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Known for its unequal income distribution, Chile experienced some improvement in this area in the 2000s. This study attempts to identify the contribution of the expansion and diversification of higher education to Chile's wage equalisation from 2000 to 2013. For this purpose, we employ the decomposition method proposed by Firpo, Fortin, and Lemieux (2009), which allows performing the Oaxaca-Blinder decomposition at any unconditional quantile. Our findings show that the positive composition effect of higher education, primarily derived from the increasing share of workers with technical training centre (*centro de formación técnica*, CFT) and postgraduate education, is larger at the upper quantiles of the distribution. However, the negative wage structure effect of higher education, primarily derived from the decreasing return to university education, was substantially larger at the upper quantiles and exceeded the positive composition effect, thereby contributing to the wage equalisation during this period. Indeed, the wage structure effect of higher education explains 27.6% of the reduction in wage gap between the 90th and 10th quantile during this period. Since the increasing supply of CFT graduates was associated with decreasing wage premiums for university education, it is suggested that CFT education has substituted for university education.

Keywords: higher education; wage equalisation; Chile; unconditional quantile regression

JEL classification codes: D31; I21; J31; O15

1. Introduction

This study analyses the evolution of the wage distribution in Chile from 2000 to 2013. Known for its unequal income distribution, Chile experienced some improvement in this area in the 2000s (Parro and Reyes 2017) possibly with the dissemination of higher education. Owing to reforms initiated in 1980, many new private universities and non-university higher education institutions, namely professional institutes (*instituto profesional*, IP) and technical training centres (*centro de formación técnica*, CFT), have been established. Thus, access to higher education has improved substantially.

Although Parro and Reyes (2017) analyse the relative contribution of several components, including years of education, to the decrease in income inequality in Chile from 2000 to 2011, they do not analyse the effects of the diversification of higher education. Therefore, we estimate wage equations using the latest available microdata and decompose the change in wage distribution into the contributions of each explanatory variable including detailed educational achievements. Thereby, we reveal the contribution of the expansion and diversification of higher education to the wage equalisation from 2000 to 2013.

The rest of this article is organized as follows. Section 2 explains the methodology and data used in the analysis, Section 3 presents the results, and Section 4 concludes the paper.

2. Methodology and data

We estimate the wage equations for the years 2000 and 2013, respectively and decompose the evolution of wage distribution into changes attributable to changes in explanatory variables (composition effect) and in the coefficients of explanatory variables (wage structure effect), respectively based on the Oaxaca–Blinder (O-B) decomposition method (Blinder 1973; Oaxaca 1973). Since our focus is on the factors that affect the changes in wages at different points of the wage distribution, we apply the method proposed by Firpo, Fortin, and Lemieux (2009). This method allows performing the O-B decomposition at any unconditional quantile. The basic concept of this method is to replace an observed value of a dependent variable with an estimated value of re-centred influence function (RIF) in the first step, and to estimate an OLS regression of this new dependent variable (unconditional quantile regression) in the second step. This method has been recently applied in studies analysing the evolution of wage distribution in developing countries including the Philippines (Sakellariou 2012) and China (Yang and Gao 2018).

The change in the wage distribution from 2000 to 2013 at a given quantile is decomposed as follows:

$$lnW_{2013}^{q} - lnW_{2000}^{q} = \overline{X'_{2013}}\beta_{2013}^{q} - \overline{X'_{2000}}\beta_{2000}^{q}$$
$$= (\overline{X'_{2013}} - \overline{X'_{2000}})\beta_{2000}^{q} + \overline{X'_{2013}}(\beta_{2013}^{q} - \beta_{2000}^{q}),$$

where q indexes the qth unconditional quantile (10th, 50th, and 90th quantiles); *2013* and *2000* index the years 2013 and 2000, respectively; W is hourly wage (deflated by the national consumer price index [December 2008 = 1] sourced from the Central Bank of Chile); X is a vector of explanatory variables including dummies for educational achievements (primary education or less, some CFT education, some IP/university education, and postgraduate education[1]), years of potential labour experience (age – years of schooling – 6) and its squared term, and other controls (see the note in Table 2); and β is the coefficient of the unconditional quantile regression. The first term on the right-hand side of the equation represents the composition effect while the second term represents the wage structure effect.

The data used for the analysis is sourced from *Encuesta de Caracterización Socioeconómica Nacional* (CASEN), conducted in 2000 and 2013.[2] CASEN is a nationally representative household survey carried out every two or three years from November to December. The data are repeated cross-sectional and the sample size is substantially large for each year included in this study with 252,748 and 218,491 individuals in 2000 and 2013, respectively.[3] We limit the sample to male workers who are employed full-time (more than 40 hours per week) and are aged between 14 to 65 years, excluding self-employed workers and military personnel.

Table 1 reports the descriptive statistics of the dataset. We confirm the expansion of higher education during this period, mainly through CFTs.

Figure 1 presents the estimated kernel densities of the log hourly wages in 2000 and 2013. We observe a shift in the whole wage distribution from left to right, while the wage increase is substantially larger at the bottom of the distribution than at the top, thereby implying wage equalisation during this period.

[Table 1 near here]

[Figure 1 near here]

3. Results

Table 2 reports the estimation results of unconditional quantile regressions in 2000 and 2013. We find that the returns to higher education (CFT, IP/University, and postgraduate education) are larger at the upper quantiles in both years, and decrease substantially across the whole distribution.

Table 3 reports the composition and wage structure effects of each explanatory variable. We find that both composition and wage structure effects of primary education are positive across the whole distribution, reflecting the decreasing share of workers (Table 1) and increasing relative wages (Table 2) in this category. The composition effects of CFT and postgraduate education are positive across the whole distribution and larger at the upper quantiles, while the corresponding wage structure effects are negative across the whole distribution. Since the former effects exceeded the latter and the differences are larger at the upper quantiles, the overall effects of CFT and postgraduate education pushed up wages at the upper quantiles. By contrast, both composition and wage structure effects of IP/university education are negative across the whole distribution and much larger in magnitude at the upper quantiles; thus, the overall effects of IP/university education pushed down the wages at the upper quantiles substantially.

As a result, the total composition effect of higher education is positive and larger at the upper quantiles, which increases wage inequality. On the other hand, the total wage structure effect of higher education is negative and much larger in magnitude at the upper quantiles, which decreases wage inequality. Indeed, the difference in the wage structure effect between the 90th and 10th quantiles indicates a reduction in the wage gap between the two quantiles. The estimation results show that the difference (– 0.086) can explain 27.6% of the total reduction in the wage gap (– 0.310). Moreover, the overall negative wage structure effect of higher education exceeded its overall positive composition effect with much larger differences at upper quantiles. Thus, the expansion and diversification of higher education contributed to the wage equalisation from 2000 to 2013.

[Tables 2–3 near here]

4. Conclusion

This study employed the decomposition method proposed by Firpo, Fortin, and Lemieux (2009) and analysed the contribution of the expansion and diversification of higher education to wage equalisation in Chile from 2000 to 2013. The negative wage structure effect of higher education, primarily derived from the decreasing return to university education, exceeded the positive composition effect, which arises primarily from the increasing share of workers with non-university higher education (CFT) and postgraduate education. Moreover, the negative wage structure effect of higher education was substantially larger in magnitude at the upper quantiles, thereby contributing to the wage equalisation during the period. The increasing supply of CFT graduates was associated with decreasing wage premiums for university education, thereby suggesting that CFT education has substituted for university education. Finally, the findings exactly support the theoretical framework of Knight and Sabot (1983), which predicts that higher education expansion exerts two opposing effects on income inequality and decreases inequality if the negative wage structure effect exceeds the positive composition effect.

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Disclosure statement

There are no potential conflicts of interest to declare.

Notes

1. Secondary education graduates and dropouts are chosen as base categories. Note that university and IP are aggregated into the same category in CASEN 2013.

2 The database is available from http://observatorio.ministeriodesarrollosocial.gob.cl/casen-multidimensional/casen/basedatos.php (accessed on June 6, 2018)

3. The data include sample weights, which are used for all estimations in this study.

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Table 1. Descriptive statistics of the variables

	2000	2013
Observations	29,752	27,169
Log hourly wage		
Mean	7.074	7.495
Q10	6.289	6.884
Q50	6.937	7.388
Q90	8.188	8.474
Experience	20.415	21.998
Primary education or less	0.270	0.196
Secondary education graduates and dropouts	0.496	0.506
Overall higher education graduates and dropouts	0.233	0.298
CFT	0.033	0.102
IP/University	0.189	0.170
Postgraduate	0.012	0.026

Note: Q10, Q50, and Q90 represent the 10th, 50th, and 90th unconditional quantiles, respectively.

Source: Authors' calculations based on data from CASEN 2000 and 2013.

Table 2. Estimation results of unconditional quantile regressions

	2000			2013		
Explanatory variables	Q10	Q50	Q90	Q10	Q50	Q90
Primary	-0.149***	-0.415***	-0.247***	-0.0996***	-0.208***	-0.0782**
	(0.0200)	(0.0207)	(0.0313)	(0.0161)	(0.0200)	(0.0331)
CFT	0.0901***	0.430***	0.417**	0.0429**	0.327***	0.350***
	(0.0257)	(0.0428)	(0.173)	(0.0192)	(0.0253)	(0.0614)
IP/University	0.110***	0.604***	2.348***	0.0907***	0.502***	2.020***
	(0.0123)	(0.0201)	(0.106)	(0.0141)	(0.0211)	(0.0827)
Postgraduate	0.0753***	0.612***	5.049***	-0.0504	0.492***	3.713***
	(0.0231)	(0.0456)	(0.292)	(0.104)	(0.0819)	(0.367)
Experience	0.00603***	0.0184***	0.0356***	0.00497***	0.0172***	0.0417***
	(0.00208)	(0.00224)	(0.00661)	(0.00186)	(0.00196)	(0.00608)
Experience-squared	-0.000123***	-0.000297***	-0.000510***	-9.45e-05**	-0.000314***	-0.000729***
	(4.25e-05)	(4.15e-05)	(0.000111)	(3.93e-05)	(3.72e-05)	(0.000113)
Constant	6.327***	6.610***	7.056***	6.889***	7.075***	7.286***
	(0.0339)	(0.0392)	(0.102)	(0.0293)	(0.0375)	(0.0966)
Observations	29,752	29,752	29,752	27,169	27,169	27,169
R-squared	0.140	0.360	0.333	0.096	0.295	0.341

Note: Numbers in parentheses represent standard errors; ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. Demographic dummies (a dummy each for the head of the household and for married workers), industry dummies, informal dummy (a dummy for workers working without any kind of contract), firm size dummies, and region dummies are also included as control variables.

Table 3. Decomposition of wage changes into composition and wage structure effects of each explanatory variable

	Composition effect			Wage structure effect		
Explanatory variables	Q10	Q50	Q90	Q10	Q50	Q90
Primary	0.0111***	0.0309***	0.0184***	0.00977***	0.0406***	0.0331***
	(0.000960)	(0.00171)	(0.00224)	(0.00277)	(0.00315)	(0.00763)
Overall higer education	0.00524***	0.0270***	0.0544***	-0.0114***	-0.0309***	-0.0970***
	(0.00167)	(0.00276)	(0.0101)	(0.00405)	(0.00453)	(0.0110)
CFT	0.00628***	0.0299***	0.0290***	-0.00483*	-0.0104***	-0.00680
	(0.00156)	(0.00193)	(0.00408)	(0.00251)	(0.00279)	(0.00665)
IP/University	-0.00208***	-0.0114***	-0.0442***	-0.00331	-0.0174***	-0.0558***
	(0.000409)	(0.00196)	(0.00757)	(0.00240)	(0.00271)	(0.00664)
Postgraduate	0.00104**	0.00844***	0.0697***	-0.00324***	-0.00309***	-0.0344***
	(0.000506)	(0.000891)	(0.00594)	(0.00107)	(0.00118)	(0.00311)
Experience	0.00953***	0.0292***	0.0563***	-0.0231	-0.0283	0.134
	(0.00205)	(0.00292)	(0.00630)	(0.0329)	(0.0369)	(0.0895)
Experience-squared	-0.0125***	-0.0301***	-0.0518***	0.0192	-0.0116	-0.146***
	(0.00248)	(0.00307)	(0.00674)	(0.0193)	(0.0217)	(0.0527)
Constant				0.562***	0.465***	0.230***
				(0.0239)	(0.0268)	(0.0649)
Total	0.0397***	0.0478***	0.0445***	0.556***	0.403***	0.241***
	(0.00376)	(0.00557)	(0.0132)	(0.00580)	(0.00651)	(0.0157)
Observations	56,921	56,921	56,921	56,921	56,921	56,921

Note: Numbers in parentheses represent standard errors; ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

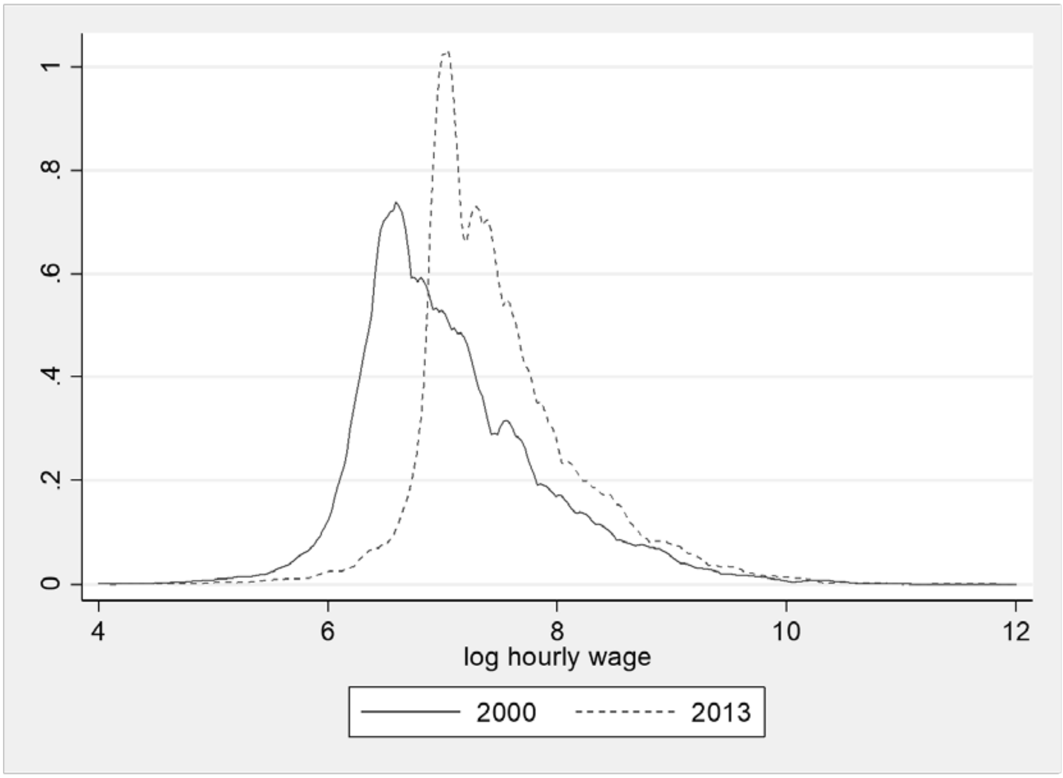

Figure 1.

Figure caption

1. Figure 1. Estimated log wage densities in 2000 and 2013