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# Firm gender labour supply elasticities and sources of separation: evidence from Chile

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## ABSTRACT

We exploit a national administrative dataset to estimate labour supply elasticities at the firm level in Chile, distinguishing for the first time the source of separation (quits versus layoffs), which is crucial as only the former is consistent with employees' responses to changes in wages. Our results suggest that labour supply elasticities increase by around 18% when all separations (i.e. without identifying its source) are used instead of voluntary separations (i.e. quits). Hence, it transpires that previous literature, which due to data constraints, did not identify the source of separations, presented results which were upward biased, thus overestimating labour market competitiveness. We also find that between firm differences in the gender-specific elasticities are more relevant than within firm differences when voluntary separations are used, a result that should be considered by governments in the design of their gender gap policy agenda.

## KEYWORDS

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

## JEL CLASSIFICATION

J16; J18; J42; J62; J71

## 1. Introduction

Before 2003, most of the literature had focused on studying the existence of discriminatory wage differences in perfectly competitive labour markets which assumes a perfectly elastic labour supply (Becker 1971). Monopsony literature, especially after Manning 2003's book, has questioned Becker's approach, suggesting that monopsonistic power on the part of the employer in the labour market can explain discriminatory behaviour due to the existence of frictions in the labour market. In particular, monopsony models could explain how discriminatory gender wage differences arise and persist if firms wield greater monopsony power over female than male workers. For this to hold, women's supply of labour to the firm must be less wage elastic than men's<sup>1</sup>


Due to data constraints, some studies have only recently started to consider the impact that imperfect competition in the labour market might have on the gender wage gap. Most of these analyses have been done at the market

level and using wage-separation elasticities (although they recognize that it is more appropriate to use the wage-quit elasticity, but they do not have that information). These studies found that male elasticity is higher than females' elasticity and that this difference can explain around one-third of the gender wage gap [Ransom and Oaxaca (2010) for the US and Hirsch, Schank, and Schnabel (2010) for Germany]. Webber (2016) extended the theoretical and empirical model to the firm level detecting substantial search frictions in the US labour market, with females facing a higher level of frictions than males. Vick (2017) points out that inclusion of layoffs in the data might confuse estimates based on worker movements, thus knowing the reason for job separations is critical, as elasticity estimates based on hazard models of quits vs. layoffs produce very different wage coefficients.

We contribute to the literature by adding some key elements. First, to the best of our

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<sup>1</sup>We use administrative merged data from the Ministry of Finance and Ministry of Education. All estimations were carried out in a secure server.

 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/13504851.2024.2399311>.

knowledge, we are among the first study to estimate labour supply elasticities by gender at the firm level using the source of separation.<sup>2</sup> We show that identification of the cause of separation is crucial as our results suggest that by using voluntary separations, labour markets appear to be more monopsonistic versus estimations obtained without identification of the source of separation, suggesting an upward bias in the extant literature. Second, by applying Webber's (2016) approach for the US to Chile is interesting as it can be argued that market imperfections (i.e. search frictions, mobility costs, etc.) are more prevalent in developing countries.<sup>3</sup> Additionally, some empirical literature notes that larger informal sectors and more widespread discrimination in many middle-income countries are especially harmful to female equality and mobility (World Bank 2012). A recent study, for the State of Oregon by Bassier, Dube, and Naidu (2023), have pointed out that studies which use Manning 2003's approach might suffered from biased estimation of labour supply elasticities. This could even be worse when monthly earnings are used instead of hourly earnings if women are more likely to work part-time. This could be a limitation when part-time work is important, although Diaz (2016) have pointed out that part-time work in Chile is not very significant by international standards<sup>4</sup> (e.g. less than half the rate of countries such as the Netherlands, Great Britain, Germany and Australia).<sup>5</sup>

## II. Estimation of the elasticity of labour supply to the firm

To estimate the labour supply elasticity at the firm level by gender, we follow Webber (2016) who begins with the estimation of the elasticity of

separation to nonemployment using a Cox proportional hazard model<sup>6</sup>

$$\lambda(t|\beta^{N,sep}\log(\text{earnings})_i + X_i\gamma^{N,sep}) = \lambda_0(t)e^{(\beta^{N,sep}\log(\text{earnings})_i + X_i\gamma^{N,sep})} \quad (1)$$

where  $\lambda()$  is the hazard function;  $\lambda_0$  is the baseline hazard;  $t$  is the length of employment;  $\log(\text{earnings})$  is the natural log of individual  $i$ 's earnings and  $X$  is a vector of explanatory variables. Workers who transition to a new employer or who are with the same employer at the end of the data series are considered to have a censored employment spell.  $\beta$  represents the estimate of the elasticity of separation to nonemployment. The estimation of the elasticity of separation to employment follows an analogous setting:

$$\lambda(t|\beta^{E,sep}\log(\text{earnings})_i + X_i\gamma^{E,sep}) = \lambda_0(t)e^{(\beta^{E,sep}\log(\text{earnings})_i + X_i\gamma^{E,sep})} \quad (2)$$

with the only difference being that the sample is restricted to those workers who do not have a job transition to nonemployment. To estimate the premium to searching while employed  $\left(\frac{\omega\theta^R(\omega)}{\theta^R(\omega)[1-\theta^R(\omega)]}\right)$  we follow Manning (2003) who

shows that this is equivalent to the coefficient on log earnings when estimating the following logistic regression:

$$P_{rec} = \frac{e^{(\beta^{E,rec}\log(\text{earnings})_i + X_i\gamma^{E,rec})}}{1 + e^{(\beta^{E,rec}\log(\text{earnings})_i + X_i\gamma^{E,rec})}} \quad (3)$$

where the dependent variable takes a value of 1 if a worker was recruited from employment and 0 if they were recruited from nonemployment.

## III. Data

We use the full administrative Unemployment Insurance database provided by the Unemployment Fund Administrator. By law, the

<sup>2</sup>Sharma (2023) studies the the role of monopsony power in explaining the gender wage gap in the Brazilian textile and clothing manufacturing industry without identifying the sources of separations. Hirsch, Schank, and Schnabel (2010) and Webber (2016) differentiate between separations to another employer and out of work (unemployment) which are imperfect measures of voluntary and involuntary separations. In our case, we cover all industries and also we have the exact cause of separation in our data as several consequences are derived from it, for example severance payments benefits depend on the cause of termination.

<sup>3</sup>Due to higher poverty rates, greater difficulty in starting businesses, poorer information technologies and transportation infrastructure, fewer education opportunities, and lower unionization rates than in the US.

<sup>4</sup>Around 10% of workers.

<sup>5</sup>Robustness analysis with only full time workers show very similar results.

<sup>6</sup>The estimations are done separately by companies.:

Administrator is required to collect, on a monthly basis, all contributions to unemployment individual accounts for each labour relationship. The time span in our dataset lasted from January 2010 to December 2017 and included individual and employer characteristics such as age, education, gender, tenure, region, time of affiliation to the insurance, monthly income, the reason and date of separation, industry, among others.<sup>7</sup>

From information included in the online Appendix (descriptive statistics), we observe that male workers are slightly older, less educated, receive 34.4% higher wages and also have shorter employment spells than female workers (17.7 months versus 20.4 months on average). The sample is made up of roughly 6,866,636 employment spells, belonging to about 3,212,361 unique individuals, who work at 7,357 separate firms.<sup>8</sup>

## IV. Results

### Labor supply elasticity by firm and gender

Column 1 of Table 1 reports the average<sup>9</sup> firm level elasticities using voluntary and all separations

broken down by gender. It can be seen that labour supply elasticities are small (i.e. 0.56 for men and 0.45 for women in our full-time varying model), suggesting significant market power for firms in Chile. Our results are lower than those obtained by Webber (2016) for the US (1.09 for men and 0.94 for women) with the same methodology, suggesting that Chilean labour markets are less competitive than the American labour market. For Chile, men earn approximately 16% more than women as a result of the difference in labour supply elasticities ceteris paribus. This difference corresponds to 52.6% of the raw earnings gap in our data.<sup>10</sup>

We re-estimate the same model but now using voluntary separations only (i.e. quits). Results are presented in column 5 of Table 1 and suggest that elasticities decrease when only quits are used (0.49 for men and 0.38 for women). This result implies that men should earn approximately 19% more than women as a result of the difference in labour supply elasticities ceteris paribus (corresponds to 62.4% of the raw earnings gap in our data).<sup>11</sup> This means that using voluntary separations instead of all separations increases by almost 19% the theoretical wage gap explained by the elasticity gap,

**Table 1.** Estimated firm-level labour supply elasticities and their distribution.

Model	All separations				Voluntary separations			
	Mean (1)	25th (2)	50th (3)	75th (4)	Mean (5)	25th (6)	50th (7)	75th (8)
<b>Male elasticities</b>								
Earnings only	1.05	0.61	0.94	1.45	0.96	0.42	0.80	1.42
No education controls	0.58	0.26	0.52	0.86	0.52	0.13	0.43	0.91
Full model	0.53	0.20	0.47	0.82	0.48	0.07	0.39	0.85
Full model time varying	0.56	0.19	0.50	0.89	0.49	0.00	0.39	0.92
<b>Female elasticities</b>								
Earnings only	1.03	0.52	1.00	1.55	0.97	0.32	0.97	1.55
No education controls	0.44	0.02	0.38	0.88	0.41	0.00	0.37	0.98
Full model	0.45	0.02	0.38	0.91	0.38	0.00	0.34	0.97
Full model time varying	0.45	0.00	0.43	0.99	0.38	0.00	0.37	1.09

Three separate regressions, corresponding to Equations (1) and (3) were estimated separately by gender for each firm in the data that met 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 model is log earnings. Second row also includes: age; age-squared; tenure, tenure squared, region, type of contract, number of employees working at the firm and industry indicator variables. Third row includes all previous controls plus 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)). The first column reports the firm labour-supply elasticity calculated with separations (i.e. voluntary and involuntary separations) while the fifth reports the same but using voluntary separations only (i.e. quits).

<sup>7</sup>Such as age squared, tenure squared, date of hiring, type of contract and geographical location. The education variable has several missing observations in the Unemployment Insurance dataset, which is why we complemented it with administrative information from the Ministry of Education. In this way, we were able to recover the missing information of the education variable. We present our results with all workers, however to acknowledge the limitation of having monthly earnings instead of hourly earnings, we have also performed a robustness analysis using only full-time workers and results do not change.

<sup>8</sup>A brief characterization of the Chilean labour market is included in the online Appendix.

<sup>9</sup>Weighted by employment.

<sup>10</sup>A similar result than the one obtained by Sharma (2023) for Brazil.

<sup>11</sup>For a brief discussion about these results as well as a related result in our 2022 companion paper, see online Appendix.

reinforcing the relevance of identifying the cause of termination of the labour relation. Failure to distinguish the two potentially biases elasticity estimates away from zero and might fail to capture gender differences in worker separation decisions.

### *Distribution of labor supply elasticity by firm and gender*

The differences between and within firms were next analysed. Results are presented in Table 1 for both cases (all and voluntary separations). Columns 2, 3 and 4 present results for the 25th, 50th and 75th percentiles of the distribution of estimated firm level labour supply elasticities. It can be noted that the results presented in columns 1 and 5 are larger than those presented in columns 3 and 7 which implies that the mean is higher than the median, which is consistent with the right skewed distribution of estimated elasticities.<sup>12</sup>

### *Between and within firms differences*

We perform a complementary analysis to further investigate between versus within firms differences in gender-specific elasticities. We used a sample of firms which only included individuals who work at firms where we were able to estimate both, a male and a female labour-supply elasticity.<sup>13</sup> In the upper panel of column 1 in Table 2 we calculated the difference among these gender-specific elasticities suggesting, in our preferred model (full model time varying) that, on average, male elasticities between firms are 0.1 bigger than female elasticities. In the second panel of column 1 in Table 2 we present within firms differences which were calculated by taking the difference between male and female elasticities for each firm and then taking the average of the differences across firms. Results of our preferred model (full model time varying) suggest that, on average, male elasticities are 0.09 times larger than female elasticities within firms, which suggests that when all separations are used there are no major differences in the elasticity gap between and within

**Table 2.** Differences in labour supply elasticities (between and within firms).

	All Separations	Voluntary Separations
	Mean	Mean
	(1)	(5)
<b>Differences Between Firms</b>		
Earnings only	0.02	-0.07
No education controls	0.14	0.09
Full model	0.08	0.06
Full model time varying	0.10	0.07
<b>Differences Within Firms</b>		
Earnings only	0.03	-0.04
No education controls	0.06	0.01
Full model	0.03	0.03
Full model time varying	0.09	0.03

Between firms differences among men and woman are obtained using firms that only includes individuals who work at firms where we were able to estimate both a male and female labour-supply elasticity. We take the average male elasticity between firms and subtract 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. This sample has 6,107,800 employment spells, belonging to 3,169,239 unique individuals who work at 6,985 separate firms.

firms. However, when voluntary separations are used (column 2 in Table 2), between firms differences are more than twice the magnitude of within firms differences (in our preferred model). In other words, when voluntary separations are used, between firms differences in elasticities are more important than within firms differences in elasticities. This latter result is in line with studies such as Card, Cardoso, and Kline (2016), Casarico and Lattanzio (2024) and Li, Dostie, and Simard-Duplain (2023) that shows that male-female sorting into firms (between firm variation) explains the biggest proportion of the gender wage gap relative to pay-setting (within firm variation). This is relevant as regulations targeted at firms might be able to help address the gender gap, however it seems that the gender wage gap is driven more by structural factors that generate gender sorting across firms.

## **V. Conclusions**

The gender wage gap has been studied for decades, but usually from the perfect competition approach. Due to data constraints, only recently

<sup>12</sup>We also observe from Table 1 that differences across firms in the elasticity gap are much bigger than differences within firms. For example, when all separations are used, the bigger within elasticity gap difference appears in the 25th percentile with 0.19 and 0.00 for men and women respectively (a difference of 0.19). This difference is much smaller than the 0.7 and the 0.99 obtained between the 75th–25th percentile for men and women, respectively. This same pattern is observed when quits are used instead of all separations.

<sup>13</sup>This sample has 6,107,800 employment spells, belonging to 3,169,239 unique individuals, who work at 6,985 separate firms.



empirical studies have attempted to analyse the gender wage gap using dynamic monopsony models; although most of these perform a market level analysis. We contribute to the literature by being among the first to estimate labour supply elasticities using voluntary separations. We find that using all separations increases the labour supply elasticities at the firm level by 18% relative to those found when voluntary separations are used. Thus, by using separations without identifying its source might bias results upward, suggesting that labour markets are more competitive than what they really are. Furthermore, when voluntary separations are used we find that between firm differences in the gender-specific elasticities are more relevant than within firm differences suggesting a relevant role of gender sorting across firms.

### Disclosure statement

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