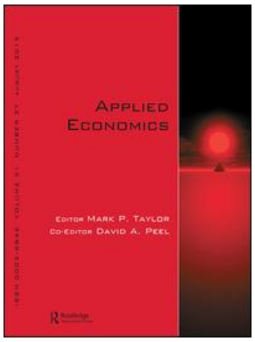

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Gender wage gap and firm market power: evidence from Chile

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ABSTRACT

The main aim of this work is to explain the Chilean gender wage gap using a dynamic monopsony model to estimate the labour supply elasticities at the firm level. Our results suggest that the elasticities of labour supply to firms are small, which implies that firms have labour market power. We also found that Chilean men would earn approximately 22% more than women as a result of the difference in labour supply elasticities by gender, ceteris paribus. Furthermore, we find that in the long run, the magnitude of between-firm differences in elasticities are higher than within-firm differences, which suggests that the gender wage gap is driven by structural factors that generate gender sorting to firms. Finally, since we use the same methodology and restrictions used in previous literatur for the US, we are able to empirically compare the elasticities for a high-income country (the US) are higher than those obtained for a middle-income country (Chile) for both men and women, which suggests higher labour market frictions in middle-income countries. The main difference between the US and Chile comes from the low labour supply elasticity of Chilean women, which appears to be explained from their low recruitment elasticity from non-employment.

KEYWORDS

Gender pay gap; dynamic monopsony; elasticity of labour supply; worker mobility; Chile

JEL CLASSIFICATION

J16; J18; J42; J62; J71

I. Introduction

The gender pay gap has been studied for decades in economics (e.g. Altonji and Blanck 1999; Bertrand 2011; Blau and Kahn 2017 for surveys), mainly but not exclusively because the diminished economic power of women has detrimental effects on society, which affects pensions, health, poverty, fiscal policy, etc. (e.g. EC 2013). Although there is a vast body of literature that studies the gender wage gap, most studies considered perfectly competitive labour markets assuming a perfectly elastic labour supply (Becker 1971). Studies related to monopsony models in the labour market have questioned Becker's approach because of the existence of frictions in the labour market (Robinson 1933; Madden 1973; Black 1995). The new monopsony literature (Manning 2003) emphasizes that monopsony power may arise even if there are many firms competing for workers. These models yield upward-sloping firm-level labour supply curves (even without concentration on the demand side) due to search frictions, heterogeneous preferences among workers and mobility costs.

This literature suggests that the monopsonistic framework can explain how discriminatory gender wage differences arise and persist if firms wield greater monopsony power over female workers than male workers. For this to hold, the supply of labour of women to the firm must be less wage-elastic than that of men. The lower labour supply elasticity of women may be due to various factors, such as: a) Family locational decisions (Cooke et al. 2009; Benson 2014; Webber 2016), b) Workers' preferences (Bonin et al. 2007; Albanesi and Olivetti 2009), c) Lower bargaining power (Croson and Gneezy 2009; Card, Cardoso, and Kline 2016; Cruz and Rau 2017), d) Psychological attributes (Mueller and Plug 2006; Borghans, Weel, and Weinberg 2014) and e) Sorting (Card, Cardoso, and Kline 2016; Cruz and Rau 2017).

Because of these factors, women may have fewer outside options than men, which makes their labour supply to the firm more inelastic. Due to data constraints, only recently have studies started considering the effect of imperfect competition in the labour market on the gender wage gap. Most of these studies have focused at the market level and

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found that male elasticity is higher than female elasticity, and this difference can explain approximately one-third of the gender wage gap. Until now, there is very little evidence at the firm level, and it is mostly for the United States. Furthermore, it can be argued that market imperfections (i.e. search frictions, mobility costs, etc.) are more prevalent in middle- and low-income countries than in the United States due to higher poverty rates, greater difficulty in starting businesses, poorer information technologies and transportation infrastructure, fewer education opportunities, and lower unionization rates (e.g. Jackson and Jabbie 2019). Additionally, empirical studies have noted that larger, more informal sectors and more widespread discrimination in many middle- and low-income countries are particularly harmful to female equality and mobility (Chioda 2011; World Bank 2012).

Hence, our work aims at calculating and comparing labour supply elasticities at the firm level by gender for Chile with those obtained for the U.S., which indirectly examines the prevalence of labour market frictions in both cases. We focused on Chile because it is an interesting case to study as it is a developing economy that shares similarities with developed countries in terms of labour market institutions (e.g. unemployment insurance, minimum wage and active labour market programmes) but has not completed the transition to economic development (e.g. a significant share of its labour market is informal work, high wage inequality, low quality of education, etc.).

We used the Chilean Unemployment Administrative Database for the 2010–2019 period. This panel database considers information about individuals who were employed in the private sector (as dependent workers) since October 2002 and decided to affiliate with this system and individuals who were not working at that time but found a dependent job in the private sector after that date.

This paper is structured as follows. Section II presents a literature review of previous works that used dynamic monopsony models. Section III presents the empirical strategy followed by Webber (2016) to estimate labour supply elasticities for the U.S.A. and his results. Section IV describes our application to the Chilean case and a discussion of both results. Section V includes concluding remarks and a discussion of avenues for future research.

II. Literature review

Previous literature on the gender wage gap is huge (see Blau and Kahn 2017 for a recent survey), but it generally assumes competitive labour markets. Only recently have studies started considering the effect of imperfect competition in the labour market on the gender wage gap. Manning (2003) estimated the labour supply elasticities for American and British data sets. Labour supply elasticities are notably low (0.68–1.4), but he does not find differences by gender. Because Manning used data sets based on supply-side individual- or household-level surveys, he could not adecuately control adequately for firm-specific determinants of transition behaviour.

Due to data constraints, only recently have studies considered the effect of imperfect competition in the labour market on the gender wage gap. Among the first, Barth and Dale-Olsen (2009) studied the gender wage gap using this framework for Norway. They found that labour supply elasticities were approximately 1.1–1.4 for men with low and high education levels and 1.0–1.1 for women with low and high education levels respectively. Ransom and Oaxaca (2010) and Hirsch, Schank, and Schnabel (2010) estimate the male and female labour supply elasticities; the former used data from one regional grocery retailer in the United States, and the latter used German panel data.

Ransom and Oaxaca (2010) exploited the differences in wages and separations between job titles in a firm. Furthermore, they did not control for firm-specific controls (as in Manning 2003) and implicitly treated wages of workers as exogenous; they claimed that employers had no control over wages because wages for each job title were fixed by bargaining. The authors found differences in labour supply elasticity between males and females, with the latter being smaller than the former (i.e. 2.5 for men and 1.6 for women). Ransom and Oaxaca (2010) relied on a specification in the spirit of Burdett and Mortensen (1998) equilibrium search model with wage posting, where the transitions to and from nonemployment are wage-inelastic; therefore, the wage-related hire of one firm is the wage-related quit of another firm.

Unlike the study by Ransom and Oaxaca (2010), Hirsch, Schank, and Schnabel (2010) allowed for wage-elastic transitions to and from nonemployment and controlled the firm characteristics. They used the German-linked employer-employee data set LIAB for the years 2000–2002. Their estimated elasticities were 1.9 to 3.7, depending on specification, with women's elasticity always lower than men's. Their results suggest that new monopsony models imply that firms have substantial monopsony power because the estimated elasticities are small in size. Furthermore, although they did not directly test the difference between men's and women's elasticities, they calculated that it should explain approximately one-third of the observed gender pay gap, which is similar to the result of Ransom and Oaxaca (2010).

Booth and Katic (2011) followed Manning's approach to estimate the elasticity of the labour supply separated by gender using the Household Income and Labour Dynamics in Australia (HILDA) Survey. They found elasticities of 0.76 and 0.61 for men and women, respectively, which are close to the result of Manning (2003) for the UK (0.75). Similarly, Sulis (2011) estimate gender wage differentials in Italy for the period of 1985–1996 using dynamic monopsony models and data from the Italian Administrative Social Security Archive (INPS). The reported elasticities for men and women are smaller than those found in previous literature, being 0.4 and 0.3 respectively.

Until now, all empirical studies have calculated the elasticity at the market level. Webber (2015) extended the theoretical and empirical model to the firm level using thousands of firms in several industries for the United States instead of one firm, as used by Ransom and Oaxaca (2010). He found support in the data for dynamic monopsony models. Webber (2016) extended his previous work by breaking down the elasticity by gender. He estimated the male and female labour supply elasticity by firm for the United States and used this information to study the gender pay gap. In both studies, Webber found substantial search frictions in the United States labour market, where females faced a higher level of friction than males. He also found that males faced a labour supply elasticity of 0.15 points higher than that for females (i.e. 1.09 versus 0.94), which explains about 33% of the raw gender wage gap in his sample.

We use Webber's approach to the Chilean context to analyse the labour market power of firms and its differences by gender. Furthermore, we also study between versus within firm differences in labour supply elasticities by gender and their magnitudes by industry.

III. Empirical strategy

Estimating the elasticity of labour supply

Webber (2016) splits the recruitment flow from unemployment versus recruitment flow from other firms and separation rate to unemployment versus separation rate to other employment:

$$\varepsilon_L = \theta^R \varepsilon_R^E + (1-\theta^R)\varepsilon_R^N - \theta^S \varepsilon_S^E - (1-\theta^S)\varepsilon_S^N \quad (1)$$

where ε_R^E is the elasticity of recruitment of workers from employment, ε_R^N is the elasticity of recruitment of workers from nonemployment, ε_S^E is the elasticity of separation of workers to employment, ε_S^N is the elasticity of separation of workers to nonemployment. θ^R and θ^S are the share of recruits from employment and share of separations to employment, respectively. As discussed in the literature, the two separation elasticities can be easily estimated with duration models (described below). However, recruitment elasticities are more difficult to obtain. Therefore, recruitment elasticities can be expressed as functions of estimable quantities such as:

$$\varepsilon_R^E = \frac{-\theta^S \varepsilon_S^E}{\theta^R} \quad (2)$$

$$\varepsilon_R^N = \varepsilon_R^E - \frac{w\theta^{R\prime}(w)}{\theta^R(w)\left[1-\theta^R(w)\right]} \quad (3)$$

This equation is derived from the definition of the share of total recruits from employment: $\left(\theta^R = \frac{R^E}{R^E+R^N}\right)$, where R^E and R^N are the recruits from employment and nonemployment, respectively. Taking the natural log of each side and differentiating yield Equations (2) and (3). The second term on the right hand side of Equation (3) can be considered as the bargaining premium that an employee receives from searching while currently employed.

Estimation of the elasticity of labour supply to the firm

To estimate the labour supply elasticity to the firm, Webber (2016) needs several elements: First, the elasticities of separation to employment (ε_S^E) and nonemployment (ε_S^N). Second, the premium to searching while employed $\left(\frac{w\theta^R(w)}{\theta^R(w)\left[1-\theta^R(w)\right]}\right)$. Third, the recruitment and separation share for each firm (θ^S and θ^R). Each of the following models is run separately by gender for every firm in the sample, where the unit of observation is an employment spell.

Webber (2016) begins with the estimation of the elasticity of separation to nonemployment (ε_S^N). To do this, we use a Cox proportional hazard model given by:

$$\lambda(t \mid \beta^{N,\,sep} \log(earnings)_i + X_i\gamma^{N,sep}) = \lambda_0(t)e^{(\beta^{N,\,sep} \log(earnings)_i + X_i\gamma^{N,\,sep})} \quad (4)$$

where $\lambda()$ is the hazard function; λ_0 is the baseline hazard; t is the length of employment; $\log(earnings)$ is the natural log of quarterly earnings of individual i and X is a vector of explanatory variables. Workers who transition to a new employer or are with the same employer at the end of the data series are considered to have a censored employment spell. β is the estimated elasticity of separation to nonemployment. The estimation of the elasticity of separation to employment (ε_S^E) follows an analogous setting:

$$\lambda(t \mid \beta^{E,\,sep} \log(earnings)_i + X_i\gamma^{E,sep}) = \lambda_0(t)e^{(\beta^{E,\,sep} \log(earnings)_i + X_i\gamma^{E,\,sep})} \quad (5)$$

with the only difference being that the sample is restricted to workers who do not have a job transition to nonemployment. β is the estimated elasticity of separation to employment.

To estimate the premium to searching while employed $\left(\frac{w\theta^R(w)}{\theta^R(w)\left[1-\theta^R(w)\right]}\right)$ Webber (2016) follows Manning (2003), who shows that it is equivalent to the coefficient on log earnings when estimating the following logistic regression:

$$P_{rec} = \frac{e^{(\beta^{E,\,rec} \log(earnings)_i + X_i\gamma^{E,rec})}}{1 + e^{(\beta^{E,\,rec} \log(earnings)_i + X_i\gamma^{E,\,rec})}} \quad (6)$$

The dependent variable takes a value of 1 if a worker was recruited from employment and 0 if she/he was recruited from nonemployment. This coefficient is interacted with time dummies to enable time variation. The same explanatory variables in the separation equations are used in this logistic regression.

Results for U.S.A

To estimate the gender-specific firm-level labour-supply elasticities presented in Equation (1), Webber (2016) uses linked employer–employee data from the U.S. Census Bureau. His data covers approximately 98% of wage and salary payments in private-sector non-farm jobs, with quarterly observations on earnings and employment for 47 states between 1990 and 2008.

The author applied some sample restrictions: first, he only included an employment spell in the sample if at some point it could be considered the dominant job, defined as paying the highest wage of an individual's jobs in a given quarter. Second, he also removed all spells that span fewer than three quarters. This is because the data do not contain information on when in the quarter an individual was hired/separated, thus the entries for the first and last quarters of any employment spell will almost certainly underestimate the quarterly earnings rate. He also removed job spells which corresponds approximately to the top and bottom 1% of observations. Additionally, he limited the analysis to firms with at least one hundred total employment spells of any length over the lifespan of the firm, and twenty-five employment spells in each estimating equation. After making these restrictions, he is left with two samples of interest: all workers for whom he can estimate a gender-specific labour-supply elasticity, and workers who work at firms where he can identify both a male and female elasticity.

Webber finds that the average labour supply elasticities (0.94 for women and 1.09 for men) are fairly monopsonistic, implying a high degree of market power for firms. Second, the difference between the male and female labour-supply elasticities (0.15) implies that men should earn approximately 7.5% more than women solely as a result of the disparity in labour supply elasticities. This corresponds to about 33% of the raw gender wage gap in his sample. Finally, Webber concludes that the difference in labour-supply elasticities between men and women is driven by the difference between the separation and recruitment elasticities to/from employment, which implies that the increased search frictions for women are due more to a lower job offer arrival rate as opposed to a higher job-destruction rate.

Webber also finds that there is only a small gender differential when looking within firms. Thus the majority of the elasticity gap between men and women is driven by differences across firms, with women disproportionately working at low-elasticity (and therefore low-wage) firms. This conforms with predictions from the early gender differential literature (Blau 1977; Groshen 1991) and the equilibrium search model of Bowlus (1997).

Finally, Webber's analyzes labour-supply elasticities by industry finding that the most competitive industries among men are the manufacturing and mining/oil/natural gas sectors, while the least competitive are the administrative support and accommodation/food service sectors. Among women, the most competitive industries are manufacturing and transportation, while the least competitive are the administrative support and health-care sectors. Overall, Webber finds that the male labour-supply elasticity is greater than or equal to the female labour-supply elasticity in eighteen of the twenty sectors, and only slightly smaller in the other two. By far, the greatest elasticity differential can be found in the construction industry, where men face an elasticity of 1.39 compared to 0.92 for women.

IV. Data and results for Chile

Data and summary statistics

To estimate the labour supply elasticity of the firm by gender, we use Chile's full administrative Unemployment Insurance ('Seguro de Cesanta', in Spanish) database provided by the Unemployment Fund Administrator. By law, the Unemployment Fund Administrator is required to collect all contributions to unemployment individual accounts for each labour relation on a monthly basis. The affiliation to the unemployment insurance is mandatory for all new contracts since 2002. For pre 2002 contracts, affiliation is voluntary.

Our dataset spans from January 2010 to June 2019. Thus, we consider employment spells that began in January 2010 or after. By 2010, 86% of the Chilean labour force were affiliated to the unemployment insurance system. Our dataset includes individual and employer characteristics such as age, age squared, education, gender, region, time of affiliation to the insurance, monthly taxable income, industry, date of hiring, type of contract, geographical location and firm size. The variable education has several missing observations in the Unemployment Insurance dataset; hence, we complemented it with administrative information from the Ministry of Education.

In order to get a comparable sample, we replicate Webber (2016)'s sample restrictions in our dataset. After making these restrictions, we have a sample of all workers for whom we can estimate a gender-specific labour-supply elasticity. This sample consists of 7,420,602 employment spells (4,899,326 and 2,521,276 employment spells for men and women, respectively).

In Table A1, we present the descriptive statistics of our database. We observe that on average, male workers are slightly older and less educated than female workers. Furthermore, male workers receive around 23% higher monthly wages than female workers and have shorter employment spells than female workers. Firms in the sample have a quarterly average of 339 and 488 men and women, respectively. The higher average for women is because in our sample firms that hire women are commonly larger than those that hire men. This result is consistent with the imposed data restrictions. At the bottom part of Table A1, we[1] observe some characteristics of the firms. On average they hired 50.9 and 51.6 men and women per quarter, respectively. When recruitment and separations are compared, we observe that the average employment growth rate per firm is 1.03 and 1.05 for men and women respectively.[2] Finally, a limitation of this study and Webber's is that neither include non-pecuniary benefits nor usual weekly working hours, which may be important to estimate the labour supply elasticities.[3]

Labour supply elasticity by firm and gender

Columns 1–4 of Table A2 report the average (weighted by employment) firm-level elasticities of recruitment from employment and nonemployment, and the separation elasticities to employment and nonemployment, respectively. Column 5 of Table A2 lists the average (weighted by employment) firm-level elasticities broken down by gender, which is a combination of the first four columns and the recruitment and separation shares to/from employment as discussed in Section III. In the first three rows of Table A2, we present the long-run labour supply elasticities, while the fourth row describes the more flexible specification when a steady-state is not assumed, and elasticities are allowed to vary over time (i.e. the short run elasticity of Manning 2003). The preferred specification for the long run elasticity is row 3 which includes all control variables. Comparing rows three and four for men and women, we observe that the long run elasticities are slightly smaller than those obtained when we relax the steady-state assumption, but in all cases, men's elasticities are larger than women's elasticities. Because of space limitation and to use the more flexible model, our preferred specification is the model in row 4.

The labour supply elasticities are 0.7 for men and 0.51 for women, which implies that men should earn approximately 22% more than women due to the difference in labour supply elasticities ceteris paribus. This value represents approximately 95% of the raw gender wage gap from our sample. Thus the labour supply elasticities are small, which suggests that firms indeed retain relevant market power. A second relevant information from Table A2, is that the differences in gender labour supply elasticities appear to be explained by the differences in elasticities to/from nonemployment. In particular, an important difference occurs in the elasticity of recruitment from nonemployment.

Distribution of labour supply elasticity by firm and gender

Now, we analyse the differences of between and within firm percentile elasticity distribution. Columns 2–5 of Table A3 list results for the 25^{th}, 50^{th}, 75^{th} and 90^{th} percentiles of the distribution of estimated firm-level labour supply elasticities. The result presented in column 1 is larger than those in columns 3, which implies that the mean is higher than the median. This finding is consistent with a right-skewed distribution of estimated elasticities, where elasticities reach 1.65 and 1.47 for men and women, respectively at the 90^{th} percentile, which are approximately 2 and 3 times the mean elasticity of each gender. Thus, elasticities up to the 90^{th} percentile remain notably low, which suggests that there is considerable monopsony power in the Chilean labour market.

A second interesting result is that the differences across firm percentiles in the elasticity gap are larger than differences within firm percentiles. For example, the within elasticity gap in the 90^{th} percentile is 0.18 (i.e. 1.65 and 1.47 for men and women, respectively). This difference is much smaller than 1.36 and 1.32 obtained for the 90^{th} – 25^{th} percentile for men and women, respectively. To gain insights into the characteristics of firms that appear at the lowest and highest parts of the elasticity distribution, we present in Table A4 a characterization of firms in the lower 25^{th} and upper 75^{th} percentile of the labour supply elasticity distribution. For men and women, firms with

[1]At least 100 employment spells over the lifespan of the firm and 25 separations or hirings.
[2]$Employmentgrowthrate = \frac{Recruitment}{Separations}$.
[3]However we do have information on weekly contractual hours, which may differ from usual working hours, but it would be at least helpful to compare men and women with identical ranges of weekly contractual hours. The results do not significantly change if we include weekly contractual hours or not. Also, results do not change significantly if we control for contractual full time hours (i.e. 45 hours a week). We decided not to include weekly contractual hours (or weekly contractual fulltime hours) in our main estimation because there are several missing values in this variable. We do not include working hours to make it comparable with Webber (2016) who also did not include hours.

low labour supply elasticities (25th percentile) pay slightly lower wages and have shorter employment spells than firms with high elasticity (75th percentile). Furthermore, on average, firms with low labour supply elasticity have slightly younger workers than firms with high elasticity. Finally, workers in firms with low labour supply elasticity have lower education than those working in firms with high labour supply elasticity.

Between and within firm differences

We conducted a complementary analysis to further investigate between versus within firm differences in gender-specific elasticities. Following Webber (2016), we use a sample of firms that only included individuals who worked at firms where we could estimate the labour-supply elasticities of both men and women. In the upper panel of Table A5, we calculate the difference among these gender-specific elasticities, which suggests that in our preferred model (full model time varying), on average, male elasticities between firms are 0.17 higher than female elasticities. In the second panel of Table A5, we present within firm differences, which are calculated by taking the difference between male and female elasticities for each firm and then taking the average of the differences across firms. The results of our preferred model (full model time varying) suggest that, on average, male elasticities are 0.09 higher than female elasticities within firms. Thus, we observe that between firm differences are higher than within firm differences (0.17 versus 0.09).

Labour supply elasticity by industry

In Table A6, we observe that for most industries, the elasticity of labour supply of men at the firm level is larger than that of women. Only in retail and financial intermediation and insurance, women have more elastic labour supply elasticities than men. Another interesting result is that there is an important variation of elasticities of 0.54–1.01 for men and 0.23–0.72 for women. For men, the more elastic industries (i.e. the more competitive industry) are manufacturing and mining; for woman, the more elastic industries are financial intermediation, transportation and storage. Despite differences in magnitude (discussed below), it is interesting that Webber (2016) also finds that manufacturing and mining are the two most competitive industries in the United States for men. For women, transportation is among the two most competitive industries in Chile and the United States. Among the least competitive industries in Chile for both men and women, are educational services and administrative services and support, which are also among the least competitive industries in the United States.

Discussion

Having obtained these estimates, one wonders if they are in line with those obtained for other countries with different or similar characteristics. Previous studies of the labour supply elasticity under dynamic monopsony models for Norway, Italy and Australia found elasticities of 0.3–1.4, and the labour supply elasticities of men (0.4–1.4) are always higher than those of women (0.3–1.1). However, these studies are not directly comparable to our estimation due to differences in frequency of data, data source (survey versus administrative data) and methodology.[4] Furthermore, all evidence estimated labour supply elasticities at the market level. The only study that estimated labour supply elasticities at the firm level with administrative data (as in our case) was Webber (2016).

Webber's work reported the labour supply elasticities at the firm level for the United States using the same methodology and restrictions as those imposed here. We compared our results with those obtained by Webber for the United States. The results in Table A7 suggest that the labour supply elasticities for the United States are higher than those estimated for Chile. As expected, this fact suggests fact would suggests that the United States has a more competitive labour market. In particular, for men, the

[4]For example: in the Italian case, monthly wages from administrative sources were used, while in the Australian case, the authors used yearly wages. For Norway, daily wages were used (see Barth and Dale-Olsen 2009; Booth and Katic 2011; Sulis 2011).

elasticity in the United States is 1.09, which is higher than the Chilean equivalent (0.70). For women, the difference is larger; the elasticity is 0.94 for the United States and 0.51 for Chile. This comparison is interesting because the Chilean labour market has important differences compared with the United States labour market. For example, the Chilean labour market has a higher level of informality (30%) than the United States labour market (20%),[5] lower levels of average education (10.3 years versus 13.4 years),[6] greater difficulty associated with starting a business (56th versus 8$^{\mathbf{th}}$ in Doing Business Ranking UNDP 2019), less investment in transport infrastructure (34% of Chilean GDP and 42% of United States GDP)[7] and an overall higher rigidity of the labour market (e.g. higher severance payments, higher unionization rate, etc.)[8] which highlights important differences between developed versus developing labour markets. For example, Chilean women working in the informal sector (or not working at all) have access to free public childcare, while they do not have it in United States. Then, with an identical raise in wages, it would be more costly to lift a women from nonemployment in Chile than in the United States, ceteris paribus. This issue affects the elasticity of recruitment from nonemployment for women, which affects the overall labour supply elasticity of women in Chile. This may be one of many potential reasons why Chilean women have a much lower labour supply elasticity than women in the US. This would be an interesting avenue for future research.

Therefore, our results suggest that the labour supply elasticities from Chile (0.70 and 0.51 for men and women, respectively) appear to be more inelastic than those obtained for the U.S. and located at the middle and lower bounds of the range of elasticities for men and women, respectively, compared to the results of several empirical studies for different developed countries such as Australia, Italy and Norway (0.3–1.4). With the elasticities obtained here (0.7 and 0.51), men should earn approximately 22% more than women due to the difference in labour supply elasticities *ceteris paribus*. The difference in labour supply elasticities explains approximately 95% of the raw gender wage gap of our data, which is higher than the approximately 33% reported for the United States by Webber.

V. Concluding remarks and policy recommendations

We analysed the gender wage gap using a dynamic monopsony model and estimated labour supply elasticities at the firm level for Chile using the same methodology and restrictions that Webber (2016)'s for the U.S.A. We find that Chilean men earn approximately 22% more than women because of the difference in labour supply elasticities, *ceteris paribus*. Our results also suggest that the labour supply elasticities are small, which implies that firms have relevant market power. Firms with low labour supply elasticities have slightly younger and less educated workers, pay lower wages and have shorter employment spells than firms with high labour supply elasticities. Furthermore, we find that the differences in gender labour supply elasticities appear to be explained by the differences in elasticities to/from nonemployment. In particular, the biggest difference occurs in the elasticity of recruitment from nonemployment. An interpretation of this finding can be that increased search frictions for women affect their recruitment from nonemployment. Thus, there may be frictions that are sticking them to their nonemployment status (or at least non formal employment). Potential explanations for this result may be that informality is more attractive in Chile due to for example, the very rigid labour code that regulates formal employment, nonpecuniary benefits, specific

[5]Chile: Instituto Nacional de Estadsticas. U.S.A.: Federal Reserve Bank of Saint Louis: https://www.stlouisfed.org/on-the-economy/2017/april/informal-labour-market.
[6]Source: Human Development Reports. http://hdr.undp.org/en/indicators/103006.
[7]OECD: https://data.oecd.org/transport/infrastructure-investment.htm.
[8]In the OECD index (2013), where 0 is soft and 5 is strict, Chile has a score of 2.5 for individual dismissal while the U.S. has 0.5. Source: https://www.oecd.org/employment/emp/oecdindicatorsofemploymentprotection.htm; https://www1.compareyourcountry.org/employment-protection-legislation/en/0/176/datatable//CHL+USA. The unionization rate in 2018 is 20% in Chile and 10.5% in the United States. Source: for Chile, Consejo Superior Laboral. For the U.S., https://www.bls.gov/news.release/pdf/union2.pdf.

preferences, bargain power or maybe even cultural issues regarding the role of women in Chilean society. For example, the current Chilean labour code establishes a very rigid working hours schedule of 45 hours a week. This situation contrasts with many other countries where working hours are defined as averages per week calculated on monthly or quarterly basis (e.g. 45 hours a week on average). Thus, working hours regulation can be one of several determinants of the low elasticity of recuitment from nonemployment (or non-formal employment) of women in Chile. Another potential determinant could be the design of social benefits as people lose some social benefits when a formal employment is found.

Our results suggest a much less competitive labour market for the middle-income country (Chile) than for the high-income country (United States). Furthermore, the elasticity of Chilean men is not far from the intermediate values obtained in the literature; however, the elasticity of women appears to be notably low compared to international evidence. Again, as expected, the main driver for the low labour supply elasticity of Chilean women appears to be the elasticity of recruitment from nonemployment. Thus, there are some determinants that affect the stickiness of women to nonemployment. As previously mentioned, several determinants should be more comprehensively investigated in future research. *While these hypotheses must be further explored, it becomes clear that a policy recommendation for the Chilean case is to go beyond salary incentives to attract women into the labour market. For example*, one policy that can encourage women to start working in the formal sector is a more flexible working hours regulation in the private sector and a better design of social benefits in order to avoid desincentives to work in the formal labour market.

We also investigated *between-* versus *within-*firm differences in gender-specific elasticities. Our results suggest that in the long run, between-firm differences are higher than within-firm differences. In other words, in the long run, between-firm differences in elasticities are more important than within-firm differences in elasticities. These results suggest that the gender wage gap appears to be driven more by *structural factors* that generate gender sorting to firms, especially in the long run. For example, women may sort themselves more into some industries or firms where the labour supply elasticity is low. This phenomenon can be due to various reasons such as education, preferences and culture, among others. *Our results call for public policies that focus on structural factors such as early determinants of gender sorting by firms. We think that these results are important and should be considered when designing policies to decrease the gender wage gap, especially in the context of developing countries*. This result is consistent with Card, Cardoso, and Kline (2016) and Cruz and Rau (2017), who analysed Portuguese and Chilean data, respectively, used different approaches and found that most of the wage gap was explained mostly by sorting instead of bargaining power within firms, which played a comparatively smaller role.

We also studied the gender labour supply elasticity by industry. Our results suggest that despite the differences between Chilean and American labour markets, manufacturing and mining appear to be the most competitive sectors in both countries for men, and transportation is among the most competitive sectors in both countries for women. Meanwhile, educational services and administrative services and support are among the least competitive industries in both countries for men and women. Finally, we propose that this type of analysis should be replicated in other middle-income and lower-income countries to gain a more in-depth understanding of the role of market power in the gender wage gap in labour markets with different characteristics.

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Appendix A.

Table A1. Descriptive statistics.

	Male		Female	
Variable	Mean	Std. Dev.	Mean	Std. Dev.
Unit of Observation: Employment Spell	(1)	(2)	(3)	(4)
Age (Years)	36.6	11.7	35.0	10.8
<High School	0.27	0.22	0.19	0.20
High School Diploma	0.38	0.49	0.34	0.47
Some College	0.23	0.42	0.28	0.45
College Degree+	0.10	0.30	0.14	0.35
Spell Duration (quarters)	7.64	6.77	8.83	7.49
Quarterly Wages (CL$)	2,317,741	1,575,745	1,783,359	1,395,037
Quarterly Wages (US$)	2,826.5	1,921.6	2,174.8	1,701.2
Observations	4,899,326		2,521,276	
Unit of Observation: Firm				
Average Hires/quarter	50.9	165.2	51.6	192.6
Employment Growth Rate	1.03	0.35	1.05	0.51
Firm Employment	339.3	869.1	488.1	1,117.1
Observations	6,333			

Summary statistics by gender of our final sample from the 'Seguro de Cesanta' administrative records complemented with the administrative records from the Ministry of Education. The wages and employment spells are presented in quarterly terms. The employment growth rate is defined as recruitment/ separations. Exchange Rate = CL$820/US$.

Table A2. Firm level labour supply elasticity.

Model	ε_r^e (1)	ε_r^n (2)	ε_s^e (3)	ε_s^n (4)	Elasticity (5)
Male Elasticities					
Earnings only	0.90	0.52	−0.90	−0.92	1.68
No education controls	0.35	0.12	−0.35	−0.46	0.67
Full model	0.37	0.06	−0.37	−0.50	0.68
Full model time varying	0.39	0.06	−0.39	−0.50	0.70
Female Elasticities					
Earnings only	0.87	0.40	−0.87	−0.94	1.54
No education controls	0.30	0.02	−0.30	−0.43	0.50
Full model	0.31	0.02	−0.31	−0.44	0.50
Full model time varying	0.32	0.01	−0.32	−0.43	0.51

The first row represents estimates from Equations (4)–(6) where the only regressor in each model is log earnings. The second row also includes: age; age-squared; region, type of contract, number of employees working at the firm and industry indicator variables. The third row includes all previous controls and indicator variables for education level. The first four columns report the average firm-level elasticities of recruitment from employment (ε_r^e) and none-mployment (ε_r^n) and the separation elasticities to employment (ε_s^e) and nonemployment (ε_s^n). The final column combines these elasticities with the calculated shares of separations/recruits to/from employment and separation rates to obtain the labour supply elasticity. The first three rows only report the long-run elasticities, while the fourth row describes the elasticities when a steady-state is not assumed, and they are allowed to vary over time (i.e. the short run elasticity of Manning 2003).

Table A3. Estimated firm-level labour supply elasticities and their distribution.

Model	Mean (1)	25^{th} (2)	50^{th} (3)	75^{th} (4)	90^{th} (5)
Male Elasticities					
Earnings only	1.68	0.96	1.49	2.23	2.41
No education controls	0.67	0.35	0.61	0.93	1.76
Full model	0.68	0.34	0.63	0.96	1.79
Full model time varying	0.70	0.29	0.63	1.02	1.65
Female Elasticities					
Earnings only	1.54	0.88	1.41	2.08	2.35
No education controls	0.50	0.22	0.44	0.75	1.41
Full model	0.50	0.22	0.44	0.75	1.41
Full model time varying	0.51	0.15	0.47	0.86	1.47

Three separate regressions, which correspond to Equations (4)–(6), were separately estimated by gender for each firm in the data that satisfied the conditions described in the Data section. The coefficients on log earnings in each regression were combined, weighted by the share of recruits and separations to employment to obtain the estimate of the labour supply elasticity to the firm. The first row of each panel represents estimates from equations where the only regressor in each mode l is the log earnings. The second row also includes: age; age-squared;, region, type of contract, number of employees working at the firm and industry indicator variables. Third row includes all previous controls and indicator variables for education level. Year effects are included in all models. The first three rows report only the long-run elasticities, while the fourth row describes the elasticities when a steady-state is not assumed, and they are allowed to vary over time (i.e. the short run elasticity of Manning (2003)).

Table A4. Characterization of firms by elasticity percentile.

Model	ull Model Time Varying	
	25^{th} (1)	75^{th} (2)
Male Elasticities		
Age	35.55	35.58
<High School	0.27	0.26
High school diploma	0.38	0.39
Some college	0.23	0.23
College degree +	0.12	0.12
spell	7.39	8.32
Log(wage)	14.40	14.44
Female Elasticities		
Age	34.76	34.81
<High School	0.22	0.21
High school diploma	0.36	0.35
Some college	0.26	0.27
College degree +	0.16	0.18
spell	8.17	8.66
Log(wage)	14.09	14.21

Columns report the 25^{th} and the 75^{th} percentile of the labour-supply elasticity distribution calculated using only the full model time varying results. The full model time varying describes the elasticity when a steady-state is not assumed, and they are allowed to vary over time (i.e. the short run elasticity of Manning (2003)).

Table A5. Differences in labour supply elasticities (between and within firms).

	Mean
Differences Between Firms	
Earnings only	0.07
No education controls	0.13
Full model	0.14
Full model time varying	0.17
Differences Within Firms	
Earnings only	0.15
No education controls	0.06
Full model	0.08
Full model time varying	0.09

Between firms differences among men and women are obtained using firms that only include individuals who work at the firms, where we could estimate both male and female labour-supply elasticities. We take the average male elasticity between firms and substract the average female elasticity between firms. Within firms differences are obtained by taking the difference between male and female elasticities for each firm and then taking the average of the differences across firms. The sample includes workers who work at firms where we can identify both a male and female elasticity.

Table A6. Average firm labour supply elasticity by industry.

Variable	Men	Women
Mining	1.00	0.66
Manufacturing	0.78	0.77
Electricity, Gas and Water	0.72	0.23
Construction	0.58	0.41
Retail	0.58	0.63
Transportation and Storage	0.72	0.68
Accommodation and Food Services	0.68	0.49
Information and Communications	0.70	0.57
Financial Intermediation and insurance	0.64	0.72
Professional, scientific and technical services	0.55	0.54
Administrative Services and Support	0.54	0.39
Educational Services	0.54	0.53
Health Care and Social Services	0.67	0.54

We present the full model time varying results only. The full model time varying describes the elasticity when a steady-state is not assumed, and they are allowed to vary over time (i.e. the short run elasticity of Manning (2003)).

Table 7. Comparing developed versus developing labour supply elasticities.

Model	Chile (1)	U.S. (2)
Male Elasticities		
Full model time varying	0.70	1.09
Female Elasticities		
Full model time varying	0.51	0.94

The first row of each panel represents estimates from Equations (4)–(6), where the control variables include: log quarterly earnings; age; age-squared, region, type of contract, number of employees working at the firm and industry indicator variables; indicator variables for education level and year effects. Both columns represent the elasticity at the mean of the distribution for the full model time varying. The results for other specifications are available upon request. The full model time varying describes the elasticity when a steady-state is not assumed, and they are allowed to vary over time (i.e. the short run elasticity of Manning (2003)).