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The redistributive effects of size-dependent childcare policies ☆

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ABSTRACT

Governments often adopt policies to reduce the cost of childcare for working families, but those can distort the allocation of resources. We develop and calibrate a general equilibrium model with firm and household heterogeneity and study the case of Chile, where firms with more than 19 female employees must provide childcare. We find that removing this policy would increase welfare on average by 2.3% of consumption equivalent units over their lifetime. However, the removal would not translate into increases in GDP, in part because of a reduced labor supply. Instead, the main effects of the policy are redistributive, shifting resources away from females towards males. The policy reduces welfare for most females, and these losses are decreasing in income. In particular, low-education single females, who do not rely on a second wage, would gain up to 20% in consumption equivalent units by removing the policy. We propose that alternative childcare financing options would be preferred. Specifically, financing childcare through labor taxes would increase aggregate welfare by over 13%, with the largest gains accruing to single, low-education mothers.

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, employer mandates are an often-used solution in contexts where government resources are more limited. 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 as they may politically be, one immediately questions the types of distortions and general equilibrium effects these mandates may have. This paper tackles this question by measuring the aggregate and distributional impact of a childcare policy in Chile, emphasizing the heterogeneous welfare impact on individuals.

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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 may become less interested in hiring those covered by the policy or transfer the cost through lower wages to finance the policy. This paper quantifies the overall impact of a policy to incentivize mothers' work through a mandate for firms to provide 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 two.

To quantify these, we set up a model based on Guner et al. (2012), expanded with a heterogeneous firm setup as in Hopenhayn (1992), using males and females as imperfect substitutes as in Ngai and Petrongolo (2017), and individuals of different skills as imperfect substitutes as in Katz and Murphy (1992). This framework is especially suitable to study the effects of the childcare mandate along four channels: i) a misallocation channel, in the sense that its size-dependent nature may produce a lower amount of output per unit of input; ii) a reallocation of resources away from females and towards males; iii) a reallocation of resources away from young females, and towards older, non-fertile-age ones; and iv) a reallocation of resources away from low-education females to higher education ones. The latter may occur because childcare expenses, as a fraction of wages, are much more considerable for lower-educated females.

The model includes heterogeneous households that differ in their composition and the education of their members. Households can include a single female, a single male, or a couple, comprised of a male and a female. Single females and couples can have children. Children need parental care or childcare. If both parents (or a single mother) work full time, childcare expenses are required. Hence, we assume that both parents can take care of a child.[1]

Information is asymmetric: firms cannot verify whether a female has or will have a child during the present period, but females do.[2] 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.[3] 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.

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 0.19% of GDP.[4] The second is the threshold of women after which hiring more would trigger the mandate to cover childcare (19 women in the data). We calibrate this threshold to match the share of females hired in firms with 20 or more females which seems to be close to the estimated number of women who currently benefit from the program.

Our framework first highlights that the impact on GDP may be small due to endogenous responses that are overlooked by non-general equilibrium analyses.[5] This is because most of the changes would imply distributional consequences. For example, removing the policy might drive a woman to reduce their labor supply while being a mother, and increase it when the children no longer need parental care, so that total hours worked do not change much. Alternatively, it might drive some families to enjoy more leisure, thus reducing aggregate variables like GDP, while increasing welfare. This suggests that welfare changes are more relevant than changes in GDP when studying the effects of the childcare policy.

Our results show that the policy has no considerable effects on aggregate GDP, but non-negligible ones in welfare. The unconditional ex-ante welfare would increase by 2% by removing the policy. This is, before birth, not knowing whether the individual will become male or female, an economy without the childcare policy would deliver a level of welfare that is 2% higher than with the policy. Within this number, there are large differences when conditioning on different types.

To the best of our knowledge, this is the first paper to describe how size-dependent policies may affect welfare distribution. Female ex-ante welfare increases by 3% without the policy, and the welfare gains are decreasing in income. Single females, who

[1] 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 men can also care for children.

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

[3] Several alternatives would generate the same type of equilibrium. 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.

[4] While it may be surprising to find that childcare costs are a relatively small fraction of the Chilean GDP, this is not very different from the US case. In the US, the entire childcare market represents 0.3% of the national GDP and employs 0.6% of workers, and this includes a wider age range than those subject to the policy: https://www.stlouisfed.org/publications/regional-economist/2022/jan/pandemic-rising-costs-challenge-child-care-industry#:~:text=The%20Child%20Care%20Sector%3A%20An%20Overview&text=In%202019%2C%20the%20gross%20output,produc%20(GDP)%20that%20year.

[5] This is opposite to Daruich (2018) who find that considering general equilibrium effects greatly increases the benefits of early childhood policies.

have the lowest household income, would increase their welfare by 3.7%. Within this group, those with a child early in life and whose employer does not pay for childcare would gain the most, with up to 20% increase in consumption equivalent units over their lifetime.[6] On the other hand, single mothers with children early in life but whose employers pay for childcare lose up to 60% of their welfare when the policy is eliminated.[7]

Interestingly, males on average, would also benefit from removing the policy, but the magnitudes are much smaller. Married males gain because their spouses gain. Single men hardly see any changes because the increase in the capital stock increases their marginal productivity, offsetting the reduction in demand from substitution towards female employees.

We study 3 alternatives to financing childcare. First, we propose to maintain the "mandated" nature of the policy but expand it to all firms, irrespective of their size. This would remove the size-dependent consequences of the policy, which we have argued are not large. However, it would also expand the benefits to many more women, not only those working for larger firms. We find substantial gains from this expansion, particularly for low-income women who reduce their costs of childcare. Mothers would enjoy large increases in welfare under this scenario, with an average increase of over 26% in consumption equivalent units.

We next propose to cover all childcare expenses as above, but this time remove the "mandate" aspect of the existing policy, replacing it with an income tax. This policy is currently being discussed as an alternative to the childcare policy in Chile, further motivating this choice of counterfactual. We find that a tax on labor income of 0.29% would be required to finance all childcare needs. The advantage of this system is that it eliminates all biases against females by taking the financing responsibilities away from firms and sharing them equally among all workers. As a result, this is the most successful policy in terms of increasing aggregate welfare. Aggregate welfare would increase by over 13%, and the aggregate welfare of mothers would increase by over 40%. It also increases coverage from around 40% to 100%.

Some of the criticisms that have been raised against the counterfactual implementing tax-funded universal childcare is its lack of targeting individuals who are in need of financing. We thus further explore a third alternative where we re-introduce the childcare mandate to all firms, but only the least educated females receive the subsidy.[8] This targeted policy would increase aggregate welfare by more than removing the policy or extending it to all firms but by less than the universal plan financed through taxes.

We contribute to the series of articles that connect childcare availability to female labor force participation. Typically, 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 their methodology, they cannot explore how providing childcare through a different policy tool may alter its impact or the channel through which the aggregate effects occur. Since childcare mandate often changes endogenous decisions such as the timing of going to the market, ignoring the general equilibrium effects can be misleading. We find that removing the policy drives young females to reduce their labor supply, increasing it when older.

Few papers have studied the impact of childcare policies in a general equilibrium framework. Daruich (2018) looks at a childcare program but focuses more on its role in the formation of the human capital of children, something we abstract from in this paper. Bastani et al. (2020) looks at subsidizing child care in an optimal taxation angle while Ho and Pavoni (2020) describe the optimal childcare subsidy in an optimal welfare framework outside of a general equilibrium framework.

Our study 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 considerable distortions. 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 that 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 lower welfare and 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 their interaction 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 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 also contribute by 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 a model without childcare payments, introducing these in section 4. Section 5 calibrates the economy to the Chilean case. Section 6 describes the results, section 7 discusses alternative policies to finance childcare, and section 8 concludes.

[6] The reason why the timing of children matters is that we assume that markets are incomplete, and individuals cannot borrow. Females with children at later stages can build savings before having children, allowing them to better smooth consumption.

[7] The large magnitude of these numbers is because having children is like introducing a subsistence level of consumption, as in Gorman preferences, which considerably increases marginal utility.

[8] Single females are the ones that would gain the most out of childcare subsidies, not necessarily low-education females. Since it is hard to enact a subsidy for single females, we do not contemplate this possibility.

2. The childcare policy: Ley de Salas Cuna

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.[9] 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[10] and then later in 1987 it required childcare to be provided until the child was two years of age.[11] 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 solution (2%). Because of these numbers, our theoretical model assumes that firms pay external providers for the cost of childcare.

Notice that this preferred way to pay for childcare would be equally burdensome for large and small firms. Originally, the mandate only affected large firms because firms had to set up in-house childcare centers. Given that most firms today compensate mothers for childcare expenses, there is no reason why the mandate should not apply to small firms. Still, the law has not caught up to these changes.

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 5 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.

What can a firm do to avoid being subject to the law? There is no distinction in terms of the type of contract (permanent or temporary, full- or part-time) for women to be counted towards the threshold of 20. It should also be noted that firms are not directly forced to pay day care to the children of their subcontracted workers, although they are considered when counting total employees. The obligation then rests on the subcontractor company, which in turn probably transfer the cost to the principal firm. Informal firms are clearly not subject to the law, but informality is much smaller in Chile than in most of Latin America. Less than a third of Chilean workers are informal, implying that they do not contribute to social security.[12] However, half of these are self-employed who were not required by law to make such contributions at the time of our study. Less than a third of all non-contributors actually work for a private-sector firm. Of those, more than half work for firms of less than 10 employees, who would never be subject to the law in any case for their size. Thus, we see informality as unlikely to affect many employees and firms.

More naturally, it appears that most firms avoid the law by restricting their hiring of female employees. The firms' distribution shows evidence of this suspected behavior. The data comes from the ENIA, a survey of manufacturing firms with more than ten employees carried out by the Chilean statistics office. Fig. 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 20 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. Escobar et al. (2016) find that there are between 30 and 40 extra firms at 19 female employees and between 50 and 90 missing firms above 19 women workers, compared to a smooth counterfactual distribution. A McCrary test for discontinuity finds that there is a jump in the distribution of firms around 19 female workers: such a discontinuity is not found at 15, 18 or 22 women; it is also not found at 19 men workers.

[9] Ley 3186, (1917), Chile.

[10] Decreto con Fuerza de Ley 178, (1931), Chile.

[11] Decreto de Ley 2200, (1987), Chile.

[12] https://www.ilo.org/wcmsp5/groups/public/—ed_emp/—emp_ent/documents/publication/wcms_725018.pdf.

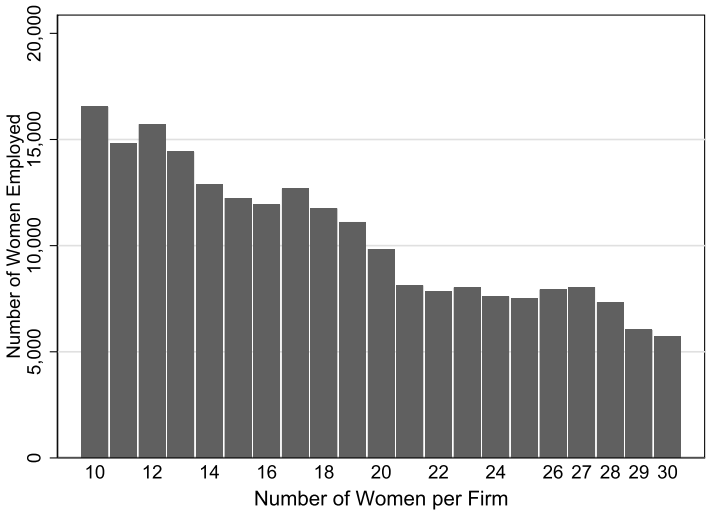

Fig. 1. Number of women employed by firms that hire x female employees.

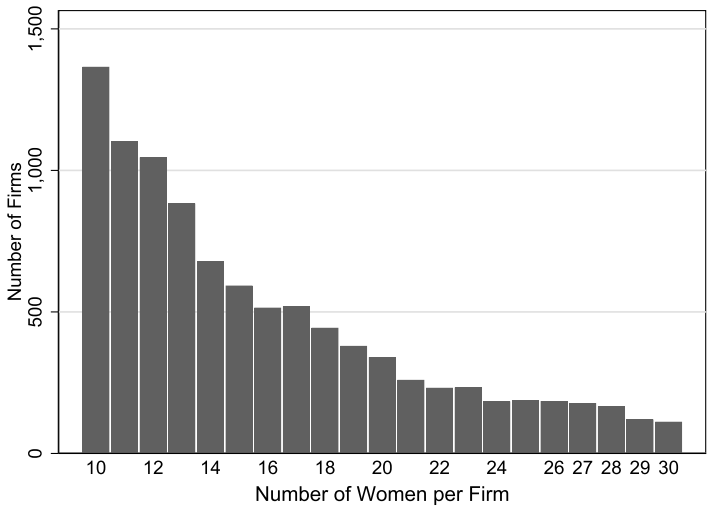

Fig. 2. Number of firms with less than 100 employees that hire x female employees.

This behavior is not the same for all firms. Fig. 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 Fig. 3. We observe that around 50 fewer firms hire exactly 20 women than those hiring 19 while the number of firms between 18 and 19 and between 20 and 21 women is almost the same. The difference may be due to the lower probability of detection among smaller firms: 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.

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 childcare 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.

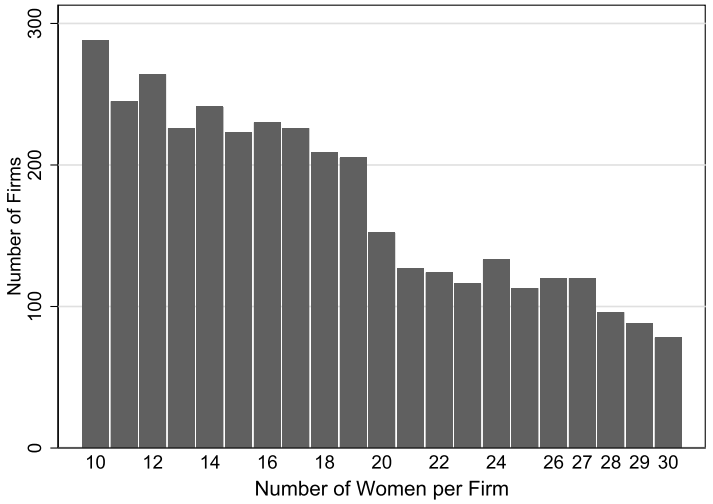

Fig. 3. Number of firms with more than 100 employees that hire x female employees.

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 incomplete, 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 at age 1, 2, and 3, respectively. Denote by p_j the probability of having children in the current period of a fertile-age female of age j, where j can be 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.[13] If parents work, they must pay childcare costs.

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, $l \in \{0, 1\}$ is time devoted to work, and $\lambda_{f,e}$ is a parameter governing the disutility of work and depends on gender and education level e.

Similarly, the male within period utility function is

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

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

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

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 of firm i is

$$y_i = A_i F(\{h_{fe}\}, \{h_{me}\}, k)$$

where

[13] We are stricter than Guner et al. (2020), who assume that the labor supply is convex. Our definition of equilibrium forces us to assume that the female labor supply is non-convex. In addition, this definition prevents us from introducing returns to age or experience. See Appendix A for details.

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

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 imply that aggregate profits after paying for entry costs are zero. That is, while firms with high productivity can be making large profits, even net of entry costs, firms with low productivity compensate by making variable profits below the entry cost, so that on aggregate the profits being rebated to firm owners 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.[14]

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 numéraire, and so its price is equal to 1. R is the market interest rate.

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

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

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:

[14] These assumptions imply that there are no profits to rebate back to households. If there were, we would need to decide who gets these profits.

$$H_{fe} = N \int_A h_{fe}(A)G(A)dA \quad e = 1,2,3,4$$

$$H_{me} = N \int_A h_{me}(A)G(A)dA \quad e = 1,2,3,4$$

$$K = N \int_A k(A)G(A)dA$$

Firms enter whenever the profits of doing so exceed the cost. The entry cost is κ units of the consumption good. 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

$$K = \sum_{j,e_m,e_f,b} \varphi_{c,j,b}(e_m,e_f)a_{c,j}(b,e_m,e_f) + \sum_{j,e_m} \varphi_{m,j}(e_m)a_{m,j}(e_m) + \sum_{j,e_f,b} \varphi_{f,j}(e_f,b)a_{f,j}(e_f,b)$$

$$H_{m,e_m} = \sum_{j,b,e_f} \varphi_{c,j,b}(e_m,e_f,b)l_{c,m,j}(e_m,b) + \sum_{j} \varphi_{m,j}(e)l_{m,j}(e_m)$$

$$H_{f,e_f} = \sum_{j,b,e_m} \varphi_{c,j,b}(e_m,e_f,b)l_{c,f,j}(e_f,b) + \sum_{j,b} \varphi_{f,j,b}(e)l_{f,j}(e_f,b)$$

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 $\hat{h}$ (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 or by information on the resume, such as graduation year. 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 $\hat{h}$ females, and therefore whether it covers childcare. While this assumption may be unrealistic with extremely large firms, these are very few, and it is common to not 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 $\hat{h}$ 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. 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. While lawsuits may be perceived as something particularly possible within the United States, the labor market in many civil law countries is also prone to legal demands. In Chile, there is an official tribunal, "Dirección del Trabajo" which receives complaints from workers who feel their rights have been violated and can sanction firms when they are found to be in opposition to the labor code. There is one complaint per 100 workers every year. In particular, in 2020, there were more women who made demands to the Ministry of Labor than men, despite women being a smaller fraction of the workforce. Many of these complaints were related to gender issues: sexual harassment, lack of respect of maternity obligations, and discrimination (https://www.dt.gob.cl/portal/1627/w3-article-119486.html). Finally, a recent reform has made this court be much more likely to be pro-worker in their decisions (Aninat et al., 2020).

In our model, 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 (or a fertile-age female of a different age), the female who was not hired can sue at an expected cost of τ units of consumption to the firm.

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 different aged 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 strictly prefer to 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.

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:*

$$\frac{\tau}{P_{eo}} \leq p_j \nu \leq \frac{\tau}{(1-P_{eo})P_{eo}}, \quad \textit{for } j=1,2,3, \quad \textit{and all } e \tag{1}$$

where P_{eo} is the proportion of females of education level e and non-fertile age.

Proof. See Appendix A. ■

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 5.

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.

4.1. Salient effects of the childcare policy

Before moving on to the calibration of the model, we describe the main changes that the childcare policy introduces in equilibrium. The first of these changes implies a gap between the wage of fertile-age and non-fertile-age females. Denote by $w_{f,e,j}$ the wage of a fertile-age female of education e and age j, and by $w_{f,e,o}$ that of a non-fertile-age counterpart. These wages need to satisfy the following relationship:

Corollary 2. *In equilibrium, the wage of a non-fertile-age female is larger than the wage of a fertile-age female conditional on age and education.*

Proof. See Appendix A. ■

Appendix A shows that one equation that must be held in equilibrium describing the relationship between fertile-age and non-fertile-age females for $j=1,2,3$ is

$$w_{f,e,j} + p_j \nu \leq \frac{\tau}{P_{eo}} + w_{f,e,o} \tag{2}$$

The left-hand side is the expected payment a large firm makes to a fertile-age female. The first term is the actual wage, and the second term is the childcare cost ν times the probability of having to pay that cost p_j. The right-hand side is the expected cost of not hiring a fertile-age female and hiring a non-fertile-age female instead. This includes the wage of the non-fertile-age female, plus the lawsuit cost associated with discriminating against a fertile-age female. This lawsuit cost is τ, and $1/P_o$ is the expected number of times it must be paid, where P_o is the proportion of non-fertile-age females in the female population. In our quantitative exploration, we assume equation (2) holds with equality.

The other change introduced by the childcare policy lies in the behavior of firms. These solve the following problem:

$$\pi(A) = \max \left\{ \max_{\{h_{f,e,j}\},\{h_{me}\},k} \left\{ AF(\{h_{f,e,j}\},\{h_{me}\},k) - \sum_e w_{me}h_{me} - P_{eo}\sum_e w_{f,e,o}h_{fe} - \right.\right.$$
$$\left.\left. \sum_e \sum_{j=1}^{3} P_{ej} w_{f,e,j} h_{f,e,j} - rk - \nu \sum_e \sum_{j=1}^{3} p_j h_{f,e,j} \right\}, \right.$$
$$\left. \max_{\{h_{f,e,j}\},\{h_{me}\},k} \left\{ AF(\{h_{f,e,j}\},\{h_{me}\},k) - \sum_e w_{me}h_{me} - P_{eo}\sum_e w_{f,e,o}h_{fe} - \right.\right.$$

$$\left.\sum_{e}\sum_{j=1}^{3} P_{ej} w_{f,e,j} h_{f,e,j} - rk\right\}$$
$$\text{s.t. } \sum_{e}\sum_{j=1}^{3} h_{f,e,j} \leq \hat{h}\Bigg\} \tag{3}$$

where P_{ej} is the probability of encountering a female of education e and age $j = 1, 2, 3$, and P_{eo} is the probability of that females being of non-fertile age.

Intuitively, a firm compares two levels of profits: those if it hires more than $\hat{h}$ females understanding that some of them require childcare expenses (the top two lines in equation (3)), with that of hiring less than $\hat{h}$ 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 $\hat{h}$ females, so the restriction is non-binding. Firms with productivity $A \in [A_1, A_2]$ would, absent the childcare policy, hire more than $\hat{h}$ females. The policy induces them to hire $\hat{h}$ 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 $\hat{h}$ avoiding childcare costs, or hiring a larger (optimal) number and paying for it. Firms with $A > A_2$ hire more than $\hat{h}$ females, incurring childcare payments. These firms are better off paying this additional cost than restricting the number of females.

5. 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. This implies that women can have children from age 25 to 40 in our model. 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 each 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 (Aedo, 2007).

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 some of these children may be taken care of by relatives.

Rosell et al. (2017) conduct a survey, where they find that 29.3% of grandparents take care of their grandchildren in 2013. We make the conservative assumption that all children have grandparents. Accordingly, only 70.7% of children need childcare. This estimate is conservative: 29.3% of grandparents take care of their grandchildren is an upper bound of grandchildren being taken care of by grandparents. This is because many grandchildren do not have grandparents, and also because several children share grandparents. If these children do not live in the same house (think cousins), the grandparents are unlikely to be able to take care of all their grandchildren. Modifying the fraction of children who need the childcare policy is isomorphic to changing the cost of childcare per child, which we do in robustness checks in Appendix C.

The GDP in Chile in 2007 was almost $86 trillion. Thus, total childcare cost relative to GDP is

$$\frac{\text{Childcare Cost}}{\text{GDP}} = \frac{0.522 \times 0.71 \times 100,000 \times 12 \times 232,481 \times 2 \times 4/5}{86,000,000,000,000} = 0.0019$$

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 71% of these need childcare.[15] 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. While 0.2% may seem small and could appear as anomalous compared to other settings, we repeated the same calculations for the case of the US and found a very similar estimate of 0.0016. We provide an idea of how our results depend on the value of ν via sensitivity exercises in Appendix C.

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

[15] 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.

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 $\lambda_{c,e_f,e}$ across e. We proceed similarly with males.

The key threshold $\hat{h}$ 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%. We would have liked to have a better target than this percentage to compute the share of women covered by the program. However, such a number is difficult to obtain. No official statistics report the number of beneficiary of this policy, since it is financed and provided by individual firms. The Labor Survey from the Directorate of Labor (ENCLA, for "Encuesta Laboral") suggests that almost all firms who should provide childcare benefits do so in one way or another. This would suggest that using the fraction of female workers in firms with 20 or more workers as potential beneficiaries is not a bad approximation. Furthermore, Comunidad Mujer (2016) (a Chilean think-tank that advocates for women) offers an estimate of the number of beneficiaries in 2014 to be 35,345. We find that this number is very close to the number we would obtain by multiplying our ratio of 39.24% by the number of all women of fertile age who work and who have children under the age of 2. There are 970,000 females of fertile age in the CASEN who work in 2011. As we describe in the paragraph below, around 10% of females have children below the age of 2. This amounts to 97,000 females. Of these, 39.24% have childcare coverage provided by the firm, which implies an actual number of covered females of around 38,000, a number that is very close to the one reported by Comunidad Mujer, reassuring us about our assumptions.

Population grows at an annual rate of 1%. The probability of having children varies by age. Using data from the CASEN, we find that 14.4% of females between 25 and 29 years old have children under the age of 2, this share is equal to 14.9% for females between 30 and 34 years old, and equal to 9% for females between 35 and 39 years old. Less than 5 percent of all births are to women above the age of 40 in Chile, which makes our assumption that fertility stops at age 40 fitting with the data. By starting life at 25, we do not study the effects on families with parents under 25. However, around 80% of women in 2006 who have children before age 25 do not work according to the CASEN. This implies that they would not be subject to the policy, which reduces the impact of this assumption.

On the firm side, we first choose a functional form for $G(A)$, the distribution from which entrant firms draw their productivity. Following 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 as representative of the upper tail of the firm distribution. 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 on 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.

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.[16] In Appendix C, we show how alternative measures of μ affect our results. In particular, using $\mu = 2$ or $\mu = 2.5$ and recalibrating all remaining parameters to match our targets does not change our results in any considerable way. If anything, a larger elasticity increase the impact of the policy because when males and females are more substitutable, the childcare policy reduces the demand for female workers even more.[17]

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

[16] 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 brawn", not on actual individuals.

[17] In Appendix C.3, we show that when modifying μ over a small range but not recalibrating all other parameters, we find large impacts of μ on our results. However, many of the moments we try to match are now far from their targets, explaining the results we obtain.

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

	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 2
Parameter values for calibration and sources.

Parameter	Target	Value
β	Guner et al. (2012)	0.9740
ν	Childcare expenses relative to GDP of 0.19%	0.3875
$\hat{h}$	39% of women work in firms with more than 19 women	4.78×10^{-9}
δ	Annual depreciation rate of 5%	0.2500
n	Annual population growth of 1%	0.0500
p_1	Proportion of women 25-29 with children by age of 14.4%	0.1440
p_2	Proportion of women 30-34 with children by age of 14.9%	0.1490
p_3	Proportion of women 35-39 with children by age of 9%	0.0900
μ	Ngai and Petrongolo (2017)	2.2700
σ	Katz and Murphy (1992)	1.4100
θ	Profits over sales ratio of 8%	0.9200
χ	Slope of the firm size distribution of -0.25	14.6732
α	Marginal productivities (see text)	0.4092
ξ_1	Marginal productivities (see text)	0.3320
ξ_2	Marginal productivities (see text)	0.3267
ξ_3	Marginal productivities (see text)	0.3763
ξ_4	Marginal productivities (see text)	0.3649
ϵ_1	Marginal productivities (see text)	0.2163
ϵ_2	Marginal productivities (see text)	0.1329
ϵ_3	Marginal productivities (see text)	0.3202
ϵ_4	Marginal productivities (see text)	0.3306
κ	Marginal productivities (see text)	10×10^{-11}
τ	Mid-point of possible values (see Proposition 1)	0.0176

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 0.0132 and 0.0215. We take the mid-point. We show how using the lower or upper bounds affects our results in Appendix C.

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 nine 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, the annual interest rate is 4%, and set κ, the entry cost, so that the wage of the lowest skilled males is 1.[18] We obtain average wages by education from the CASEN in 2006. The computed wages are summarized in Table 1.

Table 2 summarizes all parameter values and targets.

6. Results

Our main results can be divided into four main points. First, we measure the degree to which the size-dependent nature of the childcare policy lowers aggregate output per unit of input. This channel is small, but it is interesting to note that the misallocation affects females with different education levels differently. Second, we measure the extent to which this policy shifts resources away from females and towards males. Third, we measure the shift from younger females to older ones. Finally, we measure the shift from low-education females to high-education ones.

6.1. The misallocation channel

Since the policy is size-dependent, triggering changes once a firm hires 20 or more female employees, it creates incentives to induce firms to hire fewer females than otherwise, and to pay wages that differ from their marginal productivity. This makes the equilibrium allocation suboptimal, thereby reducing the amount of output per unit of input.

[18] In other words, this is how we normalize wages. Alternative normalizations would change the calibration for κ, with no quantitative differences.

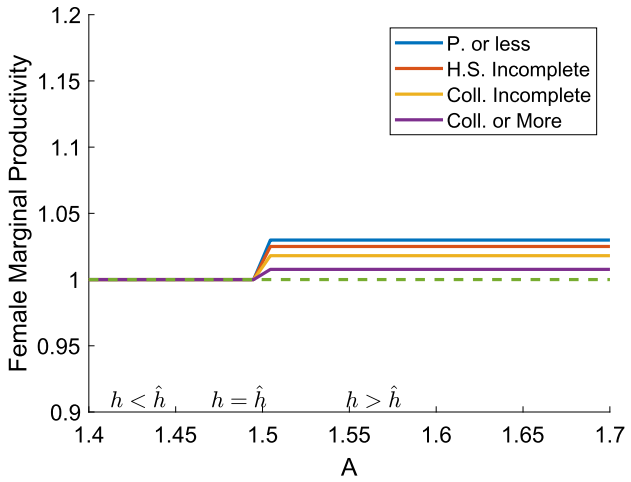

Fig. 4. Under the distorted economy, marginal productivities across firms do not equalize, and, for constrained firms, marginal productivity exceeds marginal cost. (For interpretation of the colors in the figure(s), the reader is referred to the web version of this article.)

Fig. 4 shows graphically how marginal cost (wages) differs from marginal productivity for the average female wage paid by a firm.[19] Small firms, with productivity levels $A \leq 1.4949$, are unconstrained, and therefore set marginal cost equal to marginal productivity. As firms grow past this threshold, they halt the hiring of females, so that marginal productivity becomes larger than wages. All else equal, hiring more females would increase profits, but all else does not remain equal: hiring them would trigger childcare payments for all existing female employees, making marginal cost jump above marginal productivity at some firms. These firms produce a lower level of output per unit of input, since the marginal productivity of females exceeds their marginal cost. Quantitatively, very few firms are in this segment, less than 0.03%, and as such this has hardly any aggregate consequences.

When productivity exceeds 1.5045, firms start paying for childcare expenses. The figure shows that this jump is inversely proportional to education, that is, the lower the education, the larger the jump. The reason is that childcare expenses are a much larger proportion of wages for low-education females.

Measuring how misallocation affects total resources in the economy is not straightforward. Two main strategies have typically been employed. The first is to let all inputs readjust without the misallocation and compare how this improves productivity. Another is to keep total inputs fixed but letting them being allocated across firms in a non-distorted way. In our setting, the first strategy would require us to have a measure of total workers that can be informative. Because we have many different types of labor, it is not clear what the right measure of "per capita" would be. To avoid choosing an arbitrary measure of workers, we measure misallocation by holding all factors of production constant and computing the difference in output with and without the childcare policy.[20] This is similar to Restuccia and Rogerson (2008), who compare total output per worker with and without the policy that introduces misallocation such that neither labor nor capital changes. In their paper, labor does not change because the supply is inelastic, and capital does not change because the counterfactuals are such that the aggregate stock of capital does not move.

Quantitatively, this misallocation does not have any considerable effect on output. In fact, holding aggregate inputs constant, eliminating this misallocation would increase output by 0.003%. We compute this as follows. We keep constant all different types of labor supply (i.e., the levels by gender and education) and the aggregate capital stock at the distorted-equilibrium level. We then remove the childcare policy and allow firms to re-optimize their hiring and production decisions, and compare the total output with the total output in equilibrium. The increase in output would be of 0.003%, implying that the size-dependent nature of the policy does not play a considerable role.

A second way to understand the effects of the policy that misallocates resources is by comparing output with and without the childcare policy. Removing the distortion does not increase output per capita. In fact, GDP drops mildly, by less than 0.1% (see Table 3). Changes in labor supply may be the reason for the drop in GDP, although these changes do not exhibit a clear pattern: females with Primary incomplete and College or more increase their labor supply by between 0.18% and 0.23%, while the other categories mildly reduce the labor supply. In the case of males, all educational types but high school incomplete increase the labor supply by very small fractions, less than a quarter of a percent.

The changes in labor supply imply that households change how much leisure they enjoy, and this measure does not affect GDP. For this reason, our main analysis rests on welfare rather than income, which provides a better grasp of the effects of the policy across different households.

[19] This is a weighted average between the fertile-age and non-fertile-age wage.

[20] Even coming up with an aggregate measure of labor that keeps constant the proportion of labor types would be cumbersome, since these proportions would change with and without the policy.

Table 3
Effects of removing the childcare policy on aggregate statistics.

Increase in	Remove Childcare Payments
GDP	-0.0599
Capital	0.1796
Return to capital	-0.0687
Female labor	
Primary incomplete	0.1844
High school incomplete	-0.3062
College incomplete	-0.0324
College or more	0.2251
Male labor	
Primary incomplete	0.0807
High school incomplete	0.4115
College incomplete	-0.0000
College or more	0.1514
Female wages - all ages	
Primary incomplete	1.2144
High school incomplete	1.2077
College incomplete	0.8675
College or more	0.2860
Female wages - non-fertile-age	
Primary incomplete	-0.0759
High school incomplete	0.1285
College incomplete	0.0929
College or more	-0.0420
Female wages - fertile-age	
Primary incomplete	3.2811
High school incomplete	2.9362
College incomplete	2.1082
College or more	0.8114
Male wages	
Primary incomplete	0.0533
High school incomplete	-0.1214
College incomplete	0.1219
College or more	0.0062

6.2. Resources shift from females to males

The childcare laws increase the cost of hiring a female employee, given the risk of her having a child and needing childcare expenses. For this reason, firms reduce their demand for females, especially fertile-age ones. Since these are perfect substitutes with non-fertile-age females, all female wages drop. Consequently, removing the childcare policy increases female wages, while that of males roughly stays constant. Table 3 shows how wages change when removing the childcare policy in column (1). Removing this policy increases wages for females of most educational types. Averaging across all ages, the effects are larger for females without primary complete, over 1%, while the lowest increase is among females with college complete, who increase their wages by 0.29%. Male wages, on the other hand, do not vary much, dropping the most for college incomplete ones, by 0.12%. Wages among males with primary incomplete education increase by 0.05%.

A more interesting analysis focuses on the welfare effects on each type of individual. The high degree of heterogeneity in the economy does not allow for a clean result in terms of whom the policy benefits. Table 4 shows the total number of individuals is equal to 2,912. This large number of types prevents us from summarizing the effects of the policy on each type. Instead, we aggregate the effects for particular groups that we find most interesting. We do this as follows. Consider males. Start by computing the change in welfare for all 1,312 types of males. Then compute a weighted average of these welfare changes, where the weights are given by the fraction of the male population of each type.

The interpretation is the following. Suppose males are assigned to each type probabilistically, and the probability of being of each type is equal to the fraction of males of each type. Then the weighted average is the expected welfare change an individual should expect conditional on being a male. This has also a second interpretation, commonly used in the trade literature. While some males may lose and others gain, if this weighted average shows a gain, it means that there is a tax-transfer mechanism by which all males could gain, so that there can be a Pareto improvement.

Table 5 shows the welfare consequences of eliminating the childcare policy in column 1. The units are consumption equivalent units, that is, the percentage increase in consumption needed with the childcare policy to achieve the same level of utility as in the case with no policy. The changes displayed are lifetime changes, that is, the increase in consumption equivalent units over a lifetime.

Table 5 shows that the unconditional expected welfare is higher without the childcare mandate, since removing it would increase the unconditional welfare by 2.34% (see row “All”). Conditional on being a female, welfare would increase by 3% when removing the policy. And conditional on being a male, the increase is of 1.66%. Notice that males gain in many cases because their spouses are better off, and consumption within a couple is a public good. For that reason, single males gain less than married ones (0.26%

Table 4
Number of types of individuals.

	Males	Females
Married with children		
Education types	4	4
Partner education	4	4
Timing of children	3	3
Childcare options	3	3
Generations	8	8
Total married with children	*1,152*	*1,152*
Married without children		
Education types	4	4
Partner education	4	4
Generations	8	8
Total married without children	*128*	*128*
Single with children		
Education types		4
Timing of children		3
Childcare options		3
Generations		8
Total married with Children		*288*
Single without children		
Education types	4	4
Generations	8	8
Total single without children	*32*	*32*
Total number of types	*1,312*	*1,600*
Total number of male plus female types	*2,912*	

Table 5
Effects of removing the childcare policy on welfare.

Increase in	Remove Childcare Payments
All	2.3371
Females	3.0006
Single Females	3.7108
Married Females	2.5382
Mothers	-4.7532
Single Mothers	-8.2431
Married Mothers	-2.4809
Non-Mothers	7.9451
Single Non-Mothers	11.1312
Married Non-Mothers	5.8707
Primary Incomplete	4.3009
High-School Incomplete	3.1986
College Incomplete	2.1061
College Complete	0.1422
Males	1.6621
Single Males	0.2563
Married Males	2.5382
Primary Incomplete	2.6486
High School Incomplete	1.1847
College Incomplete	1.0083
College Complete	0.0267

and 2.54%, respectively). These gain on average because the wages for males with high school incomplete and college incomplete increases, and this increase is in part due to the increased capital stock.

The largest gainers from removing the policy are females, especially single ones, who would gain about 3.7% in consumption equivalent units. This is direct evidence of resources being shifted towards males via the childcare policy.

6.3. Resources shift from non-mothers to mothers

The gains for females are not universal. It is easy to imagine that the effect would be very different when comparing a mother whose childcare expenses are covered by a firm, with one where this is not the case. Fig. 5 shows these effects for all types of single

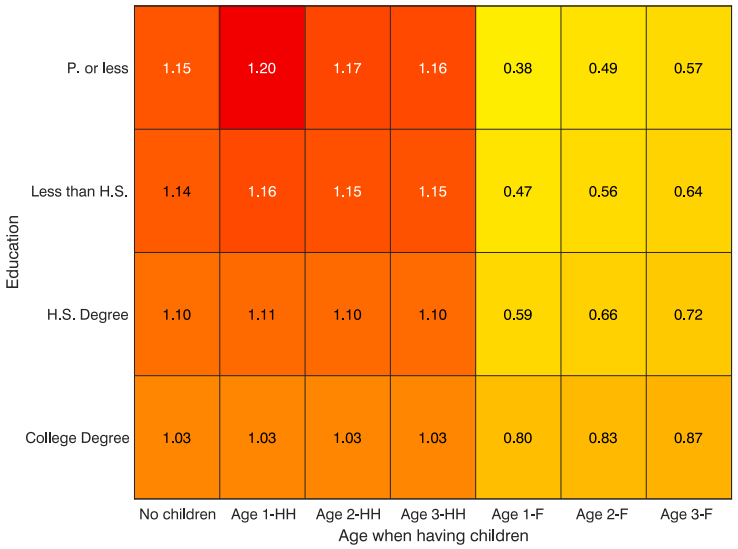

Fig. 5. The increase in welfare from removing the childcare regulation for single females with different education levels based on the timing of children.

females, based on their education, period in which they have children, and whether the firm pays for childcare.[21] The numbers displayed are percentages plus one. Notice that childless females and females that pay for childcare from their income are better off without the policy. Females whose childcare expenses are covered by a firm would end up worse off, enjoying up to 62% less in consumption equivalent units for mothers with a child in the first period, with primary incomplete, and whose childcare expenses are covered by the firm. It is important to note that only two fifths of mothers receive the subsidies.

To understand effects of this magnitude, it is helpful to think of utility, conditional on working, as being of the Gorman type, with the childcare expenses acting as a subsistence level of consumption. Consider a single mother who spends all her income w in current consumption and childcare expenses. Her current period utility is $\log(w - v)$. To understand the effects of changing v (for example, going from 0 when the firm pays for it to a positive value if she has to pay herself), compute the marginal utility as $\frac{1}{w-v}$. As $w \to v$, this marginal utility approaches infinity. This implies that females that are very poor (single, with w close to v) have a lot to gain from receiving childcare payments, or a lot to lose from dropping them. When children come in the first period, the loss is even greater, because they had no periods to accumulate assets to finance consumption or childcare. This is why single mothers with primary incomplete education and children in the first period are the most affected from losing their childcare coverage, and why the losses are so large.

While some mothers lose childcare coverage (and lose in terms of welfare) others never had coverage, and gain because of an increase in wages. Table 5 shows that the ex-ante utility conditional on being a mother drops when removing the policy. Married mothers lose on average almost 5% of lifetime consumption equivalent units, while single mothers lose over 8%. Thus, if the policy's intention was solely to help mothers, it does indeed achieve its goal. However, as we suggest later, there are more effective ways of doing this.

6.4. *Resources shift from fertile-age females to non-fertile-age ones*

Another important consequence of the childcare policy is to increase the relative demand for non-fertile-age females, that never require childcare payments, from fertile-age ones. In this case, our analysis is based on wages, and not welfare, because when computing lifetime welfare these effects are not observed.

Table 3 shows that removing the policy would have a much larger effect on the wage rates of fertile-age females than on non-fertile-age ones. While the wage of non-fertile-age females would increase by up to 0.13% (including a mild drop in wages for primary incomplete and college-educated non-fertile-age females), the increase for fertile-age females ranges between 0.8% to 3.3%. Thus, the policy has a much larger effect on dropping the fertile-age wage than the non-fertile-age one.

There are interesting patterns in terms of lifetime labor supply reallocations. Fig. 6 shows the aggregate labor supply of females by age in panel (a), and the labor supply of mothers whose childcare is covered by a firm in panel (b). The vertical axis shows the proportion of females that are working in each age group. The blue circles represent the labor supply under the current policy, and the red stars are the estimated labor supplies when removing it. The changes are larger in panel (b), but qualitatively similar in both panels.

[21] Note that the figure does not include single stay-at-home mothers. Since there is no income other than their own labor income for this group (no husband income), there are no stay-at-home single mothers in equilibrium.

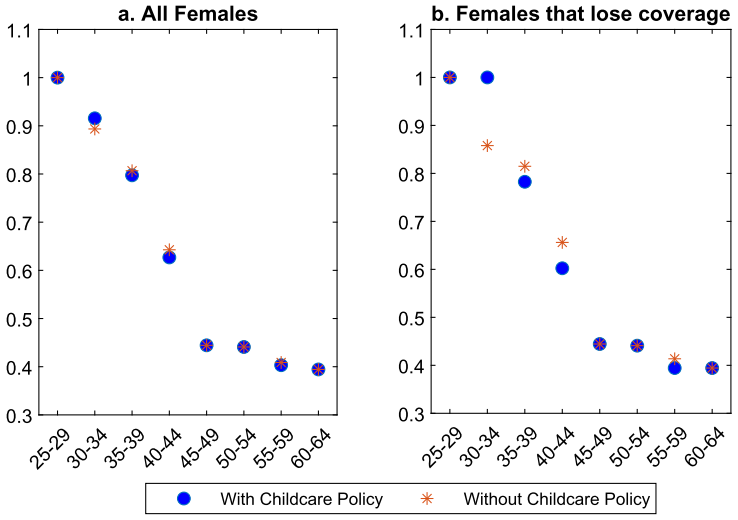

Fig. 6. Removing the policy would bias labor supply towards older females.

Focus on the labor supply between ages 30 and 34. The red stars are considerably lower than the blue dots, highlighting that females reduce their labor supply at that age when they lose coverage. They compensate by increasing their labor supply in later ages. This inter-temporal substitution also happens when females are between 35 and 39, although the increase in labor supply from females that were mothers between 30 and 34 compensates for this, so that total labor supply at ages 35-39 increase when removing the mandate. It is interesting that there are no changes for females between 25 and 29. This is because of our assumption of no borrowing, which drives all females to work at that age, irrespectively of whether they receive childcare payments or not.[22] Thus, the childcare policy affects the timing of mothers going to the market, increasing hours when young, and reducing them when old.

This reallocation across time reveals interesting features of the female labor supply. The existing literature, based on microeconomic estimates, would normally estimate the labor supply elasticity by computing changes in labor supply associated with changes in cost: in this case, it would measure the change in labor supply of a mother who no longer receives childcare payment. These studies rarely consider changes that may come after having children, or even before. This is key to understanding the response of female labor supply to changes in childcare payments. Next, we describe how these static studies may be misleading with regard to labor supply elasticity.

Most studies estimate the labor supply elasticity via the following equation:

$$\log(h_i) = a_0 + a_1 X_i + a_2 D_i + e_i \tag{4}$$

where h_i is hours worked by female i, X_i is a vector of controls, including wages, age, number of children and education, D_i is a dummy equal to 1 if the firm pays for childcare, zero otherwise, and e_i is an error term. This regression would consider females in one point in time.

Using our data, the estimate on a_2 is 0.2944, implying that removing childcare coverage would reduce the supply of labor of mothers by around 30%. This number is large, and it is essentially a comparison of the labor supply of a mother whose children's care is paid for by a firm, with one who has to pay out of pocket.

This estimate does not include labor reallocations through time. That is, a mother might choose to stay home while raising children, but this reduction in hours worked might be offset in the future by working more. In fact, when considering their lifetime labor supply, so that h_i in equation (4) is lifetime hours, the total effect is a reduction in labor supply of 0.58%, much lower than the static estimate.

Table 6 summarizes these results. Column 1 ("Static Effects") 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 ("Lifetime Effects") compares their lifetime labor supply.

An important abstraction for these results is that we do not have returns to experience. Adding these returns would reduce the extent to which females delay their participation in the labor force, since investing in early years implies higher wages when older. Abstracting from this channel implies that our estimates of this intertemporal reallocation are somewhat overstated, but most likely in the right direction.

[22] In the data, not all females between 25 and 29 work, and this is likely because they can finance consumption with transfers that are not in our model, such as government subsidies or parental transfers.

Table 6
Different estimates of the effects of a childcare mandate on the labor supply of mothers.

Household Type	Micro-Estimates (%)	Lifetime Effects (%)
Primary or less	29.54	-10.09
Less than high school	40.95	17.73
Less than college	32.35	11.95
College or more	0.00	-20.63
Total	29.44	0.58

6.5. Resources shift from the less educated to the more educated

Our last set of results relates to how the childcare policy shifts resources away from low-education females, and towards more educated ones. This is because the childcare cost, as a fraction of wages, is much larger for low-education types. Table 3 shows that removing the policy increases the wages of all fertile-age females, but the increase is inversely proportional to education. Females with less than primary education would observe a wage increase of over 3%, those with incomplete high school would observe an increase of 2.9%, those with incomplete college 2.1%, and those with a college degree 0.81%.

These effects are ratified when focusing on welfare. Table 5 shows that removing the policy would add 4.3% of consumption equivalent units to the ex-ante utility of females with less than primary education, 3.2% for those with high school incomplete, 2.1% for those with college incomplete, and 0.1% for college-educated females.

These numbers are not representative of each type. In fact, there is a considerable amount of heterogeneity among each type, mostly depending on whether a firm covers their childcare needs. These effects are magnified among single females, but they are qualitatively similar for married ones as well. Fig. 5 shows the effects for different types of single females. The poorer the female, the more extreme the response. For those not receiving childcare financing, the gains from removing the mandate are decreasing in education, with primary or less females with children in the first period of life increasing their lifetime welfare by about 20% in consumption equivalent units. If they had less than high school, the gain would be of 16%, for less than college, 11%, and with a college degree, 3%.

The opposite takes place when the female receives childcare payments. Single mothers, with less than primary education, and children in the first period observe reductions in utility of 62% of consumption equivalent units, those with less than a high school diploma observe losses of 53%, less than college 41%, and those with a college degree, 20%.

This is concerning if the policy is mostly directed at helping poor families. While it is true that receiving financing for childcare is much more valuable for the poorest families, it is also the case that the bias introduced by it affects these females the most. And only about 40% of females with less than primary education receive these subsidies in our calibrated economy.

7. Alternative policies

This section explores alternative policies to finance the cost of childcare. The first counterfactual forces all firms to pay for childcare, not only those that hire more than 19 females. 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. Extending the policy to all employers would essentially increase the coverage to all working mothers.

The second counterfactual finances 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, and that childcare subsidy funded by general taxes is akin to what occurs in several developed countries.

Our last exercise imposes the childcare mandate on all firms, but forces them to cover childcare expenses for only the least educated females, that is, those with primary education incomplete. One lesson that comes from our findings is that the subsidies are most important for the poor because of the large income effect in the presence of a non-homothetic component in childcare. Financing only the least educated increases the demand for all females with primary education or more, still maintaining a reduced demand for females with less than primary education. However, the fact that the income effect from the childcare policy is so large among these females implies that the substitution effect can easily be outweighed by the income effect. This is less so among more educated females, where income effects are not as large.

It is noteworthy that in our model, females with primary incomplete are not necessarily the poorest of females. Single females without a primary education are the poorest. Thus, our counterfactual provides subsidies for a couple where the husband has a college degree and the wife has less than a primary education, but does not provide them to a much poorer household, where the female is single but has a primary diploma. We do this because it is politically feasible to discriminate by education, but not by marital status, since this is usually not revealed to an employer.

7.1. Extending the childcare policy to all firms

In this section, we extend the mandate to all firms, irrespective of how many females are hired. By doing so, all working mothers receive childcare payments, an important feat since in our baseline exercise only about two fifths of females receive it. A problem in

Table 7
Effects of different counterfactuals on aggregate statistics.

Increase in	Extend policy to all firms	Income tax to finance childcare	Cover primary incomplete only
GDP	-0.3062	0.2221	-0.0904
Capital	0.0700	1.0409	0.4439
Return to capital	-0.1538	-0.5547	-0.2724
Female labor			
Primary incomplete	-2.2992	-0.1191	-0.1191
High school incomplete	0.1978	0.1978	-0.3062
College incomplete	0.2330	0.2330	-0.1129
College or more	-0.1454	2.3860	0.2251
Male labor			
Primary incomplete	-0.0521	-0.0521	0.0807
High school incomplete	-0.2658	-0.2658	0.4115
College incomplete	-0.0000	-0.0000	-0.0000
College or more	-0.0978	-0.0978	0.3016
Female wages - all ages			
Primary incomplete	-0.6043	1.4482	0.1046
High school incomplete	-1.5764	1.1386	0.1553
College incomplete	-1.2270	0.7791	0.1614
College or more	-0.3829	-0.1380	-0.0449
Female wages - non-fertile-age			
Primary incomplete	-0.5966	0.1549	0.1033
High school incomplete	-1.5596	0.0601	0.1536
College incomplete	-1.2176	0.0052	0.1601
College or more	-0.3817	-0.4646	-0.0448
Female wages - fertile-age			
Primary incomplete	-0.6167	3.5197	0.1068
High school incomplete	-1.6033	2.8659	0.1579
College incomplete	-1.2421	2.0188	0.1633
College or more	-0.3849	0.3851	-0.0451
Male wages			
Primary incomplete	0.1763	0.2044	0.0989
High school incomplete	0.1348	0.3318	-0.0964
College incomplete	-0.0416	0.1562	0.1536
College or more	0.0553	0.0798	-0.0623

this policy is that females, particularly young and low educated ones, suffer from a reduction in wages. But this bias is also present in the baseline model, so one can view this exercise as increasing the coverage of the childcare policy, keeping the biases constant.

Table 7, column 1, shows the results on output, capital, labor and wages, while Table 8, column 1, shows the results on welfare measures. GDP drops by more than simply removing the policy, by about 0.3%. But this does not mean welfare drops. In fact, the expected lifetime welfare of a newborn to this economy increases by 4.6% consumption equivalent units. This is mostly due to the increase in welfare of mothers, that gain on average 26% in consumption equivalent units. Among these, single mothers almost double their welfare in consumption equivalent units. The reason is that they do not need to pay for childcare, and single mothers, especially those without primary education, have a very high marginal utility of consumption. The counterpart is that non-mothers lose: single non-mothers lose about 7% in consumption equivalent units, while married non-mothers lose about 2%. This is because their wages drop to accommodate for the higher cost of hiring a female. Extending the childcare costs to all firms biases labor demand even more against females in general, reducing their equilibrium wages by between 0.4% and 1.6%.

The fact that overall welfare increases beyond the no-policy counterfactual implies that some form of childcare financing is desirable, since it increases the welfare of those most sensitive to changes in income. In essence, the childcare policy provides a much-needed income effect, especially for low-income mothers, at the expense of a substitution effect that lowers their pre-childcare wages. As the two counterfactuals so far show, the current policy falls short of providing a considerable income effect by covering only about two fifths of mothers, while generating too large of a substitution effect. Removing the policy increases overall welfare by increasing the demand for female labor, and extending the policy to all firms increases the income effect by covering all mothers.

7.2. Financing childcare with a tax on labor

This section uses an income tax to finance childcare. In a way this policy picks the best of both worlds: it does not distort the demand for males versus females, or for young versus old, or from poor versus rich, and it provides a subsidy for those most sensitive to income effects. Interestingly, there is a constant push in Chile to replace the current policy with a 0.1 percentage point increase in the income tax.[23] As we suggest next, this is a good idea.

[23] https://www.reddeproteccion.cl/fichas/ProyectoLey_ReformaSalaCuna.pdf.

Table 8
Effects of different counterfactuals on welfare.

Increase in	Extend policy to all firms	Income tax to finance childcare	Cover primary incomplete only
All	4.5544	13.0597	3.8213
Females	7.4854	20.1732	6.7172
Single Females	15.2311	36.7734	14.4490
Married Females	2.4423	9.3650	1.6831
Mothers	26.2373	42.1338	12.4352
Single Mothers	51.2241	80.0766	28.8268
Married Mothers	9.9689	17.4298	1.7629
Non-Mothers	-3.8542	6.8314	2.5097
Single Non-Mothers	-7.1114	9.8931	5.5239
Married Non-Mothers	-1.7334	4.8380	0.5471
Primary Incomplete	12.0037	26.0636	14.1971
High-School Incomplete	5.3598	20.8626	2.3638
College Incomplete	4.4026	17.2606	1.4881
College Complete	1.9439	3.3909	-0.6684
Males	1.5730	5.8240	0.8757
Single Males	0.1780	0.1420	-0.4199
Married Males	2.4423	9.3650	1.6831
Primary Incomplete	2.0767	6.7757	1.8599
High School Incomplete	1.3990	7.4008	0.3668
College Incomplete	1.0622	4.8209	0.2680
College Complete	0.9359	1.1984	-0.7900

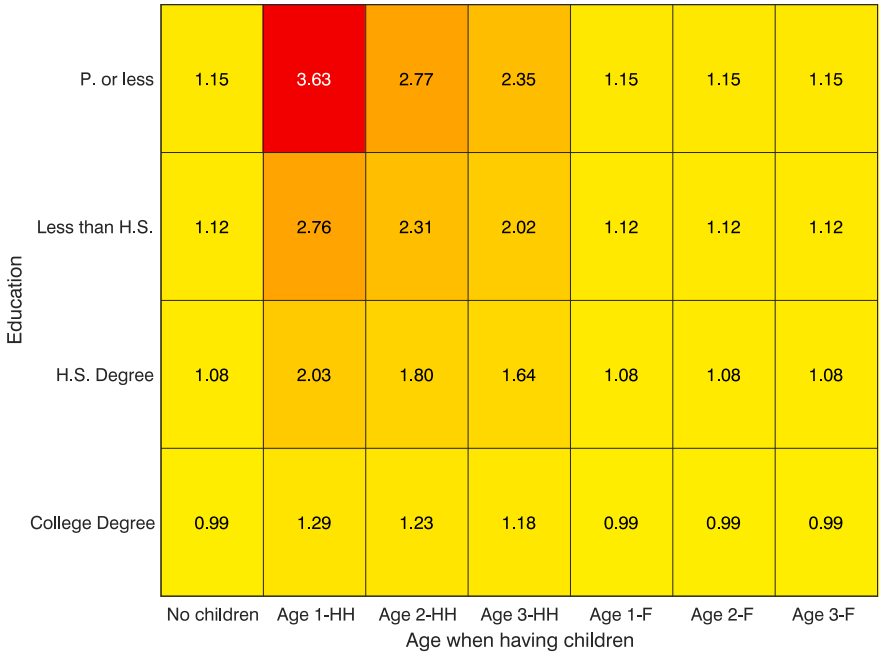

Fig. 7. The increase in welfare from replacing the childcare regulation for a labor tax for single females with different education levels based on the timing of children.

We find that a tax on wage income of 0.29% would cover the childcare needs of the population. This is larger than the increase of 0.1% the government is currently considering, although there are additional sources of revenues considered in the proposed reform.

In terms of welfare, this policy is superior in many ways to the other policies considered in this paper. It increases the unconditional ex-ante welfare of the households by 13%, while increasing the ex-ante welfare of all conditional categories in Table 8. All wages increase, except for those of non-fertile age, college educated females, that drops by about 0.1%. All other non-mothers increase their welfare, mainly because the increase in female labor supply increases the marginal productivity of capital, increasing the capital stock, and, in return, the marginal productivity of females.

Fig. 7 illustrates this with the case of single females. Notice that all numbers are above 1 except for college degree females with no children, given that these females do not use the government financed childcare. The magnitude of these gains can be understood if one considers the extremely large marginal utility of consumption among these females. Not only is their income low, but the

income in excess of childcare expenses (equal to consumption, given no savings) is extremely low, explaining the size of the marginal utility.

7.3. Covering childcare for the poorest only

The largest gains from childcare financing come from the poorest members. Accordingly, it makes sense to study the financing of this group only. In this section, we explore the effects of covering childcare only for females with primary incomplete. Note that these are not necessarily the poorest: the poorest are single females with primary incomplete in the model. Financing the childcare needs of exclusively this group would be unrealistic, since firms cannot discriminate based on marital status, but they can discriminate based on education. Financing comes from the firms themselves as a mandate (all of them, not just large ones).

Aggregate welfare would increase relative to the present situation. Not every type prefers this system over the equilibrium. As one would expect, mothers that stop receiving childcare payments are worse off. In an ex-ante sense, females of all educations except college complete are better off. Females with college complete are slightly worse off: their present value welfare drops by about 0.7%. The reason is that, first, their wages drop by about 0.04%. Second, no mother receives childcare payments in this group. Third, college-educated male wages fall relative to the current equilibrium, which includes most husbands of college-educated females. This drop further reduces this type's consumption.

The drop in male wages affects males negatively, especially single males, but the aggregate drop within this group is of 0.4%. Married men are generally better off, given that the increase in their spouses' wages more than compensates for the drop in their own wages, although college educated married males are slightly worse off.

8. Conclusion

This paper provides a better understanding of the consequences of financing childcare. These policies often have the goal of fostering female 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, firm mandates are often preferred to government subsidies. In Chile, the solution has been to force relatively large firms to pay for childcare.

To the best of our knowledge, this is the first paper that studies the effects of a size-dependent policy on the distribution of welfare. In our particular case, the macroeconomic distortion introduced by the policy is too small to matter, but the redistributive effects are large.

The policy introduces a severe bias against females. Within these, there is further bias against young, fertile-age females. Finally, there is a third layer of bias against the low educated, where the cost of childcare as a percentage of wages is the highest. These biases translate into lower wages, and these lower wages can really hurt households, particularly single mothers without a primary education degree. On the other hand, those low-educated single mothers derive the most increases when their expenses are covered, but these are only 40%.

The fact that there are winners and losers does not allow for a clear ranking between having the current policy or not. It does not allow for a clear ranking of the alternative policies we study in this paper either. However, in one sense, replacing the current policy with a childcare subsidy financed with a tax on wage income would be highly effective. Almost all households would be better off. And the gains can be quite large: on average, females would gain over 20% of consumption equivalent units in welfare relative to the present situation.

Even when increasing income taxes is unfeasible for other reasons, we do find allocations that produce better results than the current situation. These policies affect the poor the most: a subsidy to the poor has a much larger welfare effect than a subsidy to the rich, and the drop in labor demand is larger for low-educated females, where the childcare cost as a proportion of wages is the largest. But the first effect can be extremely large and outweigh the losses from the second effect. This is not so obvious for richer, more educated households. With this in mind, asking firms to cover the childcare costs only of low-educated female workers would improve things: it would still provide the large income effects where they matter most while removing biases on the demand towards more educated females, where this channel gains more relevance.

Appendix 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.[24] 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

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

[24] In principle, we should also consider a firm waiting for a candidate of different age. However, our assumptions imply that in equilibrium, the expected cost of hiring a female of any fertile age is the same, equal to $\tau/P_0 + w_{f,e,o}$, so that a firm is indifferent between hiring a fertile-age female of any age.

Table B.1
Observations for each household type.

	Primary or less	High school incomplete	Less than college	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

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

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

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):

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

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

$$w_{f,e,y} + p\nu \leq \frac{\tau}{P_o} + w_{f,e,o} \Rightarrow w_{f,e,o} \leq \frac{\tau}{1 - P_o} + \frac{\tau}{P_o} + w_{f,e,o} - p\nu \Rightarrow p\nu \leq \frac{\tau}{P_o(1 - P_o)} \quad \blacksquare$$

A key assumption for this equilibrium to hold is that the wage rate of non-fertile-age females is independent of age or tenure. Otherwise, equation (A.1) would not hold when comparing any fertile-age with any non-fertile-age females. This prevents us from adding returns to experience or returns to age into the model.

Appendix B. Number of households

We read directly from the CASEN the fraction of different types of households in 2006, normalizing the total amount to unity. Table B.1 shows the number of observations for each household type. We normalize these observations by dividing them by the sum of all observations.

Appendix C. Sensitivity

In this section, we describe the effect on the gains from removing the childcare policy from changing certain parameter values. Because of the interactions in the model, changing too much the value of a parameter may change the equilibrium in considerable ways that make the comparative analysis hard to interpret. For example, increasing ν too much might prevent low income households from being able to afford childcare, which is problematic in terms of solving the model. But even when the change in ν might not be enough to make childcare unaffordable, it might change the decisions of household members in terms of labor supply, savings or consumption in the equilibrium with childcare policy to the extent that the comparative statics are hard to interpret. For example, a higher ν might drive some households to reduce their labor supply under the childcare equilibrium when compared to lower values of ν, but display the same behavior as under lower ν when there is no policy, producing a larger increase in GDP in the counterfactual.

To avoid such cases, our sensitivity exercises study minor changes in the parameters, increasing and decreasing the childcare cost, the lawsuit cost, and the elasticity of substitution between males and females by 1%.

C.1. Changes in the cost of childcare

Fig. 8 shows the change in GDP when eliminating the childcare policy under different values of ν. The horizontal axis shows a range of values for ν of 1% above and 1% below our calibration, with a dashed line indicating our benchmark value.

There are two main channels at work that determine the effects from eliminating the policy under different values of ν. First is the change in female wages, that tend to increase when the policy is removed, and this increases female labor supply. The larger

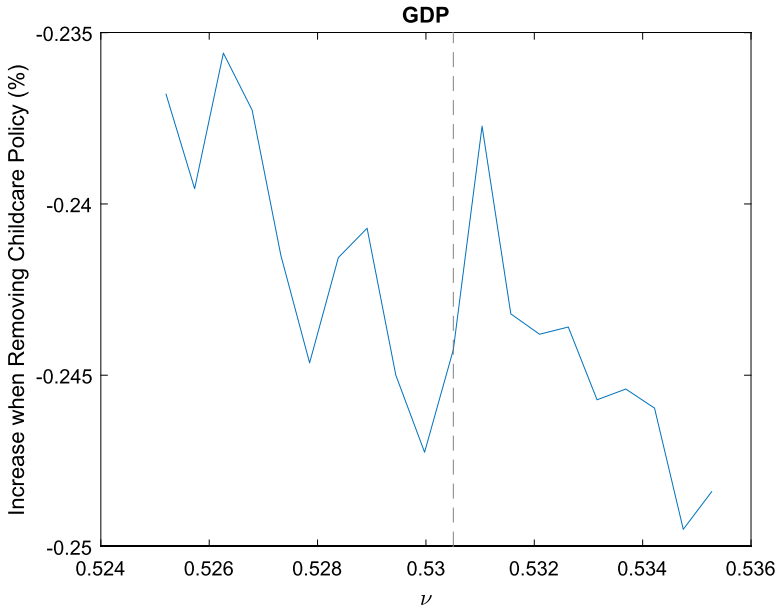

Fig. 8. Sensitivity analysis: changes in GDP under different values of ν when removing the childcare policy.

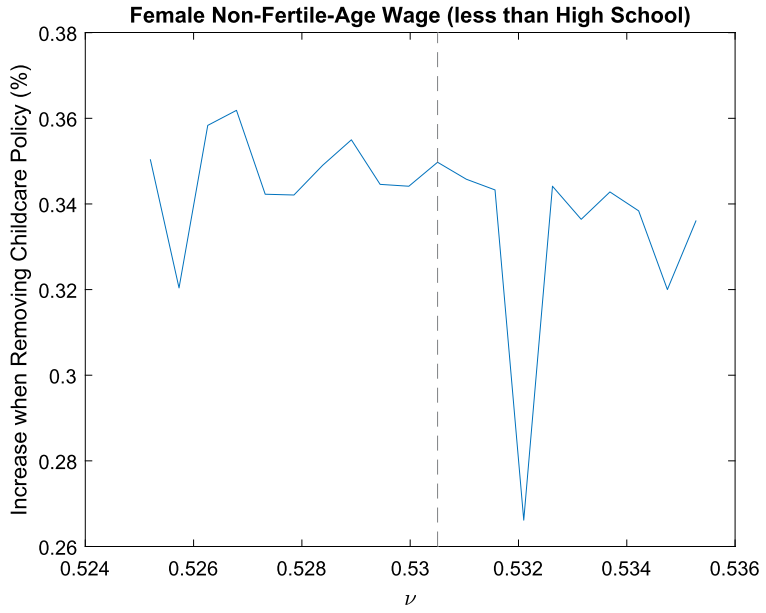

Fig. 9. Sensitivity analysis: changes in non-fertile-age female wages under different values of ν when removing the childcare policy.

the ν, the larger the increase in wages. The second is that the elimination of the childcare subsidy implies that many families need to cover that cost from their own pockets, unless one member does not work. Consequently, some family members leave the labor force.

In general, larger values of ν amplify the overall negative effects on GDP from eliminating the policy, suggesting that, as ν becomes larger, the second effect described above dominates. That is, when ν increases, eliminating the policy produces larger drops in GDP, but non-monotonically, as Fig. 8 shows. The reason why these changes are not monotonous is that the labor supply is lumpy.

As an example, consider the labor supply of females with less than high school education. Wages among this group increase more the larger the ν for fertile-age females. The increase among non-fertile age females is roughly independent of ν (see Figs. 9 and 10). This would, other things being equal, increase the labor supply of females. However, as we show in Fig. 11, the labor supply among this group falls. This is because many families lose their childcare coverage, driving some mothers to stay home to avoid the childcare

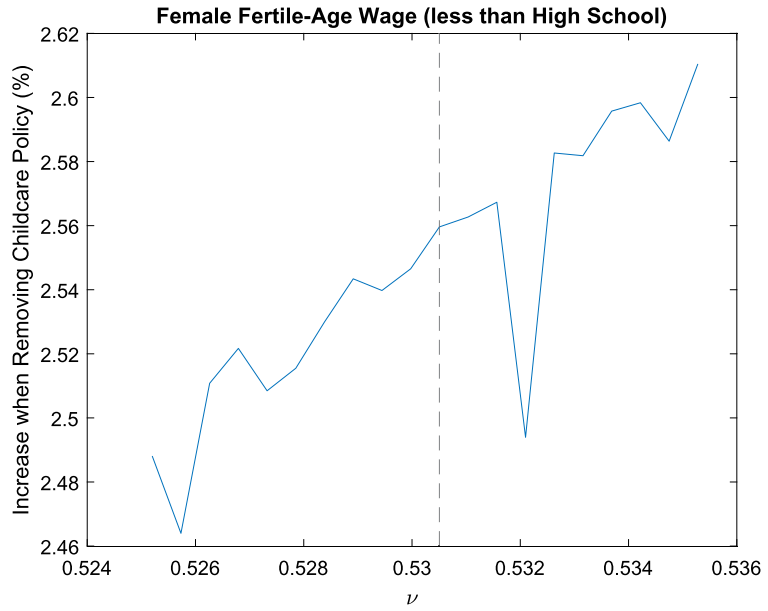

Fig. 10. Sensitivity analysis: changes in fertile-age female wages under different values of ν when removing the childcare policy.

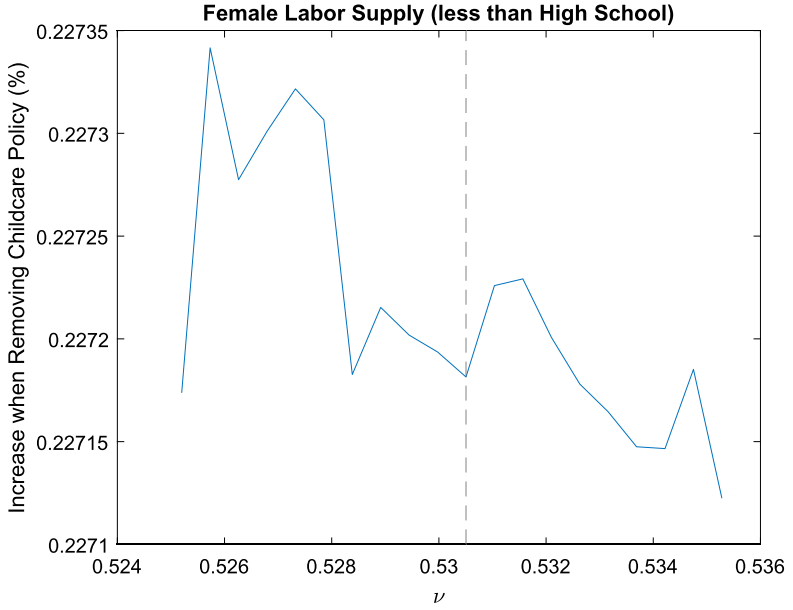

Fig. 11. Sensitivity analysis: changes in female labor supply under different values of ν when removing the childcare policy.

payments. A wealthier family might react very differently, since even after losing these payments, a high wage would still have the mother working. The larger this cost is, the more the reduction in labor supply, accounting for the greater reduction in GDP.

C.2. Changes in the cost of lawsuits

Recall that τ is the lawsuit cost, and we lack good targets for its calibration. Fig. 12 shows the effect of removing the childcare policy does not depend on τ, with a slightly milder effect when τ increases.

C.3. Changes in the elasticity of substitution between males and females

The effects of increasing μ are extremely lumpy, because of the non-convexity of the labor supply. A higher value of μ increases the substitutability between female and male labor. The elimination of the childcare policy reduces the female labor cost for many

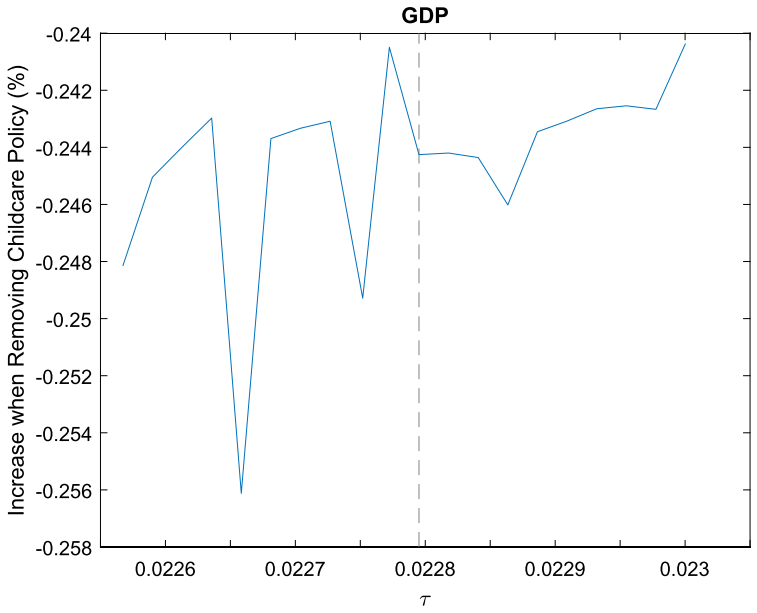

Fig. 12. Sensitivity analysis: changes in GDP under different values of τ when removing the childcare policy.

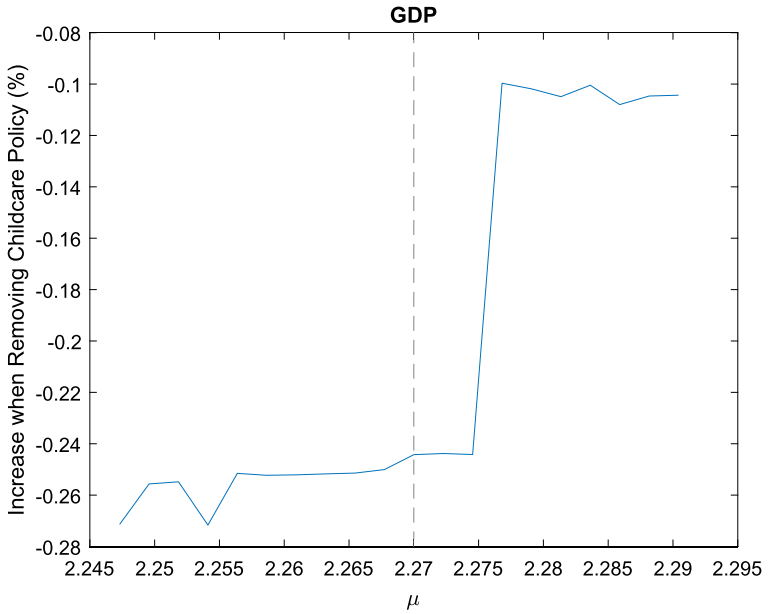

Fig. 13. Sensitivity analysis: changes in GDP under different values of μ when removing the childcare policy.

firms, and consequently increases the demand for these workers. The larger the μ, the larger the increase in demand (see Fig. 13). Two groups of females react very strongly to this increase in demand when μ is large. Figs. 14 and 15 show the reactions of these groups. Females with complete high school and college females increase their labor supply considerably when μ is large, but not when μ is small. As a result, the drop in GDP becomes milder when μ increases. A reason for the large changes in GDP and other variables when μ changes is that labor supply can react too much, provided its non-convexity. A consequence of this is that the model is far from many of our calibration targets when modifying μ, making this analysis less useful to understand the implications of the model under different values of this elasticity.

To address these issues, we perform a second type of sensitivity, where we choose a different value for μ and calibrate the remaining parameters to match our original targets. We do this with a smaller value relative to our benchmark and a larger one. Recall our benchmark is $\mu = 2.27$. Table C.2 shows changes in national account data when re-calibrating all parameters when $\mu = 2.00$ and when $\mu = 2.50$. For comparison, we also include our benchmark results. Table C.3 shows the welfare effects.

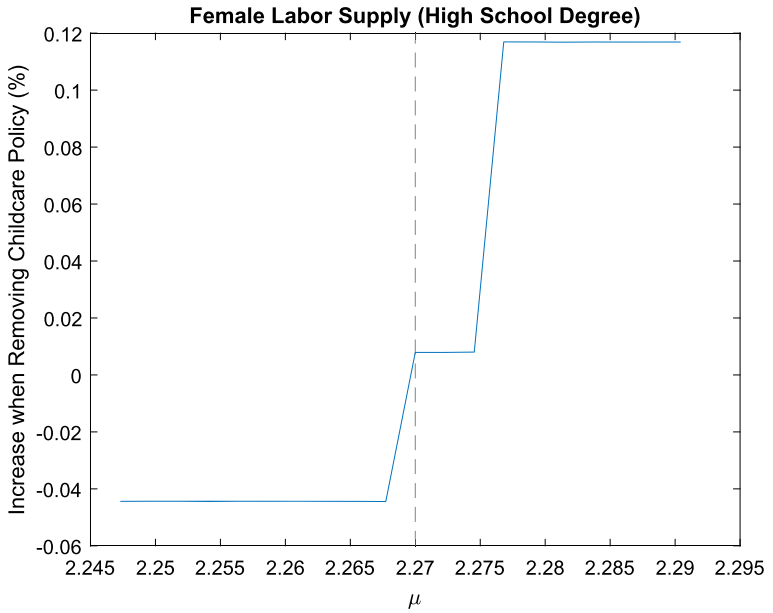

Fig. 14. Sensitivity analysis: changes in high school educated female labor supply under different values of μ when removing the childcare policy.

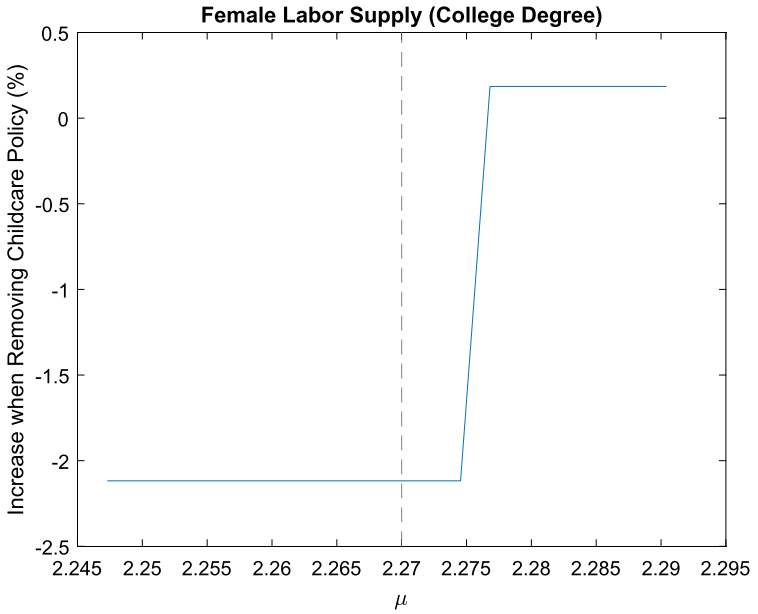

Fig. 15. Sensitivity analysis: changes in college educated female labor supply under different values of μ when removing the childcare policy.

C.4. Recalibrating the model to different elasticity of substitution between males and females

In this section we change the value of the elasticity of substitution between males and females and recalibrate all other parameters to match our targets. We set $\mu = 2$ and $\mu = 2.5$. Table C.2 shows the effect of removing the childcare policy on national account and wage data, and Table C.3 shows welfare results. For convenience, we also add our baseline results, with $\mu = 2.27$.

The tables show there is no considerable difference in results when changing μ. Perhaps the most interesting effects are on wages, but they are too small to matter, only affecting the second decimal place (so that the differences are less than 0.1 percentage points). In particular, the larger the elasticity of substitution, the larger the effect of removing the childcare policy. This is because when males and females are more substitutable, the childcare policy reduces demand for female workers more. Consequently, removing it increases the demand for female workers more the higher the μ.

Table C.2
Effects of removing the childcare policy on aggregate statistics under different values for the elasticity of substitution between males and females.

Increase in	Remove Childcare Payments		
	$\mu = 2.00$	$\mu = 2.27$	$\mu = 2.50$
GDP	-0.0592	-0.0599	-0.0596
Capital	0.1795	0.1796	0.1797
Return to capital	-0.0693	-0.0687	-0.0677
Female labor			
Primary incomplete	0.1844	0.1844	0.1844
High school incomplete	-0.3062	-0.3062	-0.3062
College incomplete	-0.0324	-0.0324	-0.0324
College or more	0.2251	0.2251	0.2251
Male labor			
Primary incomplete	0.0807	0.0807	0.0807
High school incomplete	0.4115	0.4115	0.4115
College incomplete	-0.0000	-0.0000	-0.0000
College or more	0.1514	0.1514	0.1514
Female wages - all ages			
Primary incomplete	1.2128	1.2144	1.2190
High school incomplete	1.2106	1.2077	1.1886
College incomplete	0.8676	0.8675	0.8680
College or more	0.2860	0.2860	0.2861
Female wages - non-fertile-age			
Primary incomplete	-0.0774	-0.0759	-0.0713
High school incomplete	0.1315	0.1285	0.1097
College incomplete	0.0930	0.0929	0.0934
College or more	-0.0420	-0.0420	-0.0419
Female wages - fertile-age			
Primary incomplete	3.2795	3.2811	3.2858
High school incomplete	2.9392	2.9362	2.9168
College incomplete	2.1083	2.1082	2.1087
College or more	0.8114	0.8114	0.8115
Male wages			
Primary incomplete	0.0538	0.0533	0.0516
High school incomplete	-0.1224	-0.1214	-0.1131
College incomplete	0.1219	0.1219	0.1220
College or more	0.0062	0.0062	0.0027

Table C.3
Effects of removing the childcare policy on welfare under different values for the elasticity of substitution between males and females.

Increase in	Remove Childcare Payments		
	$\mu = 2.00$	$\mu = 2.27$	$\mu = 2.50$
All	2.3351	2.3371	2.3395
Females	2.9984	3.0006	3.0020
Single Females	3.7086	3.7108	3.7090
Married Females	2.5360	2.5382	2.5417
Mothers	-4.7550	-4.7532	-4.7522
Single Mothers	-8.2451	-8.2431	-8.2452
Married Mothers	-2.4826	-2.4809	-2.4781
Non-Mothers	7.9421	7.9451	7.9488
Single Non-Mothers	11.1287	11.1312	11.1295
Married Non-Mothers	5.8673	5.8707	5.8780
Primary Incomplete	4.2938	4.3009	4.3219
High-School Incomplete	3.2079	3.1986	3.1332
College Incomplete	2.1047	2.1061	2.1133
College Complete	0.1405	0.1422	0.1410
Males	1.6604	1.6621	1.6656
Single Males	0.2554	0.2563	0.2598
Married Males	2.5360	2.5382	2.5417
Primary Incomplete	2.6468	2.6486	2.6530
High School Incomplete	1.1840	1.1847	1.1880
College Incomplete	1.0064	1.0083	1.0141
College Complete	0.0250	0.0267	0.0157

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