A microeconomic model of reproductive labor

Violetta van Veen - Paris School of Economics

Motivation

Reproductive labor is a term for women's unpaid work in the family. The adjective "**reproductive**" highlights the fact that the "productive" labor of workers cannot exist without unpaid and underrecognized work by women. The reproduction does not simply refer to the biological reproduction of the species, but to a '**social** reproduction', i.e. all the tasks associated with supporting the current, past and future workforce: cleaning, raising children, cooking meals, taking care of the elderly... Women's labor force has **increased** rapidly in the last century in all European countries (Killewald and Gough, 2010). However, time diaries data from different European countries show the same pattern: even when women and men work full-time, women spend **more time** than men on domestic work and caregiving (Eurostat, 2010). This has worsened during the **Covid-19** pandemic: the institutions to which women outsourced their domestic duties, such as schools and kindergartens, have been closed to prevent the spread of the virus for extended periods. The long-term consequences of the lockdowns on women's labor force participation have not unravelled completely yet.

In this model, I will try to understand what happens to reproductive labor when the bargaining power of the woman in the decisions of the household increases. This yields **policy-relevant** results: not only we can understand the economic shocks that lead to a change in the provision of reproductive labor, but we can extend the model to make the productivity of workers depends explicitly on reproductive labor. Moreover, we will see how the bargaining power of women is connected to the demand for professional domestic workers. Through the outsourcing of reproductive labor, the preferences and the bargaining power of women are associated with the increased demand for **migrant domestic workers**. Finally, we will try to open the black box of **bargaining** power: by assuming that it depends on the non-labor income, we will see what will be the economic consequences of paying women for their labor in the house.

A simple model of intrahousehold bargaining

Following the collective household model, I restrict the equilibrium of the bargaining game to be **Pareto-optimal** (Chiappori, 1988). In fact, repeated non-cooperative games as the decision of joint consumption and the allocation of time have multiple equilibria, and Pareto optimal equilibria can be sustained by the threat of punishment: each spouse realizes that the one-period gain from deviating from an agreement will be less than the loss associated with being punished by their spouse in the periods that follow (Lundberg and Pollak, 1996). A marital environment possesses characteristics that would promote Pareto-efficient outcomes in a repeated non-cooperative game: a long-term relationship, relatively good information and a stable bargaining environment (Browning et al., 1994). For all Pareto efficient allocations, there exists a set of weights such that the household utility function can be represented by a **linear combination** of all members' utility functions (Browning and Chiappori, 1998).

$$\begin{aligned} \max_{c,r,l} U &= \lambda U^w(c,r,l) + (1-\lambda)U^m(c,r,l) \\ \text{s.t. } & c = A_w + A_m + w_m(1-l) + w_w(1-r) \\ \text{s.t. } & c,l,r \geq 0 \end{aligned} \tag{1}$$

Where c stands for consumption (of a good whose price is normalized to 1), r for the hours of reproductive labor, l for leisure, A_w and A_m for the non-labor income of respectively the woman and the man, w_w and w_m the hourly wages of respectively the woman and the man, $\lambda \in [0,1]$ denote the bargaining power of the woman.

Assumptions for all extensions:

- **Time** constraints of the man and the woman: the man can only allocate its time (normalized to 1) between market labor supply and leisure, i.e. $s_m + l = 1$, while woman may only allocate it between market labor supply and reproductive labor, i.e. $s_w + r = 1$. In other terms, $l_w = r_m = 0$.
- The representative household has only **2 members**. The household may have children, but their preferences are not taken into account in this model. For simplicity, I call "woman" the family member who is the only one performing reproductive labor, but it would be more general to talk about marginal workers of whatever gender.
- Utility functions are **increasing** in consumption and leisure, twice continuously differentiable and **concave**. The leisure of the man enters into the utility function of the woman i.e. the woman is altruistic. I **do not define** the utility functions **explicitly** in order to find solutions as general as possible, but if I did it, the man's leisure would enter in the woman's utility with a parameter $\beta \in [0,1]$, where the higher the β, the more altruistic the woman.
- I assume that there is a **unique reproductive** labor. This assumption is coherent with the idea that there is a complementarity between different types of reproductive labor - for example, a person can clean the house while they keep an eye on the kids (Becker, 1991). Thus, it is not easy to distinguish what type of reproductive labor is done at a specific moment in time.
- I assume that the consumption good is **collectively consumed** by the household. On the one hand, this is realistic, since an important share of typical household activities (meals, recreation, housing) involve joint consumption (Lancaster, 1975). On the other hand, this simplifies the bargaining game: if spouses do not consume any private good, the household equilibrium is efficient even when spouses behave in a non-cooperative way (Browning, 2000).

Optimal reproductive labor

$$\mathcal{L} =\lambda U^w(c,r,l) + (1-\lambda)U^m(c,r,l) + \gamma(c - A_w - A_m - w_m(1-l) - w_w(1-r)) \tag{2}$$

$$\frac{\partial \mathcal{L}}{\partial c} =0 \iff \gamma = -(\lambda U_c^{w\prime} + (1-\lambda)U_c^{m\prime}) \tag{3}$$

$$\frac{\partial \mathcal{L}}{\partial r} =0 \iff w_w = -\frac{1}{\gamma}(\lambda U_r^{w\prime} + (1-\lambda)U_r^{m\prime}) = \frac{\lambda U_r^{w\prime} + (1-\lambda)U_r^{m\prime}}{\lambda U_c^{w\prime} + (1-\lambda)U_c^{m\prime}} \tag{4}$$

$$\frac{\partial \mathcal{L}}{\partial l} =0 \iff w_m = \frac{\lambda U_l^{w\prime} + (1-\lambda)U_l^{m\prime}}{\lambda U_c^{w\prime} + (1-\lambda)U_c^{m\prime}} \tag{5}$$

$$\frac{\partial \mathcal{L}}{\partial \gamma} =0 \iff c = A_w + A_m + w_m(1-l) + w_w(1-r) \tag{6}$$

$$r^* =1 + \left(A_w + A_m - c + \frac{\lambda U_l^{w\prime} + (1-\lambda)U_l^{m\prime}}{\lambda U_c^{w\prime} + (1-\lambda)U_c^{m\prime}}(1-l)\right)\frac{\lambda U_c^{w\prime} + (1-\lambda)U_c^{m\prime}}{\lambda U_r^{w\prime} + (1-\lambda)U_r^{m\prime}} \tag{7}$$

The solution is interior if $r^* \in [0,1]$. This means that $\frac{\lambda U_c^{w\prime}+(1-\lambda)U_c^{m\prime}}{\lambda U_r^{w\prime}+(1-\lambda)U_r^{m\prime}}$ and $A_w + A_m - c + \frac{\lambda U_l^{w\prime}+(1-\lambda)U_l^{m\prime}}{\lambda U_c^{w\prime}+(1-\lambda)U_c^{m\prime}}(1-l)$ need to have opposite signs. We can interpret this expression in terms of **comparative statics**, i.e. studying how r^* changes when an exogenous parameter changes.

- When A_m (A_w), the **non-labor wealth** of the man (woman) increases, the woman can afford to work less in the labor market, thus she can work more in the house. There's evidence that in 1850-1900, wives worked only in poor households, while only men took paid employment if their households could afford it (Himmelweit, 1995).
- When **consumption** increases exogenously, for example, because of a macroeconomic shock in which the household needs to sustain unexpected costs, it is optimal to have a higher income, thus that also the woman works. This is the idea of the marginal worker: women who are usually indifferent to work or not may decide to find a job in cases of shocks, since their reservation wage decreases (Borjas and Van Ours, 2010).
- When the **leisure** of the man increase, i.e. his labor supply decreases, the optimal number of hours of reproductive labor decreases, so the woman can work in the market and earn a wage. For example, during WWI, the number of hours men could work dropped since they were obliged to serve in the army, thus the labor supply of women increased, with a subsequent decrease in hours of housework.

I want to study how an exogenous increase in **woman's bargaining power** λ affects the provision of reproductive labor r^*. I here make an assumption in favor of my results, which I will lift in the second extension. I assume that reproductive labor is considered like a good by the man, thus his utility is increasing and concave in it. For the woman, it is a duty, thus her utility is decreasing and concave in it: I am assuming that she prefers a mix of domestic and market labor, thus that an additional hour of reproductive labor yields her a higher disutility than the first hour of it (see Figure 1 in Appendix).

$$\frac{\partial r^*}{\partial \lambda} =\frac{U_r^{m\prime}U_c^{w\prime} - U_c^{m\prime}U_r^{w\prime}}{(\lambda U_r^{w\prime} + (1-\lambda)U_r^{m\prime})^2}(A_w + A_m - c) + \frac{U_r^{m\prime}U_l^{w\prime} - U_l^{m\prime}U_r^{w\prime}}{(\lambda U_r^{w\prime} + (1-\lambda)U_r^{m\prime})^2}(1-l)$$

$$\frac{\partial r}{\partial \lambda} >0 \Leftrightarrow (U_r^{m\prime}U_l^{w\prime} - U_l^{m\prime}U_r^{w\prime})(1-l) > (U_r^{m\prime}U_c^{w\prime} - U_c^{m\prime}U_r^{w\prime})(c - A_w - A_m) \Leftrightarrow c < \frac{U_r^{m\prime}U_l^{w\prime} - U_l^{m\prime}U_r^{w\prime}}{U_r^{m\prime}U_c^{w\prime} - U_c^{m\prime}U_r^{w\prime}}(1-l) + A_w + A_m$$

Since $U_r^{w\prime} < 0$ and all the other marginal utilities are positive, the fraction in front of $(1-l)$ is positive. This means that *only if* the consumption of the family is smaller than the sum of the two non-labor incomes and the provision of work (multiplied by a positive fraction), the woman decides to provide more reproductive labor when she has more decisional power (i.e. $\frac{\partial r^*}{\partial \lambda} > 0$). If instead, the consumption is larger than this threshold, the woman decides to provide less reproductive labor when she has more bargaining power. It makes sense that if consumption is large, the additional wage of the woman is necessary for the family.

Extension 1: The market labor productivity depends on reproductive labor provision

The core concept of reproductive labor is that, even if it is not paid, it creates value by increasing the value of the market labor (Engels, 2010). From the perspective of a **single household**, the wage of the man depends positively on the provision of domestic labor ($\frac{\partial w_m(r)}{\partial r} > 0$). The mechanism may be that, when the woman takes care of the house and the children, the man may afford to work overtime or odd hours, thus earning a higher remuneration. Another example of a mechanism is that if he does not have to worry about his responsibilities in the house, he can focus completely on the work and be more productive - thus, assuming that the labor market is competitive, have a higher wage.

I still assume that the utility of the woman in reproductive labor is decreasing ($U_r^{w\prime} < 0$) and concave ($U_{rr}^{w\prime\prime} < 0$), while utility of the man in reproductive labor is increasing and concave. I assume that the wage of the man is increasing but concave in the reproductive labor, i.e. that each additional unit of reproductive labor makes the wage increase but less and less. Moreover, I assume that c and r are neither complements nor substitutes, that is that an additional unit of reproductive labor does not increase nor decrease the utility from consumption $\frac{\partial}{\partial r}\frac{\partial U}{\partial c} = 0$ and, thank to Schwarz theorem, $\frac{\partial}{\partial c}\frac{\partial U}{\partial r} = 0$. The Lagrangian of this case is simply $\mathcal{L} = \lambda U^w(c,r,l) + (1-\lambda)U^m(c,r,l) + \gamma(c - A_w - A_m - w_m(r)(1-l) - w_w(1-r))$. Following Reggio (2011), I define $F = \frac{\partial \mathcal{L}}{\partial r} = \lambda U_r^{w\prime} + (1-\lambda)U_r^{m\prime} + (\lambda U_c^{w\prime} + (1-\lambda)U_c^{m\prime})(w_r^{m\prime}(1-l) - w_w) = 0$. Applying the Implicit Function Theorem:

$$\frac{\partial r}{\partial \lambda} = -\frac{\frac{\partial F}{\partial \lambda}}{\frac{\partial F}{\partial r}} = -\frac{U_r^{w\prime} - U_r^{m\prime} - (U_c^{w\prime} - U_c^{m\prime})[w_w - w_r^{m\prime}(1-l)]}{\underbrace{\lambda U_{rr}^{w\prime\prime}}_{<0} + \underbrace{(1-\lambda)U_{rr}^{m\prime\prime}}_{<0} + \underbrace{[\lambda U_c^{w\prime} + (1-\lambda)U_c^{m\prime}]}_{>0}\underbrace{[w_{rr}^{m\prime\prime}(1-l)]}_{<0}}$$

$U_r^{w\prime} - U_r^{m\prime}$ represents the **direct impact** of the reproductive labor on the utilities of the two members of the household. $(U_c^{w\prime} - U_c^{m\prime})(w_r^{m\prime}(1-l) - w_w)$ represent the **indirect effect** of the reproductive labor through the budget constraint. We have multiple predictions of the sign of $\frac{\partial r}{\partial \lambda}$. The sign of the whole fraction depends on the numerator[1]. I want to see when the increase of bargaining power makes the provision of reproductive labor decrease.

$$\frac{\partial r}{\partial \lambda} < 0 \Leftrightarrow U_r^{w\prime} - U_r^{m\prime} - (U_c^{w\prime} - U_c^{m\prime})(w_w - w_r^{m\prime}(1-l)) \Leftrightarrow w_w > \underbrace{\frac{U_r^{w\prime} - U_r^{m\prime}}{U_c^{w\prime} - U_c^{m\prime}}}_{<0} + \underbrace{w_r^{m\prime}(1-l)}_{>0}$$

The woman dislikes reproductive labor $U_r^{w\prime} < 0$, then $U_r^{w\prime} - U_r^{m\prime} < 0$, while the utility from consumption is positive for man and woman. Even if the productivity of the man depends on the reproductive labor, the woman works less in the house when she has more power λ, if her wage is high enough to compensate for the lost increase in man's productivity $w_r^{m\prime}$ multiplied by how much the man works $(1-l)$, minus the negative term $\frac{U_r^{w\prime} - U_r^{m\prime}}{U_c^{w\prime} - U_c^{m\prime}}$. If her wage is extremely low, for example, because of gender job segregation into part-time contracts (Petrongolo, 2004) or wage discrimination (Stanley and Jarrell, 1998), when she has more bargaining power she decides to work less and increase r i.e. $\frac{\partial r}{\partial \lambda} > 0$. In this case, the woman knows that she is better off if she increases the productivity (and thus the wage) of the man by providing reproductive labor, rather than by working herself.

The key **economic relationship** is the one between w_w and $w_r^{m\prime}(1-l)$: are the hours of the woman better allocated in the labor market, where each hour is paid w_w? Or is it more efficient that she perform housework so that the man, when he works, can earn more? This is the point of Becker (1991), which argues that the whole family is better off if one member specializes in housework and the other in productive work. Different economic implications follow this formula:

- In contexts where the job is designed such that it is **hardly compatible with family** responsibilities, $w_r^{m\prime}$ is higher. For example, the ability to work odd hours is important when the employer communicates work shifts week by week, as for delivery workers. This means that policies that allow jobs with irregular schedules have an intra-household effect: it is more convenient for the woman to work less in the labor market and more in the house.
- When the man needs to **reduce his hours of work** (i.e. increase l), it is more convenient that the woman gives up some hours of reproductive labor to find a job that pays her a wage w_w, which replaces the lost salary of the man. In fact, since women and men tend to work in different industries, some macroeconomic shocks have a higher impact on man labor supply: for example, the Great Recession impacted more heavily the construction and manufacturing industries (Davis et al., 2012), while the Covid-19 crisis is being hardest on HoReCa and culture sector (De Vet et al., 2021).

Extension 2: Outsourcing reproductive labor

I now consider that the household may decide to outsource some reproductive labor (for example to hire a cleaner, a nurse or a nanny[2]) b at a price p[3]. As for the other good c, the utility of both the man and the woman is increasing and concave in b. I assume that c and b can be either independent ($U''_{c,b} = 0$) or complements ($U''_{c,b} > 0$). In fact, some complementarities may exist between some consumption goods c (for example, tools for cleaning) and b (for example, hiring a professional cleaner). Moreover, I assume that the overall utility of the household from reproductive labor, $\lambda U_r^{w\prime} + (1-\lambda)U_r^{m\prime}$ is positive.

The Lagrangian now becomes $\mathcal{L} = \lambda U^w(c,b,r,l) + (1-\lambda)U^m(c,b,r,l) + \gamma(pb + c - A_w - A_m - w_m(1-l) - w_w(1-r))$. Substituting the derivatives of the Lagrangian with respect to the choice variables c, r, l, b[4], the **optimal amount of outsourced domestic work** is[5]:

$$b^* = \frac{\lambda U_c^{w\prime} + (1-\lambda)U_c^{m\prime}}{\lambda U_b^{w\prime} + (1-\lambda)U_b^{m\prime}}(A_w + A_m - c) + \frac{\lambda U_l^{w\prime} + (1-\lambda)U_l^{m\prime}}{\lambda U_b^{w\prime} + (1-\lambda)U_b^{m\prime}}(1-l) + \frac{\lambda U_r^{w\prime} + (1-\lambda)U_r^{m\prime}}{\lambda U_b^{w\prime} + (1-\lambda)U_b^{m\prime}}(1-r)$$

For the sake of interpretation, I take the example of the decision of hiring a professional cleaner. The comparative statics from this model are:

- The optimal hours of professional cleaning increase when the family is **richer** (i.e. $A_w \uparrow$ or $A_m \uparrow$), since the household can afford to consume more. The demand for cleaning services decreases when the family wants to **consume** more of the other good ($c \uparrow$) since if the income does not change, there is less money available for b. However, both relationship are **mediated through** the relative size of the household marginal utility from consumption ($\lambda U_c^{w\prime} + (1-\lambda)U_c^{m\prime}$) and the one for cleaning services ($\lambda U_b^{w\prime} + (1-\lambda)U_b^{m\prime}$). If, for example, the household marginal utility from cleaning services (the denominator of the fraction) is larger than the one for consumption (the numerator), the effect of shocks in A_w, A_m and c is attenuated: for example, even if the family consumes more, the demand for cleaning services b^* would not decrease much.
- The optimal level of cleaning services decreases when the **leisure** l increases, i.e. when the man works less, thus can afford to buy fewer hours of cleaning services: this relationship is again mediated through the relative size of the household marginal utility from leisure and the one for cleaning services. For example, if the marginal utility from leisure is much higher than the one for cleaning services, an increase in leisure cause a large decrease in cleaning service demand in equilibrium.

[1] In fact, the denominator is negative and becomes positive with the minus in front of the fraction.
[2] The same model applies to the choice of buying household appliances.
[3] The price of the consumption good c is still normalized to 1.
[4] The derivative of the Lagrangian with respect to c is identical to equation 3, the one with respect to r to equation 4, the one with respect to l to equation 5. $\frac{\partial \mathcal{L}}{\partial b} = \lambda U_b^{w\prime} + (1-\lambda)U_b^{m\prime} + \gamma p$
[5] The solution is interior if $b^* \geq 0$.

- Similarly, the higher the hours of **reproductive labor by the woman**, the lower b^* in equilibrium, depending on the relative marginal household utility from reproductive labor r by the woman compared to that from the outsourced reproductive labor b. $\frac{\lambda U_r^{w\prime}+(1-\lambda)U_r^{m\prime}}{\lambda U_b^{w\prime}+(1-\lambda)U_b^{m\prime}}$ is interesting in terms of heterogeneity of reproductive labor. The utility from letting a stranger do some reproductive labor may be lower than the utility from the woman doing the same labor. This depends partly on the level of emotive involvement in the activity (for example, taking care of the children vs. vacuuming) but also heavily depends on the culture - for example, outsourcing the reproductive labor of breastfeeding to a wet nurse was common in Europe until the 20th century, while now it is not.

The negative relationship between b^* and r is the key economic relationship of the so-called **global care chain**, a term coined by Wojczewski et al. (2015): the increase in female labor participation leads to the creation of new - often underpaid - jobs as cleaners and caretakers for migrants. Without loss of generality, b^* refers to all outsourced reproductive labor, be it to the State or to a private domestic worker. In countries where the welfare system relies heavily on families, the demand for domestic workers is higher than in countries with a more comprehensive public welfare system for families (see for example the high number of Filipino migrants in Italy, Basa et al. 2011).

How does the **bargaining power** of the woman affect the demand for external reproductive labor? I define $F = \frac{\partial \mathcal{L}}{\partial b} = \lambda U_b^{w\prime} + (1-\lambda)U_b^{m\prime} - (\lambda U_c^{w\prime} + (1-\lambda)U_c^{m\prime})p = 0$ and apply the Implicit Function Theorem:

$$\frac{\partial b}{\partial \lambda} = -\frac{\frac{\partial F}{\partial \lambda}}{\frac{\partial F}{\partial b}} = -\frac{U_b^{w\prime} - U_b^{m\prime} - (U_c^{w\prime} - U_c^{m\prime})p}{\lambda U_{bb}^{w\prime\prime} + (1-\lambda)U_{bb}^{m\prime\prime} - (\lambda U_{c,b}^{w}{}^{\prime\prime} + (1-\lambda)U_{c,b}^{m}{}^{\prime\prime})p}$$

The sign depends exclusively on the numerator[6]. Again, for the sake of interpretation, I consider b as the number of hours of a professional cleaner.

$\frac{\partial b}{\partial \lambda} > 0 \Leftrightarrow U_b^{w\prime} - U_c^{w\prime}p > U_b^{m\prime} - U_c^{m\prime}p$. This leads to multiple predictions: if the woman has more bargaining power λ, the demand for cleaning services increases only if the differential between the marginal utility from cleaning services and the marginal utility from consumption (mediated through the price ratio $p/1$ of b compared to c) is larger for the woman than for the man. Vice versa, if the man prefers b to c more than the woman (i.e. $U_b^{m\prime} - U_c^{m\prime}p > U_b^{w\prime} - U_c^{w\prime}p$), when the woman has more power, the demand for cleaning services decreases. This boils down to the fact that when the woman has more power, the household decides to **buy more of her preferred** product. In this case, however, there is **no need to assume** that the woman's utility from r is negative. One may think that the work of a domestic worker and the one of the woman are substitutes. This is not necessarily the case: women who earn more may decide to outsource some housework, but they may also decide to renounce to some types of domestic work. In fact, women who work may face less social pressure to perform the traditionally female tasks of household production (Gupta, 2007).

Extension 3: Endogenizing the bargaining power

Until now, I considered that whether the non-labor income is owned by the woman or the man does not make a difference. In other terms, I implicitly assumed that there is a **game** in which in the first stage the woman and the man pool together their non-labor income A_w and A_m, and in the second stage they draw from it for their joint consumption.

It is interesting to open the black box of the bargaining power, no longer considering λ as a parameter, but instead as a **function**, in particular as $\lambda = \frac{A_w}{A_w + \psi A_m}$, where still $\lambda \in [0,1]$ holds true. Following Iyigun and Walsh (2007) specification, ψ is a parameter that reflects the **cultural** attitude towards gender equality. I assume that $\psi > 0$, i.e. even if the non-labor income of the two partners is the same, the man's bargaining power is larger that the woman's[7], as $(1-\lambda) > \lambda \Leftrightarrow \frac{\psi A_m}{A_w + \psi A_m} > \frac{A_w}{A_w + \psi A_m}$. Broader social norms may lead to less bargaining power for women than their financial resources would predict (Agarwal, 1997; Blumberg and Coleman, 1989).

"Wages for housework" (Dalla Costa and James, 2017) is a campaign for the recognition of reproductive labor through the payment of a wage by the State. Housework is by its nature private: according to the Marxist feminist Federici (1975), through the monetary recognition of the labor, women would become aware that reproductive labor is indeed labor, not a "natural predisposition", and that they are workers (and thus develop class consciousness).

If we model household production with a production function whose input is **time**, i.e. $F(l)$, we realize that time is not only an input but also an output. For example, it makes no sense to imagine that taking care of the children is more efficient if it is done in less time, as the time with the children is exactly the output. For this reason, a proposal of "wages for housework" in Canada (Strong-Boag, 1979) is to give a lump sum to all women, as it is difficult and unfair to model the "productivity" of the housework.

There is no detailed implementation for the proposal of "wages for housework". We can model it in 2 ways:

- Such a lump sum is given **only to housewives**, and as soon as the woman works an hour, she loses her salary for housework. This simply boils down to the model of an unemployment benefit that disappears completely as soon as the worker finds a job (with the related disincentive to find a job).
- It is more interesting to implement the "wages for housework" proposal as a **lump sum** given to women (who in my model are the only ones to perform reproductive labor), whatever is the number of hours they work in the labor market.

[6] The denominator is negative, as the utility of both the man and the woman is concave in the outsourced reproductive labor b, and the cross derivative $U_{c,b} \geq 0$. All the denominator is thus negative, with the minus in front it is all positive, and the sign depends directly on the sign of the numerator.

[7] Instead, gender equality is represented in the model by $\psi = 1$, i.e. the bargaining power only depends on the relative non-labor income of the two partners.

In the basic model (Equation 7) we saw that increasing A_w makes the woman work more in the house in equilibrium (since now the household can afford to renounce the wage from her job). This is exactly the criticism moved to the proposal of Federici (1975) by other feminists (for example Davis 1983) who argue that wages for reproductive labor **further institutionalize** gendered roles.

What happens if the **bargaining power of women** depends from their non-labor income, thus from the "housework salary" too? After rearranging Equation 7, I substitute the definition of λ in the formula for the equilibrium provision of domestic work (Equation 7), and I derive it with respect to A_w.

$$r^* = 1 + \frac{\lambda U_c^{w\prime} + (1-\lambda)U_c^{m\prime}}{\lambda U_r^{w\prime} + (1-\lambda)U_r^{m\prime}}(A_w + A_m - c) + \frac{\lambda U_l^{w\prime} + (1-\lambda)U_l^{m\prime}}{\lambda U_r^{w\prime} + (1-\lambda)U_r^{m\prime}}(1-l) \tag{8}$$

$$r^* = 1 + \frac{\frac{A_w}{A_w+\psi A_m}U_c^{w\prime} + \frac{\psi A_m}{A_w+\psi A_m}U_c^{m\prime}}{\frac{A_w}{A_w+\psi A_m}U_r^{w\prime} + \frac{\psi A_m}{A_w+\psi A_m}U_r^{m\prime}}(A_w + A_m - c) + \frac{\frac{A_w}{A_w+\psi A_m}U_l^{w\prime} + \frac{\psi A_m}{A_w+\psi A_m}U_l^{m\prime}}{\frac{A_w}{A_w+\psi A_m}U_r^{w\prime} + \frac{\psi A_m}{A_w+\psi A_m}U_r^{m\prime}}(1-l) \tag{9}$$

$$= 1 + \frac{A_w U_c^{w\prime} + \psi A_m U_c^{m\prime}}{A_w U_r^{w\prime} + \psi A_m U_r^{m\prime}}(A_w + A_m - c) + \frac{A_w U_l^{w\prime} + \psi A_m U_l^{m\prime}}{A_w U_r^{w\prime} + \psi A_m U_r^{m\prime}}(1-l) \tag{10}$$

$$\frac{\partial r^*}{\partial A_w} = \frac{\psi A_m (U_r^{m\prime}U_c^{w\prime} - U_c^{m\prime}U_r^{w\prime})}{(A_w U_r^{w\prime} + \psi A_m U_r^{m\prime})^2}(A_w + A_m - c) + \frac{A_w U_c^{w\prime} + \psi A_m U_c^{m\prime}}{A_w U_r^{w\prime} + \psi A_m U_r^{m\prime}} + \frac{\psi A_m (U_r^{m\prime}U_l^{w\prime} - U_l^{m\prime}U_r^{w\prime})}{(A_w U_r^{w\prime} + \psi A_m U_r^{m\prime})^2}(1-l) \tag{11}$$

$$\frac{\partial r^*}{\partial A_w} > 0 \Leftrightarrow A_w > (l-1)\frac{U_r^{m\prime}U_l^{w\prime} - U_l^{m\prime}U_r^{w\prime}}{U_r^{m\prime}U_c^{w\prime} - U_c^{m\prime}U_r^{w\prime}} - \frac{(A_w U_c^{w\prime} + \psi A_m U_c^{m\prime})(A_w U_r^{w\prime} + \psi A_m U_r^{m\prime})}{\psi A_m (U_r^{m\prime}U_c^{w\prime} - U_c^{m\prime}U_r^{w\prime})} - A_m + c \tag{12}$$

The lump sum of money needs to be **higher than a threshold** to increase the provision of reproductive labor by the woman. Even if we cannot solve for the explicit definition of this threshold without defining the utility function, it is possible to get some intuition. Such threshold depends positively on consumption, thus the more the family consumes, the higher the threshold for A_w to increase the provision of reproductive labor. It makes sense that if the family consumes much, the income from the woman's job is necessary, thus the hours of reproductive labor r^* do not increase when a lump sum is given to the woman.

Further extensions of the model

- Allow for **leisure for the woman** and **reproductive labor for men**. This would clearly be more realistic (even if there is some evidence of a gender gap in leisure time, Craig and Mullan 2013), but would mean introducing a three-term time constraint $s_i + l_i + r_i = 1$, where $i = w, m$.
- Allow for **private consumption**, i.e. modifying the budget constraint to $p_c c + p_i(x_w + x_m) = A_w + A_m + w_m(1-l) + w_w(1-r)$, where c is the jointly consumed good and x_w (x_m) is the good privately consumed by the woman (man). Introducing private consumption, and assuming that consumption decisions are efficient and private consumption is weakly separable from public consumption in individual preferences, Fujii and Ishikawa (2013) shows that changes in the distribution of λ boil down to the changes in the pattern of private consumption. Thus, this would allow for the observation and testability of the bargaining power, which in my model is an unobservable parameter.
- Allow for **wages**, rather than non-labor income as I did, to have an **effect on bargaining power**. Wages are a common determinant of bargaining power in the literature (McElroy and Horney, 1981; Brines, 1994; Bittman et al., 2003): since for example in the case of a divorce the person with the highest wage would be better off, thus the threat of divorce is more credible and bargaining power increases (Pollak, 2005).
- Allow for **heterogeneity** in the costs associated with outsourcing specific **household tasks** (Killewald and Gough, 2010), i.e. non-linearity in outsourcing reproductive labor: tasks that are the easiest to outsource (for example, cleaning) are outsourced as soon as the woman begins working. High-earning women outsource relatively less because tasks that require emotional labor (caring for children or the elderly) are more difficult to outsource. A possible extension of this model is to include 2 types of reproductive labor: one increases the woman's utility (es. time spent with children, cooking), and one decreases it (cleaning, washing clothes).

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Appendix

Figure 1: Utility function of the woman in reproductive labor