Resource Misallocation from Childcare Policies*

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March 31, 2021

Abstract

Childcare costs limit the capacity of low-income families to work. Governments have designed various policies to reduce these costs, although some may have unforeseen negative general equilibrium consequences. This paper focuses on one law in Chile that forces firms with more than 19 female workers to pay for childcare. We evaluate its effects through a calibrated model that features firm and household heterogeneity. Removing the policy would increase GDP by 3.4%. The distributional impacts are sizeable, with losses of 18% among families losing coverage to gains of up to 20% for other families in consumption equivalent units. We evaluate two alternative policies: one currently being considered by the Chilean government that finances childcare through a labor tax, and another where all firms must pay for childcare irrespective of size. Both policies would provide gains for all households, with larger improvements in the former (GDP increases by 3.5%) and welfare gains for the poorest of up to 60%.

JEL classification: E65, E24, E25, D15

Keywords: Misallocation of resources, childcare subsidies, female labor supply, family economics, labor force participation.

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*We thank Richard Rogerson and Gustavo Ventura for their comments, along with participants at a seminar in WVU and the ASU Reunion Conference 2019, and thank CAF grant "Productivity in Latin America". Corresponding author: Loris Rubini, e-mail: loris.rubini@unh.edu.

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1 Introduction

In 2016, the OECD estimated that childcare costs were around 15 percent of net family income in its member countries, implying that it could seriously curtail low-income families' capacity to work (OECD, 2016). The COVID-19 crisis has further highlighted the importance of childcare provision for female labor force participation (Alon et al., 2020). For these reasons, many governments worldwide have elaborated policies to reduce the cost of childcare for families. While subsidies are a popular method to provide such cost reductions, in contexts where government resources are more limited, employer mandates are an often-used solution. Under these mandates, employers must provide free or low-cost daycare to their employees. However, as convenient as they are for some countries and as popular they sound, one immediately questions the types of distortions and general equilibrium effects these mandates may have. In this paper, we tackle this question by measuring the aggregate and distributional impact of a childcare policy in Chile, emphasizing the welfare impacts on different individuals.

The policy in question aims to benefit women, who have traditionally borne most of the costs as reflected in the lower female labor force participation and wages (see Myck and Paull, 2001; Blau and Kahn, 1997; Kleven et al., 2019). Jaumotte (2004), in an OECD report, suggests that subsidizing childcare is one fundamental way in which the gap between female and male labor force participation rates can fall, particularly for low-income women. However, when governments rely on mandates rather than subsidies, employers become less interested in hiring those covered by the policy. This paper quantifies the overall impact of a policy under which a woman's work is incentivized through a mandate for firms to provide only their female employees with free daycare. We study the effects of this policy in Chile, where it is enacted for firms hiring more than 19 women and covering women with children below the age of 2.

We quantify such policy's aggregate costs in a general equilibrium framework with firm and household heterogeneity. We show that the policy misallocates resources by driving some firms to stop hiring once they are close to the threshold, paying wages below labor's marginal productivity. This result is consistent with Escobar et al. (2016), who find many firms restricting female employees.

While evidence on the adverse aggregate effects of size-dependent policies has been presented before, attention has rarely been given to such interventions' distributive consequences. We pay special attention to how households of different characteristics are affected. To that end, our framework introduces several aspects of heterogeneity that accommodates well to the question studied. It includes overlapping generations with households that differ on age, gender, marital status, skill level, and children's number and timing.

There are three broad types of households: married couples, single females, and single males. Married couples and single females can have children in the initial periods of life. Children need parental care or childcare. If all parents work full time, childcare expenses are required. Hence, we assume that both parents can take care of a child. This assumption probably is not along the lines of what Chilean policymakers have in mind since only mothers are eligible for childcare subsidies. We (including the two fathers authoring this paper) believe that men can also take care of children.

On the technology side, we build on Ngai and Petrongolo (2017), who combine males and females in a production function with constant elasticity of substitution. We extend their framework in three key ways. First, we introduce several layers of skills and combine them in a nested CES function as in Katz and Murphy (1992). Second, the nested CES aggregate of labor is combined with capital via a Cobb-Douglas technology. Third, we introduce firm heterogeneity as in Hopenhayn (1992), where each production function exhibits decreasing returns to scale and has a total factor productivity ("TFP") parameter that is heterogeneous across firms.

We then introduce asymmetric information. Firms cannot verify whether a female has or will have a child during the present period, but females do.[1] Similarly, females cannot verify whether their employer has or will have more than 19 female employees. Age and skills are observable, allowing firms to observe whether females are of fertile or non-fertile age and their education.

In this setting, nothing prevents a firm forced to pay for childcare ("large" firms henceforth) from hiring only non-fertile-age females, which is counterfactual because we observe many fertile-age females working in firms required to pay for childcare. To work around this, we develop a new equilibrium concept: a lawsuit-proof competitive equilibrium. If a fertile-age female does not get hired for a position, but an equally suited non-fertile-age female does, the foregone employee can sue the firm in a costly process that firms would like to prevent. In equilibrium, firms take into account this potential cost and set wages for fertile-age females in a way that, in equilibrium, both large and small firms are indifferent between hiring a fertile or a non-fertile-age female.[2] This results in higher wages for non-fertile-age females, and the difference is a function of childcare and lawsuit costs. The fixed nature of these costs implies that the difference in wages is decreasing in education, since the distortion is relatively larger where wages are lower.

Female marginal productivity differs across firms in equilibrium. Since the optimal policy is to equalize marginal productivity, we observe a reduced output per unit of resource. To understand why this is so, consider how firm behavior differs along with TFP. Firms with small TFP behave optimally by setting marginal cost equal to marginal productivity. As TFP grows, so does the demand for female labor. At some point, the quantity demanded is larger than the threshold that forces firms to pay for childcare. Firms beyond that threshold, but close to it,

[1] Without asymmetric information, the equilibrium would sort mothers into small firms that hire less than 19 females, and there would be no misallocation.

[2] Several alternatives would generate the same type of equilibria. For example, if there is a cost to search for non-fertile-age females, firms would still hire fertile-age women when the cost of hiring them would be smaller than the cost of hiring non-fertile-age females plus the cost of searching for them.

halt their hirings and operate at a lower-than-efficient level, with marginal productivity above marginal cost. As TFP keeps increasing, so does the pressure to hire more female workers until it becomes profitable to hire more females despite the larger marginal cost.

To assess the effect of the policy quantitatively, we calibrate our model to the Chilean economy. In particular, we match the production sector to the Chilean manufacturing sector using data from the *Encuesta Nacional Industrial Anual* (ENIA), and the household sector uses data from the *Encuesta de Caracterización Socieconómica Nacional* (CASEN). There are two critical features of the calibration. The first is the childcare cost. We set this so that childcare costs relative to GDP are the same in the model as in the data; we estimate this value to be close to 0.24% of GDP. The second is the threshold of 19 women for the mandate to pay childcare to female workers. We calibrate this threshold to match the share of females hired in firms with 20 or more females.

Despite the program's small magnitude, we find that it generates substantial distortions on the labor market and welfare. Removing the policy would increase GDP by 3.4%, partly due to an increase in factor supply: capital increases by 3%, female labor between 2.5 and 4.6%, and partly due to a more efficient allocation of resources. Wages would increase by 1% for males, and by between 3.2% and 11.3% for females. The largest increases in labor supply are for females of low education, which is the group the policy intended to help in the first place. Additionally, the increase in wages is more prominent for fertile-age females than for non-fertile-age ones.

This increase is not Pareto efficient. Since childcare is no longer covered, welfare drops for many females despite the higher wage. Low-education single females experience the largest welfare changes: women working in small firms whose childcare is not covered increase their welfare by up to 20% of consumption-equivalent units. In contrast, those covered lose up to 18%. Still, not all households with childcare covered lose: females married to the highest education males gain up to 1%.

We explore two alternative policies to subsidize childcare. In the first case, we transform the firm mandate into a subsidy financed through a tax on labor and provided to all females, irrespective of their workplace. The current government has proposed this policy in Chile. Our analysis firmly supports this idea: it would increase GDP by 3.5% and make every household better off. In particular, the gains for the lowest educated single mothers that must pay childcare out of pocket are considerable: in per period consumption equivalents, their welfare would increase by 59%. To understand why these increases are so large, notice that childcare payments act as a subsistence level of consumption. Thus when income is low, the marginal utility of consumption is very high. The removal of this subsistence level and the actual increase in consumption explains the large effect on welfare.

The last exercise extends the mandate to all firms, not only those hiring more than 19 females. The motivation for this is that there may be issues not considered within this analysis, such as corruption incentives or the cost of red tape, that make a government subsidy not feasible. The effects are qualitatively similar to those of the labor tax but milder. GDP would increase by 3.3%, and welfare increases would be decreasing in income. The overall effects are less marked than in the tax-funded policy because the distortions between fertile and non-fertile-age female workers and between female and male workers remain.

We contribute to the series of articles that have tried to connect childcare availability to female labor force participation. Habitually, this literature uses applied micro-econometric techniques to estimate the overall program effect on female labor force participation. They usually find that having cheaper or more accessible childcare increases female labor force participation (Blau and Currie, 2006; Cascio, 2009; Berlinski and Galiani, 2007; Baker et al., 2008; Gelbach, 2002). However, because of the methodology they employ, they cannot explore how providing childcare through a different policy tool may alter its impact or the channel through which the estimated aggregate effects occur. We argue that by ignoring the general equilibrium effects, the results can be misleading. Comparing the behavior of mothers receiving offers from large and small firms, removing the policy would reduce the labor supply of mothers by 40%, according to our model. While we find similar effects when considering general equilibrium effects (the drop is 38%), this does not include the changes that occur later in life. Adding these to the analysis, the lifetime effect of financing childcare drops to an increase in labor supply of only 10%.[3]

Our work is also related to the body of work estimating the impact of discontinuities in public policies on firms' decisions. Public policies that are dependent on firm size are called regulatory tiering, and Brock and Evans (1985) argue that when faced with administrative costs of collecting taxes, it could be optimal for the government to use size-dependent policies instead of a unique rule. However, the empirical evidence has suggested that these policies can generate significant distortions in firm size. Becker and Henderson (2001) show that size-dependent environmental regulations cause distortions in terms of firm size. Gao et al. (2009) show the same for financial regulation. Leal Ordóñez (2014) shows that incomplete enforcement can have a similar effect, where firms may withhold on capital, creating inefficiencies. We believe to be the first paper to look at a childcare policy with these discontinuities in a general equilibrium setting and, more importantly, a policy where it is not income, capital or the total number of workers what generates the size dependency, but the number of workers of a given gender.

There is ample literature studying the costs of factor misallocation. Studies have shown that policies that generate misallocation of inputs lowers welfare and measured output per capita, as in Guner et al. (2008), Garicano et al. (2013), Gourio and Roys (2014), and Restuccia and Rogerson (2008), among others (see Restuccia and Rogerson, 2013, for a survey of the literature). In contrast, the substitutability between production factors and how they interact with misallocation has been largely unexplored. Most papers include only labor so that firms cannot substitute the source of misallocation for something else. Some of these papers include capital and labor, which allows

[3] A related paper that works in general equilibrium is Guner et al. (forthcoming), which analyzes in a framework very close to ours the effect of different policies to finance childcare.

for some degree of substitutability. Still, in our case, the substitutability is starker since males and females are potentially more substitutable than capital and (total) labor. We thus see our contribution as providing estimates that do take this substitution into account.

This paper is organized as follows. Section 2 describes the Chilean regulation in detail, including the effects that other studies have found. Section 3 describes the model. Section 4 introduces the Chilean childcare policy into the model. Section 6 calibrates the economy to the Chilean case. Section 7 describes the effects of the policy on misallocating resources. Section 8 discusses the results, section 9 discusses alternative policies to finance childcare and section 10 concludes.

2 Policy

The policy we study in this paper was established when labor force participation of females was extremely low, in 1917. It was then denominated *Ley de Salas Cuna* and forced every factory, workshop, or industrial establishment that hired 50 females or more (above age 18) to provide childcare, specially conditioned to receive female employees' children under one year of age while the mother was working.[4] The use of a threshold number of female workers was most likely linked to a minimum size that made it worthwhile for the employer to open on-site childcare. Without enough women workers, a firm may have had only one or two babies in their dependency simultaneously, increasing the cost of such provision. Over time, the law reduced the required number of females from 50 to 20 in 1931[5] and then later in 1987 it required childcare to be provided until the child was two years of age.[6] In 1998, the law was made harder to evade by preventing multi-plant firms from avoiding the policy by keeping their establishments below the required number of females, now including all plants in the calculations. However, over the whole period it remained a privilege reserved to the children of female employees: male employees who have children cannot benefit from the subsidy. This is in line with the fact that new mothers (but not fathers) who return to work are also granted one hour per day as "feeding time" for their baby, linking baby care with the gender of the parent.

In order to comply with the normative, firms have three options. First, they can create and maintain childcare centers annexed to the workplace, as the law initially conceived. Alternatively, firms can share childcare facilities with other establishments in the same geographic region. Finally, firms can also pay directly to external daycare centers. According to the employees' survey *Encuesta Laboral de la Dirección del Trabajo* (ENCLA), 69% of the establishments chose the latter in 2006. The remaining 31% was split between establishments that had their own daycare (5%), paid a bonus to the mother (15%), did not do anything (9%), or provided some alternative

[4] Ley 3186, (1917), Chile.
[5] Decreto con Fuerza de Ley 178, (1931), Chile.
[6] Decreto de Ley 2200, (1987), Chile.

solution (2%). Because of these numbers, the model in the next section assumes that firms pay external providers for the cost of childcare.

The cost of providing childcare for two years is considerable for firms. According to Aedo (2007), the average cost of registering a child in a daycare was of CLP$100,000 per month in 2002, which is about US$200. As a comparison, the average wage (for males and females) in the manufacturing sector in that same year was about CLP$222,000 per month. This suggests that this cost is relatively high compared to wage levels. Rau (2010) report a similar value by measuring the cost of daycare in 2008 by calling 30 establishments and obtaining an average value of CLP$137.438 for a full-day daycare. We use this to estimate that total childcare expenditure was about CLP$178 Billion in 2007, or about US$ 300 Million, which is about 0.2% of GDP (see section 6 for details).

Why has such a law endured over the years? While there have been many calls to repeal it, alternatives have also faced considerable opposition. A subsidy would require increasing labor taxes, which is seen as potentially curtailing employment and fostering informality. Small businesses have also been resistant to becoming subject to this provision, fearing increases in their costs. A daycare voucher replacement has also been opposed by early childhood specialists who argue that it could decrease the quality of care. Because of this political opposition to alternatives, the law remains in place despite the fact that its potential for discriminating against the hiring of young women has been recognized.

The firms' distribution shows evidence of this suspected behavior where firms avoid hiring 20 female employees not to become subject to the law. The data comes from the ENIA, a survey of manufacturing firms with more than ten employees carried out by the Chilean statistics office. Figure 1 shows the number of females hired by all firms that hire 10 females, 11 females, and so on. There is a clear drop in the number of firms that hire between 19 and 21 females. Theoretically, the drop should be between 19 and 20, which is slightly milder than the one from 19 to 21. We believe a reason for this is that survey takers round up, and if they hire 19 or 21 females, it is common for them to write down 20.

This behavior is not the same for all firms. Figure 2 shows firms' distribution by female employees for firms that hire less than 100 workers. In this case, we plot the number of firms (rather than females hired by firms) that hire different number of females. It is very hard to see a discontinuity among these firms. However, this discontinuity is very evident among firms hiring 100 or more employees, depicted in Figure 3. We observe that around 50 fewer firms hire exactly 20 women than those hiring 19. The difference may be due to the lower probability of detection among smaller firms. A reason for this may be that it is easier for small firms to "fly under the radar" and get away without full compliance with the law. In fact, Escobar et al. (2016) estimate that in the Chilean manufacturing sector, there is a fall of around 20 percent in the number of firms at exactly 20 females. The fraction increases to 36 percent when focusing on firms with more than 100 employees.

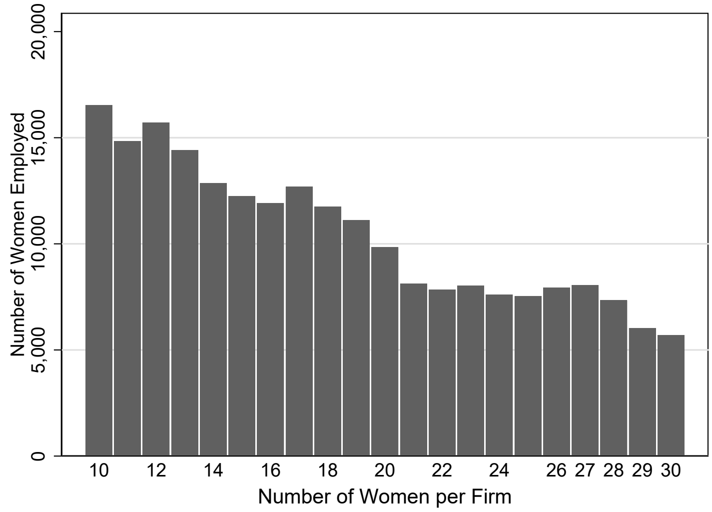

Figure 1. Number of firms by firms that hire x female employees.

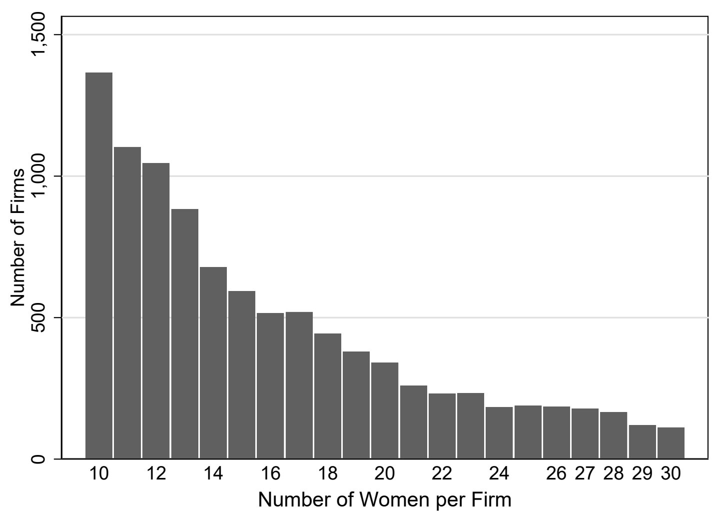

Figure 2. Number of firms with less than 100 employees that hire x female employees.

After showing evidence of the distortion generated by this law in terms of hiring, the rest of the paper quantifies the total and distributive costs of this law on the Chilean economy.

3 Model

We begin by describing the model used in this study in the absence of distortions. Thus, this section abstracts from the law that forces firms with less than 20 females to pay for child-

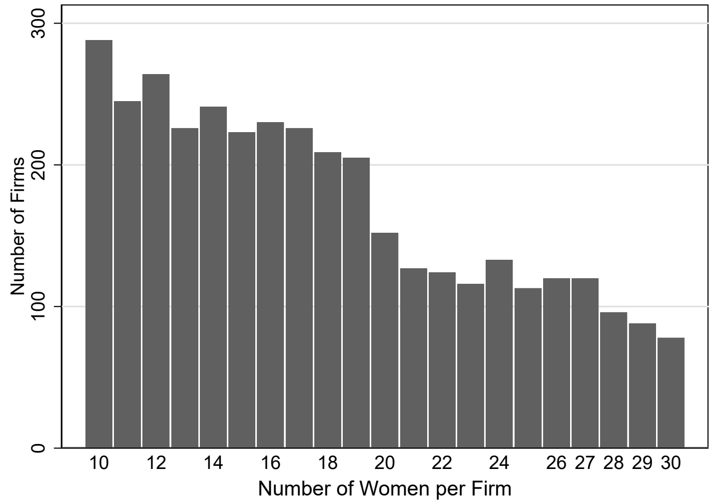

Figure 3. Number of firms with more than 100 employees that hire x female employees.

care expenses. Section 4 then introduces the law into the model and details how it affects the equilibrium.

3.1 Households

The model features overlapping generations with a continuum of males (m) and females (f), as in Guner et al. (2012). Individuals live for J periods, after which they exit the economy. Households are allowed to save but not borrow.

Population grows at rate n. There are three types of families: married couples, single females, and single males. In married couples, comprised of a male and a female, both individuals have the same age but not necessarily the same education. There are four possible education levels: primary or less, high school incomplete, college incomplete, and college or more.

Children are assigned exogenously at the start of life to single women and married couples. There are four types: *early* child bearers, *middle* child bearers, *late* child bearers, and those *without* children. Child bearers have two children for one period. Denote by $b = 0, 1, 2, 3$ individuals who have no children or that have children in generation 1, 2, and 3, respectively. Denote by p the probability of having children in the current period of a fertile-age female (equal for early, middle, and late child-bearers and across education levels).

Each period, individuals make labor supply, consumption, and savings decisions. Both males and females have an endowment of 1 unit of time each period. The labor decision is non-convex: they either work, or they do not. If parents work, they must pay childcare costs. Both males and females differ in their level of education.

Let $\varphi_{c,j}(e_m, e_f, b)$ be the measure of married couples of age j with male education e_m, female education e_f, and children at age b. Similarly, let $\varphi_{m,j}(e_m)$ and $\varphi_{f,j}(e_f, b)$ denote the analogous for single males and single females.

Preferences. The within period utility function for a single female is

$$U_f^S(c, l, e) = \log(c) - \lambda_{f,e} l$$

where c is consumption, l is time devoted to work, and $\lambda_{f,e}$ is a parameter controlling the disutility of work and depends on gender and education level e.

For simplicity and to shift focus away from male labor supply, we assume males do not value leisure, so that their within period utility function is

$$U_m^S(c) = \log(c)$$

Married households treat household consumption as a public good, so that their utility function is:

$$U^M(c, l, e_m, e_f) = \log(c) - \lambda_{c,e_m,e_f} l$$

3.2 Firms

There is an endogenous mass N of firms with a technology that inputs males, females, and capital. These technologies are nested CES functions. First, they combine male and female workers of the same education level as in Ngai and Petrongolo (2017). Then they aggregate these across education levels as in Katz and Murphy (1992). Finally, this aggregate is combined with capital in a Cobb-Douglas way. Each firm has decreasing returns to scale and differ in their level of total factor productivity (TFP), as in Hopenhayn (1992). The production function is

$$y = AF(\{h_{fe}\}, \{h_{me}\}, k)$$

where

$$F(\{h_{fe}\}, \{h_{me}\}, k) = \left\{ \left[\sum_{e=1}^{4} \epsilon_e \left(\xi_e h_{fe}^{\frac{\mu-1}{\mu}} + (1-\xi_e) h_{me}^{\frac{\mu-1}{\mu}} \right)^{\frac{\mu}{\mu-1}\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}(1-\alpha)} k^{\alpha} \right\}^{\theta}$$

where $\mu > 0$ is the elasticity of substitution between males and females, $\xi_e \in [0, 1]$ affects the female labor share, $\sigma \geq 0$ determines the elasticity of substitution across educations, $\epsilon_e \geq 0$ determines the share of output attributed to education level e, where $\sum_{e=1}^{4} \epsilon_e = 1$, $\alpha \in (0, 1)$ affects the capital share, $\theta \in (0, 1)$ determines the returns to scale, and $A > 0$ is TFP.

Firms are identical except for their productivity A. To operate, a firm spends κ units of the consumption good to draw a parameter A from a distribution with density $G(A)$. Firms last for one period, and there is a large (infinite) pool of potential entrants. They hire female labor, male labor, and capital services from the households. Capital depreciates every period at rate δ_k.

It is worth noting that the assumptions of free entry and firms lasting one period means that aggregate profits are zero. This assumption is very convenient since it implies that firm ownership is not important, as long as firm ownership is not correlated with productivity. In other words, there are no profits to rebate back to households.

3.3 Household Decision Problems

Let a denote assets, w_{fe} denote education level e female wages, and w_{me} denote education level e male wages, for $e = 1,2,3,4$. The maximization problems are, for each type, as follows.

Single females. The value function for a single female with assets a, education level e, age j and kids at time b is

$$V_f^S(a,e,j,b) = \max_{a',l}\{U_f^S(c,l) + \beta V_f^S(a',e,j+1,b)\}$$

subject to

$$c + a' = a(1+R) + w_{fe}l - \mathcal{I}_b \nu l$$

where if $b = j$ then $\mathcal{I}_b = 1$ otherwise $\mathcal{I}_b = 0$, $l \in \{0,1\}$ is labor supply, and $\nu > 0$ is the childcare cost. This childcare cost is only borne if the mother works, explaining why it is multiplied by l. $\beta \in (0,1)$ is the intertemporal discount factor. Notice that we have chosen the consumption good as the numeraire, and so its price is equal to 1.

Single males. The value function of a single male with assets a, education level e and age j is:

$$V_m^S(a,e,j) = \max_{a'}\{U_m^S(c) + \beta V_m^S(a',e,j+1)\}$$

subject to

$$c + a' = a(1+R) + w_{me}$$

where R is the market interest rate.

Married households. The problem of a couple with assets a, education levels e_m and e_f, age j and kids at time b is

$$V^M(a,e_m,e_f,j,b) = \max_{a',l_f,l_m}\{U^M(c,l_f,e_f) + \beta V^M(a',e_m,e_f,j+1,b)\}$$

subject to

$$c + a' = a(1+R) + w_{fe_f} l_f + w_{me_m} l_m - \mathcal{I}_b \nu \min\{l_f, l_m\}$$

where $l_f, l_m \in [0,1]$ and if $b = j, \mathcal{I}_b = 1$, otherwise $\mathcal{I}_b = 0$. The childcare cost is only borne if both parents work. If one of them does not, then $\min\{l_f, l_m\} = 0$ and the last term in the budget constraint vanishes.

3.4 Firm Decision Problems

Firms demand resources by maximizing profits. Their problem is

$$\pi(A) = \max_{\{h_{fe}\},\{h_{me}\},k} AF(\{h_{fe}\}, \{h_{me}\}, k) - rk - \sum_{e=1}^{4} w_{fe} h_{fe} - \sum_{e=1}^{4} w_{me} h_{me}$$

where $\pi(A)$ are the profits of a firm with TFP equal to A and $r = R - \delta$ is the rental rate. Let $h_{fe}(A)$ be the demand function for females of education e of a firm with productivity A, and define $h_{me}(A)$ and $k(A)$ accordingly. Aggregating, let H_{fe}, H_{me} and K be the total demand of females, males, and capital, then the following must hold:

$$\begin{aligned} H_{fe} &= N \int_A h_{fe}(A) G(A) dA \quad e = 1,2,3,4 \\ H_{me} &= N \int_A h_{me}(A) G(A) dA \quad e = 1,2,3,4 \\ K &= N \int_A k(A) G(A) dA \end{aligned}$$

Firms enter whenever the profits of doing so exceed the cost. The entry cost is κ units of the consumption good. Let $\pi(A)$ denote the per period profit of a firm with productivity A. Then an equilibrium with positive entry exists when the following free entry condition holds:

$$\kappa = \int_A \pi(A) G(A) dA$$

3.5 Market Clearing

Factor markets clear. Aggregate capital (K), female labor efficiency units (H_f) and male labor efficiency units (H_m) market clearing conditions are

$$
\begin{aligned}
K &= \sum_{j,e_m,e_f,b} \varphi_{c,j,b}(e_m,e_f)a_{c,j}(b,e_m,e_f) + \sum_{j,e_m} \varphi_{m,j}(e_m)a_{m,j}(e_m) + \sum_{j,e_f,b} \varphi_{f,j}(e_f,b)a_{f,j}(e_f,b) \\
H_{m,e_m} &= \sum_{j,b,e_f} \varphi_{c,j,b}(e_m,e_f,b)l_{c,m,j}(e_m,b) + \sum_{j} \varphi_{m,j}(e)l_{m,j}(e_m) \\
H_{f,e_f} &= \sum_{j,b,e_m} \varphi_{c,j,b}(e_m,e_f,b)l_{c,f,j}(e_f,b) + \sum_{j,b} \varphi_{f,j,b}(e)l_{f,j}(e_f,b)
\end{aligned}
$$

where $a_{c,j}(b,e_m,e_f)$ are the assets of a married couple of age j, kids at age b, male education e_m and female education e_f, $a_{m,j}(e_m)$ are the assets of a single male of age j and education e_m and $a_{f,j}(b,e_f)$ are the assets of a single female of age j, kids at age b, and education e_f. Similarly, $l_{c,m,j}(e_m,b)$ is the labor supply of a married male, of age j, education e_m and kids at age b, $l_{m,j}(e_m)$ is the labor supply of a single male of age j, with education e_m, $l_{c,f,j}(e_f,b)$ is the labor supply of a married female of age j, education e_f, and kids at age b, and $l_{f,j}(e_f,b)$ is the labor supply of a single female of age j, education e_f and kids at age b.

4 Childcare Policy

This section introduces the Chilean childcare policy into the model, which specifies that any firm hiring $\hat{h}_f$ (20 in the data) or more females must pay for childcare expenses during the first two years of the child. The key assumptions are that we allow firms to observe the education of a female and her age, but not whether she needs (or will need) childcare support during the present period. This assumption is motivated by the fact that firms can verify skills by looking at a resume, and age can, in most cases, be inferred by appearances. However, the decision to have a child is private, and females do not need to disclose this information in job interviews. Similarly, females cannot observe whether their potential employer hires or will hire more than $\hat{h}_f$ females, and therefore whether it will cover childcare. While this assumption may be irrealistic with extremely large firms, these are very few and it is common not to know how many females a typical Chilean firm hires.

In equilibrium, if wages of fertile and non-fertile-age females are the same, firms that hire less than $\hat{h}_f$ females are indifferent between hiring a female of fertile age or one of non-fertile age. Larger firms strictly prefer females of non-fertile age. This would produce an allocation where all females earn the same wage, and all fertile-age females would work in small firms. The rest would split between large and small firms (if the demand from large firms is less than the supply of non-fertile-age females, which is the case in our calibration). This would result in the childcare policy being ineffective since no firm would pay for it, which is not the case in Chile.

To address this problem, we develop a new equilibrium concept, the **lawsuit-proof** competitive equilibrium. The motivation is that if a fertile-age female has an interview with a large firm that decides not to hire her, but instead hires a non-fertile-age female with the same qualifications, the female who was not hired can sue at an expected cost of τ units of consumption to the firm. Similarly, a small firm must be indifferent between hiring a fertile or a non-fertile-age female.

The hiring process works as follows. A firm searches for a female employee with an education level e. The firm meets the applicant. If she is hired, the search stops. Otherwise, the search continues, in which case the applicant can sue for discrimination. The firm hires the employee when its expected cost does not exceed the lawsuit's cost plus the cost of hiring a non-fertile female.

Definition 1. *A lawsuit-proof competitive equilibrium is a competitive equilibrium where*

- *The expected cost of hiring a fertile-age female for a large firm does not exceed the cost of not hiring her, paying the lawsuit cost, and hiring a non-fertile-age female.*
- *The expected cost of hiring a non-fertile-age female for a small firm does not exceed the cost of not hiring her, paying the lawsuit cost, and hiring a fertile-age female.*
- *Absent the lawsuit threat small firms would hire all fertile-age females if demand exceeds supply. Otherwise, small firms would only hire fertile-age-females.*

The last condition in the definition makes sure the lawsuit threat is binding, which implies that the wage rate of fertile-age-females is lower than that of non-fertile-age females. In equilibrium, firms avoid the risk of a lawsuit by hiring the fertile-age female. In order to hire both fertile and non-fertile age females, firms adjust the wages of both types of females. By the law of large numbers, all firms hire the same proportion of fertile and non-fertile-age females.[7]

Proposition 1 *A lawsuit-proof competitive equilibrium where both small and large firms are indifferent between hiring females of all ages exists if and only if the following holds:*

$$\frac{\tau}{P_o} \leq pv \leq \frac{\tau}{(1-P_o)P_o} \tag{1}$$

where P_o is the proportion of females of non-fertile age.

Proof. See Appendix A. ■

[7]This ignores problems associated with non-convexities, that is, firms can hire fractions of a female. Otherwise, the law of large numbers would not apply, and the equilibrium would be highly intractable.

Notice that τ has both lower and upper bounds. This is key to narrow the scope of our quantitative results, as we detail in section 6.

While we suggest that a lawsuit is a likely justification for this equilibrium, other alternatives such as search costs that make it costly to keep looking for a non-fertile-age female would also generate similar patterns.

5 Equilibrium Characterization

We next describe a lawsuit-proof competitive equilibrium for this economy where firms hiring $\hat{h}$ females or more pay for childcare expenses.

5.1 Effects on Households

Appendix A shows the conditions that female wages need to follow in equilibrium. In particular, we work with the case in which negotiation between females and firms makes large firms indifferent between hiring a fertile-age or a non-fertile-age female.[8] This implies

$$w_{f,e,y} + p\nu = \frac{\tau}{P_o} + w_{f,e,o}$$

where $w_{f,e,o}$ is the wage of a non-fertile-age female with education e and $w_{f,e,y}$ is the wage of a fertile-age female with education e. The fact that $w_{f,e,y} < w_{f,e,o}$ implies that resources are shifted away from fertile-age females to non-fertile age females. Moreover, since equilibrium wages are increasing in education, the distortion is greater for low education levels. Finally, by targeting females, the policy shifts resources towards males.

On the other hand, under this policy families no longer need to pay for childcare, which can in principle benefit families with children. This benefit is relatively larger for lower education levels.

[8] Assuming that small firms are indifferent produces very similar results.

5.2 Effects on Firms

Firms solve the following maximization problem:

$$\pi(A) = \max\Bigg\{ \max_{\{h_{fe}\},\{h_{me}\},k} \Bigg\{ AF(\{h_{fe}\},\{h_{me}\},k) - \sum_e w_{me}h_{me} - P_o \sum_e w_{f,e,o}h_{fe} - (1-P_o)\sum_e w_{f,e,y}h_{fe} - rk - (1-P_o)p\nu \sum_e h_{fe} \Bigg\},$$
$$\max_{\{h_{fe}\},\{h_{me}\},k} \Bigg\{ AF(\{h_{fe}\},\{h_{me}\},k) - \sum_e w_{me}h_{me} - P_{ot}\sum_e w_{fe}h_{fe} - (1-P_o)\sum_e w_{f,e,y}h_{fe} - rk \Bigg\} \text{ s.t. } \sum_e h_{fe} \leq \hat{h}_f \Bigg\} \quad (2)$$

Intuitively, a firm compares two levels of profits: those if it hires more than $\hat{h}_f$ females understanding that some of them require childcare expenses (the top two lines in equation (2)), with that of hiring less than $\hat{h}_f$ females (the bottom 2 lines). They choose the maximum of those two profit levels.

The solution implies the existence of two productivity thresholds, A_1 and A_2, where $A_1 < A_2$. Firms with productivity $A < A_1$ demand less than $\hat{h}_f$ females, so the restriction is non-binding. Firms with productivity $A \in [A_1, A_2]$ would, absent the childcare policy, hire more than $\hat{h}_f$ females. The policy induces them to hire $\hat{h}_f$ females, thereby avoiding the childcare expense at the cost of setting marginal productivity above marginal cost. Firms with productivity A_2 are indifferent between hiring $\hat{h}_f$ avoiding childcare costs, or hiring a larger (optimal) number and paying for it. Firms with $A > A_2$ hire more than $\hat{h}_f$ females, incurring childcare payments. These firms are better off paying this additional cost than restricting the number of females.

6 Calibration

A period in the model corresponds to five years. We set $J = 8$, understanding that individuals start their working life at age 25 and finish it at age 64. We set $\beta = 0.974$ following Guner et al. (2012). We set δ, the depreciation rate for capital, so that annual depreciation is 5%.

To calibrate the cost of childcare ν, we match the ratio of childcare costs to GDP in Chile. We do not have a direct measure of childcare cost, so we build it as follows. Between 2005 and 2007, an average of 234,261 children were born per year. The infant death rate is 0.0076, so around 232,481 of these survive. That implies a total of almost 465,000 children under the age of two in 2007 who would be covered by the policy. On average, the cost of childcare per child is \$100,000 (Chilean Pesos) per month.

Both in the data and the model, not all children go to a childcare facility. On average, 52.2% of females between 25 and 40 years old work, so about this percentage of children need childcare. We reckon this may be an overestimation since many of these children may be taken care of by relatives, so we assume only 90% of these need childcare. The GDP in Chile in 2007 was almost $86 trillion. Thus, total childcare cost relative to GDP is.

$$\frac{\text{Childcare Cost}}{\text{GDP}} = \frac{0.522 \times 0.9 \times 100,000 \times 12 \times 232,481 \times 2 \times 4/5}{86,000,000,000,000} = 0.0024$$

The terms in the numerator are the following. The share of hours worked by fertile-age females relative to total hours is 52.2%, and 90% of these need childcare.[9] The following two terms are the annual cost of childcare: $100,000 per month, times 12 months. The next term is the number of children born that year (and surviving), and the number 2 represents the fact that children born the year before are also attending. The last term in the numerator (4/5) incorporates the fact that a period is 5 years in our model and that females send children to daycare for 4 years (2 children, 2 years each). The term in the denominator is GDP in Chile in 2007.

We calibrate the measures φ to match the shares of each type of married couples, single females and single males directly from the CASEN. Appendix B shows the number of observations for each type of household. We use these numbers divided by the total number of households. We calibrate the different λ's to match the employment rates for different groups as close as possible. We target rates of labor participation for married females. We leave single females out because we cannot generate employment rates as low as in the data. The reason for these low employment rates is that many single females in Chile receive subsidies that complement their income. Some of these are government subsidies, but most of these come from alternative sources, like family members. Since these subsidies are not in the model, we choose not to target the unemployment rates for this group. Thus, we set $\lambda_{f,e}$ as the average of $\lambda_{c,e_m,e}$ across e.

The key threshold $\hat{h}_f$ is calibrated so that the ratio of females in large firms relative to total females employed is as in the data. To compute this, the CASEN shows that 53.69% of all females work in firms with less than 10 employees. Next, the ENIA shows that of the females working in firms with 10 or more employees, 73.10% work in firms with 20 or more female employees. Thus, we compute the fraction of females working in firms with 20 or more females as the product of these two, that is, 39.24%. Using this, we assume that 39.24% of females receive offers from large firms, independently of their education, and the rest receive offers from small firms.[10]

[9] We use female hours worked as a proxy of how much time children spend in childcare. One important thing to mention is that we are not using males for this estimate. This is because we do not have data on hours worked within married couples. Even if we did, usually both parents work during the same time of day, which does not allow them to arrange hours so that one parent always takes care of the children. Most commonly, it is the female in the couple that works less in Chile, justifying our reasoning.

[10] This implies that since some females may reject an offer from a small firm but accept it from a large one, the actual number of females working in each type of firms may differ. We do this because it greatly simplifies the computational algorithm and the results are quantitatively very close to having 39.24% of females working for large firms.

Population grows at an annual rate of 1%. We set the probability of having children equal to 10%, which is roughly the proportion of females that have children between ages 25-40. More precisely, this ratio is 14% for females between 25 and 34 years old and 6% for females between 35 and 40 years old.

On the firm side, we first choose a functional form for $G(A)$, the distribution from which entrant firms draw their productivity. Following a literature that finds that the upper tail of firms' size distribution closely follows a Pareto distribution, we choose a Pareto distribution, so that $G(A) = \chi A^{-\chi-1}$. Accordingly, we calibrate χ to match the slope of the firm size distribution for large manufacturing firms, since we do not have data for other sectors.

As a measure of size we focus on male employees, since this market is less distorted than that of females. We restrict our sample to those firms that hire 20 or more females. Within male employees, we focus on the highest skilled ones, which we map to our top education category. In the data, this corresponds to male employees in the board of directors, firm owners, and specialized workers.

Our approach starts by noting that, for large firms, a firm with productivity A hires $h_0 A^{\frac{1}{1-\theta}}$ males, where h_0 is a constant. Take an arbitrary level of males h^* hired by a large firm. The productivity parameter of that firm is $A^* = \left(\frac{h^*}{h_0}\right)^{1-\theta}$. Adding up all the males employed by firms that hire more than h^* males,

$$D_{h>h^*} = \int_{A^*}^{\infty} h_0 A^{\frac{1}{1-\theta}} G(A) dA = \int_{A^*}^{\infty} h_0 A^{\frac{1}{1-\theta}} \chi A^{-\chi-1} dA = \frac{\chi}{\chi - \frac{1}{1-\theta}} h^{*\frac{1}{1-\theta}-\chi}$$

Taking logs,

$$\log D_{h>h^*} = constant - \left(\frac{1}{1-\theta} - \chi\right) \log h^*$$

We infer the value of $\frac{1}{1-\theta} - \chi$ by regressing the logarithm of the share of firms larger than h^* on the logarithm of h^*, for h^*. Given the value of θ, we obtain χ. We use the distribution of firms that hire 20 or more females. The value estimates for $\frac{1}{1-\theta} - \chi$ is -0.25.

We follow Ngai and Petrongolo (2017) and set $\mu = 2.27$ to capture the degree of substitutability between males and females. This number matches the change in the ratio of labor participation of males to females from 1970 to 2006 in the United States, given the change in wages ratio. We use their numbers because we lack the data to estimate this consistently for Chile.[11]

We set $\theta = 0.92$ so that profits are about 8% of revenues as is the average among firms in the ENIA, which implies $\chi = 14.67$.

[11] Another study focusing on this substitution is Rendall (2018). Unfortunately, it is not easy to map her results to ours, since she focuses on "units of brain or brawl", not on actual individuals.

We were not able to find reliable estimates on the expected cost of a lawsuit. Rather than this, to determine the lawsuit's cost, we note that according to Proposition 1 this value is bounded. The bounds, given the other parameters, are 0.0131 and 0.035. We take the mid-point. Using the lower or upper bounds does not change any result in any considerable way.

The remaining parameters are the ones that determine the factor shares $\{\epsilon_e, \xi_e\}_{e=1}^4$ and α and the entry cost κ. These are eight parameters since $\sum_{e=1}^4 \epsilon_e = 1$. We set $\{\epsilon_e, \xi_e\}_{e=1}^4$ so that all wages relative to the wage of the lowest skilled males are as in the data, and set κ, the entry cost, so that the wage of the lowest skilled males is 1. We obtain average wages by education from the CASEN in 2006. The computed wages are

	Males	Females
Primary or less	1.00	0.65
Less than high school	1.29	0.77
Less than college	1.62	1.06
College or more	4.43	2.48

Table 1. Wages by gender and education relative to lowest education men.

Parameter	Target	Value
β	Guner et al. (2012)	0.9740
ν	Childcare expenses relative to GDP of 0.24%	0.5600
$\hat{h}$	39% of women work in firms with more than 19 women	3×10^{-11}
δ	Annual depreciation rate of 5%	0.2500
n	Annual population growth of 1%	0.0500
p	Proportion of fertile age women with children by age of 10%	0.1000
μ	Ngai and Petrongolo (2017)	2.2700
σ	Katz and Murphy (1992)	1.4100
θ	Profits over sales ratio of 8%	0.9200
ξ	Slope of the firm size distribution of -0.25	14.6732
α	Marginal productivities (see text)	0.3210
χ_1	Marginal productivities (see text)	0.3945
χ_2	Marginal productivities (see text)	0.3834
χ_3	Marginal productivities (see text)	0.4124
χ_4	Marginal productivities (see text)	0.3736
ϵ_1	Marginal productivities (see text)	0.2320
ϵ_2	Marginal productivities (see text)	0.1410
ϵ_3	Marginal productivities (see text)	0.3209
ϵ_4	Marginal productivities (see text)	0.3061
κ	Marginal productivities (see text)	7×10^{-12}
τ	Mid-point of possible values (see Proposition 1)	0.0241

7 Misallocation and the Childcare Policy

Before presenting our main results, we illustrate the misallocation channel. To maximize output per unit of input, an economy would equalize marginal productivity across firms, and set marginal productivities equal to marginal cost. The childcare policy drives small firms to set marginal productivity of females below that of large firms. Moreover, firms between the thresholds A_1 and A_2 have a marginal cost below marginal productivity.

Figure 4 shows these effects. Small firms are firms with productivity $A \leq 1.7655$. Of these, firms with $A \leq 1.1770$ are unconstrained. The figure shows how marginal productivity spikes for constrained firms. It also shows that marginal productivity differs from marginal cost for these firms, since the dotted line that depicts females' marginal cost in small firms is below the marginal cost of females in large firms. Lastly, the figure shows that the misallocation problem is larger the lower the education. The reasoning behind this is that the childcare cost ν is proportionally greater when wages are smaller.

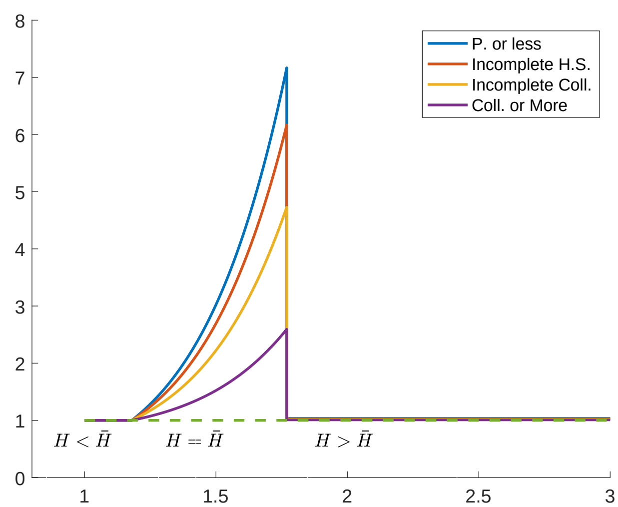

Figure 4. Under the distorted economy, marginal productivities across firms do not equalize, and, for constrained firms, marginal productivity exceeds marginal cost.

8 Eliminating the Childcare Policy

This section explores the expected steady state changes of removing the law that requires firms to pay for childcare. Naturally, given the above explanation, we need to separate these results between macroeconomic results, that focus on aggregate changes, and more microeconomic ones that pay closer attention to each type of individual. Lastly, we describe the changes expected on female labor supply.

8.1 Macroeconomic effects

The macroeconomic results show that GDP per capita would increase by 3.37%. This results from a combination of a more efficient use of resources and an increase in the supply of production factors. Capital increases by 2.95%. The supply of female labor across the highest education group increases by 2.6% for the least educated, 3.6% for the second group, 4.6% for the third group, and 4.4% for the most educated.

Wages increase for everyone. The smallest effect is among men, where the increase is between 0.75% and 0.96%. Among non-fertile-age females, those that gain the most are the least skilled, whose wage increases by 8.09%. Females with less than high school education observe increases of 6.97%, more than high school 5.39%, and college or more 3.16%. The reason for the observed ranking, where the gain is decreasing in education, is because the distortion is more relevant the lower the income, as Figure 4 shows. Among fertile-age females, the increase in wages ranges from 4% to 11%. Lastly, the marginal product of capital drops by 0.39%.

8.2 Distributional Effects

Perhaps more interesting than the aggregate changes are microeconomic changes to the distribution of welfare. This exercise shows that the increase in GDP is by no means a Pareto improvement. While there are more resources in the economy, single females and couples with childcare benefits covered by their firm increase their expenditures, which may more than offset the increase in wages. Figure 5 shows how each type of single female's welfare changes. The units are per period consumption equivalent units. That is, a number x implies that abolishing the law would increase consumption by $(x-1)\%$ every period. The y-axis displays education level and the x-axis the timing of children, split between those mothers with childcare covered by the firm (-F), and those without said coverage (-HH).

Those that lose from removing the policy are mothers that enjoy childcare payments. These females lose up to 18% of their per period consumption, with greater losses for lower educated females, where the childcare costs represent a larger fraction of their income. Analogously, the heaviest winners are the lowest educated mothers with no childcare coverage, who gain 20% consumption equivalent units. The increase in wages has the largest impact on their welfare, since their income is so low that, after paying for childcare, the marginal utility of consumption is the highest. This also explains why mothers without childcare payments gain more the sooner they have children. Waiting one or two more periods allows families to save, and thereby smooth consumption. This is not possible when the children arrive in the first period. The same reasoning explains why the losses for mothers with childcare coverage decrease in the timing of children.

Welfare for single males increases, but very moderately. The reason is that the increase in

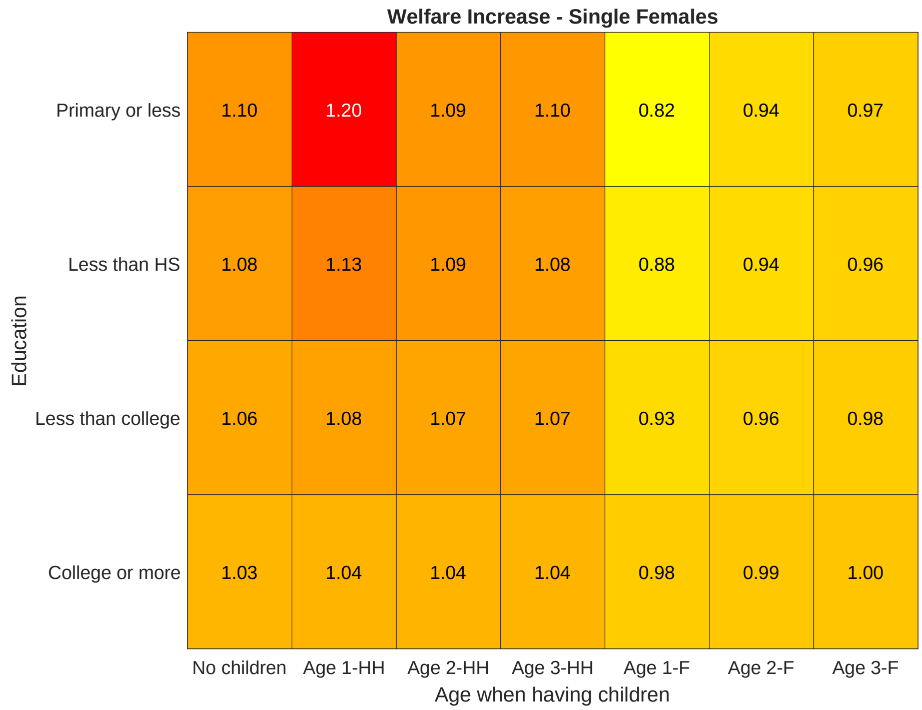

Figure 5. The increase in welfare from removing the childcare regulation for single females with different education levels based on the timing of children.

capital stock and female labor increases their marginal productivity, and therefore their wages. These gains are of around 1 percent. The effects on married couples are very similar qualitatively to those of single females, albeit milder in size. For all cases, the lower the household income, the larger the effects of removing the policy: in both directions. Families that pay for childcare are better off, and the poorer the family, the larger the gain. These gains range from 2% to 4%. The opposite holds for families with childcare covered by the firm: the poorest families lose an equivalent of 3% of per period consumption, while the wealthiest families enjoy mild gains, of about a third of a percent. This is because the increase in wages more than compensates for the extra cost of childcare.

The net increase in capital is a combination of families that had to pay for childcare saving more, and families whose childcare was covered by the firm saving less. Figure 6 shows the increase in assets by the end of life of single females. The first column displays the situation of single females with no children. The following three lines show the cases in which single females pay for childcare, and the last three show the case when firms pay for childcare. Notably, the savings of females that must pay for childcare or have no children increase considerably, between 3% and 23%. The assets of single females that have childcare covered by a firm drop by between

4% and 31%. The behavior of married couples is qualitatively similar but smaller in magnitude. Single men barely change their savings patterns.

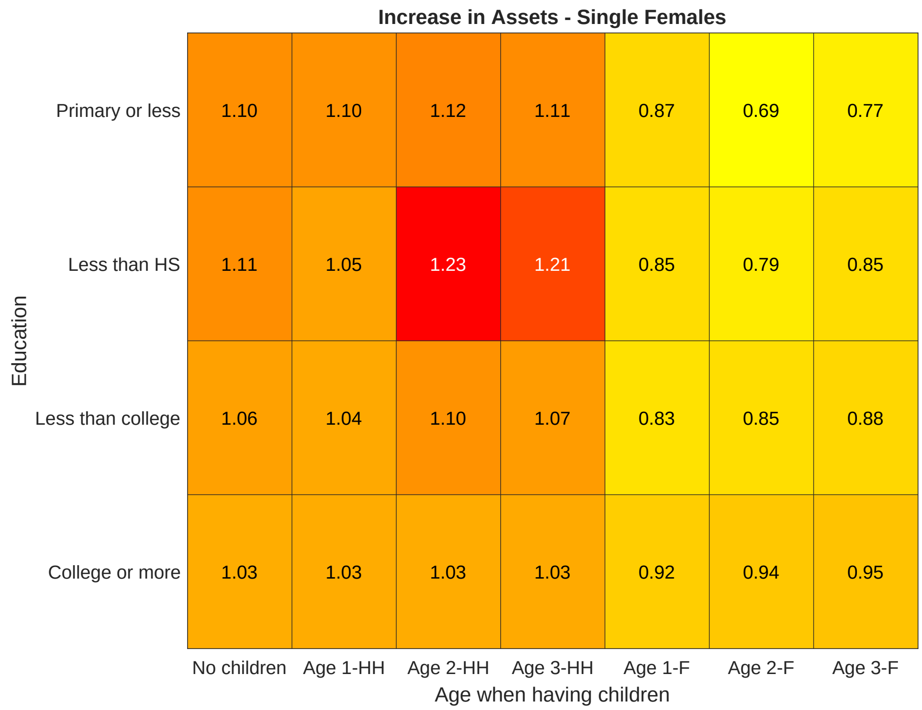

Figure 6. The increase in assets from removing the childcare regulation for single females with different education levels based on the timing of children.

8.3 Labor Supply Effects

Recall that removing the distortion increases female labor supply by between 2.6% for the highest educated to 4.4% for the lowest. These increases are the result of some females increasing their hours worked, and others reducing them.

Female labor supply behaves as one would expect: mothers that lose their coverage may reduce their labor supply, while the increase in wages would induce the opposite effect. In fact, females with children between the ages of 30 to 40 years old that lose childcare coverage are the most likely to reduce their labor supply. This does not happen with females between 25 and 30 years old because they face tighter constraints, since their assets are lower and borrowing is not allowed. For the same reason, this is less likely to happen among single females, since not having an additional income to rely on tightens their constraints even more.

Interestingly, many females that reduce their labor supply when they lose coverage compensate by increasing supply at some other age. For example, all females married to husbands with college incomplete and own education between primary and college incomplete reduce their supply when they have children between the ages of 35 and 40. They compensate by increasing it one or two periods later.

This implies that the policy biases the supply of labor towards relatively younger females, as we show in Figure 7. Panel (a) shows the overall labor supply by age. Blue circles represent the equilibrium with the existing policy, and the red asterisks show the counterfactual of removing it. Each point is the weighted sum of all types of females of a given age, where the weights represent the shares of the different types in the population. Removing the policy does not change the labor supply for females of age between 25 and 30 years old. It reduces the supply for females between 30 and 40 years old, and it (weakly) increases it for older females. The drop happens because some females aged between 30 and 40 years old choose to stay home when the employer does not cover childcare, but go to work when they do. Notice that this does not happen for females between 25 and 30 years old. This is because of financial constraints: with no savings, the labor supply of these females is very inelastic. Panel (b) focuses on females that receive childcare subsidies, and lose them when the policy is eliminated. The changes are qualitatively the same as in Panel (a), but quantitatively larger.

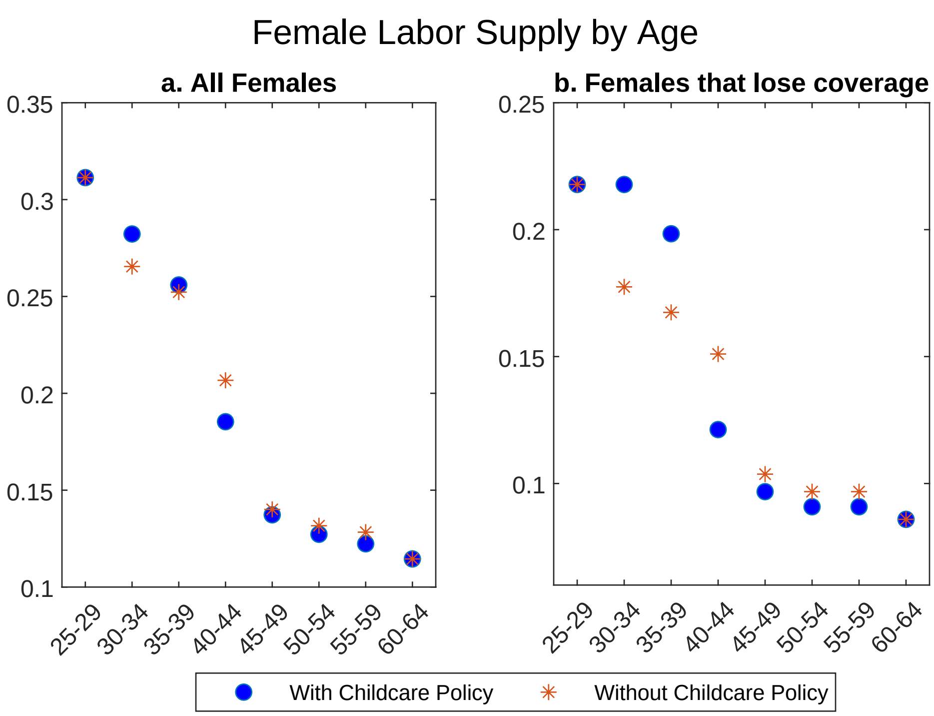

Figure 7. Removing the Policy Would Bias Labor Supply Towards Older Females.

We use this exercise to illustrate the importance of considering the general equilibrium effects. A simple regression on the effects of childcare coverage on the labor supply of mothers would find that mothers are more likely to work when their childcare is covered. This is because some mothers only work when their firm covers childcare. In particular, the regression would estimate that removing childcare coverage would reduce the supply of labor by mothers by 40%. This results from comparing the decisions of mothers with an offer from a large firm relative to having an offer from a small firm.

Including general equilibrium effects, the labor supply by mothers considering only the period in which they become mothers suggests that removing the policy would reduce their hours by 38%, a number that is close to the micro-estimate of 40%. However, when considering their lifetime labor supply, the drop is of only 10%, suggesting that many mothers reduce their hours during childcare years and increase it later on.

The estimated change in labor hours depends heavily on education. Table 2 shows these results. Column 1 ("Micro-Estimates") compares the labor supply of females offered a job in a large firm with those offered one in a small firm, considering only the period in which they require childcare. Column 2 ("Adding GE Effects") also considers only the period in which mothers need childcare, but adds the general equilibrium effects. Column 3 ("Lifetime Effects") compares their lifetime labor supply.

Household Type	Micro-Estimates (%)	Adding GE Effects (%)	Lifetime Effects (%)
Primary or less	50.31	50.31	40.72
Less than high school	49.39	38.43	1.69
Less than college	34.57	34.57	-3.22
College or more	0.00	0.00	-58.64
Total	40.11	38.48	10.67

Table 2. Different Estimates of the Effects of a Childcare Mandate on the Labor Supply of Mothers.

The micro-estimates over estimate the effects of childcare coverage by not considering the increase in wages, that increases labor supply. This produces a sizeable bias, especially for college educated females where the labor supply is more elastic.[12]

[12] It is noteworthy that only the labor supply of females with less than college changes when adding GE effects in Table 2. This limited changes arise because labor is lumpy, and there is only an extensive margin to consider. If females are already working, they cannot increase their labor supply when adding the GE effects.

9 Alternative Policies

This section explores alternative policies to finance the cost of childcare. The first of these is to finance childcare via a tax on wages, applied to both females and males. The motivation for this policy is that the Chilean government is currently evaluating this option. The second policy forces all firms to pay for childcare, not only those that hire more than 19 females. This method removes the size-dependent distortion. There are reasons beyond the scope of this paper that make government subsidies hard to enforce, such as the risk of corruption, red tape, etc. Thus, we explore the effects of a firm mandate not dependent on size.

9.1 Financing Childcare with a Tax on Labor

The Chilean government is currently evaluating financing childcare needs for all workers using a tax on labor income of 1%. In our model, the tax rate required to finance childcare is much smaller, of 0.26%. Relative to the benchmark economy, we find that GDP would increase by 3.54%. The most crucial difference with simply removing the current policy is that a tax would deliver Pareto gains: all types of families would be better off.

The gains, however, are very heterogeneous. The individuals that gain the most are single females of low education. Figure 8 shows their welfare gains. Within this group, those who have children in the first period and who have to pay for childcare out of pocket gain about 59 percent of consumption-equivalent units each period if a labor tax replaces the current policy.

To understand gains of such magnitudes, notice that childcare expenses act in the same way as a minimum consumption level when preferences are of the Gorman type. They effectively raise the marginal utility of consumption heavily. Introducing a tax that finances labor has two effects: first, it removes the minimum consumption level, reducing the marginal utility of consumption and increasing welfare dramatically. Second, while the proportional increase in wages is similar for all types, the non-homotheticity brought in by the minimum consumption level implies that the proportional increase has a larger effect on poorer females, whose consumption is closer to its subsistence level.

The same intuition drives households to save more. Figure 9 shows the increase in savings. Single females with children in period 2 and without firm childcare payments, increase their savings by 75 percent. Notice that this is higher than the increase for single females with children in period 1. The reason behind this is market incompleteness: single females that pay for childcare in their first period do not save any assets in that period. Ideally, they would like to get a loan. Single females with children in the second period do not suffer from this constraint. The increase in aggregate savings explains why GDP in this case increases more than when the policy is removed.

Figure 8. The increase in welfare from replacing the childcare regulation for a labor tax for single females with different education levels based on the timing of children.

The widespread increase in welfare relative to both the distorted equilibrium and the equilibrium with no distortion shows the importance of financing childcare. It also shows that the size dependent mandate chosen in Chile is not an efficient way of doing so.

9.2 Extending the Childcare Policy to All Firms

There may be reasons beyond the scope of this analysis that prevents the government from subsidizing childcare, such as corruption, the cost of red tape, etc. To address this, the second alternative policy we evaluate in this section is extending the mandate to all firms, irrespective of how many females are hired. This effectively removes a large source of inefficiency: the size-dependent nature of the policy. As a result, all firms operate with the same marginal costs and marginal productivities.

Removing the size-dependent nature of the policy has important quantitative effects. GDP increases by 3.32%, and this represents gains in the Pareto sense: every household is better off. Capital increases by 2.65%. Just as in the case for labor taxes, the welfare of single females with early children that pay themselves for childcare increases the most, by 54%.

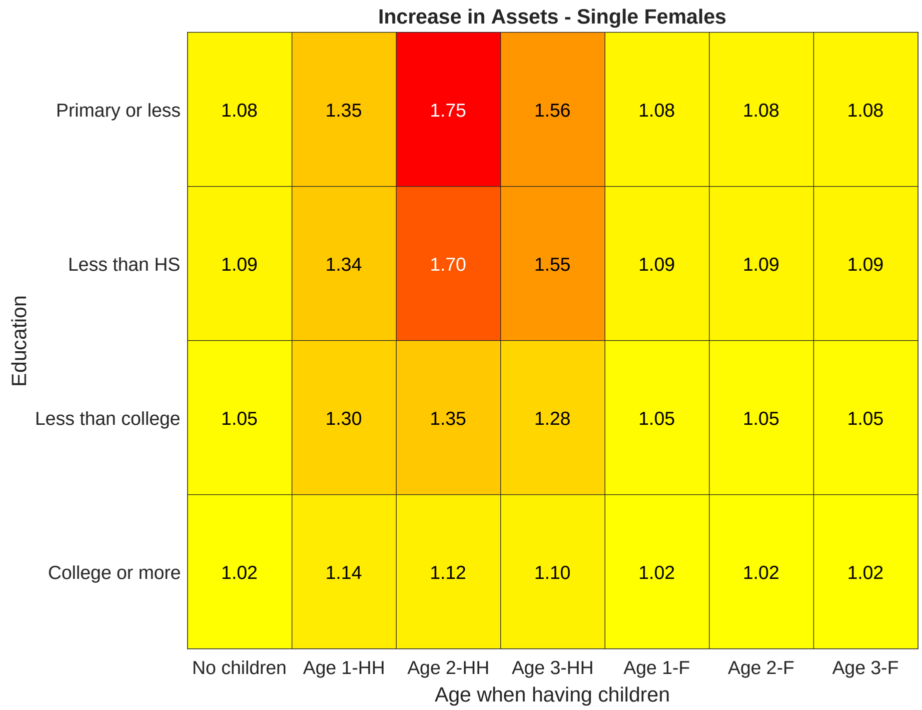

Figure 9. The increase in assets from removing the childcare regulation for single females with different education levels based on the timing of children.

The gains in this case are milder than when introducing the labor tax. The reason is that resources are "more" misallocated when asking all firms to pay for childcare. This is because there are still distortions in terms of females of fertile-age against females of non-fertile age, and between females and males. However, if for reasons not analyzed here government financing is not available, a much more efficient way of financing childcare is to remove the size dependent nature of it.

9.3 Summary of Counterfactual Policies

Table 3 compares some aggregate results across all counterfactuals. It highlights that the impact on capital is largest when replacing the policy with a tax, as this alternative has a more modest impact on the return to capital. The impact on female labor supply depends on the level of education of the female. For lower educational groups, our alternate policies increase labor supply much more than simply removing the policy because these groups cannot afford childcare without subsidies. On the other hand, removing the policy increases the labor supply of higher education groups more substantially than the alternative policies. The impact on wages is usually the largest when simply removing the policy, but this comes at the cost of removing the benefit of childcare for some women. Furthermore, while men of all educational levels are affected similarly, educational attainment strongly mediates the impact on wages for women.

Increase in	Remove Policy (%)	Replace Policy with Tax (%)	Extend Policy To All Firms (%)
GDP	3.37	3.54	3.32
Capital	2.95	3.43	2.65
Female Labor			
Education 1	2.56	3.80	3.80
Education 2	3.56	3.99	3.99
Education 3	4.60	5.06	5.06
Education 4	4.42	4.01	4.01
Male Wages			
Education 1	1.30	1.08	1.14
Education 2	1.29	1.13	1.19
Education 3	1.13	0.96	1.02
Education 4	1.30	1.22	1.28
Female Wages Non-Fertile-Age			
Education 1	8.09	7.28	4.95
Education 2	6.97	6.61	4.66
Education 3	5.39	5.01	3.62
Education 4	3.16	3.26	2.69
Female Wages Fertile-Age			
Education 1	11.32	10.49	8.09
Education 2	9.64	9.27	7.28
Education 3	7.28	6.90	5.48
Education 4	3.95	4.04	3.48
Return to capital	-0.39	-0.00	0.01

Table 3. Effects of counterfactuals on aggregate statistics

10 Conclusion

This paper provides a better understanding of the consequences of financing childcare. These policies often have the goal of fostering women's labor among poor families, which cannot easily afford childcare, forcing mothers to stay at home to take care of their children. However, in countries with limited fiscal capacities, mandates are often preferred to subsidies. In Chile, the proposed solution has been to force relatively large firms to pay for childcare.

This policy has large misallocation effects. Despite childcare representing only about 0.2% of GDP, the misallocation created by the policy reduces GDP by over 3%. This is in part because of a reduction in the accumulation of capital and labor, and in part due to a sub-optimal allocation of resources deviating firms from setting marginal cost equal to marginal revenue.

In this study, we go beyond capturing the effects of the childcare policy on output. In particular, we note that even when GDP would increase by removing the policy, not everyone would be better off. Our model captures key dimensions of market incompleteness that allow us to measure the welfare change for several households. Moreover, some of these households would be harmed even if overall resources are better allocated, so we cannot conclude that the policy is a "bad" policy.

We do, however, suggest an alternative policy that would increase welfare in a Pareto sense. This is precisely the policy being currently debated in Chile. Increasing labor taxes to finance childcare for all female workers would have very positive results. Even extending the mandate to all firms, in case the tax-subsidy mechanism were not feasible, would greatly improve the equilibrium allocation.

Our results highlight that, while identifying and quantifying regulations that lead to resource misallocation is important, it is not the only thing that matters. The analysis of these policies should be accompanied by a study of their distributional consequences. Once one understands these, we can think of better policies.

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A Proof of Proposition 1

The cost of hiring a fertile-age female for a large firm is $w_{f,e,y} + pv$, where the y stands for fertile-age. Alternatively, the firm can move on and wait for a non-fertile-age candidate. The expected cost for the firm is the probability of meeting a non-fertile-age female times its wage $w_{f,e,o}$ plus the probability of meeting a fertile-age female and not hiring her, plus the cost of a lawsuit. That is, the expected cost of not hiring a fertile-age female is

$$\tau + P_o w_{f,e,o} + (1 - P_o)(\tau + P_o w_{f,e,o} + (1 - P_o)(\tau + \dots)) = \sum_{t=0}^{\infty}(\tau + P_o w_{f,e,o})(1 - P_o)^t = \frac{\tau}{P_o} + w_{f,e,o}$$

Thus, a firm would hire a fertile-age female if

$$w_{f,e,y} + pv \leq \frac{\tau}{P_o} + w_{f,e,o} \tag{A.1}$$

Given the possibility of being sued, a small firm would hire a non-fertile-age female if the following holds:

$$w_{f,e,o} \leq \frac{\tau}{1 - P_o} + w_{f,e,y} \tag{A.2}$$

One final condition for this to be an equilibrium is

$$w_{f,e,y} \leq w_{f,e,o} \tag{A.3}$$

Otherwise, the risk of a lawsuit would not be relevant for small firms.

Combining equations (A.1) and (A.3) we obtain the left inequality in (1):

$$w_{f,e,y} \leq w_{f,e,o} \Rightarrow \frac{\tau}{P_o} + w_{f,e,o} - pv \leq w_{f,e,o} \Rightarrow \frac{\tau}{P_o} \leq pv \tag{A.4}$$

Combining equations (A.1) with (A.2) produces the right inequality in (1):

$$w_{f,e,y} + pv \leq \frac{\tau}{P_o} + w_{f,e,o} \Rightarrow w_{f,e,o} \leq \frac{\tau}{1 - P_o} + \frac{\tau}{P_o} + w_{f,e,o} - pv \Rightarrow pv \leq \frac{\tau}{P_o(1 - P_o)} \tag{A.5}$$

■

B Calibration of Household Fractions and Disutility Parameters

B.1 Fractions of Households

We read directly from the CASEN the fraction of different types of households in 2006, normalizing the total amount to unity. Table A1 shows the number of observations for each household type. We normalize these observations by dividing them by the sum of all observations.

	Primary or less	High school incomplete	High school complete	College complete
Married couples (male/female education)				
Primary or less	13,761	2,394	2,037	158
Less than high school	2,414	2,077	1,828	222
Less than college	1,612	1,700	6,277	1,079
College complete	111	212	1,272	1,758
Single females	8,895	3,174	10,487	2,779
Single males	9,310	3,108	10,090	1,742

Table A1. Observations for each household type.