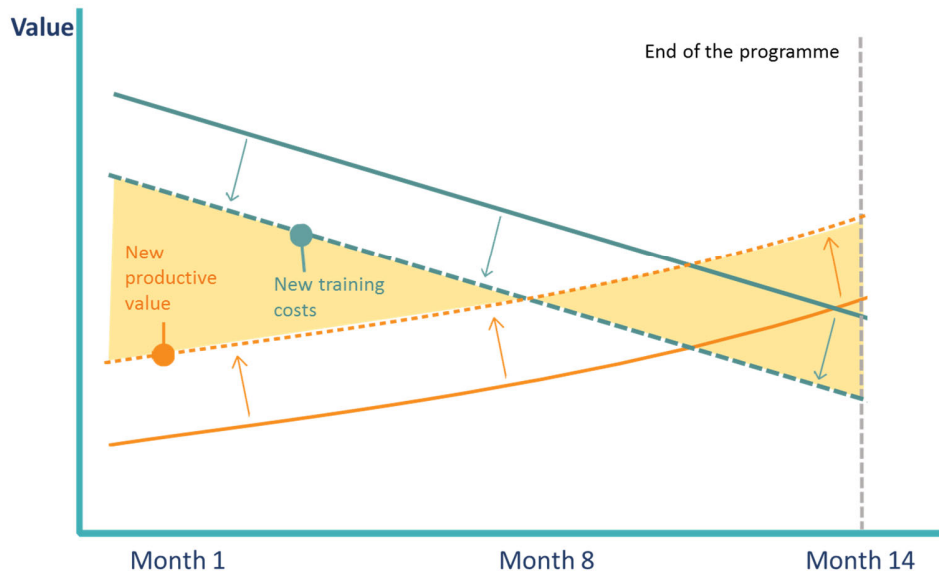




**Figure 8.1.** Scenario with a subsidy.



**Figure 8.2.** Scenario with an increase in productive value.



## 4. Conclusions

This paper analyses the costs and benefits of dual training for companies in Chile. The model has three main components: (1) the costs that arise during the programme, (2) the benefits that companies receive during the programme in terms of student's productivity, and (3) the potential benefits that companies can obtain in hiring and adjustment savings if students are hired after the programme. Using an online survey, we compute the cost and benefits.

Our main results indicate that, on the one hand, companies incur net costs of \$2,364,030 CLP (approximately US\$3,200) per year to train each student; however, on the other hand, most companies are satisfied with dual training, and 95% will maintain or increase the number of students in the following year. To explain this apparent paradox, it is necessary to examine the reasons companies note for participating in dual training; the most relevant reasons are related to the benefits that occur after the programme, such as retaining the most talented students and satisfying the demand for qualified workers. Thus, Chilean firms participate in dual training because they view it as an investment in human capital.

As we explained in the literature review, under certain conditions, the benefits that companies receive in the long term may be more important than immediate considerations when deciding whether to receive students (Muehlemann & Wolter, 2019). In this sense, Chile's programme resembles the German dual system in which companies' willingness to receive students depends largely on the benefits that occur after the programme (Muehlemann et al., 2010). In effect, the characteristics of the labour market in Chile, i.e., the shortage of qualified applicants jeopardises the growth of 75% of companies, reinforce the investment-oriented approach that companies have regarding dual education as they consider this programme a way to prepare, identify and select future human capital that meets their requirements.

However, these conditions can change over time, and there is no guarantee that companies will remain willing to receive students in scenarios that differ from the current one. Given that public policy has good reasons to scale dual education due to its positive effects on labour and academic outcomes, alternatives that reduce the net costs that companies currently incur should be explored to ensure that they remain interested in participating. The simulation analysis conducted above suggests some lines of action in this regard. A first alternative is to reimburse companies that receive students through a subsidy, although evidence regarding the effectiveness of subsidies is unclear. A second option is to promote early adjustment such that students arrive at companies better prepared and can allocate more time to productive tasks. The Ministry of Education could devote attention to this area by taking advantage of the fact that in Chile, there are several intermediate actors with experience in dual education who are able to propose relevant initiatives.

Future studies may address the limitations of the model outlined in the methodology section. Specifically, the long-term and non-accounting benefits in areas such as the work environment, productivity, leadership, and knowledge diffusion, should be addressed (see, e.g., Rupietta and Backes-Gellner, 2019). Many companies in Chile indicate that their participation in dual education is related to these factors. Another interesting line of innovation for future research could be to contrast companies that participate in the dual education programme with those that do not and, thus, examine the decisive factors that determine whether a company provides training.

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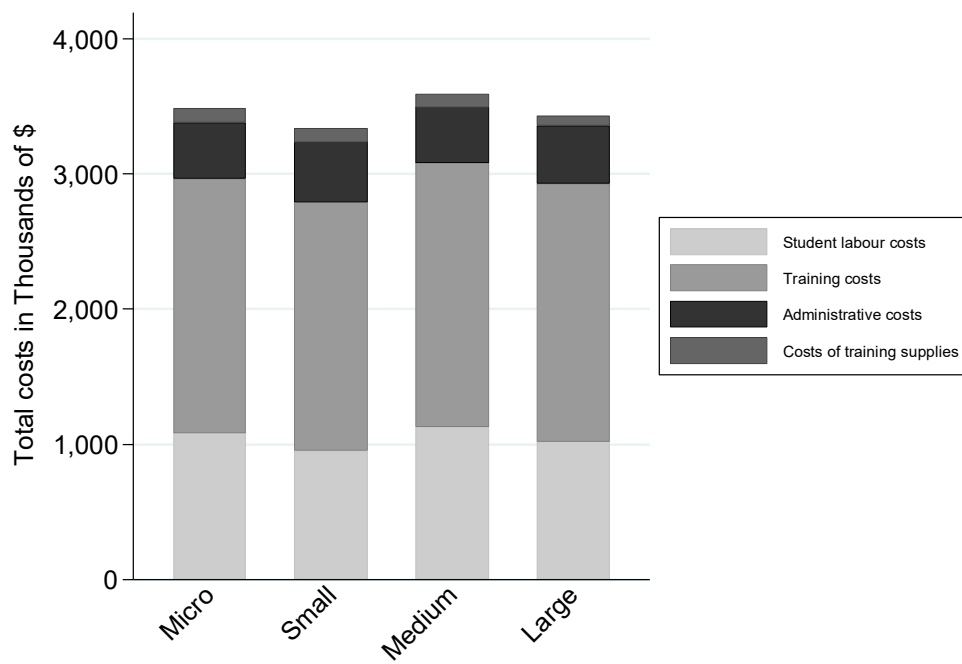
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## Appendix

**Table A1.** Sample distribution by economic sector.

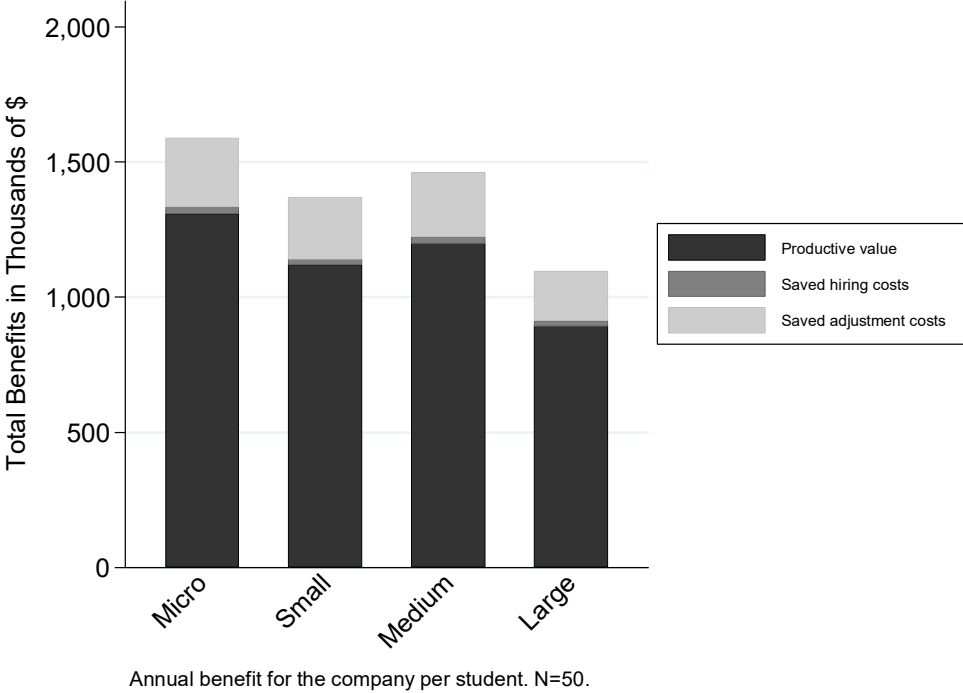
	Frequency	Percent
Administration	16	15%
Agricultural	8	7%
Hotel and food	5	5%
Construction	8	7%
Electrical	19	17%
Metal-mechanic	27	25%
Chemical	7	7%
Health and education	19	17%
Total	109	100%

**Figure A1.** Costs of dual training according to size.

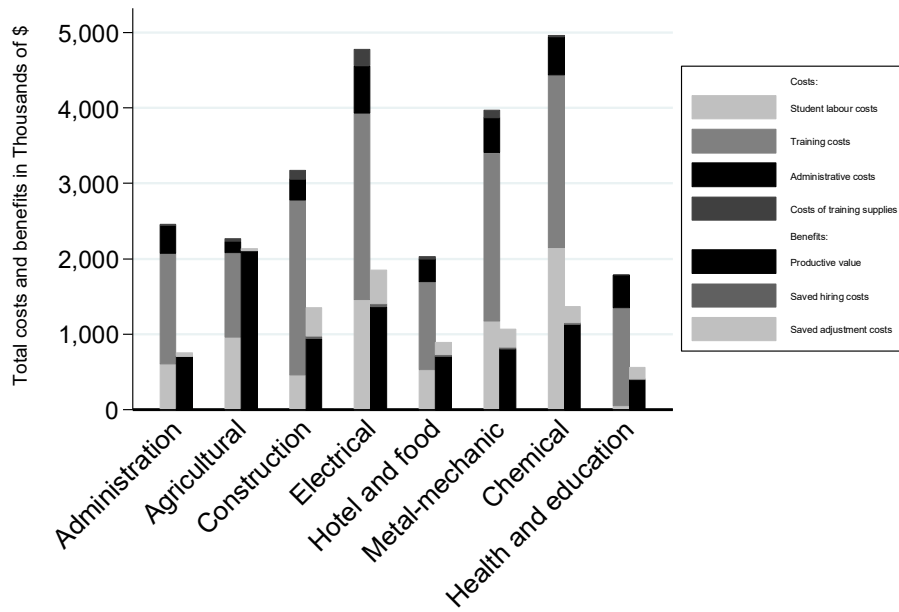


Annual cost to the company per student. N=50.

**Figure A2.** Benefits of dual training according to size.



**Figure A3.** Costs and benefits of dual training according to economic sector.



Annual costs and benefits for the company per student. N=109.