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Elisabeth Cudeville, Magali Recoules

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Household Behavior and Social Norms: A Conjugal Contract Model*

Elisabeth Cudeville† and Magali Recoules‡

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†Paris 1 Panthéon-Sorbonne University, CES 106-112 boulevard de l'hôpital, 75647 Paris cedex 13, France, elisabeth.cudeville@univ-paris1.fr

‡Paris 1 Panthéon-Sorbonne University and Paris School of Economics, CES 106-112 boulevard de l'hôpital, 75647 Paris cedex 13, France, magali.recoules@univ-paris1.fr

Résumé

Nous développons un modèle de contrat conjugal où les interactions entre le processus de décision au sein du ménage et les normes sociales sont analysées. Le ménage est perçu comme deux sphères d'activités séparées celle de l'homme et celle de la femme toutes deux reliées par un bien public et un « contrat conjugal » au travers duquel les époux échangent des ressources. Le contrat conjugal négocié au sein du couple est influencé, en partie, par les normes sociales en raison du conformisme individuel. Les normes sociales sont déterminées de façon endogène et associées au contrat conjugal moyen. Nous montrons que plus les salaires des époux sont proches et plus le partage des tâches domestiques est équitable au sein du ménage. Des politiques salariales privilégiant l'égalité des salaires entre les genres conduisent tous les couples à renégocier les termes du contrat conjugal, contribuant ainsi à l'évolution de la norme. Bien que les époux prennent leur décision de sorte à maximiser le bien être du ménage, le résultat du processus de décision n'est pas Pareto efficace et cette inefficacité s'accroît avec le conformisme social.

Mots-clés : Contrat conjugal, normes sociales, discrimination salariale, décisions familiales, processus de décision au sein du ménage

JEL Classification : D13 - J16- J18 - J22 - J71

Abstract

We present a model of household behavior to explore the complex interactions between the decision-making process within the household and social norms. The household is viewed as two separate spheres — the female and the male — both linked by a public good and a "conjugal contract" trough which spouses exchange resources. The conjugal contract negotiated within the couple is partly influenced by social norms given the conformism of individuals. Social norms are endogenously determined as the average conjugal contract. We find that the closer spouses' wages are in the labor market, the more equally they share household tasks. Wage policies promoting gender wage equality lead all couples to renegotiate the terms of their conjugal contract, which in turn changes social norms. Even though spouses aim at maximizing the household's welfare, the resulting equilibrium allocation is not Pareto efficient and inefficiency increases with social conformism.

Keywords: Conjugal contract, social norms, wage discrimination, household behavior, intra-household decision-making.

JEL Classification: D13 - J16 - J18 - J22 - J71

1 Introduction

Much research, in various disciplines of social sciences, argue that social norms and traditional division of tasks play an important role in individual consumption and labor supply decisions (Hochschild, 1990 ; Wolf, 1990). Some recent studies in applied econometrics confirm this idea and question the relevancy of standard household models to understand household allocation decisions. Some researchers have pointed to gender-segmentation in the management of businesses or agricultural plots which prevails in much of Africa as evidence of an essentially non cooperative, and possibly inefficient, family environment. Udry (1995), for example, in a study of the household allocation of resources to male and female controlled agricultural plots in Burkina Faso, rejects the efficiency hypothesis. He shows that Burkinabe women are reluctant to work on their husband's plots even though they are more productive. More recently, in a study on resource allocation within household in Côte d'Ivoire, Duflo and Udry (2004) show that the distribution of income and its uses are strongly constrained by social norms. Their empirical results lead them to reject the hypothesis of complete insurance within households. Different sources of income are allocated to different uses depending upon the identity of the income earner and upon the origin of the income. These results violate the restrictions implied by the unitary or the more general collective household model, but as emphasized by the authors, correspond closely to the descriptions that can be found in the literature on the norms of household provisioning in Côte d'Ivoire.

As pointed by Elster (1989), one of the most persistent cleavages in social sciences is the opposition between economists' and sociologists' lines of thought, respectively personified by the *homo economicus* and the *homo sociologicus*. Of these, the former is assumed to be guided by instrumental rationality, while the behavior of the latter is dictated by social norms. This paper is an attempt to build constructive bridges between these two lines of thought in order to explore the complex interaction between social norms, economic environment, and household allocation decisions. Household behavior surely results from a compromise between what social norms establish and what individual rationality requires.

We propose a model of conjugal contract based on the separate spheres approach proposed by Lundberg and Pollak (1993) and on the conjugal contract model developed by Carter and Katz (1997). The couple, following Apps and Rees (1988), is seen as a two-person economy facing fixed prices. Spouses take their decisions of consumption and labor supplies independently, but are aware of their interdependency through the production of a household public good. Given that the spouses' market wages will generally differ, the partners may obtain efficiency gains by specializing in market or household activities according to their comparative advantages. Consequently, they have an incentive to negotiate and agree upon an income sharing rule in order to benefit from specialization gains, that is to "sign" a voluntary contribution conjugal contract through which they exchange household labor against money. This is where social norms come in, as a way to enforce the "conjugal contract" setting the income sharing rule within the couple. In the negotiation of the "conjugal contract", we assume that spouses are conformist, in the line of Akerlof (1997). The utility of individuals declines as distance between the sharing rule negotiated within their own couple and that of other couples increases. The partners lose utility from failing to conform to the behavior of the average couple. If through the conformism of individuals, social norms affect household decisions, individuals are not aware of the fact that their own behavior participates in the norm's formation. Consequently, they consider the social norm as given when they make their decisions of consumption and labor supplies. Hence, households make their decisions in two stages. First, given the social norm governing the sharing of income between spouses, the two partners agree upon a conjugal contract in order to benefit from specialization gains. Then, they play a non-cooperative game, each one maximizing his/her own utility subject to his/her own budget constraint, given the income transfer rate they agreed upon. If couples are perfectly homogeneous, the social norm will simply correspond to the optimal conjugal contract chosen by the representative couple. Any exogenous shocks affecting the environment of couple will lead spouses to renegotiate their conjugal contract, to adjust their allocation decisions and will eventually participate in making social norms evolve.

In the proposed model, men and women, intrinsically identical in terms of preference and productivity in household production, may choose to both partially specialized even though men are better paid than women in the labor market. Standard models of household cannot account for such partial specialization. The model is also consistent with the empirical observation that women still undertake a greater share of household chores even when they are more educated (Aguiar and Hurst, 2007) and better paid in the labor market (Rizavi and Sofer, 2008). Standard household models fail to explain this statement, except by assuming intrinsic gender differences in preferences or in marginal productivity of household labor, assumptions that no empirical evidence permit to support. The present model also accounts for the fact that the origin of the income matters in household allocation decisions. Another implication of the model is that the sharing of household tasks between spouses is sensitive to their relative market wage rate. The closer the female and male wage rates are, the more equally spouses share household work, a result conform with the empirical results of Greenstein (2000). We actually show that wage policies promoting wage equality may lead men and women to share household duties more equally. However, the more conformist individual are, the less efficient wage policies are in changing household allocation decisions, and the degree of specialization of spouses in market and household activities. Conformism impedes the evolution of household allocation decisions and social norms in response to new economic opportunities. Even if the household always judges an increase in utility of any one of its members to be a good thing, other things being equal, the equilibrium resource achieved is not Pareto efficient.

The present work is an attempt to better understand the way by which, beyond their impact on household allocation decisions, economic policies may affect the household decision making process itself, and how policy measures are susceptible to weight on family arrangements and thus eventually contribute to shape social norms. By explicitly modeling the endogeneity of family arrangements with respect to the economic environment, we make clearly appear the double link of causality existing between these two dimensions. If institutions as social norms and customs influence individual economic behavior, and economic performances, as emphasized by numerous recent empirical studies in the line of the pioneer work of Acemoglu and al. (2001), they are themselves shaped by individuals' behaviors, and ultimately by the economic environment in which the individuals make their decisions. Our analysis proceed as follows. In Section 2, the model is presented. In Section 3, the link between household decisions and social norms is established and the results discussed. Section 4 concludes.

2 A conjugal contract model

2.1 The Model

We consider an economy inhabited by N men m and N women f facing fixed prices. Labor market is gender specific, all the men receive the same wage rate w_m and are better paid than women who all receive the same wage rate w_f, with $w_f < w_m$. We assume that individuals live in a couple composed of a man and a woman, so N couples (m, f) are formed. Divorce is excluded. Following Carter and Katz (1997) we propose to model the couple in the line of Sen's view (1990) as the site of a "cooperative conflict": spouses are seen as two separated spheres of activities and decisions bound by a "conjugal contract" materialized by an income sharing rule negotiated in each time period.

Men and women are assumed to have the same preferences. They get their utility from the consumption of two types of goods: a private good and a household public good (typically children or child services). The public good is produced within the couple, using both partners' time. Men and women are assumed to be equally productive in the household production. When they make their decisions, the partners play a non-cooperative game — each one maximizing his/her own utility subject to his/her own budget constraint —, but they are aware of their interdependency through the joint production of the public good. Given that their market wages differ, the spouses may obtain efficiency gains by specializing according to their respective comparative advantage. Consequently, they have an incentive to negotiate and agree upon an income sharing rule in order to benefit from specialization gains, that is to "sign" a voluntary contribution conjugal contract. In the negotiation process over the conjugal contract, the two partners — husband and wife — are assumed to have an equal socially recognized right to bargain. Any intrinsic gender differences in the ability of individuals to weigh on the intra household decision process are thus excluded. The spouses agree upon a conjugal contract that maximizes the joint utility gains from cooperation. These gains are defined in terms of a threat point representing the utility each spouse will achieve in the absence of agreement.

The conjugal contract signed by the two partners is negotiated on the basis of their individual preferences and the economic environment, but it is also shaped by social norms. In their bargaining, individuals are assumed to be conformist: their personal utility decreases when they fail to conform to other couples whose average behavior sets the norm[1]. If the social norm results from individual behaviors, the individuals ignore this dependency and consider the norm as exogenously given when making their decisions. The norm is gender specific in the sense that it defines not only the share of income that has to be transferred from one partner to the other, but also the gender of the donor and the receiver. Given that we have assumed, conforming to empirical evidence on aggregate data, that men are better paid than women on the labor market, the average couple is such that the man has a comparative advantage in the labor market and the women in the household production. Efficiency gains in production will then be obtained within the couple if the man transfers a part of his income to his wife in exchange of a greater involvement

[1]As argued by Apps and Rees (2007), descriptively speaking, it seems reasonable to assume that a household cannot write exogenously enforceable agreements to implement cooperative behavior. On the other hand, there are laws and social norms that at least to some extent regulate or influence behavior within households, though ultimately, an important role must be played by the self-interest of the members in supporting efficient allocations.

from her part in household activities, permitting him to work more on the market. The conjugal contract signed by the representative household will thus set a positive income transfer rate from husband to wife — that we will denote by $\bar{\theta}$, with $\bar{\theta} \in [0,1[$. The conjugal contract of the average couple will spread across society as the social standard.

Hence, the process determining the distribution of the marital surplus between spouses within the period occurs implicitly over two stages:

- In stage 1, given the social norm $\bar{\theta}$, spouses bargain and agree upon a marital arrangement — denoted by θ — that specifies the income sharing rule they will follow in stage 2 in order to benefit for efficiency gains associated with task specialization.

- In stage 2, the two partners make their decisions independently given the transfer rate θ they agreed upon in stage 1, and the social standard $\bar{\theta}$.

The equilibrium household allocation is obtained by solving the problem backward for a given social norm $\bar{\theta}$: first examining the non-cooperative Cournot-Nash equilibrium for a given θ; second deriving the optimal conjugal contract θ cooperatively negotiated. In equilibrium of course, since all couples are alike, $\theta=\bar{\theta}$. It is then possible to explore the endogenous dimension of the social norm.

2.2 The Non-Cooperative Nash Equilibrium

Cooperation within the couple is limited to the conjugal contract setting the income transfer rate θ from husband to wife. Once the conjugal contract agreed upon, the two partners make their decision of consumption and labor supplies independently in order to maximize their own level of utility. We assume that their utility depends separately and increasingly on the consumption of the private good, C, and of the public good, n, jointly produced within the household. The couple chooses the level of production of the public good given a fixed time endowment equal to 1 for each spouse that must be allocated between household production z_i $(i = m, f)$ and market activities (typically paid work), L_i $(i = m, f)$. The public good is produced using inputs of time of both partners according to a linear production technology, $n = a(z_m + z_f)$, where a is a positive constant. Men and women are assumed to be equally productive in the household production.

The utility of each partner is conditional upon the conjugal contract θ and the social norm $\bar{\theta}$ which are both considered as given by the agents at the time of the production and consumption decision-making. Because of their conformism, the utility of each partner is affected by the distance between the conjugal contract signed within their own couple and the average conjugal contract of couples in the society, $(\theta-\bar{\theta})$. The more individuals are conformism, the higher is the cost of violating social norms. We will denote by ϕ — a positive constant — this taste for conformity.

Each spouse is constrained in his or her purchase of goods by the income earned in the labor market net of the income transfer. Even though acting independently, spouses are aware of their interdependency through the production of the public good and consequently make their decisions considering their partner's behavior as given at some expected level. The conjectures formed by the partner i on partner j's market and household labor supplies are respectively denoted by $\bar{L}_i$ and $\bar{z}_i$ $(i = m, f)$.

The program solved by each member of the representative couple may be written as follows:

Man

$$\begin{cases} \max\limits_{C_m, n} \left[C_m^{\gamma} \; n^{(1-\gamma)} \; e^{-\frac{\phi}{2}(\theta-\bar{\theta})^2} \right] \\ \text{s.t.} \\ C_m = (1-\theta) w_m L_m \\ n = a \; (z_m + \bar{z}_f) \\ L_m + z_m = 1 \\ C_m, \; n \geq 0 \end{cases} \tag{1}$$

Woman

$$\begin{cases} \max\limits_{C_f, n} \left[C_f^{\gamma} \; n^{(1-\gamma)} \; e^{-\frac{\phi}{2}(\theta-\bar{\theta})^2} \right] \\ \text{s.t.} \\ C_f = w_f L_f + \theta w_m \bar{L}_m \\ n = a \; (\bar{z}_m + z_f) \\ L_f + z_f = 1 \\ C_f, \; n \geq 0 \end{cases} \tag{2}$$

with θ and $\bar{\theta} \in [0, 1[$.

Simultaneous solution of the decision variables in the non-cooperative problem written above can be modeled as a two-person, strictly competitive game of complete information as no coordination is required for the two couple members to choose equilibrium strategies. For each one, the non cooperative optimization behavior results in a set of conditional demand and supply functions that depends on expectations about the partner's behavior. These best-responses functions give the optimal resource allocation for one individual given the expected behavior of the partner. The Nash-noncooperative equilibrium, for a given level of the transfer rate θ and of the social norm $\bar{\theta}$, is then given by the solution of the system formed by the two partners' best-responses. We successively study the male and female programs before deriving the household optimal allocation decisions.

2.2.1 The Man's Behavior

The best-response function of the man is obtained as the solution of the program (1) and is given by:

$$z_m = \begin{cases} -\gamma \bar{z}_f + (1-\gamma) & \text{if } 0 \leq \bar{z}_f < \frac{1-\gamma}{\gamma} \\ 0 & \text{if } \bar{z}_f \geq \frac{1-\gamma}{\gamma}. \end{cases} \tag{3}$$

Since $\gamma > 0$, the system (3) defines a decreasing relation between z_m and $\bar{z}_f$. The man will allocate time to domestic production z_m, and thus to labor market L_m, so as to equalize the utility-valued marginal returns of his household and market activities, $\gamma(1-\theta) w_m \frac{\partial U_m}{\partial C_m} = (1-\gamma) a \frac{\partial U_m}{\partial n}$. A rise in his partner's involvement into the production of the public good enables him to get more time to work on the market and thus to consume more private goods for an unchanged level of consumption of the public good.
But as the private and public goods are assumed to be normal goods, he will choose to increase his consumption of both goods and thus will increase his market labor supply L_m and reduce his household labor supply z_m but less than proportionally than the rise in $\bar{z}_f$. The man will benefit from such a reallocation as long as his utility gain in terms of private consumption compensate his loss in terms of household production. Beyond the threshold $\bar{z}_f = \frac{1-\gamma}{\gamma}$, the opportunity cost of household production in terms of private consumption becomes too high, the man then chooses to spent all his available time on the labor market, leaving his wife taking in charge alone household activities. The more the man likes

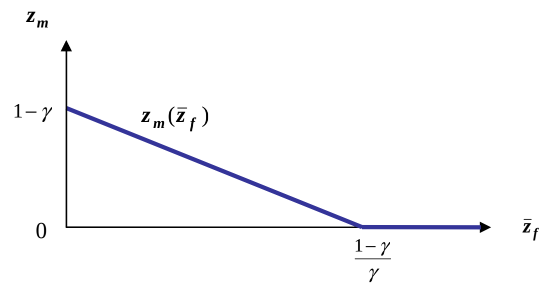


Figure 1: Household Labor Supply of the man

the private good, the more he will be ready to substitute private to public consumption when his wife increases her involvement into household production. Consequently, the man will be more likely fully specialized in labor market activities when his relative preference for the private good, γ, is high.

2.2.2 The Woman's Behavior

Similarly, the woman's best-response function is obtained as the solution of the program (2), and is given by:

$$\text{For}\quad 0 \le \theta < \tfrac{\gamma}{1-\gamma}\rho,\quad z_f = \begin{cases} -\frac{(1-\gamma)\theta+\gamma\rho}{\rho}\bar{z}_m + \frac{(1-\gamma)(\rho+\theta)}{\rho} & \text{if} \quad 0 \le \bar{z}_m < \frac{(1-\gamma)(\rho+\theta)}{(1-\gamma)\theta+\gamma\rho} \\ 0 & \text{if} \quad \frac{(1-\gamma)(\rho+\theta)}{(1-\gamma)\theta+\gamma\rho} \le \bar{z}_m \le 1 \end{cases}$$

$$\text{For}\quad \tfrac{\gamma}{1-\gamma}\rho \le \theta \le 1,\quad z_f = \begin{cases} 1 & \text{if} \quad 0 \le \bar{z}_m < \frac{(1-\gamma)\theta-\gamma\rho}{(1-\gamma)\theta+\gamma\rho} \\ -\frac{(1-\gamma)\theta+\gamma\rho}{\rho}\bar{z}_m + \frac{(1-\gamma)(\rho+\theta)}{\rho} & \text{if} \quad \frac{(1-\gamma)\theta-\gamma\rho}{(1-\gamma)\theta+\gamma\rho} \le \bar{z}_m < \frac{(1-\gamma)(\rho+\theta)}{(1-\gamma)\theta+\gamma\rho} \\ 0 & \text{if} \quad \frac{(1-\gamma)(\rho+\theta)}{(1-\gamma)\theta+\gamma\rho} \le \bar{z}_m \le 1 \end{cases}$$

where ρ denotes the female-to-male wage ratio: $\rho = w_f/w_m$.

The female optimal decision rule described above also defines a decreasing relation between z_f and $\bar{z}_m$. If the wife who receives the transfer expects her husband to increase his involvement in household activities, she will be pushed, all things being equal, to reallocate time into market activities. But if her husband devotes more time to household production, he simultaneously has to reduce his market labor supply and thus his earned income decreases as well as the transfer he makes to his wife. The woman will then face a reduced set of private consumption, and consequently, the marginal utility of her private consumption will increase, what will also push her to increase her labor supply in the market. So, because of the income transfer, the female household labor supply is more sensitive than the male one to a change in her partner's involvement into household production.

The extent of the female response depends on the female-to-male wage ratio ρ compared to the income transfer rate θ. When the woman decides to devote more time to household production, she loses her wage, but gives her husband the opportunity to spend more time on the labor market and consequently increase his wage income. Hence, the more she gives up market activities, the more transfer she will receive from her husband. Through the conjugal arrangement, spouses exchanges resources: the husband

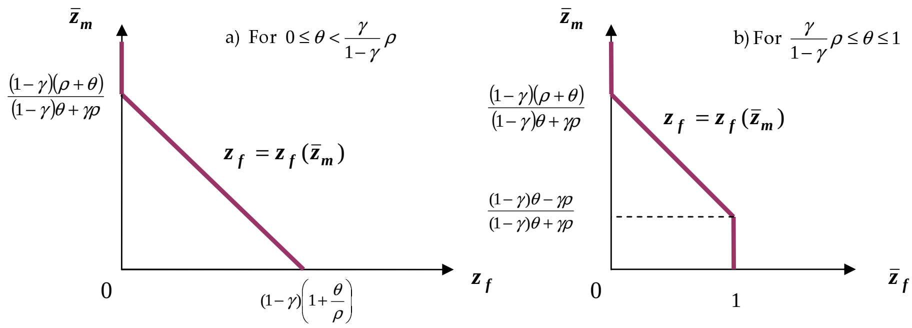


Figure 2: Household Labor Supply of the woman

buy household labor from his wife with money, and the wife accepts the deal, that is gives up part of her market activities for money (Brines, 1994). Following a decrease in $\bar{z}_m$, the woman will be pushed to importantly increase her involvement into household production if the associated gain in terms of income transfer — that is θw_m — is high, and the associated loss in terms of wage — that is w_f — is low. The woman will thus be more likely fully specialized into the provision of the household public good if the transfer rate θ is high compared to the wage ratio ρ (see Figures 2). Specialization regime of the woman within the couple is also depending on the preference parameter, γ; the more the woman favors private goods (γ high), the more it will be costly for her to specialize into household production and the more slowly she will fully specialize.

The Cournot-Nash equilibrium is defined as the solution of the system formed by the two partners' best-response functions. Several specialization configurations are possible depending on the values of the relative preference parameter, γ, the female-to-male wage ratio, ρ, and the transfer rate, θ (see Figure 3).

2.2.3 Household Decisions and Comparative-static Analysis

Equilibrium household labor supplies, represented on Figure 4, are given by:

$$\text{For } \gamma < \tfrac{1}{2}, \quad \begin{cases} z_m^* = \frac{(1-\gamma)\rho-\gamma\theta}{(1+\gamma)\rho-\gamma\theta} \\ z_f^* = \frac{(1-\gamma)\rho+\gamma\theta}{(1+\gamma)\rho-\gamma\theta} \end{cases} \quad \text{if } \ 0 \leq \theta < \rho \ ,$$

$$\begin{cases} z_m^* = 1 - 2\gamma \\ z_f^* = 1 \end{cases} \quad \text{if } \ \rho \leq \theta \leq 1 \ ,$$

$$\text{For } \gamma \geq \tfrac{1}{2} \text{ and } \rho < \tfrac{1-\gamma}{\gamma}, \quad \begin{cases} z_m^* = \frac{(1-\gamma)\rho-\gamma\theta}{(1+\gamma)\rho-\gamma\theta} \\ z_f^* = \frac{(1-\gamma)\rho+\gamma\theta}{(1+\gamma)\rho-\gamma\theta} \end{cases} \quad \text{if } 0 \leq \theta < \tfrac{1-\gamma}{\gamma}\rho \ ,$$

$$\begin{cases} z_m^* = 0 \\ z_f^* = (1-\gamma)\left(1+\frac{\theta}{\rho}\right) \end{cases} \quad \text{if } \tfrac{1-\gamma}{\gamma}\rho \leq \theta < \tfrac{\gamma}{1-\gamma}\rho \ ,$$

$$\begin{cases} z_m^* = 0 \\ z_f^* = 1 \end{cases} \quad \text{if } \tfrac{\gamma}{1-\gamma}\rho \leq \theta \leq 1 \ ,$$

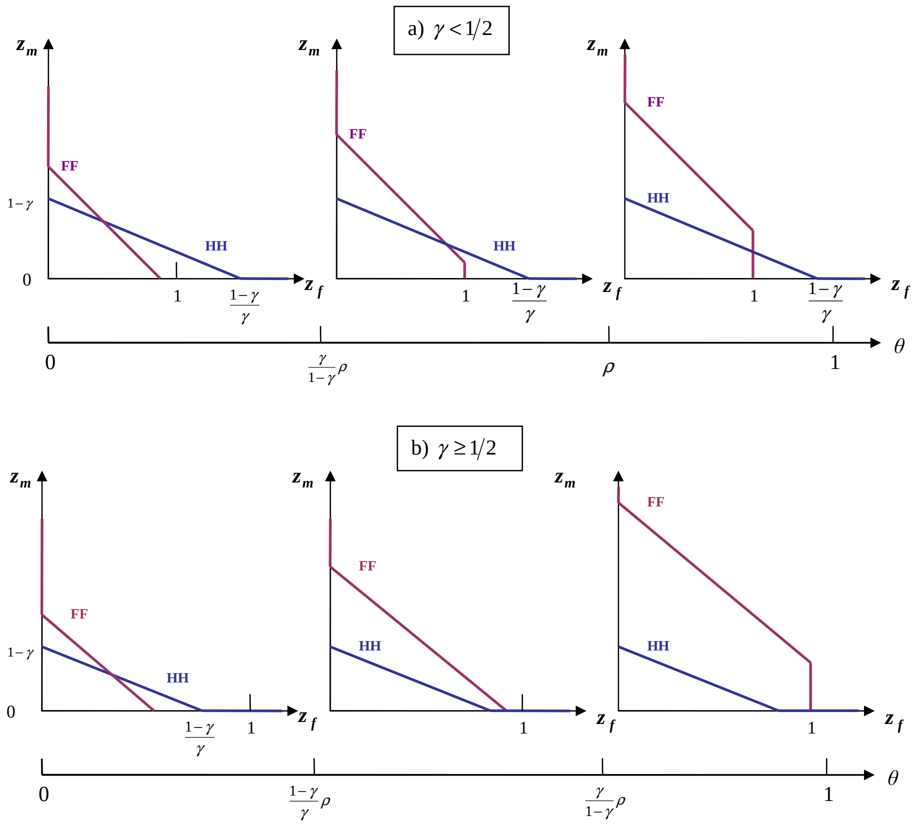


Figure 3: The Non Cooperative Equilibrium

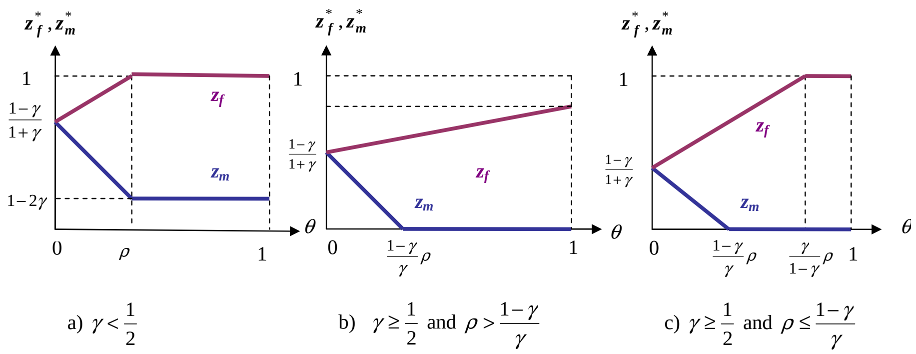


Figure 4: Optimal Household Labor Supplies

If the relative preference for the private good is high ($\gamma \geq 1/2$), spouses may be fully specialized, the man in the labor market and the woman in the domestic sphere. Higher is the preference for the consumption of the private good, more the partners will seek after specialization gains in order to increase their monetary income. By contrast, if the household favors the public good ($\gamma < 1/2$), full specialization of both partners is excluded, the man always devoting a minimum time to child care.

Once determined the equilibrium household labor supplies, the optimal household choices of private and public good consumptions can be derived:

$$
\begin{aligned}
&C_m^* = (1-\theta)w_m\left[1 - z_m^*(\gamma,\theta,\rho)\right] \\
&C_f^* = \rho w_m\left[1 - z_f^*(\gamma,\theta,\rho)\right] + \theta w_m\left[1 - z_m^*(\gamma,\theta,\rho)\right] \\
&n^* = a\left[z_m^*(\gamma,\theta,\rho) + z_f^*(\gamma,\theta,\rho)\right]
\end{aligned}
$$

The optimal household allocations depend, for given preference and technology, on the transfer rate θ, the level of the male wage rate w_m and the gender wage ratio ρ.

Table 1: Comparative-Static Analysis

	ρ	w_m	θ	
z_f^*	$-$		$+$	
z_m^*	$+$		$-$	
n^*	$-$		$+$	
C_f^*	$+$	$+$	$+$	
C_m^*	$-$	$+$	$+/-$	if $\rho < \frac{\gamma}{1+\gamma}$
			$-$	if $\rho \geq \frac{\gamma}{1+\gamma}$

- A rise in the female wage for a given male rate, that is a rise in ρ increases the opportunity cost of the household production for the woman and leads her to reduce her involvement in the domestic sphere z_f and increase her market labor supply L_f. In response, the man reallocates time to household production and reduces his labor market working time L_m. But as the male response is less than proportional than the female one, the household production n decreases. As the man reduces his market labor supply, his earned income decreases. Consequently he reduces his consumption of private goods C_m and the level of the income transfer he makes to his wife. However, this last will increase her private good consumption C_f as the gain in terms of earned income associated with the rise in her wage more than compensates her loss in terms of income transfer.

- Following a rise in the male wage, both partners see their income increase and thus they both consume more of private consumption: C_m and C_f increase.

- If the transfer rate θ increases, the man facing a reduced set of consumption possibilities increases his market labor supply L_m and reduces his contribution to the household production z_m. In contrast, the woman reallocates time to household production, her income increasing through the transfer. The response of the female household labor supply being more than proportional than the male one, household production n increases. The rise in the transfer rate permits the woman to consume more private good, C_f increases. For given preferences, the evolution of the male consumption C_m depends on the relative value of the wage ratio parameter ρ compared to the transfer rate θ. If the transfer rate is not too high and the female relative wage low enough ($\rho < \frac{\gamma}{1+\gamma}$), following a rise in the transfer rate θ, the gain obtained from specialization more than compensates the loss in terms of earned income and the male consumption C_m increases. If not, the man's consumption lessens. Beyond a certain threshold ($\theta > \rho$ if $\gamma < 1/2$ and $\theta > \frac{1-\gamma}{\gamma}\rho$ if $\gamma \geq 1/2$), the loss in terms of income becomes too high to be compensated by specialization gains and the male consumption decreases. Notice that a change in the transfer rate modifies the distribution of domestic labor between spouses as long as they are not fully specialized. The higher is the transfer rate, the less egalitarian is the distribution of housework within the couple.

To sum up, for given preferences and a given conjugal contract, the probability of being fully specialized for both partners decreases with the female-to-male wage rate ρ as specialization gains decreases when the wage differential is lower. For a given wage rate and a given conjugal contract, partial specialization is more likely if the relative preference for the private good is high. At last, for given preferences and a given gender wage ratio, specialization is more likely when the transfer rate is high.

2.2.4 Non-cooperative Equilibrium and Individual Welfare

Given that the intra-household resource allocation depends on the transfer rate θ, so does the welfare of each spouse. The male and female indirect utilities are respectively given by:

$$V_m = \left[C_m^{*\,\gamma} \quad n^{*(1-\gamma)} \quad e^{-\frac{\phi}{2}(\theta-\bar{\theta})^2} \right] \tag{4}$$

$$V_f = \left[C_f^{*\gamma} \quad n^{*(1-\gamma)} \quad e^{-\frac{\phi}{2}(\theta-\bar{\theta})^2} \right] \tag{5}$$

In order to simplify the analysis of the conjugal contract effect on spouses' welfare, let us neglect in a first step the taste for conformity of individuals by assuming that ϕ is close to zero. Figures 5 shows the indirect utilities of spouses in this case[2]. Two configurations are possible depending on the values of the ρ and γ parameters.

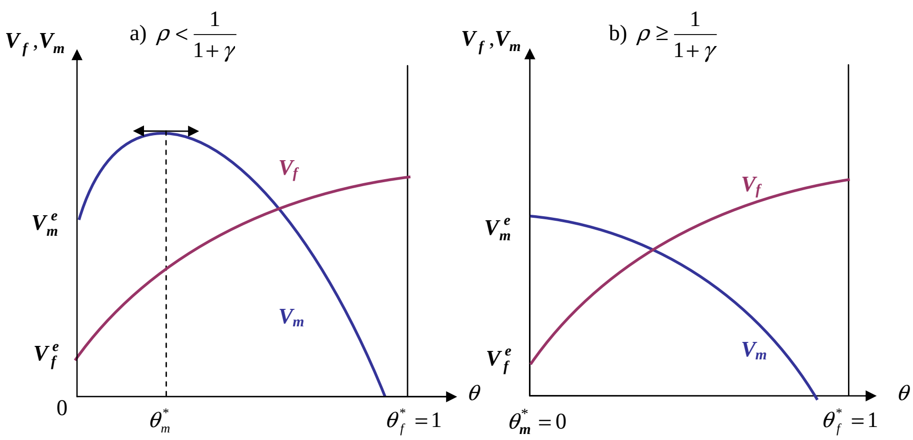


Figure 5: Indirect Utility Functions ($\phi = 0$)

[2]For an analytical analysis of the relation between the conjugal contract and the indirect utilities, see Appendix 1.

For all parameters' values, the woman always benefits from more cooperation as n^* and C_f^* are both increasing in θ. Consequently, if she could set the terms of the conjugal contract unilaterally she will for all values of γ and ρ choose the level of θ which maximizes her sole indirect utility, that is $\theta_f^* = 1$.

Things are different for the man as his optimal consumption of private goods is bell-shaped related to θ if $\rho < \frac{\gamma}{1-\gamma}$ and strictly decreasing with θ if not. The man will benefit from cooperation as long as the gains obtained in terms of his own utility through the rise in the public good consumption n more than compensate the loss in terms of private consumption. It will be the case if the difference in spouses' wages is sufficiently high and the preference for the private good not too high, more precisely if $\rho < \frac{1}{(1+\gamma)}$. The man will then gain from transferring a positive share of his income to his wife. Consequently, in this case, if he could set the transfer rate unilaterally, he will set it to the level that maximizes his indirect utility, that is $\theta_m^* \in [0, 1[$. If this condition is not met, what is more likely if the wage ratio is small and the preference for the private good is high ($\rho \geq \frac{1}{1+\gamma}$), the man will lose from cooperation, the gain in the public good consumption not compensating the loss in private consumption. In this case, the man's indirect utility function is strictly decreasing in θ, he will therefore simply refuse to cooperate and set θ to $\theta_m^* = 0$.

Analytically, the transfer rate maximizing the man's indirect utility is given by:

For $0 \leq \gamma < \frac{1}{2}$:

$$\begin{array}{ll} \text{if } 0 \leq \rho < \frac{1}{2}\ , & \theta_m^* = \rho \\ \text{if } \frac{1}{2} \leq \rho < \frac{1}{1+\gamma}\ , & \theta_m^* = \frac{1-(1+\gamma)\rho}{1-\gamma} \\ \text{if } \frac{1}{1+\gamma} \leq \rho \leq 1, & \theta_m^* = 0 \end{array}$$

For $\frac{1}{2} \leq \gamma \leq 1$:

$$\begin{array}{ll} \text{if } 0 \leq \rho < \frac{(1-\gamma)^2}{\gamma(2-\gamma)}\ , & \theta_m^* = \frac{\gamma}{1-\gamma}\rho \\ \text{if } \frac{(1-\gamma)^2}{\gamma(2-\gamma)} \leq \rho < \frac{\gamma(1-\gamma)}{1-\gamma(1-\gamma)}\ , & \theta_m^* = 1-\gamma(1+\rho) \\ \text{if } \frac{\gamma(1-\gamma)}{1-\gamma(1-\gamma)} \leq \rho < \frac{\gamma}{1-\gamma(1-2\gamma)}\ , & \theta_m^* = \frac{1-\gamma}{\gamma}\rho \\ \text{if } \frac{\gamma}{1-\gamma(1-2\gamma)} \leq \rho < \frac{1}{1+\gamma}\ , & \theta_m^* = \frac{1-(1+\gamma)\rho}{(1-\gamma)} \\ \text{if } \frac{1}{1+\gamma} \leq \rho \leq 1, & \theta_m^* = 0 \end{array}$$

The evolution of the male optimal conjugal contract θ_m^* with ρ is represented on Figure 6 and depends on the preference parameter γ:

- If the relative preference for the private good is low ($\gamma < 1/2$), the value of the optimal transfer rate from the man's point of view — θ_m^* — increases with ρ as long as ρ is lower than $1/2$ and decreases beyond this threshold until it gets equal to zero when ρ increases beyond $1/(1+\gamma)$.
- If the relative preference for the private good is high ($\gamma \geq 1/2$), the evolution of θ_m^* is more complex as it starts increasing with ρ for low levels of the wage gap, then decreases to starts to increase again and finishes by decreasing to become null beyond $1/(1+\gamma)$.

Let us consider an initial situation in which the relative preference for private consumption is low ($\gamma < 1/2$, see Figure 6a) and the female-to-male wage ratio ρ is close to zero, that is the differential in wages is

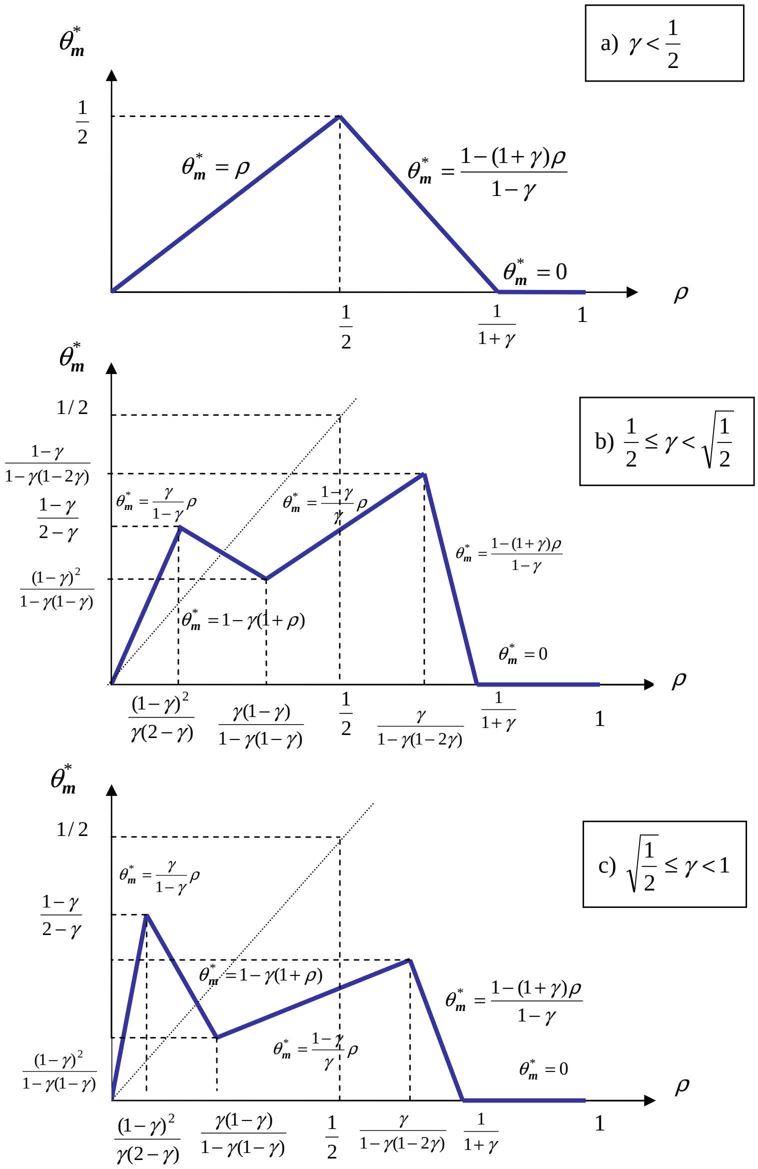


Figure 6: Evolution of the Man's Optimal Contract

very high. In this situation, potential specialization gains are important[3]. The man's objective being to maximize the surplus he can get through cooperation, he will set θ to $\theta_m^* = \rho$, as ρ is the minimum value of θ that pushes the woman to fully specialized in household tasks. By setting $\theta = \rho$, the man can reduce to the minimum its own involvement in household tasks, $z_m^* = 1 - 2\gamma$. He will work more on the labor market and thus benefit fully from specialization gains at a minimum cost in terms of transfer.
When ρ increases, specialization gains decrease as the differential in partner's wages gets lower, and so does the surplus that the man can extract through cooperation. But as long as ρ is not too high

[3] To better understand this analysis you can refer to the Figure 4.

($\rho < 1/2$), they remain sufficiently important so that full specialization of the woman into domestic production remains profitable for the man and the man's interest is to increase the transfer rate θ in the same proportion as ρ, in order to maintain the optimality condition that insures him a maximized surplus, that is $\theta_m^* = \rho$.
Beyond $\rho = 1/2$, if ρ continues to increase, it is no more in the man's interest to maintain his wife at home. The new value of the transfer rate that maximizes the man's utility is $\theta_m^* = \frac{1-(1+\gamma)\rho}{1-\gamma} < \rho$. Specialization gains are not sufficient anymore to make full specialization of the woman into household production profitable. The reduction of the transfer rate permits the man to increase his private consumption and leads the woman to reduce her household labor supply and increases her involvement in the labor market. By contrast, the man increases his involvement in the public good production but less proportionally and consequently the public good production starts to decrease but not enough to overcome the gain in terms of utility of the rise in the private consumption. The man will follow this decision rule as long as utility gains may be obtained through partial specialization of the woman.
When ρ reaches the threshold value $1/(1+\gamma)$, cooperation is not profitable anymore from the man's point of view. At this point his utility becomes strictly decreasing in θ, he has no more interest to cooperate, $\theta_m^* = 0$.

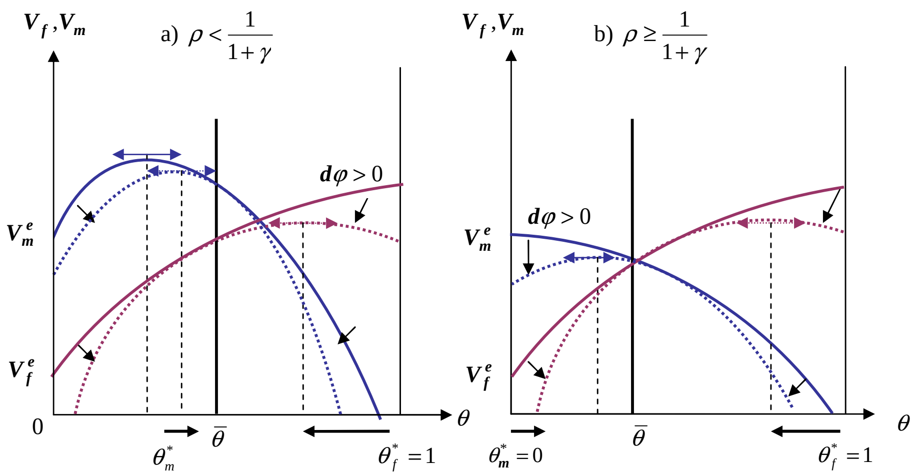


Figure 7: Conformity Effect on indirect utilities

Let us now consider how conformism does alter these results (for an analytical analysis see Appendix 2). Individuals being conformist ($\phi > 0$), they will not be ready to agree on a conjugal agreement too different from the social standard $\bar{\theta}$. The taste for conformity plays through the third terms of the right member of equations (4) and (5). This component impacts in the same way the two partners' indirect utility. A rise in the transfer rate will increase the indirect utility obtained by the spouses if θ is lower than the social standard $\bar{\theta}$ and decrease it in the opposite case. Both indirect utility curves squeeze around $\bar{\theta}$ as represented in Figures 7. This movement will be more pronounced when the preference for conformity ϕ is high. Consequently, the transfer rate optimal from the man point of view — denoted in this case $\tilde{\theta_m}$ — will be lower than the transfer rate he would have chosen in the non conformist case —

θ_m^* — if $\theta_m^* > \bar{\theta}$ and lower if not. As for the woman, the transfer rate optimal for her will always be lower in the conformist than in the non-conformist case: $\tilde{\theta_f} < \theta_f^* = 1$. At the limit, when ϕ tends toward infinity, the couple will set the conjugal contract equal to the social norm $\bar{\theta}$.

Exogenous shocks in the economic environment will lead the spouses to renegotiate their conjugal arrangement. Hence, not only the household allocation decisions will change, but the household decision-making process will be modified. The household decision-making process is not invariant relative to the economic environment. It is this endogenous dimension of conjugal arrangements and ultimately social norms that we will explore now.

2.3 The Cooperative Bargaining Problem

The partners will agree upon a conjugal contract that maximizes the product of the utility gains from cooperation. These gains are defined in terms of a threat point representing the utility each spouse will achieve in the absence of agreement, that is for $\theta = 0$. In the negotiation process over the conjugal contract, the two partners are assumed to have an equal socially recognized right to bargain.[4] This cooperative problem can be written as a Nash bargaining problem where spouses maximize a social welfare function that depends on the threat points denoted by V_m^e and V_f^e for the man and the woman respectively:

$$\max_{\theta} \left\{ [V_m - V_m^e] \left[V_f - V_f^e\right] | \bar{\theta} \right\} \tag{6}$$

$$0 \leq \theta \leq 1 \tag{7}$$

$$[V_m - V_m^e] \geq 0 \tag{8}$$

$$\left[V_f - V_f^e\right] \geq 0 \tag{9}$$

where $V_m^e = \frac{2a(1-\gamma)}{1+\gamma} \left[\frac{\gamma w_m}{a(1-\gamma)}\right]^{\gamma} e^{-\frac{\phi}{2}\bar{\theta}^{\,2}}$ and $V_f^e = \frac{2a(1-\gamma)}{1+\gamma} \left[\frac{\gamma w_f}{a(1-\gamma)}\right]^{\gamma} e^{-\frac{\phi}{2}\bar{\theta}^{\,2}}$. Notice that the threat point of each partner depends positively of his/her own wage rate.

Condition (7) stipulates that the male-to-female transfer cannot exceed the male wage income. Conditions (8) and (9) correspond to the participation constraints which indicate that the partners will agree to take part in the contract only if they reach an indirect utility level higher than their reservation utility. This negotiation is conditional on the social norm which corresponds to the average conjugal contract in the society: $\bar{\theta} = \frac{1}{N}\sum_1^N \theta$. Couples being perfectly homogenous, they all agree upon the same conjugal contract. Consequently, the social norm corresponds to the conjugal contract negotiated within the representative couple. Of course, couples taken individually are unaware of the relation between their own choice and the social norm. The model permits to explore the endogenous dimension of the social norm.

The first-order condition of the bargaining problem is:

$$\frac{\partial V_f}{\partial \theta} [V_m - V_m^e] + \frac{\partial V_m}{\partial \theta} \left[V_f - V_f^e\right] = 0 \tag{10}$$

[4]This could also be analyzed as to assume that spouses have the same risk aversion (Binmore, Rubinstein and Wolinsky, 1986).

Mutual gains associated with the conjugal contract when $\rho < \frac{1}{(1+\gamma)}$ appear clearly on Figure (5a) and have been studied in the previous section. As a positive transfer — θ_m^* for the man and θ_f^* for the woman — permits each partner to reach a higher level of utility, they will both be voluntarily willing to cooperate and bargain over the transfer rate. They will agree on an intermediate value of the transfer rate $\theta^* \in [\theta_m^*, \theta_f^*[$. The distance to the bounds is determined by the relative threat points of the two spouses $V_f^e/V_m^e = \rho^\gamma$. Higher is the threat point of the man (resp. the woman) compared to that of the woman (resp. the man), closer to θ_m^* (resp. θ_f^*) the optimal contract θ^* will be set. Figure 5b also shows clearly that, in the case where $\rho \geq \frac{1}{(1+\gamma)}$, the man cannot benefit from cooperation, consequently the conjugal contract will be set to zero: $\theta^* = 0$. The spouses will not cooperate and will respectively reach the utility levels given by V_m^e and V_f^e. The evolution of the social norm will thus be driven by both the evolution of the woman's threat point and the male optimal transfer θ_m^*, this last depending on the female-to-male relative wage rate ρ.

3 Household Decisions and Social Norm

Lets us now study how changes in the relative wage rate resulting from a rise in the female wage w_f will lead the couple to renegotiate the optimal conjugal contract.

3.1 Conjugal contract and household decisions in the non-conformist case

For the sake of simplicity, we will first neglect the taste for conformity of individuals by assuming $\phi = 0$ and we restrict to the case where the relative preference of individuals for private consumption is low ($\gamma < 1/2$) (see Figure 8 and Appendix 3 for an analytical analysis).

If the female to male wage ratio is high enough to insure important specialization gains which means ρ is close to zero, cooperation through the transfer may be beneficial in terms of utility for both partners. As seen before, the woman's interest is always to ask for the maximum value of the transfer rate ($\theta_f^* = 1$). The man has interest to propose a θ^* equal to ρ, the minimum value of the transfer rate that pushes his wife to fully specialized into household activities. In the bargaining process, the woman will not accept to do so without a compensation, proportional to her wage which is low at this stage. As long as ($\rho < \gamma/(1+\gamma)$), the man's surplus, as that of the woman, is strictly increasing in θ. Consequently, the man will agree to set θ^* higher than $\theta_m^* = \rho$ in order to compensate the woman for her wage loss as long as it permits to maximize the couple's joint surplus. If ρ continues to increase, as specialization gains decrease and cost of cooperation increases with ρ, the gain in the joint surplus associated with a marginal increase in θ^* will become progressively lower, so the couple will increase θ^* at a progressively slower pace. When ρ becomes higher than $\gamma/(1+\gamma)$, the male private consumption starts to decrease when θ^* rises, the public consumption remaining constant at its maximum level, the man's surplus thus becomes decreasing in θ. But as long as the woman's gain more than compensate the man's loss in terms of surplus, the joint surplus remains increasing with θ, so it is still optimal from the couple's point of view to follow the same decision rule and increase θ^* more proportionally than ρ.
Therefore when $\rho > \hat{\rho}$, for $\theta^* > \theta_m^* = \rho$, the man's loss in term of private consumption will overcome the woman's gain, that is where the joint surplus will become strictly decreasing in θ. The couple will thus agree to increase θ^* in the same proportion as ρ as long as the man's surplus remains increasing in

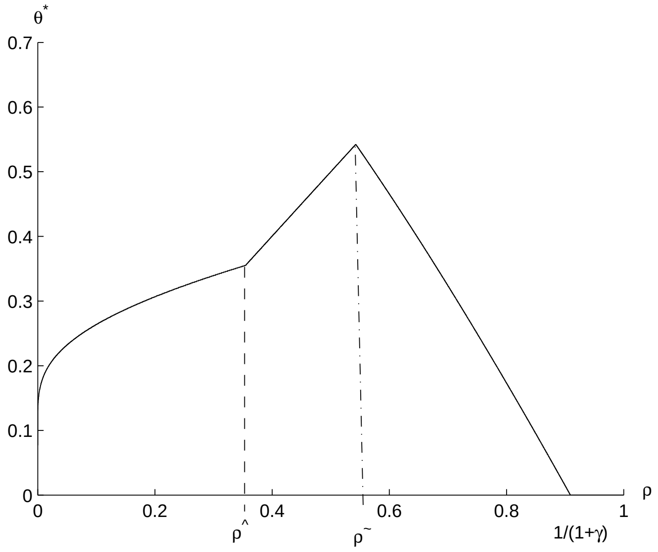


Figure 8: Evolution of the Couple's Optimal Contract ($\gamma < \frac{1}{2}$)

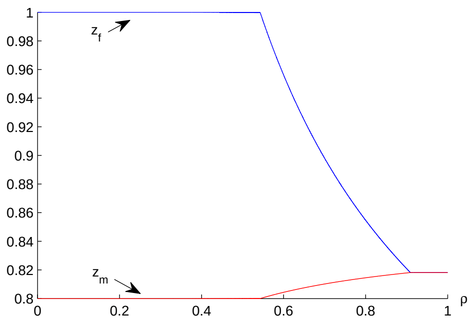
θ. Simulations show that following a rise in ρ, the couple will follow this decision rule beyond the point $\rho = 1/2$. Actually, when ρ becomes higher than $1/2$, it becomes too costly from the man's point of view to maintain full specialization of his partner through the transfer. Actually, at this point, an increase in θ^* is not optimal from his point of view as it reduces his surplus. Nevertheless, the man, who takes into account the woman's interest, will accept to do so as long as it allows an increase in the joint surplus.

But when $\rho > \tilde{\rho}$, maintaining full specialization of the women into household production by increasing θ^* will become too costly from the couple's point of view, that is will lead to a loss in the man's surplus overcoming the gains in the woman's one, the couple will agree to reduce cooperation by reducing the transfer rate, so θ^* will start to decrease as ρ increases. The woman will enter in the labor market and the man will increase his participation into household production.

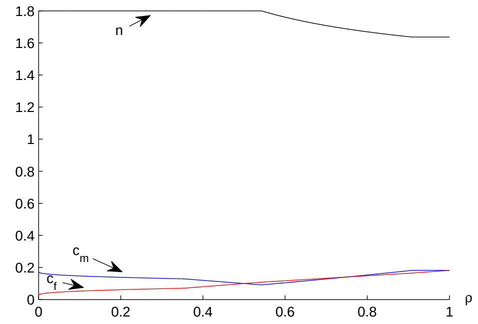
The more the woman gets paid on the labor market, the more income transfer she will ask in compensation as her reservation utility increases with ρ. So, from the man's point of view, as cooperation is more costly when the female relative wage gets higher, there will come a point, $\rho > 1/(1+\gamma)$, where he will no longer find any interest in cooperating and consequently the couple will stop to cooperate, θ^* will thus be set equal to zero.

To conclude, for high level of gender wage inequality, a rise in the female wage rate will lead to an increase in the transfer rate negotiated within the couple, that is will increase cooperation between spouses. But beyond a certain threshold, that is for low levels of gender wage inequality it will, by contrast, lead the individuals to negotiate a lower level of transfer rate, that is to behave more independently and to have a more egalitarian share of chores between spouses. We thus obtain a "Kuznet's curve" of spouses' financial autonomy within the couple.

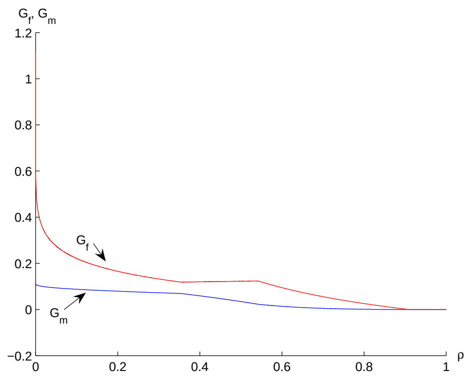
The evolution of optimal labor supplies and consumptions of the household and gains from cooperation with respect to the gender wage gap ρ are plotted on Figures 9(a) to 9(d).



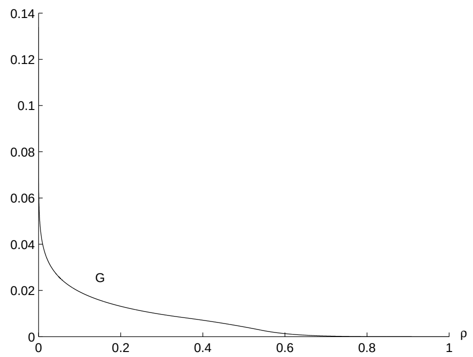
(a) Domestic Labor Supplies



(b) Public and Private Consumptions



(c) Man's and Woman's Gains from Cooperation



(d) Joint Surplus from Cooperation

Figure 9: Household Behaviors

For high levels of wage inequality, that is low levels of the female relative wage, the woman will be fully specialized in household tasks and the man's involvement in the labor market will be maximum, given the incompressible time he wishes to spent in household activities (see Figure 9(a)). When the wage gap lessens (ρ increases), there comes a point where full specialization of the woman in household duties is no more profitable for the couple, and the woman will enter on the labor market. In the same time, the man will get more involved into household production. If the wage gap continues to lessen, will come a point where cooperation is no longer profitable for the couple, the partners will stop to cooperate when the egalitarian division of work between market and household spheres is reached. As shown on Figure 9(d), the surplus the couple may extract from cooperation monotonically decreases with ρ but notice that the rise in her wage rate allows the woman to extract an increasing part of the joint surplus (Figure 9(c)) and thus to increase her welfare until she reaches the same utility level than the man (Figure 9(b)).

Similar results are obtained when considering the case of a high preference for private consumption ($\gamma \geq 1/2$), even though the evolution of the optimal contract is slightly more complex given that complete specialization of both partners is possible in this regime.

3.2 Conjugal contract and household decisions in the conformist case

Taking into account the taste for conformity of individuals ($\phi > 0$) does not fundamentally alter the results described so far. Simulations show that the negotiated transfer rate increases with the taste for conformity and that its evolution is less sensitive to changes in the wage ratio ρ (see Figure 10).

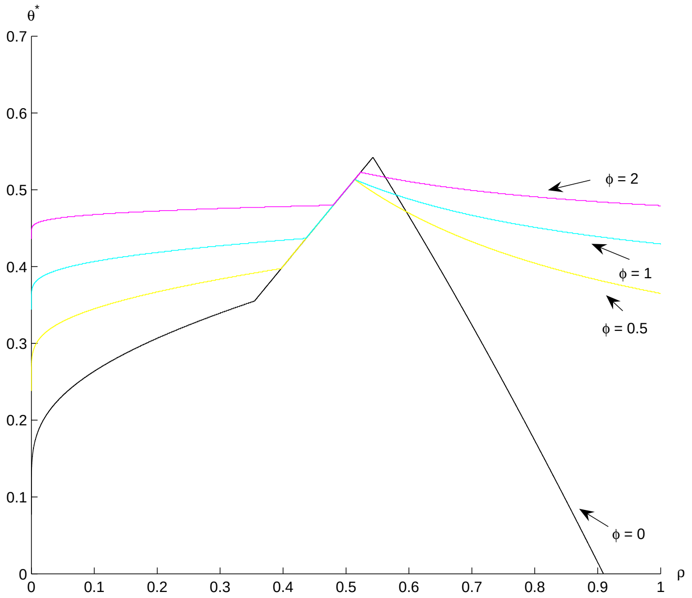


Figure 10: Conformism and Evolution of the Social Norm

The more conformist individuals are, the more they will negotiate a high level of transfer rate since refusing cooperation is more costly for them as $\bar{\theta} > 0$, the more cooperation within marriage will remains profitable when ρ increases and consequently the more unequal the division of tasks between gender will remain even if wage equality is reached. The more conformist individuals are, the less efficient wage public policies are in modifying the intra-household allocation and the less social norms evolve in time. So conformist attitudes introduce inertia in individual behaviors and in the evolution of social norms themselves.

4 Discussion and Concluding Remarks

The model presented in this paper is halfway between cooperative and non-cooperative bargaining models. Actually, these two approaches are fundamentally distinguished by the ability of spouses to make binding agreements within the couple. The negotiation, monitoring and enforcement of such agreements give rise to transactions costs. The non-cooperative default allocation described in the "separate spheres" model of Lundberg and Pollak (1993) avoids these costs, and the voluntary contribution equilibrium described in our model is maintained by social enforcement of the obligations corresponding to generally recognized and accepted gender roles. If in both cases, social norms and customs play a role, they come in as exogenous determinants of the "separate spheres" in the Lundberg and Pollak (1993) model dictating the task specialization of each spouses, although they are endogenously determined in our model.

The model presented actually shows how the intra-household decision-making process, and social norms and customs which partly drive it, may be influenced by the economic environment. Wage public policies such as those promoting gender wage equality through a reduction of the gender wage gap will modify the terms of the bargaining through which household members allocate resources within the family. When the gender wage gap is highly favorable to men in the labor market, an improvement in the female wage rate will lead the couple to agree upon a higher male-to-female income transfer rate. This would result in less financial autonomy of partners. On the contrary, if the gender wage gap is low, as in countries where discrimination against women is low, anti-discrimination policies would push the couple to renegotiate the transfer down, what would result in more financial autonomy of spouses, and a more equal sharing of household tasks.

One implication of the model is that the closer the spouses' wages are, the more equally they share household activities, a result in accordance with the empirical evidence described in Greenstein (2000). Since partners share household tasks, the household public good is under-provisioned in comparison with the case where spouses are fully specialized according to their comparative advantages. The resulting resource allocation is thus Pareto inefficient. By introducing inertia in household decisions, the conformism of individuals creates a second best Pareto inefficiency. This inefficiency result opens a discussion about the role public policies might play to restore the first best optimum.

A potential extension of the present work could be to study the dynamic of the model, which is tacitly introduced here, by modeling explicitly an overlapping generation structure. It would be also interesting to taste this model empirically.

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Appendix 1: Indirect utilities and Conjugal Contract if $\phi = 0$

Spouses' utility functions are defined by segments:

– For $\gamma < 1/2$, **if** $0 \leq \theta < \rho$,

$$V_f = \lambda(\rho w_m)^\gamma \frac{\rho}{(1+\gamma)\rho-\gamma\theta}, \quad \lambda = 2\gamma^\gamma(a(1-\gamma))^{1-\gamma} \quad \frac{\partial V_f}{\partial\theta} = \frac{\gamma\rho\lambda(\rho w_m)^\gamma}{[(1+\gamma)\rho-\gamma\theta]^2} > 0$$

$$V_m = \lambda(w_m)^\gamma \frac{\rho}{(1+\gamma)\rho-\gamma\theta}, \quad \frac{\partial V_m}{\partial\theta} = \frac{\lambda(w_m)^\gamma\gamma[1-(1+\gamma)\rho-(1-\gamma)\theta]}{(1-\theta)^{1-\gamma}[(1+\gamma)\rho-\gamma\theta]^2}$$

$$\text{with} \quad \frac{\partial V_m}{\partial\theta} = 0 \quad \Rightarrow \quad \theta^*_m = \frac{1-(1+\gamma)\rho}{1-\gamma}$$

Then if $1 > \theta \geq \rho$,

$$V_f = \lambda(w_m)^\gamma\theta^\gamma, \quad \frac{\partial V_f}{\partial\theta} = \gamma\lambda(w_m)^\gamma\theta^{\gamma-1} > 0$$

$$V_m = \lambda(w_m)^\gamma(1-\theta)^\gamma, \quad \frac{\partial V_m}{\partial\theta} = -\gamma(1-\theta)^{\gamma-1}\lambda(w_m)^\gamma < 0$$

– For $\gamma \geq 1/2$, **first if** $0 \leq \theta < \frac{1-\gamma}{\gamma}\rho$, same situation as when $\gamma < 1/2$ and $\theta < \rho$.
Then if $\frac{\gamma}{1-\gamma}\rho > \theta \geq \frac{1-\gamma}{\gamma}\rho$,

$$V_f = \tilde{\lambda}(w_f)^\gamma(1+\frac{\theta}{\rho}), \quad \tilde{\lambda} = \gamma^\gamma(a(1-\gamma))^{1-\gamma} \quad \frac{\partial V_f}{\partial\theta} = \gamma\theta^{\gamma-1}[\frac{\gamma w_m}{a(1-\gamma)}]^\gamma 2a(1-\gamma) > 0$$

$$V_m = \tilde{\lambda}(w_m)^\gamma(1-\theta)^\gamma(1+\frac{\theta}{r})^{1-\gamma}\gamma^{-\gamma}, \quad \frac{\partial V_m}{\partial\theta} = \tilde{\lambda}(w_m)^\gamma(1-\theta)^{\gamma-1}(1+\frac{\theta}{\rho})^{-\gamma}[-(1+\rho)\gamma-\theta+1]$$

$$\text{with} \quad \frac{\partial V_m}{\partial\theta} = 0 \quad \Rightarrow \quad \theta^*_m = (1-\gamma)-\gamma\rho$$

Finally, if $1 > \theta \geq \frac{\gamma}{1-\gamma}\rho$,

$$V_f = [\theta w_m]^\gamma a^{1-\gamma}, \quad \frac{\partial V_f}{\partial\theta} = \gamma w_m^\gamma a^{1-\gamma}\theta^{1-\gamma} > 0$$

$$V_m = [(1-\theta)w_m]^\gamma a^{1-\gamma}, \quad \frac{\partial V_m}{\partial\theta} = -\gamma w_m^\gamma a^{1-\gamma}(1-\theta)^{1-\gamma} < 0$$

Appendix 2: Spouses' indirect utilities, Social Norms and Conformism Effect, $\phi > 0$

$$V_m = \left[C^*_m(\gamma,\theta,\rho)^\gamma \;\; n^*(\gamma,\theta,\rho)^{(1-\gamma)} \;\; e^{-\frac{\phi}{2}(\theta-\bar{\theta})^2}\right] \quad V_f = \left[C^*_f(\gamma,\theta,\rho)^\gamma \;\; n^*(\gamma,\theta,\rho)^{(1-\gamma)} \;\; e^{-\frac{\phi}{2}(\theta-\bar{\theta})^2}\right]$$

$\frac{\partial V_i}{\partial\theta} = \phi(\theta-\bar{\theta})\; C_i^{*\gamma}\; n^{*(1-\gamma)} i = \{m,f\}$ with $\frac{\partial V_i}{\partial\theta} > 0$ (resp. < 0) if $\theta > \bar{\theta}$ (resp. $\theta < \bar{\theta}$)

Appendix 3: Evolution of the Conjugal Contract for $\gamma < 1/2$

As the utility functions are defined by segments, the evolution of the conjugal contract with respect to ρ is made in two steps:
If $0 \leq \theta < \rho$, **the Nash bargaining program** defining the optimal conjugal contract may be written as:

$$\max_\theta N(\theta,\rho) = \ln\underbrace{(V_f - V_f^e)}_{G_f} + \ln\underbrace{(V_m - V_m^e)}_{G_m} \tag{11}$$

$G_f = \lambda(\rho w_m)^\gamma \left[\frac{\rho}{(1+\gamma)\rho-\gamma\theta} - \mu\right] \quad G_m = \lambda(w_m)^\gamma \left[\frac{(1-\theta)^\gamma\rho}{(1+\gamma)\rho-\gamma\theta} - \mu\right] \quad \lambda = 2\gamma^\gamma(a(1-\gamma))^{1-\gamma} \quad \mu = \frac{1}{1+\gamma}$

The first-order condition of this problem is given by:

$$\frac{1}{\rho - \mu[(1+\gamma)\rho - \gamma\theta]} = \frac{(1-\theta)^{\gamma-1}[(1+\gamma)\rho + \theta(1-\gamma) - 1]}{(1-\theta)^\gamma\rho - \mu[(1+\gamma)\rho - \theta\gamma]} \tag{12}$$

The optimal solution $\theta^* \in [\theta_{min}, 1[$, with $\theta_{min} = \frac{1-(1+\gamma)\rho}{(1-\gamma)}$ and will satisfy the condition $(1-\theta)^\gamma > 1 - \frac{\gamma\theta}{\rho(1+\gamma)}$ which insures $G_m \geq 0$. Notice that (12) depends only on the wage ratio ρ and γ. After simplification of the equation (12) we obtain the following relation:

$$\underbrace{(1+\gamma)[(1-\theta)^\gamma - 1]\rho + \theta\gamma}_{F_1(\theta,\rho)} = \underbrace{\gamma\theta(1-\theta)^{\gamma-1}[(1+\gamma)\rho + (\theta(1-\gamma) - 1)]}_{F_2(\theta,\rho)} \tag{13}$$

and consider a function $\Psi(\theta,\rho)$ such as: $\Psi(\theta,\rho) = F_1(\theta,\rho) - F_2(\theta,\rho)$. Given $\frac{\partial\Psi(\theta,\rho)}{\partial\theta} < 0$, $\Psi(\theta_{min},\rho) > 0$ and $\Psi(1,\rho) < 0$, the existence and uniqueness of the solution θ^* has been proved. So given ρ there is only one θ^* implicitly defined by the function $\Theta(\rho)$ such as $\theta^* = \Theta(\rho)$. From the derivative of (13) with respect to ρ, the relationship between the optimal conjugal contract and ρ can be deduced:

$$\Theta'_\rho = \frac{\frac{\partial\Psi(\theta,\rho)}{\partial\rho}}{-(\underbrace{\frac{\partial\Psi(\theta,\rho)}{\partial\theta}}_{(-)})} \tag{14}$$

According to equation (14), the effect of ρ on the optimal conjugal contract θ^* depends on the sign of $\frac{\partial\Psi(\theta,\rho)}{\partial\rho}$, in other words the sign of $\frac{\partial F_1(\theta,\rho)}{\partial\rho}$ - $\frac{\partial F_2(\theta,\rho)}{\partial\rho}$:

$$\frac{\partial F_1(\theta,r)}{\partial\rho} = -(1+\gamma)[1-(1-\theta)^\gamma] < 0 \quad \frac{\partial F_2(\theta,\rho)}{\partial\rho} = (1+\gamma)\gamma\theta(1-\theta)^{\gamma-1} > 0 \quad \Rightarrow \Theta'_\rho < 0$$

Thus, for $\rho \in [\tilde{\rho}, 1]$ such as $\tilde{\rho}$ satisfies the condition $(1-\rho)^{1-\gamma} > (1+2\gamma) - \rho(1+3\gamma)$, $\Theta'_\rho < 0$.

If $\theta \geq \rho$, the **cooperation gains** are: $G_f = \lambda(w_m)^\gamma[\theta^\gamma - \mu\rho^\gamma] \quad G_m = \lambda(w_m)^\gamma[(1-\theta)^\gamma - \mu]$.
The first-order condition of **the Nash bargaining program** is given by:

$$\frac{\partial N(\theta,\rho)}{\partial\theta} = \frac{\theta^{\gamma-1}}{\theta^\gamma - \mu\rho^\gamma} - \frac{(1-\theta)^{\gamma-1}}{(1-\theta)^\gamma - \mu} = 0 \tag{15}$$

A solution of the Nash bargaining program θ^* exists if $G_f \geq 0$ and $G_m \geq 0$, that is if $\theta^* \in [\theta_{min}, \theta_{max}]$, with $\theta_{min} = (\mu)^{\frac{1}{\gamma}}\rho$ and $\theta_{max} = 1-(\mu)^{\frac{1}{\gamma}}$. Given $\frac{\partial^2 N(\theta(\rho),\rho)}{\partial\theta^2} < 0$, $\frac{\partial N(\theta_{min},\rho)}{\partial\theta} \to +\infty$ and $\frac{\partial N(\theta_{max},\rho)}{\partial\theta} \to -\infty$, the existence and uniqueness of the solution θ^* has been proved. After simplification of equation (15), we obtain :

$$\rho = \left[\underbrace{[\frac{1-\theta}{\theta}]^{1-\gamma} - \frac{(1-2\theta)(1+\gamma)}{\theta^{1-\gamma}}}_{A}\right]^{\frac{1}{\gamma}} \tag{16}$$

$$\frac{\partial\rho}{\partial\theta} = \frac{1}{\gamma}A^{\frac{1}{\gamma}-1}\frac{1}{1-\theta}\frac{1}{\theta^{2-\gamma}}\underbrace{[-(1-\gamma)(1-\theta)^{1-\gamma} + (1+\gamma)(1-\theta)(2\gamma\theta + 1 - \gamma)]}_{C} \tag{17}$$

Given that $\theta \geq \rho \geq 0$, we can deduce from (16):

$$\theta + (1-2\theta)(1+\gamma) \geq (1-\theta)^{1-\gamma} \geq (1-2\theta)(1+\gamma) \tag{18}$$

Using equation (18), we get:

$$\underbrace{[1+\gamma][1-\theta][2\gamma\theta+1-\gamma] - [\theta + [1+\gamma][1-2\gamma]][1-\gamma]}_{\underline{C}} \leq C \leq \underbrace{[1+\gamma][1-\theta][2\gamma\theta+1-\gamma] - [1-2\theta][1-\gamma]}_{\overline{C}}$$

and after simplification: $\underline{C} = \gamma\theta[(1-\gamma) + 2(1+\gamma)(1-\theta)] > 0$ and $\overline{C} = (1+\gamma)\theta[(1-\gamma) + 2\gamma(1-\theta)] > 0$. For $\rho \in [0, \hat{\rho}]$ with $\hat{\rho}$ implicitly defined by $(2+\gamma) - 2(1+\gamma)\rho > (1-\rho)^{1-\gamma}$ and $\tilde{\rho} > \hat{\rho}$, $\Theta^{'}_{\rho} > 0$.