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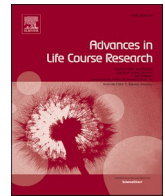
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School-to-work transition in Chile and Uruguay from the education-occupation linkage perspective

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ABSTRACT

This study examines school-to-work transitions (STWTs) in Chile and Uruguay, focusing on education-occupation linkages. For the first time, we apply the linkage strength approach to Latin American countries, using cross-sectional household survey data. Since STWT research is highly segregated across the different world regions, we do so in a comparative perspective with France, Germany, and the United States. Although Chile and Uruguay are high-income countries, they still face STWT challenges common to Latin America, such as high levels of informal and agricultural work. However, Chile has higher educational attainment than Uruguay, similar to the comparison countries. Our analysis reveals strong education-occupation linkages not only among higher qualified young adults, but also among low-qualified entrants – thus a “linkage trap” into low-skilled jobs – in Chile and especially in Uruguay. Moreover, unlike in France and Germany, general education provides stronger linkages than vocational programs. Informal employment does not differ significantly from formal employment in terms of linking education to occupations in STWTs. In fact, informal employment is associated with stronger linkages for low-qualified young workers in Uruguay. Furthermore, in Uruguay, strong linkages are associated with lower earnings for both tertiary and less-educated entrants, challenging the positive interpretation of high linkage strength drawn from the comparison countries. Overall, the linkage strength patterns are not as different across the different world regions: Chile’s and Uruguay’s patterns are in some aspects closer to France and Germany than the United States is to either European country.

1. Introduction

The school-to-work transitions (hereafter STWT) is an important phase in individuals’ life courses, as it strongly influences young people’s lives (Buchmann & Kriesi, 2011; Shavit & Müller, 1998), their subsequent career trajectories (Brunner & Kuhn, 2014; Manzoni et al., 2014), and their success in other life domains such as family formation (Lorentzen et al., 2019). Improving the labor market prospects of young adults is therefore a major concern around the world. It is also regarded as a means of increasing economic productivity and social cohesion, particularly if education equips young people with skills that facilitate entry into rewarding jobs (Quintini & Martin, 2014).

Comparative STWT research has accumulated rich knowledge on how institutions shape the relationship between education and occupational attainment (Blossfeld et al., 2015; Müller & Gangl, 2003). However, this research has been heavily focused on STWTs in Europe, North America, or Australia, while research on other world regions

remains scarce (see review in Nilsson, 2019). There are few studies for the Caucasus and Central Asia (Gebel, 2020), the Middle East (Assaad et al., 2023; Gebel & Heyne, 2016; Heyne & Gebel, 2016), or Latin America (Menezes dos Santos et al., 2021; Parrado, 2005).

Moreover, STWT research is highly segregated across the different world regions and lacks a comparative perspective. It is therefore unknown whether and how STWT pathways in other world regions differ from those in Europe and North America. STWTs in the former regions face particular challenges, including high(er) inequality and poverty rates, high shares of informal work, self-employment, agricultural and unpaid family work (Manacorda et al., 2017; Nilsson, 2019; Quintini & Martin, 2014). These challenges could generate differences in STWT pathways despite similarities in education systems or labor market institutions, which are considered as important factors in European and North American STWT studies. However, STWT pathways in Latin American countries, for example, may not be as different as studies focusing on these countries claim. Thus, a comparative perspective may

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challenge insights drawn from studies of either region.

Our aim is to provide insights into STWT pathways in two Latin American (LA) countries – Chile and Uruguay – in a comparative perspective, specifically in comparison with France, Germany, and the United States (US). Like the latter, Chile and Uruguay are classified as high-income countries by the World Bank as of 2012 (Hamadeh et al., 2022). Their level of economic and social development is relatively high among LA countries (Bértola et al., 2014; Ordóñez & Silva, 2019). However, both are characterized by high shares of informal employment and agricultural work, but they have very different educational distributions. Both countries have introduced vocational education programs (see Section 3). But little is known about whether these programs also generate stronger education-occupation linkages than general education programs in contexts with high levels of informal work.

The similarities and differences across the selected countries allow us to examine whether and how the impact of educational certificates (considered as the main determinant in STWT research) on early occupational pathways varies by the formal/informal nature of employment and the extent of agricultural work, and whether this depends on educational supply (i.e., young adults' educational attainment) or occupational demand (i.e., the occupational distribution of jobs) – while holding constant that all countries are high-income countries. We thus combine a similar case approach (Chile and Uruguay, which however differ in their educational distribution) with a different case approach (comparison with three northern countries) and explore parallels between seemingly different cases and differences between similar cases.

We know that labor market entry is faster in countries with high(er) poverty rates and high family financial needs (Manacorda et al., 2017). However, if faster transitions are associated with poorer matches between educational qualifications and occupational entry positions, faster does not necessarily mean better. For European and North American countries, research shows that education programs that facilitate stronger education-occupation linkages promote both smoother labor market entry and more stable employment careers (Scherer, 2005), while weakly linked education programs increase competition among labor market entrants (Di Stasio et al., 2016). Furthermore, well-matched workers tend to have higher wages (Bol et al., 2019; Witteveen & Attewell, 2024), higher job satisfaction, and lower turnover rates (Verhaest & Omeij, 2009) than mismatched workers with similar qualifications. Thus, in these countries, strong education-occupation linkages are an important factor for the success in STWTs.

However, these positive consequences of strong education-occupation linkages may not apply to countries with high shares of informal work, agricultural work, and less-educated adults – conditions that have not been addressed in European and North American studies. Moreover, the consequences may depend on the level of the formal qualification. For example, strong education-occupation linkages for young adults with only lower secondary education may rather represent a lack of occupational options if matching traps them in low-skilled, informal, and low-paid jobs. We do not know whether this is the case because we lack individual-level analyses of the education-occupation linkage for early career job placements for LA countries.

Against this background, we apply the linkage strength approach (Bol et al., 2019; DiPrete et al., 2017; Elbers et al., 2021) for the first time outside Europe and the US. The linkage strength measures the extent to which individuals with a particular education work in occupations typical of that education (DiPrete et al., 2017). We study Chile and Uruguay and compare our findings with existing research on France, Germany, and the US, published in DiPrete et al. (2017) and Elbers et al. (2021). We examine not only the linkage strength, but also whether stronger/weaker linkages are associated with differences in returns to education (earnings) or “traps” in more precarious jobs (informality). We focus on recent labor market entrants, using pooled cross-sectional household survey data from Chile and Uruguay. To facilitate comparisons with the published analyses for Germany, France, and the US, we

follow the sample restrictions used by DiPrete et al. (2017: 1884/5), but include informal work and self-employment in the employment category to reflect the realities of the two LA countries.

We first discuss the linkage strength approach as a perspective of STWT pathways (Section 2) and the linkage strength context of Chile and Uruguay (Section 3), followed by the data and methods used (Section 4), and the presentation and discussion of our results (Sections 5 and 6).

2. STWT and the linkage strength approach

A key issue in comparative STWT research is how educational institutions, especially vocational vs. general education, in conjunction with labor market structures, affect young people's labor market entry. Several studies have shown that STWTs are smoother in countries with strong vocational education and training (VET) systems, such as Germany, than in countries with more general upper secondary education systems, such as the UK or France (e.g., Brzinsky-Fay, 2007). This research draws mainly on two country-level typologies: occupational vs. internal labor markets (Marsden, 1990) and qualificational vs. organizational space (Maurice et al., 1986). Occupational and qualificational labor markets refer to countries with strong VET systems, for which entry-level positions and career trajectories are assumed to be strongly organized by formal qualifications in terms of education level-field combinations. In contrast, internal and organizational labor markets refer to countries with more general education systems, where entry positions and career trajectories are structured more by work experience and level (rather than field) of education. These country-level typology-based comparisons have been criticized because they examine the linkage between education credentials and occupational placement only indirectly, based on country-level aggregates, rather than directly at the level of individuals' actual STWT pathways (DiPrete et al., 2017).

Because of this criticism, several scholars have developed the so-called linkage strength approach (DiPrete et al., 2017; Elbers et al., 2021). The linkage strength indicates how young people's educational attainment – in conjunction with the countries' education systems, occupational structures, and occupational closure (Bol & Weeden, 2015; Sørensen, 1983) – shapes their occupational attainment. It “reflects the typically travelled education-to-occupation pathways with specific educational credentials” early in the career (Lu et al., 2024: 463). The linkage strength is high when a large number of graduates of an education program (defined by the level and/or field of education) work in a narrow set of occupations and, conversely, it is weak when graduates of an education program work in a large number of occupations (DiPrete et al., 2017).

However, whether a strong linkage facilitates successful STWTs depends on its consequences. Graduates with credentials with stronger education-occupation linkages are assumed to be more eligible (entitled) to enter a particular occupation and to have more occupation-specific skills, making them more productive early in their careers (Bol et al., 2019). Thus, strong linkages may be associated not only with skill-matching but also with well-paying jobs (Bol & Weeden, 2015). In contrast, we argue that strong education-occupation linkages that channel and trap individuals into low(er) paying jobs and more often into precarious work (such as informal employment) harm individuals' current and, given path dependency in individual life courses, future occupational attainment (see e.g., Manzoni et al., 2014). Thus, while the linkage strength indicates the “coherence” of STWT pathways in terms of educational attainment and occupational placement, it is also important to examine its consequences in order to assess the “success” of STWT pathways, especially in countries with very high labor market inequalities in terms of wages and informality, such as Chile and Uruguay.

Linkage strength is measured by the mutual information index M using entropy-based multi-group segregation (Mora & Ruiz-Castillo, 2011). It is the average of local linkage scores (defined by educational and occupational categories), weighted by the respective proportions of

different categories (DiPrete et al., 2017) (for more details, see Section 4). Thus, its magnitude depends on the number of categories included in the calculation and is not margin-free (i.e., its magnitude also depends on the marginal distributions). For cross-country comparisons, this margin dependence can be seen as an advantage. First, country differences in the marginal distributions capture differences in “reality”. Second, unlike margin-free indices, the linkage strength M can be decomposed to identify the extent to which cross-country differences are due to differences in the educational and occupational margins (compositional differences) and to differences in the strength of the education-occupation associations (Elbers, 2021; Lu et al., 2024). For example, the French-German study by Elbers et al. (2021) found that country differences in the education-occupation nexus in STWT pathways are only due to country differences in the share of vocational programs (which is higher in Germany than in France), while the (margin-free) association is similar in both countries. It is precisely this non-margin-free but decomposable property of M that allows us to also examine the influence of the significantly higher share of low-qualified adults in Uruguay (compared to all other countries included in the study, see Section 3) on the education-occupation nexus in STWT pathways.

3. Chile and Uruguay: linkage strength context and expectations

Chile and Uruguay (like other LA countries) follow the French tradition of (upper) secondary education (Castro et al., 2000). Secondary education is organized into two tracks: the academic track prepares for the university and the vocational/technical track prepares for work and leads to a formal certificate at the same level as academic track (see Appendix, Table A1). Social inequality in education is high in both countries (Jornitz & Parreira Do Amaral, 2021).

The majority of workers in Uruguay have completed only primary and lower secondary education (see Table 1). This strikingly high proportion of low-qualified workers in Uruguay is partly due to high dropout rates at all levels, and delayed graduation due to grade retention and temporary dropouts (Fernández Aguerre et al., 2021). In contrast, Chile's secondary and tertiary graduation rates are high among LA countries (Sepúlveda Valenzuela & Valdebenito Infante, 2019) and similar to the three comparison countries. Both LA countries have a very high share of workers with *general* educational degrees, also among the recent labor market entrants, suggesting a rather weak linkage strength in Chile and Uruguay. Looking at educational fields, the ranking is similar in all countries, with “social sciences, business, law” being the largest educational field in all countries, followed by “engineering, manufacturing” – with the former having a weaker linkage than the latter according to Bol et al. (2019).

Comparing the recent entrants to the total working-age population, both countries show a significant educational expansion, with increases in upper secondary and tertiary education completion in Uruguay and a large increase in tertiary completion in Chile. Completion of vocational education programs has also increased over time and is more common at the upper secondary level than at the tertiary level, but it is mainly school-based. Nevertheless, Chile and Uruguay have a much lower share of workers with secondary vocational education degrees than France and Germany, but higher than the US. The share of young tertiary graduates is also higher in Chile than in the US, similar to France and Germany. Note that in Chile and Uruguay, ISCED 5 A/B includes only three- and four-year BA degrees (as in the US), while in France and Germany also MA degrees are included (UNESCO, 2006). Overall, given the different educational distributions, we may expect a weaker linkage strength in Uruguay, but not in Chile, than in the three comparison countries.

Gender differences follow recent trends observed in high-income countries: Women outperform men in both LA countries (see Appendix, Table A2). The share of tertiary-educated young workers is much higher for women than for men. Conversely, men are more likely to have completed only upper secondary education in Chile or less than upper

Table 1

Educational attainment and fields of education of the employed population, by country (column %).

	Chile	Uruguay	France	Germany	USA
Level of educational attainment					
Less than upper secondary education	18 (4)	65 (51)	24	14	12
0–1	3	35 (20)	7	2	4
2 A–B	17 (4)	29 (31)	17	12	8
Upper secondary education	53 (52)	22 (26)	44	59	52
3 B/C (VOC)	14 (16)	10 (13)	32	50	–
3 A	41(36)	11 (13)	12	2	52
4 A (VOC)	–	–	–	7	–
Tertiary education^{a)}	27 (44)	14 (24)	31	27	37
5 B (VOC)	9 (13)	2 (4)	13	10	7
5 A	16(28)	9 (16)	18	16	19
6	2 (4)	2 (4)	1	1	11
Educational fields					
General	70 (54)	61 (48)	24	13	
education/no field					
Teacher training, education	5 (7)	4 (6)	2	4	
Humanities, languages, arts	2 (2)	1 (2)	8	4	
Social sciences, business, law	9 (11)	12 (16)	34	30	
Science, mathematics, computing	2 (3)	2 (4)	8	3	
Engineering, manufacturing	8 (8)	10 (10)	29	34	
Agriculture, veterinary	1 (1)	2 (2)	4	3	
Health, welfare	4 (8)	5 (7)	10	14	
Services	3 (5)	3 (5)	5	8	
N	192,790 (38,945)	253,631 (37,799)	216,253	185,934	1430,831

Notes: Workers aged 15–64. In parentheses: “recent labor market entrants”, defined as employed individuals who are no more than 10 years above the normal school-leaving age for someone with their level of education. VOC stands for vocational programs. Levels and fields of education are classified by ISCED 1997.

^{a)} ISCED 5 A/B includes BA and MA degrees in France and Germany; in the other three countries, MA degrees are included in ISCED 6 (see UNESCO, 2006).

Sources: CASEN (2015, 2017) and ECH (2012–2016) (see Section 4), own calculations. Figures for France (2005–2012), Germany (2006), and United States (2004–2012) taken from DiPrete et al. (2017, Table 1).

secondary education in Uruguay. Male and female rates of vocational (secondary and tertiary) education, however, are quite similar. Moreover, despite their higher educational attainment, women are more often economically inactive than men (see Table 4). Reasons for this are the prevalence of traditional gender norms and a lack of institutions for reconciling work and family life (OECD, 2014, 2021).

Chile's high share of tertiary graduates has raised questions about overqualification and credential inflation (Didier Pino, 2018). However, whether this is an issue depends on the demand for skills. Both countries have relatively large agricultural sectors (see Table 2) and¹ have remained primary resource-based economies – with copper mining in Chile and cattle ranching in Uruguay. Their economies are characterized by low levels of value added, technology use and innovation (Bértola et al., 2014; Ordóñez & Silva, 2019).

Looking at the occupational demand as measured by the 1-digit ISCO

¹ We use 2019 (or earlier, if needed) to approximate the data used in our analyses and to avoid the impact of the COVID-19 pandemic years.

Table 2

Indicators of inequality, agricultural employment, and employment, 2019.

Country	Absolute poverty: \$6.85 per day (%) ^{a)}	Gini Index ^{a)}	Employment in agriculture (%) of total employment)	Employment protection legislation (EPL)	Informal employment (% of total employment)	Youth unemployment rate (15–24, %)
Chile	7.5	45.3	9	2.34	29.3	19.6
Uruguay	5.1	39.7	8	0.98	24.5	27.5
France	0.4	31.2	3	2.68	9.4 ^{b)}	20.1
Germany	0.2	31.7	1	2.33		5.8
USA	1.8	41.5	1	1.31	9.8 ^{c)}	8.4

Notes: ^{a)} Chile 2017^{b)} Northern/Southern/Western Europe

^{c)} North America. EPL: Individual and collective dismissals (regular contracts) ranges from 0 to 6, OECD version 4 based on 4 dimensions and 23 items (OECD, 2020). Sources: Poverty: <https://ourworldindata.org/poverty> (07/17/2024). GINI: <https://data.worldbank.org/indicator/SI.POV.GINI?skipRedirection=true&view=map&year=2019>, <https://data.worldbank.org/indicator/SI.POV.GINI?skipRedirection=true&view=map&year=2017> (retrieved 07/17/2024). Employment in agriculture: <https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS> (retrieved 06/09/2023). EPL: OECD (2024). Employment Protection Legislation: Strictness of employment protection legislation: regular employment. OECD Employment and Labour Market Statistics (database), <https://doi.org/10.1787/data-00318-en> (retrieved 07/31/2024). Informal employment: Chile <https://www.statista.com/statistics/1232761/informal-employment-share-chile/> (retrieved 07/17/2024), Uruguay <https://www.statista.com/statistics/1039978/informal-employment-share-uruguay/> (retrieved 7/17/2024); other countries: <https://doi.org/10.54394/HQAE108> (retrieved 07/17/2024). Youth unemployment rate: <https://ilostat.ilo.org/data/> (retrieved 02/10/2023).

(International Standard Classification of Occupations), we see that in both LA countries, the share of employment in elementary occupations (ISCO 9) is still high among younger workers, especially among young men, and more so in Uruguay (Table 3). Given this high share of unskilled jobs, it remains to be seen whether vocational programs in Chile and Uruguay are as likely as in France and Germany to be linked to skilled occupations, thereby reducing the risks of working in unskilled jobs (Elbers et al., 2021). Moreover, the LA countries have much lower shares of high(er) skilled occupations at skill levels 3 and 4 than France and Germany – although the share of workers in professional and technical occupations (ISCO 2–3) is higher among recent entrants than in the total population, despite being more at the beginning of their careers. Given these differences in the countries' occupational structure, we may expect a weaker linkage strength for Chile and Uruguay. However, since the share of employment at skill levels 3 and 4 (ISCO 1–3) is as high as the share of tertiary graduates, we may not observe a weaker linkage strength for them, which would also speak against the aforementioned concern of overqualification in Chile.

In both LA countries, young women's higher educational attainment is associated with a higher share of (semi-)professional skilled jobs than for young men. This would suggest no gender differences in the linkage strength. However, at skill level 2, young women work more often in service and sales occupations (especially in Uruguay), while men work more often in craft occupations, as is the case in Germany, France and the US. According to Bol et al. (2019), this occupational sex segregation would suggest a weaker linkage strength for women.

The linkage strength may be weaker only in Uruguay, because Chile has a higher share of workers with upper secondary vocational degrees than the US, although much lower than France and especially Germany (see Table 1), and a higher employment protection legislation (EPL) for regular contracts² than in the US, similar to France and Germany (see Table 2). Higher employment protection is argued to provide incentives for individuals to invest in occupation-specific education (Estevez-Abe et al., 2001). Both Uruguay's low share of vocational degrees and its low EPL suggest that it can be characterized as an internal/organizational labor market (see Section 2), which would hint at weaker education-occupation linkages. In contrast, Chile cannot be clearly characterized as an occupational/qualificational or an

internal/organizational labor market. It is, however, closer to an occupational/qualificational labor market structure than the US, which would suggest rather strong education-occupation linkages for skilled and high-skilled workers.

As in other LA countries, the labor markets in Chile and Uruguay show a high degree of formal/informal segmentation, interacting with urban/rural fragmentation (Quintini & Martin, 2014). Informal workers participate in economic activities (partially) outside the state regulatory framework, often lack employment-based social security, and face inferior working conditions (Herrera-Idárraga et al., 2015; La Porta & Shleifer, 2014). Informal work is more prevalent in agriculture, small-scale trade and, more recently, the platform economy (Ceyhan et al., 2021). The share of informal employed workers is 29 % in Chile and 24 % in Uruguay (see Table 2).³ As suggested by research on the upper-middle-income country of Colombia (Herrera-Idárraga et al., 2015), the high prevalence of informal work may lead to both lower wage returns to education and weaker education-occupation linkages in the two LA countries than in the comparison countries, if informal work is an indicator that young people have to "take any job." This may also be true for Chile, despite (or because of) its higher EPL, as Ulyseas (2010) has shown that strong labor market regulations increase the risk of informal work at labor market entry in LA countries. On the contrary, we may still find strong linkages if informal jobs are used as a screening phase for higher-educated labor market entrants and/or represent "traps" into low-skilled occupations for low-qualified entrants. Moreover, the rather high share of informal low-skilled jobs in agriculture (and also in mining) may also suggest strong education-occupation linkages for low-qualified young adults, not because of their "field of education", but because of the limited occupational low-skill job options they face. They may be channeled into a few occupations (resulting in high linkage strength) as much as (or more than) their more educated counterparts.

Finally, absolute poverty and youth unemployment rates in both countries are still higher than in the comparison countries, and their levels of inequality (measured by the Gini index) are high, similar to the US (see Table 2). This may force young adults to enter the labor market faster to earn money, thereby making them more likely to sacrifice good jobs (which they may have found with more time to search) for greater speed. We may therefore expect a weaker overall linkage strength in Chile and Uruguay.

In summary, we may expect a rather weak linkage strength in Chile

² This index includes four aspects of dismissal regulations: procedural requirements, notice period and severance pay, the regulatory framework for unfair dismissals and the enforcement of unfair dismissal regulation. The four dimensions contribute with equal weight to the overall score (OECD, 2020: 174 ff).

³ The average share of informal employment in Latin America and the Caribbean was 53 % in 2019 (ILO, 2024).

Table 3
Distribution of major occupational groups (1-digit ISCO-88), by country (%).

Major occupational groups	ISCO	15–64 year-olds					
	skill level	Chile	Uruguay	France	Germany		
Managers/senior officials	3+4	5	2	9	6		
Professionals	4	12	10	14	16		
Technicians and associate professionals	3	10	7	19	22		
Clerical support workers	2	8	10	11	12		
Service and sales workers	2	16	22	13	12		
Skilled agricultural, forestry/fishery workers	2	4	5	3	2		
Craft and related trades workers	2	14	15	11	14		
Plant and machine operators, and assemblers	2	9	8	9	7		
Elementary occupations	1	22	20	10	8		
0.Armed forces	1+2+4	0	1	1	1		
Recent entrants							
Major occupational groups	ISCO	Chile			Uruguay		
	skill level	All	Women	Men	All	Women	Men
Managers/senior officials	3+4	2	3	2	1	1	1
Professionals	4	21	26	17	16	24	10
Technicians and associate professionals	3	13	16	10	7	8	7
Clerical support workers	2	10	14	7	12	17	8
Service and sales workers	2	19	25	14	23	34	14
Skilled agricultural, forestry/fishery workers	2	2	1	3	2	1	3
Craft and related trades workers	2	11	2	19	11	2	17
Plant and machine operators, and assemblers	2	6	1	9	5	1	9
Elementary occupations	1	16	11	19	23	13	32
0 Armed forces	1+2+4	0	0	0	0	0	0

Notes: See Table 1 for the definition of “recent entrants.” ISCO = International Standard Classification of Occupations.

Sources: CASEN (2015, 2017) and ECH (2012–2016), own calculations. Figures for France (2010) and Germany (2010) taken from Elbers et al. (2021, Table 2).

and Uruguay due to the dominance of general education (as in the US). However, the linkage strength in Chile may be higher than in Uruguay and also than in the US, because of Chile’s higher share of young workers with vocational and tertiary education and its higher EPL. The occupational structure, the high share of informal work, and the economic situation of young people in Chile and Uruguay would, on the one hand, support the expectation of a rather weak linkage strength in both countries. On the other hand, we may find a rather strong linkage for low(er) education due to the high prevalence of the agricultural and extractive sectors. Thus, it remains to be seen how important occupational closure (the argument for high linkage strength in Europe and the US) is relative to countries’ occupational demand. Moreover, the consequences of strong education-occupation linkages may not be as positive in Chile and Uruguay as observed in the three comparison countries (Bol et al., 2019) and may depend more on the level of education. As discussed above, strong education-occupation linkages can be associated with both lower and higher informal employment risk. They may be beneficial in terms of higher wages only for young workers with at least upper secondary education, while for low-qualified workers, stronger linkages may be more likely to trap them in precarious jobs (informal, low-skilled and low-paid jobs).

4. Data and methods

4.1. Data and samples

We use large-*N*, cross-sectional household survey data from Chile’s “National Socioeconomic Characterization Survey” (CASEN, Encuesta de Caracterización Socioeconómica Nacional) and Uruguay’s “Continuous Household Survey” (ECH, Encuesta Continua de Hogares). They are used as the basis for official statistics in both countries (INE, 2023; Ministerio de Desarrollo Social, 2021). To have sufficient sample sizes and to facilitate the comparison with the published analyses for Germany, France, and the US, we use pooled survey data from CASEN 2015 and 2017 and ECH 2012–2016.

CASEN has been conducted by the Ministry of Social Development since 1990 (every two or three years). It is representative of private households and their members throughout Chile, except for some very

remote or difficult to access areas. The sample frame is derived from the censuses of the National Institute of Statistics. The sample design is multistage randomized and cluster stratified. The effective sample sizes are 82,100 households for 2015 and 69,816 households for 2017, with an average response rate of about 75 % and non-responding households being replaced and not imputed (CASEN, 2016, 2018).

ECH has been conducted annually since 1968 by the National Statistics Institute (INE). Since 2006, it has been representative of all private households and their members in Uruguay. The sample frame is the national census, and the sample design is randomized and stratified by socioeconomic and geographic clusters in three stages. The effective sample size for 2012–2016 is 52,395 households per year, in total 261,973 households, with an average response rate of 89 % and non-responding households being replaced and not imputed (INE, 2022).

The linkage strength analysis is, by definition, restricted to the subsample of the working population aged 15–64, excluding students⁴ (similar to DiPrete et al., 2017; Elbers et al., 2021). To capture the STWT phase, we focus on the “recent labor market entrants,” defined as employed individuals who are no more than 10 years above the normal school-leaving age for someone with their highest level of education completed (similar to DiPrete et al., 2017). The “recent” population ranges from 15 years old (those with only primary education) up to about 34 years old (those with master’s degrees plus 10 years) (see Appendix, Table A1). Some may be older if they have a doctorate.

In Chile, 58 % of the working-age population are employed, and in Uruguay 64 % (see Table 4). Moreover, almost half of the younger generation is still in education. However, only 6 % had never been employed until the time of the survey. Thus, the reason why individuals are not included in the linkage strength calculation is not because they are unemployed/not employed, but because they are in education (i.e. at university). Therefore, the analysis sample of low(er) qualified young people is not much affected by this, but mainly the analysis sample of tertiary-educated young people – and given that we found high linkage

⁴ We have also not included “working students” because it is not theoretically meaningful to consider the association between their current employment and their current (not yet completed) participation in higher education as part of the “linkage strength.”

Table 4

Employment status and share of informal work at time of survey, Chile and Uruguay (%).

Employment status (%)	15–64 year-olds		Recent entrants	
	Chile	Uruguay	Chile	Uruguay
Employed (without students)				
All / Women / Men	58 / 48 / 69	64 / 55 / 73	37 / 33 / 42	36 / 30 / 41
(thereof % informal work)	(29 / 28 / 29)	(24 / 24 / 24)	(21 / 20 / 22)	(24 / 19 / 28)
Unemployed (but employed before)				
All / Women / Men	7 / 8 / 6	4 / 4 / 3	7 / 6 / 7	4 / 4 / 5
Inactive (but employed before)				
All / Women / Men	11 / 18 / 4	12 / 17 / 6	5 / 8 / 2	4 / 6 / 2
Never employed				
All / Women / Men	6 / 9 / 3	4 / 5 / 3	6 / 7 / 4	6 / 7 / 5
Full-time/part-time students				
All / Women / Men	18 / 17 / 19	17 / 18 / 15	46 / 45 / 46	50 / 52 / 47
(thereof % students working, all)	(19)	(37)	(16)	(30)
Population of the linkage strength analysis				
% of employed on the non-student population ^{a)}	71 / 58 / 85	77 / 67 / 86	69 / 60 / 78	72 / 63 / 77
Number of observations (individuals) included	202,982	253,631	46,884	38,175

Notes: ^{a)} Calculation: % employed / (100 % – % students). Recent entrants are defined as employed individuals who are no more than 10 years above the normal school-leaving age for someone with their level of education.

Sources: CASEN (2015, 2017) and ECH (2012–2016), own calculations.

strength for employed tertiary graduates in both LA countries, we may be underestimating the linkage strength for them.

These figures imply that our linkage strength analysis captures 71 % (69 %) in Chile and 77 % (72 %) in Uruguay of the “at-risk” population aged 15–64 (recent entrants) and is based on sample sizes of 202,982 (46,884) workers for Chile and 253,631 (38,175) workers for Uruguay (see Table 4). These subsamples are larger than the minimum of 20,000 needed to calculate the linkage strength (DiPrete et al., 2017). In both countries, there are considerable gender differences in employment status, but only small differences in informal work (see Table 4). Thus, more men than women are included in our analysis of linkage strength.

4.2. Linkage strength measure

The idea of the linkage strength is to capture how predictive educational credentials (defined by level and/or field of education) are for one’s occupational job placement – that is, the higher M , the more workers with shared education g cluster into relatively few occupations j . The linkage strength approach, developed by DiPrete et al. (2017) and Elbers et al. (2021), applies Mora and Ruiz-Castillo’s (2011) mutual information index M to the education-occupation nexus. The linkage strength M is derived from Thiel’s entropy by quantifying the uncertainty in the educational distribution, measuring the reduction of this uncertainty about a person’s education when their occupation j is observed (DiPrete et al., 2017: 1882). Linkage scores M (also called local linkage strength) can be calculated for each combination of education level/field and minor/major occupational group of interest, using Equations 1 and 2 (Bol et al., 2019: 284).

Equation 1: Local linkage strength M for one educational cell

$$M(ed)_g = \sum_j P_{j|g} \log \left(\frac{P_{j|g}}{P_j} \right)$$

Equation 2: Linkage strength M for multiple education cells weighed by proportions of the cells

$$M = \sum_g P_g M(ed)_g$$

with $P_{j|g}$ = conditional probability of working in occupation j given that one is in educational outcome g , P_j = unconditional probability of working in occupation j , and P_g = unconditional probability of being in education cell g .

Following DiPrete et al. (2017), we only consider occupational and educational categories with at least 100 cases. We regrouped categories where necessary to meet this threshold, using the same categories as DiPrete et al. (2017). We have harmonized the educational and occupational groups across the countries as much as possible to facilitate comparisons across countries (see Appendix, Table A3).

To examine where the linkage strength difference between Chile and Uruguay originates, we use the method of Elbers et al. (2021); see also Lu et al., (2024) to decompose the total linkage strength into two compositional components (i.e., differences in the educational and occupational margins) and an associational component (i.e., differences in the margin-free strength of the education-occupation associations). The decomposition approach is based on the idea that odds ratios (as measure of association) of the contingency table do not change when transforming the margins. Therefore, iterative proportional fitting (IPF) is used to obtain counterfactual matrices with identical margins (Elbers et al., 2021). Thus, $M(\text{CL})$ and $M(\text{UR})$ are the observed linkage in Chile and Uruguay. $M(\text{CL}^*)$ is the adjusted linkage in Chile in such a way that the margins are equal to the values in Uruguay; thus, it is the counterfactual linkage to $M(\text{UR})$ – with $M(\text{UR})$ and $M(\text{CL}^*)$ differing only in their association structure (i.e., the odds ratios). The same can be calculated for $M(\text{UR}^*)$ to be the counterfactual linkage to $M(\text{CL})$. Estimates for the contributions of the compositional and associational differences are obtained by Shapley decompositions using fully cross-country harmonized level-field cells (Elbers et al., 2021).

4.3. Variables

Both datasets provide information on the highest educational attainment and the current occupational position. *Educational attainment* is classified according to the International Classification of Education 1997 (ISCED 1997) (UNESCO, 2006). We use the highest educational degree completed and its respected educational field (measured by 24 two-digit field groups). For *occupational placement*, we take the job at interview and use the International Standard Classification of Occupations (ISCO) of 1988 (ILO, 1991). Major occupational groups are defined by the 1-digit ISCO code (see Table 3), and detailed occupational groups by the 3-digit ISCO code. Following the ILO definition, we consider as “workers” all those who had a paid job in the last week. In view of the reality in LA countries, we include informal work, in contrast to the linkage strength analyses for France, Germany and the US (DiPrete et al., 2017).

To explore whether strong linkages are positive or “traps” in more precarious jobs, we examine the association between the linkage strength and job quality, using informality of employment and earnings at the time of survey as indicators. For Chile, we define *informal employment* using the survey questions “Have you signed a contract in this job?” for dependent workers. For informality of the self-employed, we follow the definition of the Ministerio de Desarrollo Social (2021), that is, we use the 1-digit ISCO group excluding professionals, technicians and all those in managerial positions. For Uruguay, we use the survey question “Does your job contribute to the pension/retirement fund?” (question f82, own translation). Discenza et al. (2023) have shown that these questions provide reliable measures of informal work using surveys. This is also indicated by the fact that the incidence of informal work in the datasets used (see Table 4) closely resembles the official statistics (see Table 2).

We only have information on monthly gross *earnings* in the data,

which may differ due to hours worked. We refrain from focusing only on full-time workers, as this would be selective, since part-time work is a reality, especially for women. We do, however, control for weekly hours worked (the only information available in the data).

5. Results

We start with a cross table of occupational destinations by educational levels to get a first impression of the education-occupation association in STWT pathways in Chile and Uruguay. Table 5 shows that, contrary to the above-mentioned fear of overeducation (see Section 3), young workers with a general tertiary education (ISCED 5 A/6) are almost exclusively able to enter high-skilled jobs, while those with less than upper secondary degrees are much more likely to end up in low-skilled jobs. Workers with upper secondary degrees (as their highest educational attainment) are largely protected against low-skilled jobs – less so in Chile than in Uruguay (where upper secondary degrees are much less common), but in Chile more so for those with vocational (ISCED 3B) than general (ISCED 3 A) education degree. This pattern is very similar to that found in European and North American countries (Shavit & Müller, 1998). The question, however, is whether this educational sorting results from strong education-occupation linkages.

Table 6 shows the local linkage strengths for different levels of occupational and educational groups and, as the sum of all local scores, the total linkage strength (which thus includes both levels and fields of education) (see DiPrete et al., 2017). Since the absolute values are not comparable across countries (see Section 2), we use the relative contributions of the four local linkage strengths to total M (see % in Table 6).

The local linkage strengths A and B represent the vertical linkage strength during STWTs (i.e., only the association between educational level and occupational destinations or how predictive educational level is for occupational placement). This vertical linkage accounts already for (more than) half of the total linkage strength in the US (57 %) and Uruguay (51 %). Its contribution is smaller but still very substantial in the other countries (43 %, 40 % and 33 %, respectively).

The local linkage strengths C and D include the fields of education. Educational fields are important for labor market sorting in all countries – despite the high share of informal employment in Chile and Uruguay. They are more important in Chile (56 %) than in Uruguay (49 %), and in both countries more than in the US (43 %), but less than in France (60 %) and especially in Germany (68 %). Finally, the ratio of the total linkage strength for recent vs. all workers indicates that educational sorting is higher for more recent cohorts in all countries.

To better understand the origins of the country differences in the total linkage strength M – that is, whether the high contribution of D in Chile originates from occupation specificity of educational credentials

Table 6

Local and total linkage strengths M from educational levels and fields of recent labor market entrants, by country.

	Chile	Uruguay	France	Germany	USA
Number of educational categories	59	54	54	42	63
Number of occupational categories	56	65	90	90	90
Local linkage strengths					
A: Major occupational groups by educational levels	.391 (39 %)	.410 (44 %)	.330 (32 %)	.322 (25 %)	.252 (44 %)
B: Detailed occupations within major occupational groups by educational levels	.045 (5 %)	.070 (7 %)	.085 (8 %)	.098 (8 %)	.073 (13 %)
C: Fields of study within educational levels by major occupational groups	.113 (11 %)	.110 (12 %)	.215 (21 %)	.320 (25 %)	.040 (7 %)
D: Fields of study within educational levels by detailed occupations within major occupational groups	.441 (45 %)	.350 (37 %)	.399 (39 %)	.558 (43 %)	.204 (36 %)
Total linkage strength	.990 (100 %)	.940 (100 %)	1.028 (100 %)	1.299 (100 %)	.569 (100 %)
Ratio: Total linkage strength of recent vs. all workers	1.39	1.43	1.37	1.33	1.25
N	46,884	38,175	45,608	29,867	279,454

Notes: In parenthesis, relative contributions to the total linkage strength.

Sources: CASEN (2015, 2017) and ECH (2012–2016), own calculations. Figures for France (2005–2012), Germany (2006), and United States (2004–2012) taken from DiPrete et al. (2017, Table 4 (In Table 4 by DiPrete et al. (2017), the column labels for B and C are mixed up, as can be seen in Fig. 1 (DiPrete et al., 2017). We use the corrected assignment.)).

and whether the higher contribution of educational levels (A+B) in Uruguay originates from the high share of low-qualified workers –, we decomposed M by four major educational groups. This also allows us to distinguish between general and vocational education. Fig. 1 presents the results as relative contributions to M (in %). Since M is not margin-free, it is also instructive for interpretation to compare these contributions to the population shares of the respective educational levels (see Table 1).

There are clear country differences: In Chile and Uruguay, about half of the linkage strength comes from tertiary education (5 A/6), while in

Table 5

Education-occupation mobility of recent labor market entrants, Chile and Uruguay (row %).

Formal qualification (Highest level of education attained)	Chile			Uruguay		
	Occupational position			Occupational position		
	Low-skilled	Skilled	High-skilled	Low-skilled	Skilled	High-skilled
Less than upper secondary education						
0–1				53	46	2
2 A/B	43	54	3	31	64	4
Upper secondary education						
3 B (VOC)	19	71	10	12	72	16
3 A	27	66	7	12	73	15
Tertiary education						
5 B (VOC)	6	47	47	3	49	48
5 A/6	2	15	83	1	17	83

Notes: Formal qualification and occupational position measured at time of survey. Low-skilled (ISCO 9), skilled (ISCO 4–8), high-skilled (ISCO 1–3), see Table 3. Differences to 100 % due to rounding.

Sources: CASEN (2015, 2017) and ECH (2012–2016), own calculations.

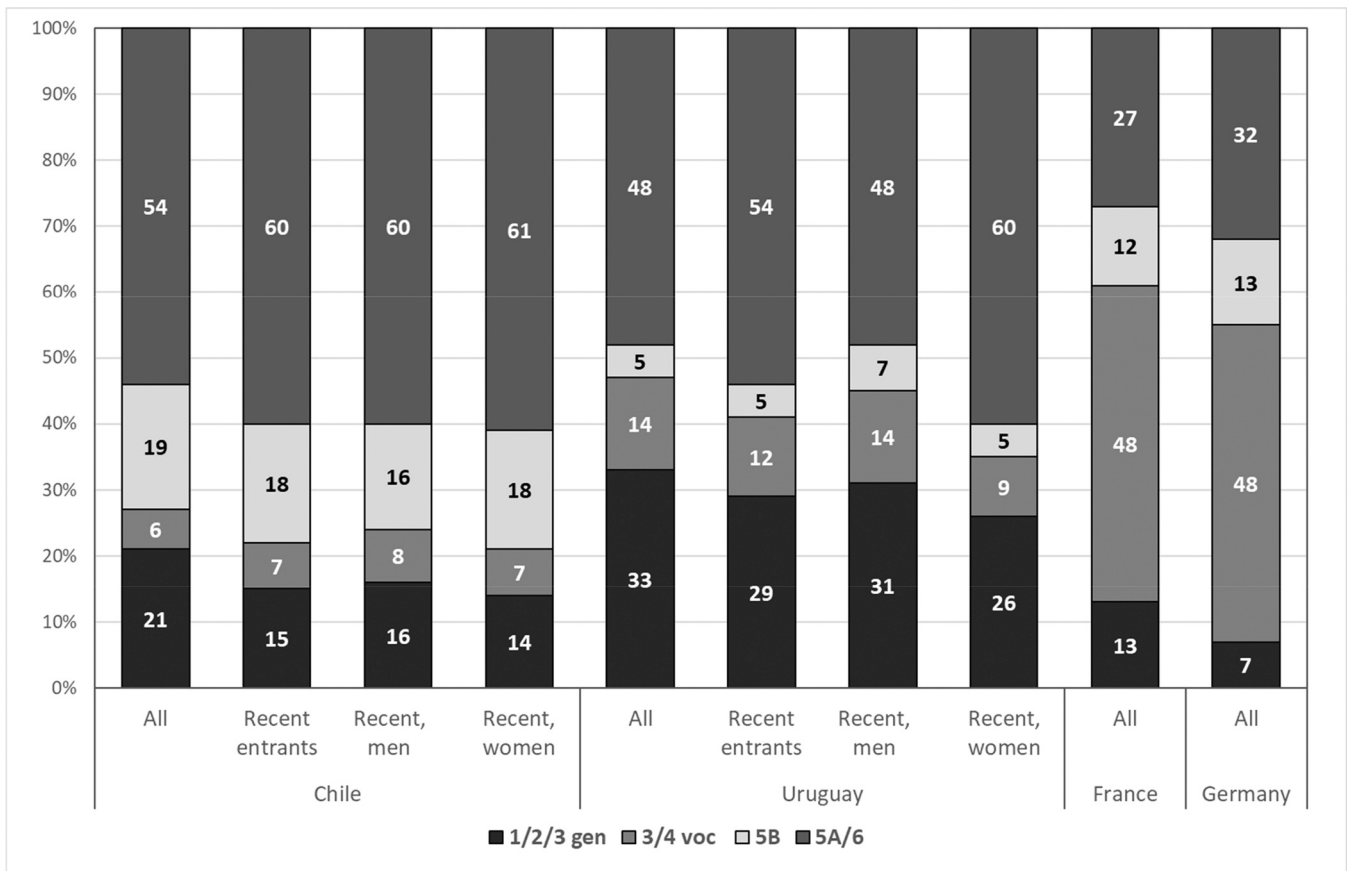


Fig. 1. Decomposition of total linkage strength M by ISCED levels, relative contributions (in %). *Notes:* Relative contributions of total linkage strengths of level-field combinations, decomposed by 4 educational level groups. “All” = workers aged 15–64. gen = general, voc = vocational.

Sources: CASEN (2015, 2017) and ECH (2012–2016), own calculations. Figures for France (2010) and Germany (2010) taken from Elbers et al. (2021, Figure 3).

France and Germany tertiary education contributes only about a third – although they all have comparable proportions of tertiary-educated workers aged 15–64 (ranging from 11 % in Uruguay to 19 % in France), which are smaller than their M contribution. However, in Germany and France, a higher proportion of workers with ISCED 5 A/6 have MA degrees, while in Chile and Uruguay, they mostly have BA degrees (see Table 3). The higher over-proportional contribution in Chile and Uruguay therefore suggests that BA degrees tend to be more occupation-specific. For recent entrants, the contribution of ISCED 5 A/6 is higher in Chile and Uruguay, mainly due to an increase in the share of tertiary-educated entrants (to 32 % and 20 % respectively). Vocational tertiary education has also an over-proportional contribution to M : In Chile, it is twice as high as its population share; in Uruguay, the contribution is much smaller, but several times higher than the share of workers with ISCED 5B.

The much higher share of lower/upper secondary *general* education (ISCED 1–3 gen) in Chile (59 %) and Uruguay (76 %) among all workers than in France (36 %) and Germany (16 %) is also visible in its contribution to M : Its contribution is higher in the two LA countries, especially in Uruguay (33 % for “all” and 29 % for “recent”) – but much lower than their population shares would suggest. Thus, this high contribution in Chile and especially in Uruguay is not only due to high population shares, but also to the fact that even low levels of education are often associated with clear occupational destinations – and not only tertiary education, as in France and Germany. Contrary to the argument used to explain the high linkage of vocational (occupation-specific) education (Elbers et al., 2021), this high sorting power of low educational levels is not due to occupational closure or “entitlement” (because of the type of education) – but rather seems to be due to the limited set of occupations

in the low-skilled sector. For example, 43 % respective 40 % of low-qualified workers (ISCED 0–2) in Chile and Uruguay working in low-skilled jobs are spread over only six 3-digit ISCO groups (see Appendix, Table A3) – of which 38 % in Chile and 23 % in Uruguay work in agricultural occupations (ISCO 921) and 18 % (17%) and 26 % (23%) respectively as low-skilled manufacturing (or transport) workers (ISCO 932, 933).

Conversely, upper secondary *vocational* education (ISCED 3/4 voc) contributes much less to M in Chile and Uruguay than in France and Germany, where it is the largest contributor to the country’s linkage strength (and larger than its population share). In Uruguay, this relative contribution corresponds more or less to the shares in the educational distribution (see Table 1), but it is lower in Chile (with rather similar population share). Thus, in contrast to France and Germany, general secondary education generates stronger education-occupation linkages than vocational education.

In sum, the total linkage strength M originates mainly from tertiary degrees in the two LA countries – more so in Chile than in Uruguay – and also from lower education, especially in Uruguay. Looking at gender differences, we see that in Chile, tertiary education generates stronger linkages for men than for women: Despite the lower share of men with general tertiary education, ISCED 5 A/6 contributes as much to M as the larger group of their female counterparts. In Uruguay, by contrast, the contribution of general tertiary education is higher for women than for men, while the contribution of lower/upper secondary education is higher for men – both corresponding to the gender difference in educational attainment.

Next, we directly examine where the differences between Chile and Uruguay in the total linkage strength M result from: differences in the

marginal distributions or from differences in the education-occupation association? We apply the decomposition method of Elbers et al. (2021). Positive values in Table 7 indicate that the Chilean component is lower than the Uruguayan component, and vice versa.

The higher M in Chile than in Uruguay (by -0.13) is mainly due to differences in the educational distributions (-0.12), with Uruguay having a much high share of adults with low levels of educational attainment than Chile (see Table 3). Differences in the occupational margins and the associational component do not seem to matter. However, this overall finding has to be qualified. We do find an impact of the occupational margins when separating men and women. For women, the occupational margin contribution is larger in Chile (because they work more in semi-/professional jobs), while for men it is larger in Uruguay (because they work more in low-skilled jobs) – these opposite directions offset each other to a zero difference for all workers.⁶

Thus, in contrast to the French-German comparison for 2010 by Elbers et al. (2021), where two-thirds of the country differences are explained by associational differences and the rest by differences in educational margins, the differences between Chile and Uruguay are explained only by differences in their educational margins and gender differences in their occupational margins – consistent with the differences presented in Section 3. Hence, the individual educational credentials are equally strongly or weakly related to occupational destinations in both countries. This implies that the countries' education systems and their labor market institutions operate similarly with respect to educational sorting and occupation specificity.

Finally, we examine whether strong education-occupation linkages are associated with better job quality – higher earnings and lower risk of informal work – in Chile and Uruguay, as it is for earnings in France, Germany, and the US (Bol et al., 2019). We use regressions with fixed effects for the 1-digit educational fields (see Table 1), to mitigate to some extent unobserved selection into education, and several control variables (see notes below Tables 8 and 9). These analyses, however, are exploratory due to substantial item non-response (for in/formal employment status, item non-response is 30 % in Chile but only 1 % in Uruguay; for monthly earnings, it is high in both at 45 % and 42 % respectively). M estimates are based on 31 field-level cells with at least 100 respondents in Chile and 45 field-level cells in Uruguay. We regrouped cells with fewer than 100 respondents into broader cells.

As discussed in Section 3, the influence of informal employment can operate in both directions: Informal employment may (or may not) preclude strong linkages, or strong linkages may protect against (or increase) informal employment. Table 8 shows that level of education is strongly associated with informal work in both countries: Low-qualified recent entrants (ISCED 0–2) are significantly more likely to work in

informal (as opposed to formal) jobs than those with higher education (ISCED 3 and 5/6). This applies equally to male and female young workers (see Appendix, Table A4). Vocational education is associated with a higher risk of informal employment, but only for those with tertiary degrees (i.e. mainly with ISCED 5B). Finally, and importantly, a higher linkage strength M correlates strongly with informal employment, but only for the low-qualified entrants in Uruguay – by about 13 percentage points for a change of one standard deviation ($=1.096 \cdot SD(0.13)$) – and this more so for men than for women (see Appendix, Table A4). Again, this suggests that for low-qualified young adults, strong education-occupation linkages to agricultural and low-skilled occupations are “traps” rather than indicating occupational closure.

Table 9 shows the regression results for log gross monthly earnings. Similar to the comparison countries (see Bol et al., 2019), level of education is strongly associated with earnings in Chile and Uruguay. Tertiary-educated entrants earn about 68 % ($\exp(0.519)-1$) more than those with less than upper secondary education in Chile and 104 % ($\exp(0.711)-1$) more in Uruguay. The difference between low-qualified workers (ISCED 0–2) and those with upper secondary education (ISCED 3) is smaller, but still significant and notable: 17 % in Chile and 29 % in Uruguay. Earnings differences by educational level are similar for men and women (see Appendix, Table A5). Vocational education is associated with considerably lower earnings than general education – more so in Chile (by 38 %) than in Uruguay (15 %). Finally, there are strong country differences concerning the impact of M . In Chile, stronger linkages are associated with slightly higher earnings, but only for tertiary-educated entrants (4 % for a change of one standard deviation $= \exp(0.067 \cdot SD(0.54))-1$). In Uruguay, by contrast, stronger linkages correlate with significantly lower earnings for low-qualified entrants (15 % $= \exp(-1.222 \cdot 0.13)-1$) and for tertiary-educated entrants (9 % $= \exp(-0.183 \cdot 0.53)-1$) – but only for men, not for women (see Appendix, Table A5).

In conclusion, strong linkages are beneficial in terms of higher earnings for tertiary-educated entrants in Chile, similar to France and the US (Bol et al., 2019). In contrast, Uruguay demonstrates that strong education-occupation linkages are not per se beneficial: Low-qualified entrants are doubly disadvantaged (higher informal employment and lower earnings). For tertiary-educated entrants, strong linking educational credentials tend to be “traps” in relatively lower-paid jobs – but these lower earnings are not generated by higher risks of informal employment (see Table 8) or lower shares of working in high-skilled occupations (see Table 5).

6. Summary and conclusions

Research for Europe and North America has used strong education-occupation linkages as indicators of success in STWTs (Bol et al., 2019; Lu et al., 2024). We investigated the education-occupation nexus in STWTs for Chile and Uruguay, and compared them with findings for France, Germany, and the US, applying the linkage strength approach (DiPrete et al., 2017). STWTs in Chile and Uruguay face challenges that are also common to other LA countries: Both countries (albeit high-income countries) have high shares of informal work and of low-skilled jobs, and a greater need for young adults to start working more quickly due to economic strain and poverty. However, the two countries differ greatly in their educational distribution: Chile has a much higher level of educational attainment than Uruguay, very similar to the three comparison countries, while about half of young Uruguayans are still low-qualified (i.e., they have *not* completed at least upper secondary education).

Given these challenges, country differences, and what we know so far from the comparison countries, we examined how these countries differ in their STWT pathways, as indicated by the education-occupation nexus at labor market entry. The linkage strength approach also addresses the question of occupational closure or occupational specificity of educational qualifications (Bol et al., 2019; DiPrete et al., 2017). This is also

Table 7

Decomposition of the differences in the total linkage strength M of Chile vs. Uruguay, recent labor market entrants.

	All	Women	Men
M Chile	0.88	0.95	0.78
M Uruguay	0.76	0.90	0.57
Difference in M	−0.13	−0.05	−0.21
Contributions			
Occupational margins	−0.01	0.10	−0.09
Educational margins	−0.12	−0.13	−0.11
(Margin-free) education-occupation association	−0.00	−0.03	−0.00

Notes: M calculations based on 27 fully harmonized field-level cells for both countries. Difference between “Difference in M ” and sum of “Contributions” are due to rounding.

Sources: CASEN (2015, 2017) and ECH (2012–2016), own calculations.

⁶ Country differences in education-occupation associations are very small or non-existent (see Appendix, Figure A1).

Table 8

LPM for informal work of recent labor market entrants, Chile and Uruguay.

	Chile ^{a)}			Uruguay			
	All	ISCED 3	ISCED 5/6	All	ISCED 0–2	ISCED 3	ISCED 5/6
Linkage strength <i>M</i>	–.005 (.007)	–.031 (.128)	.004 (.006)	.139 ** (.009)	1.096 ** (0.0303)	–.049 (.029)	.015 (.010)
Vocational education (ref.: general)	.023 ** (.006)	–.019 (.065)	.034 ** (.006)	.042 ** (.009)		.003 (.012)	.049 ** (.012)
Educational level (ref.: less than upper secondary education/ISCED 0–2)							
Upper secondary education (ISCED 3)	–.194 ** (.012)			–.168 ** (.006)			
Tertiary education (ISCED 5/6)	–.277 ** (.014)			–.336 ** (.014)			
Control variables	Yes			Yes			
R ²	.065	.005	.010	.127	.082	.026	.006
N	32,582	15,557	15,354	37,784	19,003	9754	9027

Notes: Linear probability models, including fixed effects for 1-digit ISCED educational fields. Control variables included are gender, age, public/privat secondary school attendance (as SES indicator), region, and indigenous ancestry. Standard errors in parentheses.

** $p < 0.01$, * $p < 0.05$ (two-tailed tests).

a) Chilean sub-sample of ISCED 0–2 is too small for a separate estimation.

M Chile based on 31 field*level cells, SD of *M* (standard deviation): 0.66 (all) / 0.12 (ISCED 3) / 0.54 (ISCED 5/6).

M Uruguay based on 45 field*level cells, SD of *M*: 0.77 / 0.13 (ISCED 0–2) / 0.33 / 0.53.

Sources: CASEN (2015, 2017) and ECH (2012–2016), own calculations.

Table 9

Regression on log gross monthly earnings (dollars) of recent labor market entrants, Chile and Uruguay.

	Chile ^{a)}			Uruguay			
	All	ISCED 3	ISCED 5/6	All	ISCED 0–2	ISCED 3	ISCED 5/6
Linkage strength <i>M</i>	.112 ** (.010)	.039 (.139)	.067 ** (.012)	–.059 ** (.020)	–1.222 ** (.063)	.065 (.075)	–.183 ** (.042)
Vocational education (ref.: general)	–.483 ** (.009)	–.031 (.0702)	–.541 ** (.012)	–.165 ** (.022)	–	–.014 (.030)	–.498 ** (.052)
Educational level (ref.: less than upper secondary education/ISCED 0–2)							
Upper secondary education (ISCED 3)	.155 ** (.017)			.257 ** (.015)			
Tertiary education (ISCED 5/6)	.519 ** (.021)			.711 ** (.033)			
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ²	.428	.194	.344	.398	.330	.219	.244
N	25,564	12,152	12,239	22,046	11,111	5621	5314

Notes: OLS regressions, including fixed effects for 1-digit ISCED educational fields. Control variables included are weekly hours worked, gender, age, public/privat secondary school attendance (as SES indicator), region, and indigenous ancestry. Standard errors in parentheses.

** $p < 0.01$, * $p < 0.05$ (two-tailed tests).

a) Chilean sub-sample of ISCED 0–2 is too small for a separate estimation.

M Chile based on 31 field*level cells, SD of *M* (standard deviation): 0.66 (all) / 0.12 (ISCED 3) / 0.54 (ISCED 5/6).

M Uruguay based on 45 field*level cells, SD of *M*: 0.77 / 0.13 (ISCED 0–2) / 0.33 / 0.53.

Sources: CASEN (2015, 2017) and ECH (2012–2016), own calculations.

important for our study, as Chile and Uruguay have expanded their vocational education, which is known to generate high linkage strength in Germany and France (Elbers et al., 2021). Finally, in the three comparison countries, stronger linkages are associated with better jobs in terms of higher wages (Bol et al., 2019). However, this may not be the case for Chile and Uruguay, given the high share of informal employment in both countries and of low-qualified young workers in Uruguay.

Our analyses showed that in Chile and Uruguay, the linkage strength is markedly higher for recent cohorts than for the entire working-age population, suggesting that more young people are experiencing education-occupation matches today – akin to trends in Europe and North America (DiPrete et al., 2017; Elbers et al., 2021). However, in both LA countries, education-occupation linkages are strong not only at higher levels of education, but also at lower levels of education – in contrast to France, Germany, and the US. Moreover, despite the growing importance of vocational education in Chile and Uruguay, general education credentials provide stronger occupational linkages than vocational programs, unlike in France and especially in Germany. A closer look revealed that in the two LA countries, it is the economic (occupational) structure (as occupational destinations) rather than the field of

education (and thus occupation-specific skills) that generates strong education-occupation linkages, especially for low-qualified workers.

Moreover, our results for Chile and Uruguay showed that informal employment per se does not seem to function differently from formal employment in terms of the education-occupation linkage in STWTs, challenging conclusions drawn from studies that focus only on countries with high shares of informal employment (e.g., Herrera-Idárraga et al., 2015). Controlling for educational attainment (which is strongly associated with the risk of informal employment), informal employment does not correlate with a weaker linkage strength. In contrast, it is even associated with a higher linkage strength for low-qualified young workers in Uruguay.

Regarding earnings, vocational programs at the tertiary level (ISCED 5B) are associated with lower wages than general tertiary education in both LA countries, as in France, Germany, and the US (Bol et al., 2019). At the same time, we found that educational sorting into occupations can have opposite effects: Stronger linkages are associated with higher earnings among tertiary-educated entrants in Chile, but with lower earnings in Uruguay. The same is true for low-qualified entrants in Uruguay. The Uruguayan results suggest that stronger linkages at both

the low and high ends of the educational distribution can generate “traps” in low(er) paying jobs – challenging the positive interpretation drawn from the three comparison countries.

In conclusion, our study shows that the linkage strength approach is fruitful for studying and comparing STWTs between LA countries as well as with Europe and North America. The patterns of linkage strength are not as different across the different world regions: Chile’s and Uruguay’s patterns are in some aspects closer to France and Germany than the US is to either European country. Moreover, gender differences are mainly due to women’s higher educational attainment and gender-segregated labor markets, rather than due to differences in the strength of the education-occupation associations.

Our findings have some policy implications. Early school leaving is the major problem for successful STWTs in Uruguay: the share of low-qualified recent entrants is still very high and, as we have shown, the high linkage strength for low qualifications operates as a “linkage trap” into low-skilled jobs. Reducing early school leaving should therefore be given high priority. Such an increase in educational attainment will only improve STWTs at the societal level if occupational destinations are attractive. Thus, further economic development is needed to reduce the higher prevalence of low-skilled jobs in Chile and Uruguay compared to the comparison countries. In addition, in view of the high stock of low-qualified young adults already in the labor market, adult education and

training should also be intensified. Finally, while tertiary vocational programs are successful in channeling young workers into matching occupations, they are less attractive because they are associated with lower earnings and a higher risk of informal employment. Efforts should therefore be made to improve their wages and contractual conditions.

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CRediT authorship contribution statement

Heike Solga: Writing – original draft, Methodology, Investigation, Conceptualization. **Agustina Marques Hill:** Writing – review & editing, Methodology, Investigation, Formal analysis, Data curation.

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Appendix

Table A1
Education system of Chile and Uruguay

Levels	ISCED 1997	Age	Chile	Uruguay
Early childhood education	0	0 1 2 3 4 5	Nursery Middle Level Transition Level	Early childhood education Kindergarten
Primary education	1	6 7 8 9 10 11	Primary ISCED 1/2 A	Primary ISCED 1
Lower Secondary	2	12 13 14		Lower secondary vocational ISCED 2B Lower secondary general ISCED 2 A
Upper Secondary	3	15 16 17	Technical-professional ISCED 3B	Humanistic-scientific ISCED 3 A Technical-professional ISCED 3B General upper secondary ISCED 3 A
Tertiary education	5–6	18 19 20 21 22 23 24 25 +	Technical training centers (CFT) ISCED 5B Professional Institutes (IP) ISCED 5B Postgraduate, Master, Doctorate ISCED 6	Bachelor programs (4 years), Professional ISCED 5 A Technical programs ISCED 5B Bachelor programs (4 years) Professional ISCED 5 A Teacher education ISCED 5 A Postgraduate, Master, Doctorate ISCED 6

Notes: (a) Technical education (Educación Técnica, Técnico-Profesional) is the common denomination for vocational education in Spanish in Latin America. (b) We illustrate the different types of education (vocational and general) with different columns, but certificates of both vocational and academic secondary education entitle to continue tertiary education (any type) in Chile and Uruguay.

Source: Own arrangement based on [Jornitz and Parreira do Amaral \(2021: 391, 1155\)](#).

Table A2

Educational attainment of recent labor market entrants, by gender and country (column %)

Highest level of education attained	Chile			Uruguay		
	Total	Women	Men	Total	Women	Men
Less than upper secondary education	4	2	5	51	37	61
0–1	–	–	–	20	11	26
2 A-B	4	2	5	31	26	34
Upper secondary education	52	45	58	26	28	24
3 B/C (VOC)	16	16	17	13	13	13
5 A	36	29	41	13	16	12
Tertiary education^{a)}	44	54	37	24	35	15
5 B (VOC)	13	16	10	4	4	3
5 A	28	34	23	16	25	9
6	4	4	3	4	6	3
N	38,945	17,199	21,986	37,799	16,987	20,806

Notes: ISCED 1997. ^{a)} MA degrees are included in ISCED 6. “Recent labor market entrants” are defined as employed individuals who are no more than 10 years above the normal school-leaving age for someone with their level of education. VOC = vocational programs.

Sources: CASEN (2015, 2017) and ECH (2012–2016) (see [Section 4](#)), own calculations.

Table A3

Occupational categories in Chile and Uruguay, harmonized with France, Germany, US (total and 100 + cases)

Occupational categories	3-digit ISCO-88 (included in DiPrete et al. (2017))	Chile		Uruguay	
		All	100 +	All	100 +
Officials	11				
Legislators	110				
Production/operations department managers	122	+	+	+	
Other department managers	123	+		+	+
General managers	130	+	+	+	
General professionals	200				
Mathematicians, statisticians, related professionals (rel. profess.)	212	+		+	+
Architects, engineers and rel. profess.	214	+	+	+	+
Life science professionals	221	+	+	+	+
Health professionals	222	+	+	+	+
Higher education teaching professionals	231	+	+	+	+
Secondary educational teaching professionals	232	+	+	+	+
Primary/pre-primary teaching professionals	233	+	+	+	+
Other teaching professionals	235	+	+	+	+
Business professionals	241	+	+	+	+
Legal professionals	242	+	+	+	+
Archivists, librarians and information professionals	243	+		+	+
Social science and rel. profess.	244	+	+	+	+
Writers and creative or performing arts	245	+	+	+	+
Religious professions	246	+		+	
Physical and engineering science technicians	311	+	+	+	+
Computer associated professions	312	+	+	+	+
Optical and electronic equipment operators	313	+	+	+	+
Ship and aircraft controllers and technicians	314	+		+	
Life science technicians and rel. profess.	321	+		+	+
Modern health associate professionals	322	+	+	+	+
Nursing and midwifery associate professionals	323	+	+	+	+
Teaching associate professionals	330	+	+		
Other teaching associate professionals	334				
Finance sales associate professionals	341	+	+	+	
Business services agents and trade brokers	342			+	+
Administrative associate professionals	343	+	+	+	+
Customs, tax, related government associate profess.	344	+	+	+	
Police inspectors and detectives	345			+	
Social work associate professionals	346	+		+	+
Artistic, entertainment, sports associate profess.	347	+	+	+	+
Religious associate professionals	348	+		+	
Office clerks	410	+	+	+	+
Numerical clerks	412	+	+	+	+
Material recordings and transport clerks	413	+		+	+
Library, mail and related clerks	414	+	+	+	+
Other office clerks	419	+	+	+	+
Cashiers, tellers and related clerks	421	+	+	+	+
Client information clerks	422	+	+	+	+
Personal and protective service workers	510	+	+	+	+
Housekeeping and restaurant service workers	512	+	+	+	+
Personal care and related workers	513	+	+	+	+
Other personal service workers	514	+	+	+	+

(continued on next page)

Table A3 (continued)

Occupational categories	3-digit ISCO-88 (included in DiPrete et al. (2017))	Chile		Uruguay	
		All	100 +	All	100 +
Protective service workers	516	+	+	+	+
Models, salespersons and demonstrators	520	+	+	+	+
Market-oriented skilled agricultural/fishery workers	610	+	+	+	+
Market-oriented animal producers, related workers	612	+	+	+	+
Market-oriented crop and animal producers	613	+		+	
Craft and related trade workers	700	+			
Building frame and related trade workers	712	+	+	+	+
Buildings finishers and related trades workers	713	+	+	+	+
Painters, building structure cleaners, related trades	714	+	+	+	+
Metal, machinery and related trades workers	720	+	+	+	+
Blacksmiths, tool-makers, related trades workers	722	+		+	+
Machinery mechanics and fitters	723	+	+	+	+
Electrical/electronic equipment mechanics, fitters	724	+	+	+	+
Precision handcraft printing, related trades workers	730	+		+	
Potters, glass-makers, related trades workers	732	+		+	+
Printing and related trades workers	734	+		+	+
Other craft and related trades workers	740			+	+
Wood traders, cabinet-makers, related trades workers	742	+	+	+	+
Textile, garment, related trades workers	743	+	+	+	+
Pelt/leather/shoemaking trades workers	744	+		+	+
Plant and machine operators and assemblers	800	+	+	+	
Metal-processing plant operators	812	+		+	
Glass, ceramics, related plant operators	813	+		+	
Chemical processing plant operators	815	+		+	
Power production and related plant operators	816	+			
Machine operators and assemblers	820	+	+	+	+
Chemical products machine operators	822	+		+	
Rubber and plastic products machine operators	823	+		+	
Textile, fur, leather products machine operators	826	+		+	+
Food and related products machine operators	827	+	+	+	+
Assemblers	828	+		+	
Locomotive engine drivers and related workers	831	+		+	
Motor-vehicle drivers	832	+	+	+	+
Agricultural and others mobile plant operators	833	+	+	+	+
Ships' deck crews and related workers	834	+		+	
Sales and services elementary occupations	910	+	+	+	+
Domestic and related helpers, cleaners, launderers	913	+	+	+	+
Buildings caretakers, window, related cleaners	914	+	+	+	+
Garbage collectors related laborers	916	+		+	+
Agricultural, fishery, and related laborers	921	+	+	+	+
Manufacturing laborers	932	+	+	+	+
Transport laborers, freight handlers	933	+	+	+	+
Missing	999	+	+	+	+
Total	90	86	56	84	65

Sources: Own calculations, CASEN (2015, 2017) and ECH (2012–2016). DiPrete et al. (2017: 1930f).

Table A4

LPM for informal work of recent labor market entrants, by gender, Chile and Uruguay

	Chile			Uruguay		
	All	Women	Men	All	Women	Men
Linkage strength <i>M</i>	-.005 (.007)	-.009 (.012)	.004 (.014)	.139 ** (.009)	.051 ** (.011)	.238 ** (.014)
Vocational education (ref.: general)	.023 ** (.006)	.021 * (.009)	.026 ** (.010)	.042 ** (.009)	.007 (.012)	.092 ** (.015)
Educational level (ref.: less than upper secondary education/ISCED 0–2)						
Upper secondary education (ISCED 3)	-.194 ** (.012)	-.254 ** (.022)	-.176 ** (.013)	-.168 ** (.006)	-.177 ** (.009)	-.160 ** (.009)
Tertiary education (ISCED 5/6)	-.277 ** (.014)	-.313 ** (.026)	-.279 ** (.018)	-.336 ** (.014)	-.267 ** (.018)	-.421 ** (.022)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
R ²	.065	.063	.065	.127	.161	.080
N	32,582	14,674	17,908	37,784	16,997	20,807

Notes: Linear probability models, including fixed effects for 1-digit ISCED educational fields. Control variables included are gender (in models “all”), age, public/private secondary school attendance (as SES indicator), region, and indigenous ancestry. Standard errors in parentheses.

** $p < 0.01$, * $p < 0.05$ (two-tailed tests).

M Chile based on 31 field*level cells, SD of *M* (standard deviation): 0.66 (all) / 0.72 (women) / 0.58 (men).

M Uruguay based on 45 field*level cells, SD of *M*: 0.77 / 0.88 / 0.64.

Sources: CASEN (2015, 2017) and ECH (2012–2016), own calculations.

Table A5

Regression on log gross monthly earnings (dollars) of recent labor market entrants, Chile and Uruguay

	Chile			Uruguay		
	All	Women	Men	All	Women	Men
Linkage strength <i>M</i>	.112 ** (.010)	.086 ** (.012)	.140 * * (.015)	-.059 ** (.020)	.031 (.028)	-.164 ** (.030)
Vocational education (ref.: general)	-.483 ** (.009)	-.522 ** (.013)	-.441 ** (.014)	-.165 ** (.022)	-.158 ** (.029)	-.192 ** (.033)
Educational level (ref.: less than upper secondary education/ISCED 0–2)						
Upper secondary education (ISCED 3)	.155 ** (.017)	.162 (.037)	.167 ** (.020)	.257 ** (.015)	.337 ** (.022)	.201 ** (.020)
Tertiary education (ISCED 5/6)	.519 ** (.021)	.514 ** (.042)	.523 ** (.026)	.711 ** (.033)	.685 ** (.046)	.776 ** (.049)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
R ²	.428	.454	.413	.398	.434	.368
N	25,564	11,663	13,901	22,046	9844	12,202

Notes: OLS regressions, including fixed effects for 1-digit ISCED educational fields. Control variables included are weekly hours worked, gender (in models “all”), age, public/privat secondary school attendance (as SES indicator), region, and indigenous ancestry. Standard errors in parentheses.

** $p < 0.01$, * $p < 0.05$ (two-tailed tests).

M Chile based on 31 field*level cells, SD of *M* (standard deviation): 0.66 (all) / 0.72 (women) / 0.58 (men).

M Uruguay based on 45 field*level cells, SD of *M*: 0.77 / 0.88 / 0.64.

Sources: CASEN (2015, 2017) and ECH (2012–2016), own calculations.

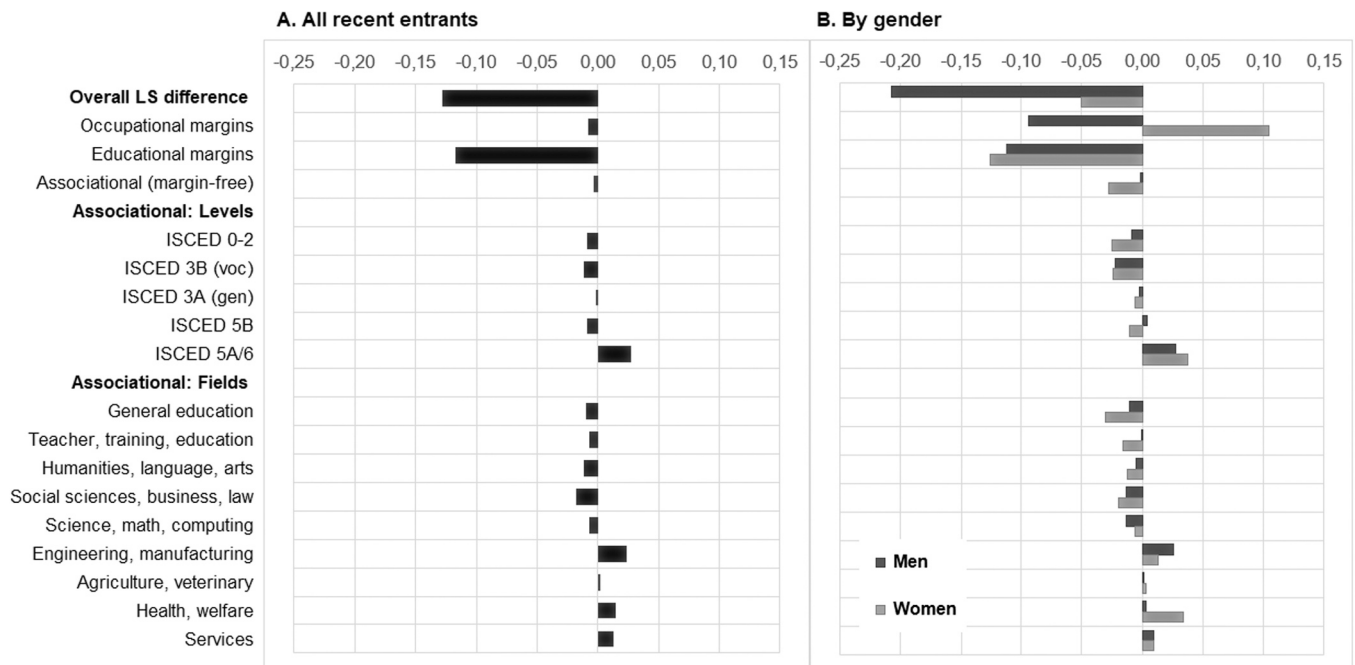


Figure A1. Decomposition of harmonized total linkage strength *M* between countries (Uruguay minus Chile) for recent labor market entrants. Note: *M* calculations based on 27 fully harmonized field-level cells for both countries.

Sources: CASEN (2015, 2017) and ECH (2012–2016), own calculations.

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