Optimal Intra-household Decision Structure

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Abstract

This paper develops a model of the allocation of authority in intra-household decision-making. We analyze the cases (i) when decisions are decided unilaterally by one spouse, (ii) when the household head delegates his or her authority to the other spouse, (iii) when both spouses bargain over the investment decisions. Comparing the various scenarios, we derive testable predictions about the optimal decision structure depending on various parameters such as time preferences, degree of congruence of partners over a project, opportunity cost of information search. We bring these predictions to the data, relying on a detailed first-hand survey in Cameroon.

JEL Classification: D13, O12
Keywords: intra-household decision model, delegation model, Cameroon.
1 Introduction

While the economic literature largely focuses on decisions made by single individuals, our societies are largely structured by individuals belonging to households. The household represents the core and first institution in which individuals interact and take interlinked decisions. The choices made at the household level have large socio-economic implications, since they concern all aspects of the economic life: education, labor, investment, consumption spending, savings etc. Hence, understanding how these decisions are taken within households, i.e. between individuals who differ in their preferences and resources, is crucial.

In the economic literature, decisions made by or within households are formalized by three different types of models: the unitary model (Becker, 1974; Samuelson, 1956), assuming a benevolent dictator taking decisions for all the household members, the collective model (Chiappori, 1988, 1992), assuming pareto-efficiency of the household decision, fruit of the maximization of the weighted sum of the utility of each member, and finally, the non-cooperative approach (Chen and Woolley, 2011; Lundberg and Pollak, 1993), formalizing intra-household decision-making by game-theoretic strategic interactions.

The objective of the current paper is to analyze various household decision structures and then, to identify which decision structure is optimal – for the household or each spouse – depending on key parameters, such as preference alignments, opportunity cost of time, differences in resources. To the best of our knowledge, this is the first paper to identify under which conditions different authority structures are optimal.

We test the predictions of our theoretical model empirically, relying on a rich first-hand survey conducted in 2010 in Cameroon.

The paper is structured as follows. In Section 2, we briefly discuss the state of the literature on the matter. In Section 3, we introduce the model while in Section 4, we study
the decisions under various authority structures. In Section 5, we derive the conditions under which the husband choose each type of authority structure, while in Section 6, we investigate the optimal authority structure in terms of the social welfare. In Section 7, we present the data and present evidence of our theoretical predictions. Section 8 concludes.

2 Related literature

2.1 Intra-household decision-making models

The canonical model of the household, known as the “collective” model - originally developed by Chiappori (1988) and Bourguignon et al. (1993) - sees the household as a cooperative environment in which outcomes are efficient. The same is true for the cooperative Nash-bargaining models discussed in Manser and Brown (1980) and McElroy and Horney (1981). In both cases, the relative ‘outside” options of the spouses determine distribution of power in the households and no resource is wasted in the decision making progress. Efficiency seems to be a realistic assumption, given the long-lasting nature of intra-household interactions.

However, a recent body of literature, coming especially form developing countries, provides evidence of the existence of inefficient behaviors in the household such as sub-optimal allocation of productive inputs (Udry, 1996), imperfect risk-sharing (Dercon and Krishnan, 2000), strategic appropriation of resources (Anderson and Baland, 2002), lying and hiding (Ashraf, 2009). When directly testing for efficiency in a lab-in-the field setting, several papers show a substantial amount of heterogeneity in behavior with very few households being completely efficient (see Hoel, 2014)).

The seminal work of Lundberg and Pollak (1993) has been the first one introducing the possibility of non-cooperative equilibria inside marriage as the outside option of a cooperative bargain. Generally, non-cooperative models use the Cournot-Nash equilibrium concept where individuals within a household maximize their own utility, relative to their
own budget constraints, taking the actions of other household members as given (Brown- ing et al., 2010; Doepke and Tetrilt, 2014).

However, to the best of our knowledge, a general framework, able to pin down the factors affecting which decision making framework is optimal for the household, has not been developed up to now.

2.2 Optimal authority structure within firms

The literature on household decision-making is rather scarce on the question of the transfer of authority from one member to another. Therefore, our paper builds on the literature on delegation of authority within organizations, as initiated by the seminar paper by Holmström (1984). In Aghion and Tirole (1997), the authors compare under which cases it is optimal for the principal of a firm to delegate his or her authority, rather than to exert it. They analyses cases where communication about the knowledge of the projects’ payoffs are verifiable or not. Similarly, in Dessein (2002), the author shows that delegation is preferred by a principal to a cheap talk communication with his agent when the difference in preferences about the project is not too large relative to the principal’s uncertainty about the state of the world. Alonso and Matouschek (2007) analyze a cheap talk game where they endogenize the commitment power of the principal to delegation in an infinitely repeated game.

We primarily build our model on Dessein (2002) and for some dimensions on Aghion and Tirole (1997).

3 The model

We want to characterize the decision-making process between spouses about resource allocation or long-term decisions such as the education of children. We rely on a Principal-
Agent framework where the principal, the husband, $H$ and the wife, $W$, the agent\(^1\).

Our model is based on the following characterization of the Husband-Wife relationship. The husband is the principal income earner in the household, meaning that we will assume that he has a higher income than the wife. The husband $H$ and the wife $W$ have potentially different preferences over some projects, e.g. specific spending or investment decisions. They may also face different costs to make such decisions: one spouse may have some informational advantage, lower opportunity cost of time, difference in time preferences.

The model is based mainly on the model of delegation of authority in firms developed by Dessein (2002), and for some dimensions on the model by Aghion and Tirole (1997).

**Preferences** We consider the situation where spouses have to make an investment decision between various potential projects that all vary according to one dimension and that are represented by a real number $y \in \mathbb{R}$.

Each spouse derives a private benefit from each project $y$: $U_H = U_H(y, m)$ for the husband $H$ and $U_W = U_W(y, m, b)$ for the wife $W$, where $m$ is a random variable accounting for the state of the world and $b$ a parameter of dissonance between both spouses. We assume that the bias between $H$ and $W$ is positive, $b > 0$: since $y$ can represent the amount that has to be spent on the project, a positive bias means that the wife is willing to invest more in the project that the husband.

The utility of the husband is assumed to reach a unique maximum for $y = m$ while the utility of the wife is maximized for when the project $y = m + b$ is chosen.

For the sake of simplicity, we use a standard quadratic loss function for the spouses’ utility: $U_H = -(y - m)^2$ and $U_W = -(y - (m + b))^2$.

---

\(^1\)By choosing that the husband is the principal and the wife, the agent, we place our model in a patriarchal society. However, our results could easily be read under the angle where the wife is the principal and the husband, the agent, by switching roles in the model.
Information and cost structures  Unlike in Dessein (2002), we do not impose an information asymmetry between $H$ and $W$ a priori. We rather assume that both spouses are a priori ignorant. They only know that the random variable $m$ is distributed by a distribution function $F(m)$, with density $f(m)$, on the support $[-L, L]$. We assume a uniform distribution for $F$.

Building on Aghion and Tirole (1997), we further assume that each spouse $i \in \{H, W\}$ can provide some effort $e_i$, at a cost $g_i(e_i)$, so that with probability $e_i$, they learn the exact $m$ while with probability $1 - e_i$, they remain ignorant. We assume a quadratic cost function: $g_i(e_i) = c_i \cdot e_i^2$.

Decision rules and contracts  We consider the following different types of decision rules that the husband can implement: (i) $H$ is a dictator, meaning he decides without the consent of $W$ and he supports the cost. (ii) $H$ and $W$ can provide effort but $H$ has the final say in the decision. (iii) $H$ delegates the decision to $W$ – and cases with various refinements of the delegation model – (iv) $H$ and $W$ bargain over the decision for $y$, both incur the cost and an additional cost of negotiating.

4  Optimal decisions under different authority structures

We derive in this section for each type of decision-making process the optimal project $y^*$ that will be chosen and the level of effort, $e_i^*$, each spouse will choose. We denote the total net utility of each spouse $V_i$, with $i \in \{H, W\}$.

4.1  Husband sole decision-maker

We consider here the extreme case where the husband decides alone his preferred project $y^{*Dict}$, without the consent of his wife $W$ and without communicating with her. Therefore, he has to incur the full cost of acquiring information about the true state of nature, $m$. 
and thus, to choose how much effort he provides.

With probability $e_H$, he is lucky and will learn $m$ and will thus choose $y^{*_{Dict}}_S = m$, where $S$ stands for *successful state*. With probability $1 - e_i$, he does not learn the state of nature and will rely on his prior about $m$ and will thus choose the expected value of $y^{*_{Dict}}_U$ that maximizes his utility given his prior $F(\cdot)$, with $U$ for *unsuccessful state*:

$$y^{*_{Dict}}_H \equiv \arg\max_y \int_{-L}^{L} U_H(y, x) df(x) = \arg\max_y \int_{-L}^{L} -(y - x)^2 df(x) = 0 \quad (4.1)$$

The pay-off function of the husband $H$ is thus the following, assuming a uniform distribution for $m$ and a quadratic cost function $g$.

$$V_H(y, e_H) = e_H \cdot U_H(y^{*_{Dict}}_S, m) + (1 - e_H) \cdot U_H(y^{*_{Dict}}_U, m) - g_H(e_H)$$

$$= -\frac{1 - e_H}{3} \cdot L^2 - e_H \cdot \frac{e_H^3}{3} \quad (4.2)$$

We derive the first order condition and obtain the optimal level of effort provided by the husband:

$$e^{*_{Dict}}_H = \frac{L^2}{6 \cdot c_H} \quad (4.3)$$

Finally, we substitute the optimal effort choice obtained in (4.3) in the pay-off function of the husband (4.2):

$$V^{*_{Dict}}_H = \frac{L^2}{3} \left( \frac{L^2}{12 c_H} - 1 \right) \quad (4.4)$$

We thus find that the optimal level of effort for the husband as well as his pay-offs are a decreasing function of his own cost and an increasing function of how diverse the projects may be a priori.

$$V^{*_{Dict}}_W = \frac{L^2}{3} \left( \frac{L^2}{6 c_H} - 1 \right) - b^2 \quad (4.5)$$
4.2 Joint production of effort and Husband’s veto

In this case, both spouses can decide to produce some level of effort but the husband has the final say in the decision. The idea here is that it may be beneficial for the wife to invest in effort because she prefers the husband informed choice \( y = m \), rather than his non-informed choice \( y = 0 \).

Each spouse decides simultaneously upon his or her own level of effort depending on the other spouse’s effort choice. We make two main assumptions: first, the information obtained through the effort provision is public knowledge. Second, the probability to learn from the effort is independent across spouses.

We thus have the following different cases depending on whether each spouse is successful or not in learning the true state of nature \( m \). With probability \( e_H \), the husband is successful – state denoted \( S_H \) –, and learns about \( m \): he chooses \( y_{S_H}^{\text{VetoH}} = m \). With probability \( 1 - e_H \), the husband is unsuccessful – state \( U_H \) – and does not learn anything about \( m \): his choice will depend on his wife’s own effort choice and success in learning something. With probability \( (1 - e_H)e_W \), the husband is unsuccessful but the wife is successful – \( U_H, S_W \) –: the husband learns the true state of nature from his wife and chooses: \( y_{U_H,S_W}^{\text{VetoH}} = m \). Finally, with probability \( (1 - e_H)(1 - e_W) \), both spouses are unsuccessful – \( U_H, U_W \) – and the husband thus chooses: \( y_{U_H,U_W}^{\text{VetoH}} = \text{Argmax}_y \int_{-L}^{L} U_H(y, x)df(x) = 0 \).

The payoffs function of each spouse as a function of each effort choice are as follows:

\[
V_H(y, e_H) = (e_H + (1 - e_H)e_W) \cdot U_H(m, m) + (1 - e_H) \cdot U_H(y_{U_H,U_W}^{\text{VetoH}}, m) - g_H(e_H)
\]

\[
= - \frac{(1 - e_H)(1 - e_W)}{3} \cdot L^2 - c_H \cdot e_H^2
\]

(4.6)
\[ V_W(y, e_W) = (e_H + (1 - e_H)e_W) \cdot U_W(m, m) + (1 - e_H)(1 - e_W) \cdot U_W(y^{*VetoH}, m) - g_W(e_W) \]
\[ = -\left( e_H + (1 - e_H)e_W \right) \cdot b^2 - (1 - e_H)(1 - e_W) \cdot \left( \frac{L^2}{3} + b^2 \right) - c_W \cdot e_W^2 \]
\[ = -b^2 - (1 - e_H)(1 - e_W) \cdot \frac{L^2}{3} - c_W \cdot e_W^2 \]  

(4.7)

We take the derivative of both pay-off functions with respect to the effort provided and obtain the following system of equations with the two variables \((e_H, e_W)\):

\[ e^{*VetoH}_H = \frac{(1 - e_W)L^2}{6c_H} \]  
(4.8)

\[ e^{*VetoH}_W = \frac{(1 - e_H)L^2}{6c_W} \]  
(4.9)

Solving the system we obtain:

\[ e^{*VetoH}_H = \frac{6L^2c_W - L^4}{36c_Wc_H - L^4} \]  
(4.10)

\[ e^{*VetoH}_W = \frac{6L^2c_H - L^4}{36c_Wc_H - L^4} \]  
(4.11)

Since both effort levels have to be lower or equal than one, we have three scenarios: (i) if \(c_W < c_H\), the effort of wife will be equal to 1 and the husband is going to provide zero effort; (ii) if \(c_W > c_H\), the reverse will happen; (iii) if \(c_W = c_H\), both will provide the maximum effort of 1.
The payoffs of each spouse are thus easily obtained:

\[
\begin{align*}
  c_W < c_H &\Rightarrow e_W^{VetoH} = 1, 
  V_W^{VetoH} = -b^2 - c_W \\
  e_H^{VetoH} = 0, 
  V_H^{VetoH} = 0 \\
\end{align*}
\]

(4.12)

\[
\begin{align*}
  c_W > c_H &\Rightarrow e_W^{VetoH} = 0, 
  V_W^{VetoH} = -b^2 \\
  e_H^{VetoH} = 1, 
  V_H^{VetoH} = -c_H \\
\end{align*}
\]

(4.13)

\[
\begin{align*}
  c_W = c_H &\Rightarrow e_W^{VetoH} = 1, 
  V_W^{VetoH} = -b^2 - c_W \\
  e_H^{VetoH} = 1, 
  V_H^{VetoH} = -c_H \\
\end{align*}
\]

(4.14)

### 4.3 Delegation to the wife

We consider the case where the husband decides to give the authority to decide upon the project to the wife. We assume that he cannot overrule her once he delegates her the decision, while we relax this assumption in the case 4.5. As a consequence, the wife chooses to exert a certain level of effort in order to learn about the state of the world. The rationale for the husband to prefer delegating rather than acting as a dictator is that he is trading off between a project closer to his preferences and sparing the cost of learning about the state of the world.

The resolution of this scenario is symmetric to the husband’s dictator case, one difference being that the women is taking the decision and she has a systematic bias \( b \) for the project. Hence, she will choose \( y_S^{Del} = m + b \) if after exerting effort \( e_w \), she learns about \( m \). However, if she ends up in the unsuccessful state, she will choose \( y_U^{Del} \) satisfying:

\[
y_U^{Del} \equiv \arg\max_y \int_{-L}^{L} U_W(y, x)df(x) = \arg\max_y \int_{-L}^{L} -(y - x - b)^2 df(x) = b
\]

(4.15)
Similarly to the first case, the wife chooses the level of effort $e_W$ so as to maximize her payoff function as follows: the pay-off function of the wife $W$ is thus the following, assuming a uniform distribution for $m$ and a quadratic cost function $g$.

\[
V_W(y^{S\text{Del}}, e_W) = e_W \cdot U_W(y^{S\text{Del}}, m) + (1 - e_W) \cdot U_W(y^{U\text{Del}}, m) - g_W(e_W)
\]

\[
= -\frac{1 - e_W}{3} \cdot L^2 - e_W \cdot e_W^2
\]  

(4.16)

We thus obtain the optimal level of effort of the wife when the husband delegates to her the authority.

\[
e^{*\text{Del}}_W = \frac{L^2}{6 c_W}
\]

(4.17)

Finally, the payoff functions of the husband is the following:

\[
V^{*\text{Del}}_H = V_H(y^{S\text{Del}}, e_H = 0)
\]

\[
= \frac{L^2}{3} \left( \frac{L^2}{6 c_W} - 1 \right) - b^2
\]

(4.18)

The optimal level of effort of the wife in the delegation case is symmetric to the level of the husband in the dictator case. We further obtain that the husband’s payoffs in the delegation case is decreasing both in the cost parameter of the wife and in the bias she has relative to him for all projects.

4.4 Joint production of effort and full delegation to the wife

In this case, both spouses can decide to produce some level of effort but the husband delegates to the wife the final say in the decision. This is the exact symmetric situation to the case 4.2 where the husband has a veto right and both spouses produce some effort.

We thus have the following different cases depending on whether each spouse is successful...
or not in learning the true state of nature \(m\). With probability \(e_W\), the wife is successful – state denoted \(S_W\) – and learns about \(m\): she chooses \(y_{S_W}^{\text{Veto}} = m + b\). With probability \(1 - e_W\), the wife is unsuccessful – state \(U_W\) – and does not learn anything about \(m\): his choice will depend on her husband’s own effort choice and success in learning something. With probability \((1 - e_W)e_H\), the wife is unsuccessful but the husband is successful – \(U_W, S_H\): the wife learns the true state of nature from her husband and chooses: 
\[
y_{U_W, S_H}^{\text{Veto}} = m + b.
\]
Finally, with probability \((1 - e_W)(1 - e_H)\), both spouses are unsuccessful – \(U_W, U_H\) – and the wife thus chooses: 
\[
y_{U_W, U_H}^{\text{Veto}} = \arg\max_y \int_{-L}^L U_W(y, x) df(x) = b.
\]

The payoffs function of each spouse as a function of each effort choice are as follows:

\[
V_H(y, e_H) = \left( e_W + (1 - e_W)e_H \right) \cdot U_H(m + b, m) + (1 - e_H)(1 - e_W) \cdot U_H(y_{U_H, U_W}^{\text{Veto}}, m) - g_H(e_H)
\]
\[
= - \left( e_W + (1 - e_W)e_H \right) \cdot b^2 - (1 - e_H)(1 - e_W) \cdot \left( \frac{L^2}{3} + b^2 \right) - c_H \cdot e_H^2
\]
\[
= -b^2 - (1 - e_H)(1 - e_W) \cdot \frac{L^2}{3} - c_H \cdot e_H^2 \quad (4.19)
\]

\[
V_W(y, e_W) = \left( e_W + (1 - e_W)e_H \right) \cdot U_W(m + b, m) + (1 - e_H)(1 - e_W) \cdot U_W(y_{U_H, U_W}^{\text{Veto}}, m) - g_W(e_W)
\]
\[
= - \frac{(1 - e_H)(1 - e_W)}{3} \cdot L^2 - c_W \cdot e_W^2 \quad (4.20)
\]

We take the derivative of both pay-off functions with respect to the effort provided and we obtain the same system of best responses as in equations 4.8 and 4.9.

Therefore, we derive the effort levels and the payoffs of each spouse depending on the relative cost parameters as previously:
\[ c_W < c_H \Rightarrow e^*_{VetoW} = 1, \quad V^*_{VetoW} = -c_W \]
\[ e^*_{VetoW} = 0, \quad V^*_{VetoW} = -b^2 \]  
(4.21)

\[ c_W > c_H \Rightarrow e^*_{VetoW} = 0, \quad V^*_{VetoW} = 0 \]
\[ e^*_{VetoW} = 1, \quad V^*_{VetoW} = -b^2 - c_H \]  
(4.22)

\[ c_W = c_H \Rightarrow e^*_{VetoW} = 1, \quad V^*_{VetoW} = -c_W \]
\[ e^*_{VetoW} = 1, \quad V^*_{VetoW} = -b^2 - c_H \]  
(4.23)

### 4.5 Delegation to the wife without commitment of the husband

Building on the case developed in the Subsection 4.3, we investigate here the refinement where the husband may renege on his decision to delegate his authority to the wife if he observes that she learns the true state of nature. The wife knows *ex ante* the possibility of her husband overruling her *ex post* and adapt her level of effort.

The resolution of this scenario is similar to the delegation case, one difference being that the women is taking into account that if she learns the true state, the husband will decide in fine and without taking into account her systematic bias \( b \) for the project. Hence, after exerting effort \( e_w \), she learns about \( m \) and the husband will choose \( y^*_{DWC} = m \), where \( DWC \) stands for Delegation Without Commitment. However, if she ends up in the unsuccessful state, she will choose \( y^*_{DWC} \) satisfying:

\[ y^*_{DWC} \equiv \arg\max_y \int_{-L}^L U_W(y, x)df(x) = \arg\max_y \int_{-L}^L -(y - x - b)^2 df(x) = b \]  
(4.24)
Hence, the wife chooses the level of effort $e_W$ so as to maximize her payoff function as follows:

$$V_W(y^{*_{DWC}}, e_W) = e_W \cdot U_W(y^{*_{DWC}}, m) + (1 - e_W) \cdot U_W(y^{*_{U_{DWC}}}, m) - g_W(e_W)$$

$$= -e_W b^2 - \frac{1 - e_W}{3} \cdot L^2 - c_W \cdot e_W^2$$  \hspace{1cm} (4.25)$$

We thus obtain the optimal level of effort of the wife in this case after deriving the first order condition:

$$e_{W}^{*_{DWC}} = \frac{L^2 - 3b^2}{6c_W} = e_{W}^{*_{Del}} - \frac{3b^2}{6c_W}$$  \hspace{1cm} (4.26)$$

Finally, the payoff functions of the husband is the following:

$$V_{H}^{*_{DWC}} = -(1 - e_{W}^{*_{DWC}}) \left( b^2 + \frac{L^2}{3} \right)$$

$$= \frac{L^2}{3} \left( b^2 + \frac{L^2}{6c_W} - 1 \right) - b^2 \left( 1 + \frac{3b^2}{6c_W} \right)$$

$$= V_{H}^{*_{Del}} - \frac{3b^4}{6c_W}$$  \hspace{1cm} (4.27)$$

In the delegation case without commitment of the husband, the wife provides less effort than in the case of delegation with full commitment in Subsection 4.3. Therefore, this comes at a cost to the husband who achieves a lower utility than in this case.

### 4.6 Bargaining between spouses

**Decision rules and contracts** We focus here on the bargaining decision making model. The decision process is as follows: (1) Both spouses decide how much effort to provide. (2) The husband $H$ and the wife $W$ bargain over the decision for $y$, given the disclosure of information.
**Solving the model**  The model is going to be solved by backward induction and the bargaining process is modeled as a Nash bargaining solution.

**Step 2: project choice with information disclosure**  We are here considering the case where the husband and the wife manage to discover the true state of nature. This occurs with probability: \( e_H e_W + e_H (1 - e_W) + (1 - e_H) e_W \). Given the information, they bargain over the optimal \( y^{*NB} \), where \( NB \) stands for Nash Bargaining case. Assuming the two spouses have the same bargaining power, \( y^{*B} \) is the solution of the following maximization problem:

\[
\begin{align*}
\max_y & \left[ U_H(y) \right]^{\frac{1}{2}} \left[ U_W(y, b) \right]^{\frac{1}{2}} \\
\Rightarrow & \max_y \left( - (y - m)^2 \right)^{\frac{1}{2}} \left( - (y - m - b)^2 \right)^{\frac{1}{2}} \\
\Rightarrow & y^{*NB} = m + \frac{b}{2} 
\end{align*}
\]

(4.28)

**Step 2: project choice without information disclosure**  Now, we consider the case where neither husband nor the wife manage to discover the true state of nature. This occurs with probability: \( (1 - e_H)(1 - e_W) \). Given the information, they bargain over their expected utility and choose \( y^{*ENB} \) so to maximize.

\[
\begin{align*}
\max_y & \left[ U_H(y) \right]^{\frac{1}{2}} \left[ U_W(y, b) \right]^{\frac{1}{2}} \\
\Rightarrow & \max_y \left( \int_{-L}^{L} - (y - x)^2 df(x) \right)^{\frac{1}{2}} \left( \int_{-L}^{L} - (y - x - b)^2 df(x) \right)^{\frac{1}{2}} \\
\Rightarrow & y^{*ENB} = \frac{b}{2} 
\end{align*}
\]

(4.29)
**Step 1: effort decisions**  After simplifications, each spouse \(i \in \{W, H\}\) has the following pay-off function:

\[
V_i^{*NB}(y_i^{*NB}, e_i) = -[e_H e_W + e_H (1 - e_W) + (1 - e_H) e_W] \left( \frac{b^2}{4} - (1 - e_W)(1 - e_H) \left( \frac{b^2}{4} + \frac{L^2}{3} \right) \right) - g_i(e_i)
\]

\[
= -\frac{b^2}{4} - (1 - e_W)(1 - e_H) \frac{L^2}{3} - c_i e_i^2
\]

This implies the best response function of effort of each spouse: \(e_i^{*B} = \frac{(1 - e_j)L^2}{6c_i}\). Interestingly, the optimal effort level for each spouse is the same as the level in the veto case, in equations 4.8 and 4.9. We can easily derive the payoffs of each spouse under each case:

\[
c_W < c_H \Rightarrow e_W^{*NB} = 1, \quad V_W^{*NB} = -\frac{b^2}{4} - c_W
\]

\[
e_H^{*NB} = 0, \quad V_H^{*NB} = -\frac{b^2}{4}
\]

\[
c_W > c_H \Rightarrow e_W^{*NB} = 0, \quad V_W^{*NB} = -\frac{b^2}{4}
\]

\[
e_H^{*NB} = 1, \quad V_H^{*NB} = -\frac{b^2}{4} - c_H
\]

\[
c_W = c_H \Rightarrow e_W^{*NB} = 1, \quad V_W^{*NB} = -\frac{b^2}{4} - c_W
\]

\[
e_H^{*NB} = 1, \quad V_H^{*NB} = -\frac{b^2}{4} - c_H
\]

**5 The husband’s choice of authority structure**

We compare the net-payoffs of the husband under the various scenarios and characterize under which conditions on the parameters, \(H\) prefers to delegate rather than act as a dictator or to bargain.
5.1 Delegation versus dictatorship cases

We aim here at understanding under which condition the husband prefers to delegate his authority to the wife rather than being the sole decision-maker. We thus compare the net pay-offs of the husband under the two cases, namely equation 4.4 for the dictator case and equation 4.18 for the delegation case.

\[ V_{H}^{*_{Dict}} - V_{H}^{*_{Del}} > 0 \]
\[ \Rightarrow \frac{L^2}{3} \left( \frac{L^2}{12c_H} - 1 \right) + b^2 + \left( 1 - \frac{L^2}{6c_W} \right) \frac{L^2}{3} > 0 \]
\[ \Rightarrow b^2 + \frac{L^4}{36c_Wc_H}(c_W - 2c_H) > 0 \]  

(5.1)

Hence, independently of the bias, when the cost of the wife is sufficiently larger than the one of the husband – at least twice as high –, the husband is always better off not to delegate, i.e. to incur himself the cost and to decide alone. However, when the cost of the wife is less than twice the cost of the husband, the preference of the husband for dictatorship will depend on the size of the bias of the wife relative to the cost differential weighted by the additional loss of the unsuccessful state \( \left( \frac{L^2}{3} \right) \). We can also rewrite the previous expression as follows:

\[ b^2 > \frac{L^2}{3} \left( \frac{L^2}{6c_W} - \frac{L^2}{12c_H} \right) = \frac{L^2}{3} \left( e_{W}^{*_{Del}} - e_{H}^{*_{Dict}} \right) \]  

(5.2)

This shows that dictatorship is preferred when the certain loss with delegation \( (b^2) \) is bigger than differential loss in the uncertain state; this is particularly the case when the effort of the husband is at least two times higher than the effort of the wife.

5.2 Veto with joint effort versus bargaining cases

In both cases, the level of effort of each spouse is the same. However, the project implemented differs in the bargaining and veto cases: in the veto case, it matches the husband
preferences while in the bargaining case, the project implemented is a weighted average of both spouses preferences.\(^2\) Hence, if the husband has to choose between the two decision structures, he will always choose the veto case with joint effort provision over the bargaining process. Analytically, looking at the expressions obtained for the husband’s payoffs in both scenarios and for any condition on the cost parameters of the spouses, the husband always prefers the case of the veto with joint effort.

### 5.3 Bargaining versus Delegation case

In these two scenarios, the husband trades off between incurring some effort costs and getting a project that is closer to his preferences.

Looking at the expressions 4.31, 4.32, and 4.33 in the bargaining case, we see that the payoffs of the husband is lower in the case when \(c_W > c_H\). We thus start analyzing this case.

If \(c_W > c_H\), the utility of the husband in the bargaining case is higher than in the delegation case if:

\[
\frac{-b^2}{4} - c_H > -b^2 - \left(1 - \frac{L^2}{6c_W}\right) \frac{L^2}{3}
\]

\[
\Rightarrow \frac{3b^2}{4} > c_H - \left(1 - \frac{L^2}{6c_W}\right) \frac{L^2}{3} \quad (5.3)
\]

A particularly clear case occurs when \(e_{W\text{Del}}^* = 1 \iff 6c_W = L^2\), that is when the wife puts the maximum effort in the delegation set-up.

[In progress]

### 6 The social optimal authority structure

[To be completed]

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\(^2\)Here, the weight being 1/2, the project is located at the exact half.
7 Data and empirical tests

[To be completed]

8 Conclusion

[To be completed]

References


