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Determinants of Wage Equalisation in Chile from 1996 to 2006: Decomposition Approach

Abstract

In this paper, we analyse the determinants of wage equalisation in Chile during the commodity boom from 1996 to 2006. For this purpose, we take advantage of a methodology recently developed by Firpo, et al. (2009), which enabled us to apply the standard Blinder–Oaxaca type decomposition approach to the quantile regression technique. Our study finds three main channels for the wage equalisation witnessed from 1996 to 2006: (1) the decreasing share of the workers with primary education as well as the increase in their relative wages across the whole wage distribution, (2) the decreasing returns to higher education, especially the university level, at the top of the wage distribution, and (3) the increasing industry wage premiums of the primary commodity sectors such as agriculture and forestry at the bottom of the wage distribution. The findings indicate that the wage equalisation can be explained by the Stolper–Samuelson effect and the increasing relative supply of higher educated workers, both of which dominate the possible upward pressure on the wages of higher educated workers, derived from skill-biased technological changes (SBTCs).

JEL codes: F16, F66 and I26

1. Introduction

Since the late 1990s, and especially from 2002 to 2008, Latin American countries (henceforth, LAs) have enjoyed a favourable external economic environment derived from the continued strong demand for primary commodities, mainly from China. Most LAs reported not only high economic growth but also lowered wage inequality during this period, which had hardly occurred in the LAs since the introduction of neoliberal reforms. Therefore, it is very important to conduct a detailed analysis on the determinants of the decrease in wage inequality during this period.

In this regard, two aspects can be generally considered. The first one is related to demand-side changes driven by the international economic environment. The wage distributions in primary commodity-exporting South America countries are likely to be equalised by the rise in world commodity prices. According to the Stolper–Samuelson theorem, the rise in the prices of primary commodities observed in this period should have increased returns to factors intensively involved in the production of such products, and thus, wage inequality should have decreased as long as such primary commodity sectors are unskilled labour-intensive. The second aspect is related to supply-side changes. Most LAs experienced considerable educational expansion during the 2000s, and in some cases, like Chile, during the 1980s. The quantitative educational expansion in this period is, to some extent, generated by the favourable economic situation, which provided the public sector with sufficient fiscal revenue for expenditure on higher education. Such educational expansion resulted in an increase in the relative supply of educated workers in the labour market and a decrease in wage premiums for them, thereby contributing to the reduction in wage inequality.

In this regard, Chile is a particularly interesting case study for this topic.[1] First, Chile is a typical small open economy that has benefited significantly from the rise in world commodity prices. In fact, Chilean export prices substantially increased during the commodity boom; the export price index rose from 0.58 in 2001 to 1.48 in 2008.[2] Moreover, it is likely that such primary commodity sectors in Chile are relatively unskilled labour-intensive; the shares of unskilled workers (that is, workers whose final educational achievement is no higher than the primary school level) in primary commodity sectors, such as agriculture and hunting (ISIC 11), forestry and logging (ISIC12), and fishing (ISIC13), are relatively high during 1996 to 2006 (Table 1). Some previous studies also point out that the primary commodity sectors in Chile, especially non-traditional ones such as the fruit and salmon aquaculture sectors, were successful in creating relatively unskilled labour-intensive jobs (Schurman, 2001; O'Ryan et al., 2010). Therefore, we can expect that the rise in world commodity prices contributed to lowering the wage inequality in this period, as predicted by the Stolper–Samuelson theorem. Thus, there is a need to empirically analyse these effects during the period in question.

Second, Chile experienced substantial educational expansion, especially in higher (post-secondary) education, which was to some extent derived from higher education reforms carried out during the 1980s. Although Chile is recognised as the first LA to introduce far-reaching economic changes (that is, neoliberal reforms), including trade and financial liberalisation, privatisation, tax reforms, labour market deregulation, and macroeconomic stabilisation, one prominent feature of its neoliberal reforms has been its application of market-oriented privatisation and deregulation to various social arenas, including educational policies. The main components of Chile's higher education reforms, which started in 1980, were the deregulation of establishment standards and the diversification of its system, which permit private institutions to establish new private universities as well as non-university higher education institutions (namely, professional institutes (*institutos profesionales*, IPs) and technical training centres (*centros de formación técnica*, CFTs)) with minimum establishment criteria.[3] As a result of the deregulation and diversification of the higher education system, the number of higher education institutions as well as their enrolments increased rapidly during 1980 to 1990.[4] Therefore, *ceteris paribus*, this increase in the relative supply of higher educated workers decreased their wage premiums, thereby contributing to reduced wage inequality, as indicated by the 'compression effect' of educational expansion (Knight and Sabot, 1983).[5] On the other hand, the distributional impacts derived from this educational expansion could have been cancelled out if the possible increases in the demand for more skilled workers within all industries (that is, skill-biased technological changes, SBTCs) exceeded the rise in the relative supply of skilled workers. Indeed, many developing and emerging countries have observed this phenomenon as a typical impact of their integration into the global economy, as discussed in greater detail by Goldberg and Pavcnik (2007). Therefore, it is important to conduct a detailed analysis on the distributional impacts of the expansion of education, particularly diversified higher education, in Chile.

Therefore, the principal motivation of this study is to analyse the determinants of the lowered wage inequality in Chile during the commodity boom. We identify the dominant factors that contributed to the relative increase in workers' wages at the bottom of the wage distribution, and their decrease at the top of the distribution. For this purpose, Machado and Mata (2005) provide a methodology for performing detailed decomposition of unexplained effects (wage changes attributable to returns to endowments), which decomposes the unexplained effects into the relative contribution of each explanatory variable, at any point of a conditional distribution (henceforth, the MM decomposition). They apply the MM decomposition to the case of Portugal during 1986 to 1995, and show that increases in educational levels contributed to rising wage inequality. However, the method cannot conduct a detailed decomposition of the explained effect (wage changes attributable to changes in endowments), as discussed in more detail in Section 2.2. Therefore, we apply a method recently developed by Firpo et al. (2009) to the case of Chile. The method enables us to decompose the changes in the outcomes between two periods into various explanatory factors at different points of the wage distribution, analogous to the standard Binder–Oaxaca (B–O) decomposition.

The paper is organised as follows. Section 2 explains the specification of the wage equation and the methodology used to apply the decomposition approach to the quantile regression technique. Section 3 explains the descriptive statistics of the data set as well as the evolution of the wage distribution. Section 4 discusses the empirical results. The final section concludes and provides some implications.

2. Methodology

In this section, we explain the specification of the wage equation and the method of decomposition using the estimation results of the wage equation. This study analyses the factors affecting the changes in the wage distribution before and after the commodity boom (that is, between 1996 and 2006) in Chile.[6] For that purpose, we decompose the differences in the wage distribution between 1996 and 2006 into the components attributable to the changes in endowments and coefficients, using the methodology for decomposition proposed by the seminal works of Blinder (1973) and Oaxaca (1973). Since we are interested in the factors that affect the changes in the wages at the bottom and top of the wage distribution, we apply the decomposition approach to the quantile regression technique, following Firpo et al. (2009).

2-1. Specification of the wage equation

In this study, we engage in a detailed analysis of the rates of return to each level of formal education (for example, primary, secondary, and higher education). Accordingly, we use a specification that treats the log wage as a step function for each education level without imposing any restriction (such as linearity) on the education–wage profile. Thus, we categorise each worker on the basis of the final education level that is represented by dummy variables. In addition to the educational achievements, we are interested in industry wage premiums, which are defined as the wage differentials that cannot be explained by observable workers' characteristics but can be attributed to workers' industry affiliations (Goldberg and Pavcnik, 2007). This is because different industries employ distinct shares of skilled and unskilled workers; thus, changes in industry wage premiums also affect the wage differential between skilled and unskilled workers (Pavcnik et al., 2004). Thus, the wage equation specification to be estimated in this study is as follows:

(1)

$$\ln w_i = cons + \beta_1 \, experience_i + \beta_2 \, experience_i^2 + \mathbf{education}_i'\boldsymbol{\beta}_3 + \mathbf{industry}_i'\boldsymbol{\beta}_4 + \mathbf{Z}_i'\boldsymbol{\beta}_5 + u_i \,,$$

where *i* indexes the individual; *w* is hourly wage (that is, the sum of regular salary and bonuses from the principal occupation[7] deflated by the national consumer price index (December 2008 = 1)); and *experience* is potential labour experience (age – years of schooling – 6). The vector of dummy variables categorising workers' educational achievements are denoted by *education*.[8] *Industry* indicates the vector of dummy variables categorising workers' industry affiliation.[9] In order to control observable workers' characteristics, we include vector *Z* which contains demographic dummies, that is, *HeadHH* and *Married*, which take the value 1 for the head of the household and married worker, respectively; a part-time dummy that takes the value 1 for workers working fewer than 40 h/week; an informal dummy that takes the value 1 for workers working without any kind of contract; 13 region dummies;[10] and 3 workplace characteristics dummies.[11] *U* is an error term.

2-2. Decomposition approach

After separately estimating the wage equation for 1996 and 2006, we decompose the wage changes into two components—explained and unexplained effects, as proposed by the seminal works of Blinder (1973) and Oaxaca (1973) (that is, the B–O decomposition). The explained effect refers to the wage differences attributable to the differences in the endowments such as workers' educational levels. The unexplained effect refers to the wage differences attributable to the differences in the coefficients of the explanatory variables (that is, the differences in returns to the endowments).

To decompose changes in the average wage, we use the following properties of ordinary least squares (OLS) regressions. Since the sum of the explanatory variables multiplied by the estimated coefficients is equal to the conditional mean of the dependent variable, as indicated by equation (2), we obtain equation (3) by taking expectations on both sides:

(2) $E(y_i \mid X_i) = \mathbf{X}_i{}'\hat{\boldsymbol{\beta}}^{\mathbf{OLS}}$,

(3) $\bar{y} = \bar{\mathbf{X}}'\hat{\boldsymbol{\beta}}^{\mathbf{OLS}}$.

This holds because of the law of total expectation, that is, $E[E(y_i \mid \mathbf{X}_i)] = E(y_i)$.

Therefore, after estimating separate wage equations for 1996 and 2006, we can decompose the changes in average log wages as follows.

(4) $\bar{y}_{06} - \bar{y}_{96} = (\bar{\mathbf{X}}_{\mathbf{06}} - \bar{\mathbf{X}}_{\mathbf{96}})'\hat{\boldsymbol{\beta}}_{\mathbf{06}}^{\mathbf{OLS}} + \bar{\mathbf{X}}'_{\mathbf{96}}(\hat{\boldsymbol{\beta}}_{\mathbf{06}}^{\mathbf{OLS}} - \hat{\boldsymbol{\beta}}_{\mathbf{96}}^{\mathbf{OLS}})$,

where, superscript 06 and 96 indicate the years under the analysis.

The first term on the right-hand side of equation (4) is referred to as the explained effect (that is, changes in the average log wage attributable to changes in the averages of independent variables, $(\bar{\mathbf{X}}_{\mathbf{06}} - \bar{\mathbf{X}}_{\mathbf{96}})$). The second term is referred to as the unexplained effect (that is, changes in the average log wage attributable to changes in the regression coefficients, $(\hat{\boldsymbol{\beta}}_{\mathbf{06}}^{\mathbf{OLS}} - \hat{\boldsymbol{\beta}}_{\mathbf{96}}^{\mathbf{OLS}})$).

We can decompose changes in average log wage using equation (4) because the unconditional mean of the dependent variable is equal to the sum of the explanatory variables multiplied by the estimated regression coefficients. However, decomposing changes in the quantiles of wage distribution is not straightforward. The law of iterated expectations will not apply in the case of quantiles, because the average of conditional quantiles is not equal to their unconditional counterparts, unlike the case of the conditional mean (Fortin et al., 2011). This issue must be overcome to apply the decomposition approach to the quantile regression technique. Although there is no comprehensive methodology for decomposing the overall difference between two groups into explained and unexplained effects at any point of the distribution, some progress has been made recently in this area.[12] For example, as mentioned in Section 1, Machado and Mata (2005) provide a methodology for performing detailed decomposition of unexplained effects at any point of a conditional distribution. However, one important disadvantage inherent in this technique is that it does not conduct a detailed decomposition of the explained effect (Fortin et al., 2011: 63). In fact, they use only one educational variable (that is, years of education), assuming that the rate of return to additional years of education is constant irrespective of education attainment.

In this regard, the methodology proposed by Firpo et al. (2009) is very useful for the objective of our study. The methodology uses a recentred influence function (RIF) for the distribution statistic of interest, instead of the observed outcome values, as the dependent variable in a regression. The RIF is given by equation (5):

$$(5)\quad \mathrm{RIF}(y;Q_q) = Q_q + \frac{q - 1\{y \le Q_q\}}{f_y(Q_q)},$$

where $\mathrm{RIF}(y;Q_q)$ denotes the estimated values of the RIF of the *q*-th quantile of the dependent variable of *y*, Q_q is the *q*-th quantile of the dependent variable *y*, $1\{.\}$ is an indicator function, and $f_y\{\cdot\}$ is the density of the marginal distribution of the dependent variable *y*.

Once the RIF regression is estimated, the estimated coefficients enable us to perform the detailed decomposition analogous to the standard B–O decomposition. This is because the conditional expectation of the RIF is constructed as a linear function of the explanatory variables, as is the case with OLS. Therefore, we can obtain the following decomposition as an equivalent of the B–O decomposition at any unconditional quantile by replacing the original independent variables with the estimated values from the RIF.

(6) $Q_{06,q} - Q_{96,q} = (\overline{\mathbf{X}}_{\mathbf{06}} - \overline{\mathbf{X}}_{\mathbf{96}})'\hat{\boldsymbol{\gamma}}_{\mathbf{06,q}} + \overline{\mathbf{X}}'_{\mathbf{96}}(\hat{\boldsymbol{\gamma}}_{\mathbf{06,q}} - \hat{\boldsymbol{\gamma}}_{\mathbf{96,q}})$,

where $\hat{\boldsymbol{\gamma}}_{\mathbf{06,q}} = (\sum \mathbf{X}_{\mathbf{06}}\mathbf{X}'_{\mathbf{06}})^{-1}(\sum \mathbf{X}_{\mathbf{06}} \mathrm{RIF}(y_{06}; Q_{06,q}))$ is the coefficient of the *q*-th unconditional quantile regression.[13] From this equation, we obtain the detailed decomposition of the explained and unexplained effects of each explanatory variable of the wage equation at the selected quantiles (10th, 50th, and 90th), as discussed in Section 4.

3. Data and descriptive statistics

In this section, we describe the data used in this study and present descriptive statistics of the data set as well as the statistics pertaining to the evolution of wage distribution. We source the data from *Encuesta de Caracterización Socioeconómica Nacional* (CASEN), conducted in 1996 and 2006. CASEN is a nationally and regionally representative household survey carried out in November of each year by the Ministry of Planning and Cooperation (*Ministerio de Planificacion y Cooperación,* MIDEPLAN). CASEN intends to generate a reliable portrait of socioeconomic conditions across the country and to monitor the incidence and effectiveness of the government's social programs (Valdés, 1999). Therefore, the survey provides detailed information on demographic characteristics, education, health, housing, employment, and various sources of income, including income transfers and government subsidies. The data are repeated cross sections, and the sample size of each year is substantially large: the survey covered 134,262 and 268,873 individuals in 1996 and 2006, respectively. CASEN is appropriate for our study because it covers the whole country, including primary commodity production areas located outside the metropolitan region. Another advantage of CASEN is that it provides very detailed information about the educational attainments of the surveyed individuals, including their years of schooling and the type of educational institution last attended.

The sample used in this study is constructed as follows. We focus on waged workers aged 14 to 65 years, who worked more than 80 hours per month. Thus, self-employed workers and employers are excluded from the sample. Military personnel and domestic workers are also excluded from the sample, because their wages are not likely to be determined by market forces. Finally, workers who did not report the required information are also excluded.

Table 2 shows the descriptive statistics, including the evolution of explanatory variables used in our wage equation, from 1996 to 2006. We confirm improvements in the educational level during this period in Chile. The average number of years of schooling in the sample increased slightly from 10.25 in 1996 to 10.98 in 2006, and the share of workers with primary education[14] decreased from 32.12% in 1996 to 24.94% in 2006 (also see Table 1). On the other hand, the share of workers with secondary education[15] as well as the share of workers with higher education[16] increased from 48.56% in 1996 to 52.03% in 2006, and from 19.32% in 1996 to 23.03% in 2006, respectively. The expansion of higher education during this period is derived from the increase in the number of graduates and dropouts from non-university higher education institutions (IPs and CFTs) (Table 2).

The evolution of the estimated wage distribution is presented in Figures 1 and 2. Figure 1 presents the estimated kernel densities of the log hourly wages in 1996 and 2006 for the whole sample. Figure 1 also shows the counterfactual distribution in 2006, where all educational variables are distributed as of 1996 and the other explanatory variables are distributed as of 2006. Thus, the differences between the distribution in 2006 and the counterfactual distribution in 2006 represent the explained effect of education, because the differences are attributable to the changes in the educational composition. The differences between the distribution in 1996 and the counterfactual distribution in 2006 represent the unexplained effect of education, because they are attributable to the changes in the coefficients of variables pertaining to education. Figure 2 shows the estimated wage densities in 1996 and 2006, classified by educational achievements (workers with primary, secondary, and higher education).

From Table 3 and Figures 1 and 2, we confirm the clear tendency of wage equalisation during this period in Chile. The average hourly wage increased by 27.5% from 1996 to 2006, as evidenced by the shift of the whole wage distribution from right to left (Figure 1), while the wage increase at the bottom of the distribution is substantially larger than that at the top, thereby reducing the right-skewed asymmetry of the wage distribution observed in the year 1996. For example, the ratio of the hourly wage at the 90th quantile to that at the 10th quantile decreased from 7.22 in 1996 to 5.57 in 2006 (Table 3). This tendency of wage equalisation is also confirmed from the differences between the wage increase among the higher educated workers (that is, relatively high-wage earners) and the less educated workers (that is, relatively low-wage earners). The increase in the average hourly wage of the workers with primary education is considerably larger than that of the workers with higher education (Figure 2).

We also find that such wage equalisation is more evident in the less educated workers. The ratio of the hourly wage at the 90th quantile to that at the 10th quantile among the workers with primary education decreased from 4.09 in 1996 to 3.15 in 2006 (Table 3). On the other hand, the corresponding ratio for the workers with higher education increased slightly from 7.53 in 1996 to 8.67 in 2006 (Table 3). Thus, the less educated subsamples with relatively low wages experienced larger reductions in wage inequality. Such wage equalisation among relatively low-wage workers can also be confirmed by the wage distribution of the whole sample. While the ratio of the hourly wage at the 25th quantile to that at the 10th quantile (that is, the wage dispersion among the relatively low-wage workers) decreased from 1.37 in 1996 to 1.29 in 2006, the ratio at the 90th quantile to that at the 75th quantile (that is, the wage dispersion among the relatively high wage workers) remained quite stable at 1.88 in 1996 and 1.89 in 2006.

In summary, we confirm that there was considerable wage equalisation for salaried workers in Chile during the period under the analysis and that such wage equalisation was more evident among the less educated such as workers with primary school education.

<Table 1 here>

<Table 2 here>

<Table 3 here>

<Figure 1 here>

<Figure 2 here>

4. Estimation results

Table 4 reports the OLS estimation results of wage equation (1) for 1996 and 2006. A comparison of the findings for 1996 and 2006 can be summarised as follows. First, the wages of workers with primary education increased relative to those of workers with secondary education. Second, the returns to all types of higher education, except postgraduate school, decreased. Third, the industry wage premiums of the primary commodity sectors such as agriculture and forestry increased vis-à-vis the construction sector.

Table 5 provides the results of the decomposition of the wage changes from 1996 to 2006 into explained and unexplained effects at the mean and selected (10th, 50th, and 90th) quantiles of the wage distribution. We find that the unexplained effect is larger than the explained effect at the mean. Regarding the selected quantiles, the unexplained effects are larger than the explained effects at the 10th and 50th quantiles of the wage distribution, while the unexplained effects at the 90th quantile are relatively small and not statistically significant.

Tables 6 and 8 show the detailed decomposition of the total explained and unexplained effects attributable to each category of variables, respectively. The relative contributions of the explained and unexplained effects attributable to each category of variables to total wage changes are shown in Tables 7 and 9, respectively. The estimation results of the detailed decomposition of the effects on the mean wages are summarised as follows. First, both the explained and unexplained effects of primary education are significantly positive. Thus, the decreases in the share of workers with primary education as well as the increases in their relative wages contributed to the rise in the mean wages from 1996 to 2006. Second, except for the university level, the explained effects of higher education (that is, CFT, IP, and postgraduate school), are significantly positive, while the unexplained effects of higher education (that is, CFT, IP, and university), except for post-graduate school, are significantly negative. Thus, the increases in the share of workers with higher education contributed to the rise in the mean wages, while the decreases in the return to higher education contributed to the declines in the mean wages. As a sum of the explained and unexplained effects, higher education slightly increased the mean wages during the period under the analysis.[17] Third, both the explained and unexplained effects of primary commodity sectors such as agriculture are significantly positive. Thus, the decreases in the employment share and the increases in the industry wage premiums of the primary commodity sectors contributed to the rise in the mean wages.

The estimation results of the detailed decomposition of these effects on the selected quantiles of the wage distribution are summarised as follows. First, the decreases in the share of workers with primary education (that is, the explained effect) as well as the increases in their relative wages (that is, the unexplained effect) contributed to the rise in wages at all selected quantiles (except for the unexplained effect at the 10th quantile of the wage distribution). Thus, both compositional changes and the increasing relative wages of workers with primary education operated in the direction of wage equalisation from 1996 to 2006. Second, the increases in the relative share of workers with higher education, especially those with IP and postgraduate school, contributed to the rise in wages at the 90th quantile. Conversely, the declines in the return to higher education, especially at the university level, contributed to the decrease in wages at the 90th quantile. Thus, higher education operated in the opposite direction in terms of the impacts on the wage distribution during the period under the analysis: the compositional changes to higher education certainly operated in the direction of increasing wage inequality, while the decreasing returns operated in the direction of the wage equalisation. As a sum of the explained and unexplained effects, higher education slightly increased the wages at the 10th quantile, while it substantially decreased the wages at the 90th quantile.[18] Third, the decreases in the employment share of the primary commodity sectors such as agriculture contributed to the wage increases at all selected quantiles, although the relative contributions of such explained effects are small (Table 9). The increases in the industry wage premiums of the primary commodity sectors at the 10th and 50th quantiles contributed to the rise in wages at those quantiles. On the other hand, the decreases in these industry wage premiums at the 90th quantile contributed to the wage decreases at the said quantile. Thus, the increasing industry wage premiums of such primary commodity sectors operated in the direction of wage equalisation, because such sectors initially employed higher fractions of unskilled workers (Table 1) and provided a lower level of industry wage premiums (Table 4).

Therefore, we find three main channels of wage equalisation from 1996 to 2006: (1) the decreasing share of workers with primary education as well as the rise in their relative wages in comparison with more educated workers across the whole wage distribution, (2) the decreasing returns to higher education, especially university education, at the 90th quantile of the wage distribution, and (3) the increasing industry wage premiums of the primary commodity sectors, such as agriculture and forestry, at the 10th and 50th quantiles of the wage distribution.

Channels (1) and (3) are explainable by the impacts derived from the relative price increases of the above-mentioned primary commodity sectors. As predicted by the Stolper–Samuelson effect, the price increases of such unskilled labour-intensive products increased economy-wide returns to unskilled workers (that is, workers with primary education) across different industries. These rising prices also increased returns to the specific skills useful in such sectors. Since the workers were more or less immobile across the industries, especially in the short to medium term, their wages show a relative increased in comparison with the economy-wide average, thereby contributing to the increase in their industry wage premiums.[19]

Channel (2) can be attributable to the relative increases in the supply of higher educated workers, especially workers with CFT, IP, and postgraduate schooling (Table 2).Thus, the findings show that the increasing relative supply of such higher educated workers dominated the possible upward pressure on their wages due to SBTCs during the period under the analysis in Chile. Taking into consideration that the return to university education decreased without their relative supply (Table 2), it is likely that the relative demand for workers with university education reduced. This finding is in clear contrast with the results of previous studies that analysed the distributional impacts of education after their integration into the global economy (for example, Machado and Mata, 2005).[20]

In addition to the above-mentioned three channels, the unexplained regional effect on the mean wages is practically large and significantly positive. It is also significantly positive at all selected quantiles of the wage distribution (Tables 8 and 9). The findings show that regional wage differentials vis-à-vis the urban area of the metropolitan region decreased across the whole wage distribution. Such reductions in regional wage differentials also contributed to wage equalisation throughout the country during the period under the analysis. Considering that the production areas of the main primary commodities in Chile are located in regions outside the metropolitan area, such reduction in wage differentials can be explained by the positive externalities on the wages of primary commodities production, which cannot be captured by observable workers' characteristics and workers' industry affiliations.

<Table 4 here>

<Table 5 here>

<Table 6 here>

<Table 7 here>

<Table 8 here>

<Table 9 here>

5. Conclusions

In this paper, we analysed the determinants of reducing wage inequality in Chile during the commodity boom from 1996 to 2006. Thus, we assessed the dominant factors that contributed to the relative increase and decrease in workers' wages at different quantiles of the wage distribution. For that purpose, we employed the methodology recently developed by Firpo et al. (2009), which enabled us to apply the standard B–O type decomposition approach to the quantile regression technique. Using this methodology, we performed the decomposition of the wage changes from 1996 to 2006 (that is, before and after the commodity boom) into explained effects (wage changes attributable to changes in endowments) and unexplained effects (wage changes attributable to returns to endowments) for various explanatory variables at the selected (that is, 10th, 50th, and 90th) quantiles of the wage distribution as well as its mean.

We found three main channels for Chile‘s wage equalisation from 1996 to 2006: (1) the decreasing share of the workers with primary education as well as the increase in their relative wages in comparison with more educated workers across the whole wage distribution, (2) the decreasing returns to higher education, especially at the university level, at the 90th quantile of the wage distribution, and (3) the increasing industry wage premiums of the primary commodity sectors such as agriculture and forestry at the 10th and 50th quantiles of the wage distribution.

These findings are explainable by both demand and supply side factors. Findings (1) and (3) can be explained by the impacts derived from the rising commodity prices driven by the increasing global demand, as predicted by the Stolper–Samuelson effect. Finding (2) is attributed to the increasing relative supply of higher educated workers, dominating the effects derived from the possible demand shifts favouring skilled workers within all industries (that is, SBTCs); this has been observed in many developing and emerging countries after their integration into the global economy. For example, Gallego (2012), who analyses the case of Chile during the period prior to the commodity boom (that is, 1960 to 2000), finds that the wage premium in the United States, which is a proxy for SBTC in Chile, is the main determinant of the increase in the wage premium for skilled workers. Although we cannot deny that SBTCs took place in Chile during the commodity boom, the findings of our study indicate that the possible upward pressure on the wages of higher educated workers derived from SBTCs was relatively weak and thus did not surpass the downward pressure on their relative wages derived from the increasing supply of skilled workers.

Therefore, the findings are quite different from those of previous studies that analyse the distributional impacts of the integration of developing and emerging countries into the global economy. These studies find that the increase in the wage inequality can be explained by SBTCs and (or) the price reductions of labour-intensive goods protected with the highest tariffs, as discussed in Goldberg and Pavcnik (2007). Therefore, our study provides new evidence regarding the distributional impacts of globalisation in an emerging country.

We propose the following as a possible reason why Chile experienced wage equalisation during the commodity boom, just as the standard trade theories had predicted. Chile's unskilled labour-intensive sectors were not protected by high tariffs prior to the commodity boom, because it has applied a flat tariff to almost all industrial sectors since 1979, and the level of this tariff had already been sufficiently low in this period.[21] Thus, during the commodity boom, unskilled labour-intensive sectors in Chile experienced the price increasing effects driven by the strong global demand, without the price decreasing effects derived from the changing protection patterns. Thus, the findings are also in contrast with the situation in Chile during the period following the rapid and far-reaching trade liberalisation (the mid-1970s). In this period, wage inequality substantially increased in Chile, because unskilled labour-intensive sectors protected with the highest tariffs experienced large tariff reductions (Murakami, 2014).

Our results suggest that Chile temporarily achieved both high economic growth and reduction in wage inequality during the commodity boom as it was supported by a favourable external economic environment. However, this study does not argue that Chile is likely to continue achieving sustainable economic growth with distributional equity under the current production structure, which is heavily dependent on exports of primary commodities. On the contrary, Chile revels in its economic vulnerability, as attested by its low-to-medium economic growth level and few improvements in wage inequality after the end of the commodity boom. Although this study found that weakness in technological changes, which seem to be related with the current production structure of Chile, could have favoured improvements in the wage distribution during the period under the analysis, we cannot deny that such weakness with regard to technological progress may harm the country's long-term economic growth.

This study did not directly analyse the relationships between commodity prices and factor returns because of the limitation of data availability. It would be interesting to perform a detailed analysis on the impacts of the evolution of commodity prices on unskilled workers' wage premiums as well as the changes in industry wage premiums, on the basis of time-series and industry-level panel data analyses. We propose to conduct this analysis in our future research.

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Notes

1. Chile also reported high economic growth (GDP growth averaged 4.7% per year during 2003 to 2008) and decrease in wage inequality (the Gini coefficient decreased from 0.552 in 2003 to 0.516 in 2011). Source: CEPALSTAT (http://estadisticas.cepal.org/cepalstat/web_cepalstat/estadisticasIndicadores.asp?idioma=e)

2. The price index of 2005 = 1. The data are sourced from the country's international trade deflator indicators. Source: CEPALSTAT (http://estadisticas.cepal.org/cepalstat/web_cepalstat/estadisticasIndicadores.asp?idioma=e)

3. For more details, see Brunner (1993). IPs offer four-year programs leading to professional titles (*títulos profesionales*), although universities only offer four- or five-year programs leading to both professional titles and college degrees (*licenciaturas*). The latter allow graduates to enrol in post-graduate school. CFTs provide two-year vocational programs leading to technical certificates (*títulos técnicos de nivel superior*).

4. The number of higher education institutions (all of them are traditional universities) increased from 8 in 1980 from 310 in 1990, and the number of enrolments rose from 116,992 in 1980 to 249,482 in 1990 (Brunner, 1993). The share of higher education graduate equivalents (that is, the sum of university and non-university higher education graduates and university dropouts) in total full-time salaried workers increased from 15.1% in 1992 to 21.8% in 2006 (see Figure 1 of Murakami (2014)).

5. However, if the private universities as well as non-university higher education institutions established after 1980 are not comparable with the traditional universities, the quantitative expansion of such higher education institutions cannot be seen as making them equivalent to

the traditional universities. Thus, the calculation of the relative supply of higher educated workers could be biased, and the findings of previous studies regarding the differences in return to education between the traditional and new universities as well as the universities and non-university higher education institutions remain controversial. See, for example, after controlling for various individual characteristics, Meller and Rappoport (2008) find that the return to the non-university higher education institutions (that is, IPs) is not necessarily lower than that to universities.

6. In addition to the fact that the years 1996 and 2006 represent the time before and during the commodity boom, respectively, we choose these years because it is considered that the Chilean economy was relatively free from external shocks that could affect the wage distribution between 1996 and 2006. This is confirmed by the small gaps between the actual and potential GDP in the years 1996 and 2006. For more details, see Ffrench-Davis (2010: 15).

7. With regard to CASEN 2006, we engage in the construction of 'wages' in line with the classification shown in CASEN 1996. As a result, we cannot eliminate bonuses from wages in CASEN 2006, because we cannot distinguish wage income from bonuses.

8. Secondary education graduates and dropouts are chosen as base categories.

9. The industries are classified according to the 2-digit ISIC level (Rev.2). Construction (ISIC code 50) is chosen as the base category, because it holds the largest employment share among all non-tradable sectors and its average hourly wages are similar to those of the all industrial sectors in 1996 and 2006.

10. Chile has 13 regions, and only RM is classified into urban and rural areas. The urban area

of RM is chosen as the base category.

11. The workplace characteristics are classified according to the size of the establishments. The workers employed at establishments with fewer than nine people are chosen as the base category.

12. For more details, see Fortin et al. (2011).

13. For more details, see Firpo et al. (2009) and Section 5.2 of Fortin et al. (2011).

14. Workers with primary education include both primary school graduates and dropouts, including workers who did not receive any formal education.

15. Workers with secondary education include both secondary school graduates and dropouts.

16. Workers with higher education include both higher education graduates and dropouts.

17. The sum of the relative contributions of the explained and unexplained effects of all types of higher education is 0.11% (Tables 7 and 9).

18. The sum of the relative contributions of the explained and unexplained effects of all types of higher education is 0.66% at the 10th quantile and –11.62% at the 90th quantile (Tables 7 and 9).

19. It is plausible that the changes in return to the primary education and industry wage premiums are interlinked. In fact, if we add the interaction terms between primary education dummy and industry dummies to equation (1), the unexplained effects of the interactions terms of primary commodity sectors such as forestry and fishing are significantly positive at the bottom of the wage distribution. Thus, the findings show that the relative wages of unskilled workers increased markedly in such primary commodity sectors from 1996 to 2006.

20. Machado and Mata (2005), who analysed the case of Portugal from 1986 to 1995 (that is,

in the period after the country's accession into the European Union in 1986), found that the return to education increased on average and especially at the top of the wage distribution, contributing to the observed increase in wage inequality during the period.

21. The flat tariff rate of the most favoured nation (MFN) was progressively reduced from 11% in 1992 to 10% in 1999, 9% in 2000, 8% in 2001, 7% in 2002, and 6% in 2004. The data are obtained from World Integrated Trade Solution (WITS)

Table 1. Evolution of the share of unskilled workers in employment for each industry (1996 to 2006)

ISIC	Industry	1996	2006
11	Agriculture and Hunting	74.9%	62.5%
12	Forestry and Logging	57.9%	54.8%
13	Fishing	44.9%	38.6%
2	Mining	21.7%	17.2%
3	Manufacturing	27.0%	20.4%
4	Electricity, Gas and Water	9.2%	11.7%
50	Construction	45.6%	33.4%
6	Wholesale and Retail Trade and Restaurants and Hotels	18.6%	11.3%
7	Transport, Storage and Communication	24.4%	17.3%
8	Financing, Insurance, Real Estate and Business Services	5.1%	9.4%
9	Community, Social and Personal Services	17.3%	14.3%
	All industries	32.1%	24.9%

Note: The calculated values are weighted using sample weights. The industries are classified according to the International Standard Industrial Classification (ISIC, Rev-2).

Source: Author’s calculations, based on data from CASEN.

Table 2. Descriptive statistics of the explanatory variables

	1996	2006
Observations	18,167	36,615
Log hourly wage	6.950	7.225
Years of schooling	10.25	10.98
Experience	19.55	21.30
HeadHH	65.97%	60.25%
Married	60.75%	50.10%
Part-time	6.39%	6.89%
Informal	18.86%	15.29%
Education		
Primary Education graduates and dropouts	**32.12%**	**24.94%**
Secondary Education graduates and dropouts	**48.56%**	**52.03%**
CFT	1.99%	2.85%
IP	4.25%	6.17%
University	12.56%	12.77%
Postgraduate	0.52%	1.24%
Sum: Higher Education graduates and dropouts	**19.32%**	**23.03%**
Industry		
Agriculture and Hunting	13.70%	12.61%
Forestry and Logging	2.14%	2.11%
Fishing	1.30%	1.22%
Mining	3.44%	3.52%
Manufacturing	20.29%	17.69%
Electricity, Gas and Water	1.30%	1.05%
Construction	13.08%	14.53%
Wholesale and Retail Trade and Restaurants and Hotels	26.45%	28.57%
Transport, Storage and Communication	8.94%	10.31%
Financing, Insurance, Real Estate and Business Services	6.86%	8.25%
Community, Social and Personal Services	15.57%	14.66%

Note: The numbers are weighted using sample weights.

Source: Author’s calculations, based on data from CASEN.

Table 3. Detailed statistics of the hourly wages of the whole sample and subsamples classified by educational achievements (1996 to 2006)

		log of average hourly wage	log of hourly wage at the 10th quantile	log of hourly wage at the median	log of hourly wage at the 90th quantile	ratio of hourly wage at the 90th to the 10th quantile
All samples	1996	6.95	6.07	6.86	8.05	7.22
	2006	7.22	6.51	7.09	8.23	5.57
Primary school graduates and dropouts	1996	6.48	5.81	6.45	7.22	4.09
	2006	6.84	6.31	6.80	7.46	3.15
Secondary school graduates and dropouts	1996	6.91	6.18	6.91	7.75	4.81
	2006	7.12	6.54	7.06	7.85	3.69
Higher school graduates and dropouts	1996	7.84	6.86	7.82	8.88	7.53
	2006	7.89	6.87	7.86	9.03	8.67

Note: The numbers are weighted using sample weights.

Source: Author's calculations, based on data from CASEN.

Table 4. Estimation results of the wage equations for 1996 and 2006

	1996		2006	
Cons	6.6326	***	6.7747	***
	(0.0207)		(0.0143)	
Experience	0.0183	***	0.0156	***
	(0.0013)		(0.0009)	
Experience2	-0.0003	***	-0.0003	***
	(0.0000)		(0.0000)	
Education (omitted: Secondary education)				
Primary	-0.2923	***	-0.2179	***
	(0.0118)		(0.0086)	
CFT	0.5035	***	0.3714	***
	(0.0319)		(0.0182)	
IP	0.4762	***	0.4084	***
	(0.0225)		(0.0129)	
University	0.9779	***	0.8392	***
	(0.0146)		(0.0098)	
Postgraduate	1.3988	***	1.4808	***
	(0.0612)		(0.0277)	
Industry (omitted: Construction)				
Agriculture and Hunting	-0.2937	***	-0.1943	***
	(0.0180)		(0.0123)	
Forestry and Logging	-0.1714	***	-0.0312	
	(0.0330)		(0.0224)	
Fishing	0.1869	***	0.0779	***
	(0.0409)		(0.0287)	
Mining	0.3566	***	0.3089	***
	(0.0286)		(0.0188)	
Manufacturing	-0.0219		0.0055	
	(0.0158)		(0.0107)	
Electricity, Gas and Water	0.2383	***	-0.0187	
	(0.0406)		(0.0302)	
Wholesale and Retail Trade and Restaurar	-0.0973	***	-0.0937	***
	(0.0175)		(0.0114)	
Transport, Storage and Communication	-0.0206		-0.0345	***
	(0.0193)		(0.0122)	
Financing, Insurance, Real Estate and Busi	0.2048	***	0.0817	***
	(0.0216)		(0.0134)	
Community, Social and Personal Services	-0.0788	***	-0.0877	***
	(0.0171)		(0.0115)	
HeadHH	0.1196	***	0.1939	***
	(0.0127)		(0.0078)	
Married	0.1180	***	0.0965	***
	(0.0116)		(0.0075)	
Part	0.2403	***	0.1656	***
	(0.0183)		(0.0121)	
Informal	-0.2444	***	-0.2624	***
	(0.0122)		(0.0089)	
Regional dummies	yes		yes	
Workplace characteristics dummies	yes		yes	
Numbers of obs	18,167		36,615	
R-squared	0.5062		0.4320	

Note: The numbers in parentheses are standard errors. *** indicates significance at the 1% level.

Source: Author’s calculations, based on data from CASEN.

Table 5. Decomposition of the wage changes into explained and unexplained effects (1996 to 2006)

		Mean	10th percentile	50th percentile	90th percentile
	2006	7.2250	6.5015	7.0600	8.2362
	1996	6.9504	6.0874	6.8611	8.0907
Difference		0.2745 ***	0.4141 ***	0.1990 ***	0.1454 ***
		(0.0074)	(0.0074)	(0.0074)	(0.0193)
Explained effects		0.0692 ***	0.0437 ***	0.0546 ***	0.1445 ***
		(0.0052)	(0.0041)	(0.0038)	(0.0128)
Unexplained		0.2053 ***	0.3704 ***	0.1444 ***	0.0009
		(0.0059)	(0.0077)	(0.0067)	(0.0171)

Note: The numbers in parentheses are standard errors. *** indicates significance at the 1% level.

Source: Author's calculations, based on data from CASEN.

Table 6. Detailed decomposition of the total explained effects attributable to each category of variables

	Mean	10th percentile	50th percentile	90th percentile
Explained effects attributable to				
Category: Education (omitted: Secondary education)	0.0361 ***	0.0127 ***	0.0217 ***	0.0832 ***
	(0.0033)	(0.0016)	(0.0018)	(0.0091)
Primary	0.0131 ***	0.0103 ***	0.0124 ***	0.0230 ***
	(0.0013)	(0.0015)	(0.0013)	(0.0033)
CFT	0.0030 ***	0.0002	0.0019 ***	0.0069 ***
	(0.0005)	(0.0002)	(0.0003)	(0.0012)
IP	0.0077 ***	0.0014 ***	0.0047 ***	0.0193 ***
	(0.0008)	(0.0004)	(0.0005)	(0.0021)
University	0.0017	0.0002	0.0006	0.0052
	(0.0025)	(0.0002)	(0.0008)	(0.0074)
Postgraduate	0.0107 ***	0.0006 **	0.0021 ***	0.0288 ***
	(0.0012)	(0.0003)	(0.0003)	(0.0032)
Category: Individual characteristics	-0.0171 ***	-0.0023	-0.0125 ***	-0.0350 ***
	(0.0019)	(0.0015)	(0.0015)	(0.0045)
Category: Industry (omitted: Construction)	-0.0002	0.0019 *	0.0035 ***	-0.0025
	(0.0014)	(0.0012)	(0.0013)	(0.0036)
Agriculture and Hunting	0.0022 ***	0.0014 ***	0.0031 ***	0.0015 ***
	(0.0006)	(0.0004)	(0.0009)	(0.0006)
Forestry and Logging	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0002)	(0.0001)	(0.0000)
Fishing	-0.0001	0.0000	-0.0001	-0.0001
	(0.0001)	(0.0000)	(0.0001)	(0.0002)
Mining	0.0015 **	0.0004	0.0010 ***	0.0037 *
	(0.0006)	(0.0004)	(0.0004)	(0.0020)
Manufacturing	0.0021 ***	0.0001	0.0003	0.0083 ***
	(0.0006)	(0.0006)	(0.0005)	(0.0017)
Electricity, Gas and Water	0.0000	0.0003 *	-0.0001	0.0000
	(0.0001)	(0.0002)	(0.0001)	(0.0002)
Wholesale and Retail Trade and Restaurants and Hotels	-0.0027 ***	-0.0011 ***	-0.0009 ***	-0.0064 ***
	(0.0004)	(0.0004)	(0.0003)	(0.0011)
Transport, Storage and Communication	-0.0001	-0.0006 *	0.0001	0.0012 *
	(0.0002)	(0.0003)	(0.0002)	(0.0006)
Financing, Insurance, Real Estate and Business Services	-0.0041 ***	0.0008	-0.0003	-0.0128 ***
	(0.0007)	(0.0006)	(0.0004)	(0.0019)
Community, Social and Personal Services	0.0009 **	0.0007	0.0004	0.0021 **
	(0.0005)	(0.0005)	(0.0003)	(0.0010)
Category: Workplace characteristics	0.0404 ***	0.0125 ***	0.0325 ***	0.0918 ***
	(0.0018)	(0.0021)	(0.0016)	(0.0048)
Category: Part-time	0.0008 **	0.0002 *	0.0009 **	0.0019 **
	(0.0004)	(0.0001)	(0.0004)	(0.0009)
Category: Informal	0.0094 ***	0.0178 ***	0.0083 ***	0.0061 ***
	(0.0010)	(0.0018)	(0.0009)	(0.0011)
Category: Region	0.000	0.001	0.000	-0.001
	(0.0008)	(0.0007)	(0.0007)	(0.0012)

Note: The numbers in parentheses are standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. 'Category' indicates that the category of variables (for example, education) aggregates the effects of more than one explanatory variable (for example, primary, CFT, IP, university, and postgraduate).

Source: Author's calculations, based on data from CASEN.

Table 7. Relative contribution of each category of variables to the total explained effects

	Mean	10th percentile	50th percentile	90th percentile
Explained effects attributable to				
Category: Education (omitted: Secondary education)	13.16% ***	3.06% ***	10.89% ***	57.19% ***
Primary	4.76% ***	2.48% ***	6.22% ***	15.79% ***
CFT	1.08% ***	0.04%	0.97% ***	4.72% ***
IP	2.80% ***	0.34% ***	2.35% ***	13.27% ***
University	0.63%	0.04%	0.28%	3.58%
Postgraduate	3.89% ***	0.15% **	1.07% ***	19.82% ***
Category: Individual characteristics	-6.23% ***	-0.56%	-6.27% ***	-24.03% ***
Category: Industry (omitted: Construction)	-0.09%	0.47% *	1.74% ***	-1.75%
Agriculture and Hunting	0.80% ***	0.34% ***	1.58% ***	1.01% ***
Forestry and Logging	0.00%	0.01%	0.01%	0.00%
Fishing	-0.02%	0.00%	-0.03%	-0.10%
Mining	0.55% **	0.09%	0.51% ***	2.53% *
Manufacturing	0.76% ***	0.02%	0.14%	5.70% ***
Electricity, Gas and Water	0.00%	0.06% *	-0.07%	-0.01%
Wholesale and Retail Trade and Restaurants and Hotels	-0.97% ***	-0.28% ***	-0.47% ***	-4.37% ***
Transport, Storage and Communication	-0.02%	-0.15% *	0.05%	0.79% *
Financing, Insurance, Real Estate and Business Services	-1.51% ***	0.19%	-0.16%	-8.78% ***
Community, Social and Personal Services	0.33% **	0.18%	0.18%	1.47% **
Category: Workplace characteristics	14.72% ***	3.03% ***	16.36% ***	63.12% ***
Category: Part-time	0.31% **	0.05% *	0.46% **	1.30% **
Category: Informal	3.42% ***	4.31% ***	4.16% ***	4.19% ***
Category: Region	-0.08%	0.21%	0.09%	-0.62%

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. ‘Category’ indicates that the category of variables (for example, education) aggregates the effects of more than one explanatory variable (for example, primary, CFT, IP, university, and postgraduate).

Table 8. Detailed decomposition of the total unexplained effects attributable to each category of variables

	Mean	10th percentile	50th percentile	90th percentile
Unexplained effects attributable to				
Category: Education (omitted: Secondary education)	0.0044	0.0087	0.0069	-0.0459 ***
	(0.0060)	(0.0079)	(0.0069)	(0.0177)
Primary	0.0272 ***	0.0084	0.0350 ***	0.0312 **
	(0.0049)	(0.0064)	(0.0056)	(0.0143)
CFT	-0.0028 ***	-0.0014	-0.0021 **	-0.0111 ***
	(0.0007)	(0.0010)	(0.0009)	(0.0022)
IP	-0.0026 **	0.0004	-0.0073 ***	-0.0022
	(0.0011)	(0.0014)	(0.0013)	(0.0032)
University	-0.0177 ***	0.0012	-0.0181 ***	-0.0615 ***
	(0.0023)	(0.0030)	(0.0026)	(0.0067)
Postgraduate	0.0004	0.0002	-0.0006	-0.0023 **
	(0.0004)	(0.0005)	(0.0004)	(0.0011)
Category: Individual characteristics	-0.0055	-0.0011	-0.0473 ***	0.0558
	(0.0143)	(0.0189)	(0.0166)	(0.0421)
Category: Industry (omitted: Construction)	0.0084	0.0333 *	0.0445 ***	-0.1107 ***
	(0.0137)	(0.0180)	(0.0158)	(0.0401)
Agriculture and Hunting	0.0130 ***	0.0203 ***	0.0278 ***	-0.0248 ***
	(0.0030)	(0.0039)	(0.0035)	(0.0087)
Forestry and Logging	0.0029 ***	0.0057 ***	0.0046 ***	-0.0068 ***
	(0.0009)	(0.0012)	(0.0010)	(0.0025)
Fishing	-0.0014 **	0.0004	-0.0009	-0.0016
	(0.0007)	(0.0008)	(0.0007)	(0.0019)
Mining	-0.0029 **	0.0007	-0.0047 ***	-0.0071 **
	(0.0012)	(0.0016)	(0.0014)	(0.0036)
Manufacturing	0.0032	0.0017	-0.0007	-0.0001
	(0.0039)	(0.0051)	(0.0044)	(0.0113)
Electricity, Gas and Water	-0.0033 ***	-0.0009	-0.0002	-0.0139 ***
	(0.0007)	(0.0009)	(0.0008)	(0.0021)
Wholesale and Retail Trade and Restaurants and Hotels	0.0029	0.0019	0.0125 ***	-0.0212 ***
	(0.0028)	(0.0037)	(0.0032)	(0.0082)
Transport, Storage and Communication	-0.0014	-0.0008	0.0023	-0.0084
	(0.0020)	(0.0027)	(0.0024)	(0.0060)
Financing, Insurance, Real Estate and Business Services	-0.0032 *	0.0051 **	0.0020	-0.0261 ***
	(0.0018)	(0.0023)	(0.0021)	(0.0053)
Community, Social and Personal Services	-0.0014	-0.0009	0.0018	-0.0008
	(0.0032)	(0.0042)	(0.0037)	(0.0094)
Category: Workplace characteristics	-0.0057	-0.0054	-0.0046	-0.0195
	(0.0086)	(0.0114)	(0.0098)	(0.0252)
Category: Part-time	-0.0050 ***	-0.0038 **	-0.0059 ***	-0.0019
	(0.0014)	(0.0018)	(0.0016)	(0.0041)
Category: Informal	-0.0038	-0.0281 ***	0.0042	-0.0225 ***
	(0.0028)	(0.0038)	(0.0032)	(0.0083)
Category: Region	0.079 ***	0.020 **	0.122 ***	0.068 ***
	(0.0070)	(0.0092)	(0.0082)	(0.0206)
Constant	0.134 ***	0.347 ***	0.025	0.077
	(0.0253)	(0.0333)	(0.0291)	(0.0743)

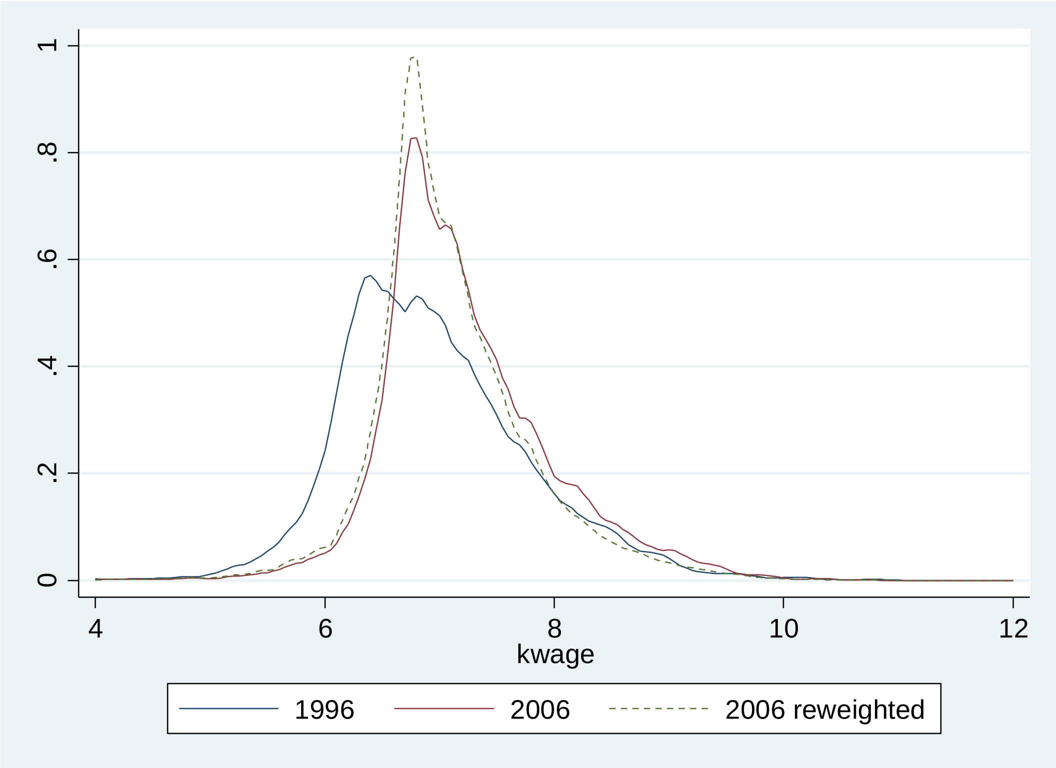
Note: The numbers in parentheses are standard errors. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. ‘Category’ indicates that the category of variables (for example, education) aggregates the effects of more than one explanatory variable (for example, primary, CFT, IP, university, and postgraduate).

Table 9. Relative contribution of each category of variables to the total unexplained effects

	Mean	10th percentile	50th percentile	90th percentile
Unexplained effects attributable to				
Category: Education (omitted: Secondary education)	1.62%	2.11%	3.47%	-31.6% ***
Primary	9.91% ***	2.02%	17.59% ***	21.5% **
CFT	-1.03% ***	-0.34%	-1.04% **	-7.7% ***
IP	-0.96% **	0.10%	-3.67% ***	-1.5%
University	-6.45% ***	0.28%	-9.10% ***	-42.3% ***
Postgraduate	0.15%	0.04%	-0.30%	-1.6% **
Category: Individual characteristics	-2.02%	-0.25%	-23.78% ***	38.4%
Category: Industry (omitted: Construction)	3.05%	8.04% *	22.38% ***	-76.1% ***
Agriculture and Hunting	4.73% ***	4.91% ***	13.95% ***	-17.0% ***
Forestry and Logging	1.07% ***	1.37% ***	2.31% ***	-4.7% ***
Fishing	-0.52% **	0.10%	-0.45%	-1.1%
Mining	-1.04% **	0.16%	-2.34% ***	-4.9% **
Manufacturing	1.16%	0.42%	-0.35%	-0.1%
Electricity, Gas and Water	-1.21% ***	-0.21%	-0.11%	-9.5% ***
Wholesale and Retail Trade and Restaurants and Hotels	1.05%	0.45%	6.28% ***	-14.6% ***
Transport, Storage and Communication	-0.53%	-0.19%	1.17%	-5.7%
Financing, Insurance, Real Estate and Business Services	-1.15% *	1.24% **	1.00%	-17.9% ***
Community, Social and Personal Services	-0.51%	-0.22%	0.91%	-0.5%
Category: Workplace characteristics	-2.08%	-1.31%	-2.29%	-13.4%
Category: Part-time	-1.81% ***	-0.93% **	-2.94% ***	-1.3%
Category: Informal	-1.40%	-6.80% ***	2.10%	-15.5% ***
Category: Region	28.73% ***	4.88% **	61.16% ***	47.0% ***
Constant	48.69% ***	83.70% ***	12.47%	53.1%

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. 'Category' indicates that the category of variables (for example, education) aggregates the effects of more than one explanatory variable (for example, primary, CFT, IP, university, and postgraduate).

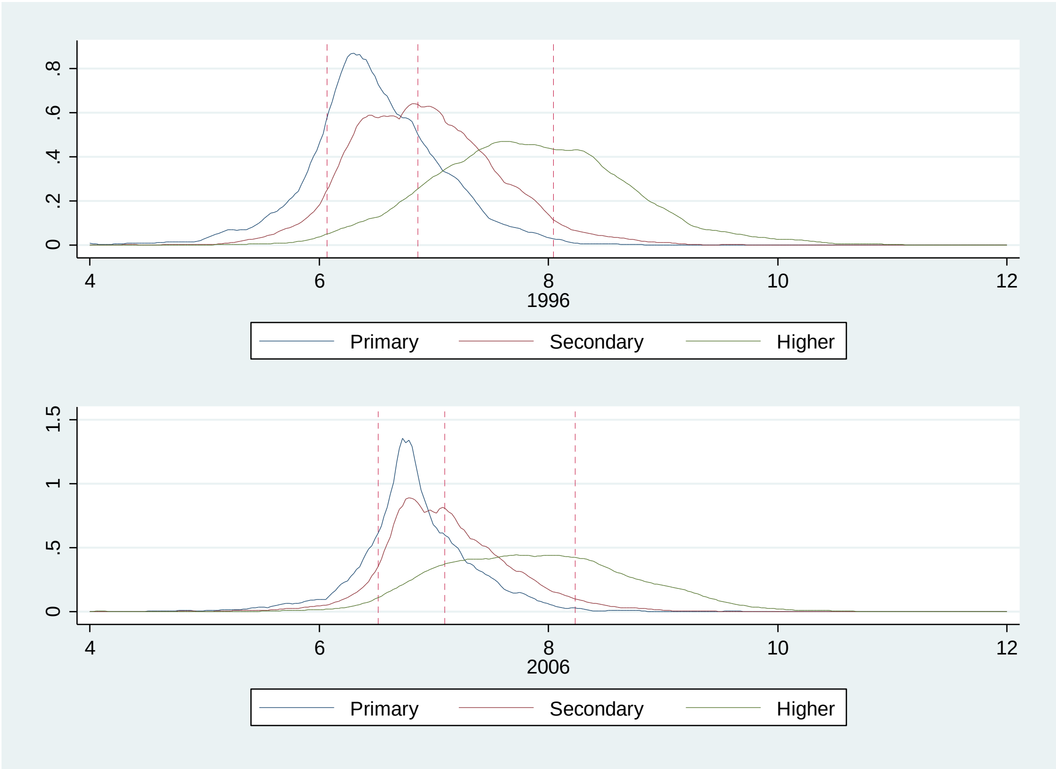
Figure 1. Estimated wage densities in 1996 (blue) and 2006 (red), and counterfactual densities in 2006 ('2006 reweighted'; green dotted).



Note: The densities are weighted using sample weights. 'Reweighted 2006' refers to the wage densities if all educational variables had been distributed as of 1996.

Source: Author's calculations, based on data from CASEN.

Figure 2. Estimated wage densities in 1996 and 2006, classified by educational achievements (workers with primary, secondary, and higher education).



Note: The densities are weighted using sample weights. The red dotted lines show the 10th, 50th, and 90th quantiles of the wage distribution of the whole sample for each year.

Source: Author's calculations, based on data from CASEN.