Economic Abuse: A Theory of Intrahousehold Sabotage[☆]

Dan Anderberg

Royal Holloway University of London, Institute for Fiscal Studies

Helmut Rainer

University of Munich, CESifo, Ifo Institute for Economic Research

Abstract

While research on domestic abuse in economics has to date almost exclusively focused on physical violence, research in other disciplines has documented that abusive males frequently also use sabotage tactics to interfere with the employability and job performance of the victim. This paper puts forward a theoretical framework that rationalizes why men may use labor market sabotage "instrumentally" to thwart their partners' training or career efforts. The model predicts a non-monotonic relationship between the gender wage gap and intrahoushold sabotage committed by abusive males. There are no one-size-fit-all solutions when it comes to reducing the incidence of economic abuse. Instead, specific measures have to be targeted at different types of households.

Keywords: Economic abuse, intrahousehold sabotage, non-cooperative family decision-making, welfare policy.
JEL Classification: J12, J22, D19.

1. Introduction

The term domestic abuse typically evokes images of physical and sexual violence. However, researchers across a range of social science disciplines have long understood that a typical pattern of domestic abuse also includes economic abuse as a tactic used by perpetrators to control their partners' behavior (Tjaden and Thoennes, 1998). Economic abuse consists, inter alia, of sabotage actions that act as barriers to the employability and job performance of the victim (Swanberg and Macke, 2006; Adams et al., 2008).[1] For example, there is evidence of abusers starting fights and keeping their partners up all night before an important job interview or test. Others are disrupting their partner's work effort or try to damage their reputation at work. Some perpetrators sabotage their partner's child care arrangements etc. The various tactics used by abusers share the common

[☆]Earlier versions of this paper were presented at the Geary Institute, FEDEA Madrid, EEA in Malaga, CESifo Area Conference on Employment and Social Protection, University College Dublin, and at the Universities of Munich, Konstanz and St Gallen. We are grateful to participants for their comments.

Email addresses: Dan.Anderberg@rhul.ac.uk (Dan Anderberg), rainer@ifo.de (Helmut Rainer)

[1]Indeed, the so-called Work/School Abuse Scale (W/SAS) survey instrument was constructed to measure interference with employment and education by abusive males (Riger et al., 2000).

feature that they thwart the victim's work or training efforts, in some cases through direct physical violence.[2]

Economic abuse has so far remained a relatively "unseen side" of domestic violence. Indeed, recent research in economics on the causes of domestic violence has focused mainly on physical abuse. The most commonly used framework, which builds on the cooperative approach, assumes that some males have a preference for physical violence and women tolerate it in return for higher transfers (Tauchen et al., 1991; Farmer and Thiefenthaler, 1997; Aizer, 2010).[3] While this literature has been insightful, no attempt has yet been made to understand intrahousehold economic abuse. In particular, no explanation has been put forward regarding what might drive husbands who, as their wives enter employment or increase hours of work, turn into saboteurs and contrive to pull them back down. With this paper, we aim to fill this void by presenting a theory of intrahousehold sabotage which rationalizes economically abusive behavior within partnerships.[4]

The key feature of our analysis is to think of economically abusive behavior as emerging endogenously from the internal organization of the family. More specifically, our theory is predicated on the idea that incentives for sabotage are a consequence of spousal disagreements regarding their respective economic roles, modeled here as having its root cause in the time allocated to the provision of family-specific public goods. To this effect, we present a model which depicts family behavior as a noncooperative game. However, we also assume that partners have caring preferences, which implies that, for couples with "near complete caring", equilibrium behavior is nearly "completely cooperative". Hence the caring parameter effectively parameterizes the degree of noncooperation. In the model, each partner derives utility from own private consumption and from a household public good which is produced using time-inputs by both partners. In the noncooperative equilibrium, spouses do not provide the efficient level of the family public good, and each partner would like the other to work less in the labor market and to contribute more time to household production activities. We allow for transfers between the partners. Transfers serve two purposes. First, a partner may use a transfer to support the other's consumption. Second, a transfer by one partner may also serve the purpose of influencing the other's time allocation.

The only gender asymmetry in the model is that men are assumed to have the option of using economically abusive behavior. A motivating fact for this assumption is that most victims of domestic violence in general and economic abuse in particular are women. Economic abuse in our model is an instrumental activity that is directly targeted at women's labor market opportunities. This modeling approach is motivated by the observation, outlined in detail below, that abusive males routinely sabotage their partner's labor market activities. In particular, we will identify instrumental incentives for economic abuse with the husband's equilibrium utility being locally decreasing in the wife's earnings capacity. We assume that, by behaving economically abusive, the husband can damage his partner's earnings capacity through direct and indirect interference with work efforts.

[2]According to the literature, the examples highlighted above are repeatedly reported by victims of domestic violence (see, e.g., Johnson, 1995; Brandwein and Filiano, 2000; Raphael and Tolman, 2000; Swanberg and Logan, 2004; Swanberg and Macke, 2006)

[3]Others have argued that intimate partner violence represents expressive behavior that is triggered when conflictual situations escalate out of control (Card and Dahl, 2011) or suggested that males use partner violence to extract transfers from the victim's family (Bloch and Rao, 2002). See below for a brief survey.

[4]Throughout the paper, the terms "economic abuse" and "sabotage" are synonymous. Similarly, the terms "husband/wife" and "partner" are used interchangeably since the legal distinction between marriage and cohabitation plays no role in our analysis.

We obtain three main sets of results. First, we derive and analyze the set of parameter values under which intrahousehold sabotage emerges as instrumental equilibrium behavior. A key result is that the husband's incentives for economic abuse are effectively inversely U-shaped in the wife's relative wage. On the one hand, when the wife has a very low wage relative to the husband, he supports her financially through a monetary transfer and she will voluntarily specialize completely in household production. Since the wife's post-transfer time allocation choice coincides with her partner's preferred outcome, the relationship stays free of economically abusive behavior. On the other hand, when the wife has a very high wage relative to the husband, her labor market income is too important for the household for him to sabotage her earnings capacity. Instead, incentives for economic abuse obtain when her relative wage is at an intermediate level. In this case, it is individually rational for the wife to enter employment, but the husband's preferred choice is for her to stay specialized at household production. The husband attempts to shift the woman's employment choice towards his preferred specialization outcome through his monetary transfer. However, from the perspective of the husband, he would be better off is her wage was lower, thus giving him an incentive to sabotage her work efforts. Hence the model effectively predicts that economic abuse is associated with the wife's labor supply being contentious and economic roles in the family "hanging in the balance". Second, we demonstrate that economic abuse will not occur among couples' whose behavior is characterized by complete cooperation. In the current framework, intrahousehold sabotage as an equilibrium phenomenon requires some degree of noncooperation between partners and is ultimately triggered by the misalignment of spousal preferences regarding the intrahousehold allocation of time. Even though this result should not come as a surprise, it underscores the difference between our approach and bargaining theories of domestic violence where physical abuse may obtain under complete cooperation between spouses. Third, our framework serves to highlight some policy dilemmas as it allows us to think about the consequences of welfare policy. We show that various welfare policies (e.g., unconditional family cash benefits) aimed universally at all households shift the incidence of economic abuse without necessarily reducing it. In order to reduce economic abuse, different types of households have to be targeted with different types of instruments.

Central to our model is the notion of economic abuse by males being "instrumental" and directly related to women's economic activity. The notion that abusive males target their partners' work or schooling efforts is well-documented in the literature (Raphael 1995, 1996). Sabotage tactics used by abusive males noted in the literature include, but are not limited to, the destruction of homework assignments, keeping women up all night with arguments and fights before key tests or job interviews, turning off alarm clocks, destroying or hiding clothes, or failing to show up as promised for child care or transportation (Tjadden and Thoennes, 1998; Zachary, 2000). As a result, employed victims may experience lower productivity, higher absenteeism rates, and more frequent tardiness (Tolman and Rosen, 2001; Swanberg and Macke, 2006). However, a husband may also play the role of saboteur through innuendo, e.g. through spreading rumors about her at her place of work.[5] Finally, covert forms of sabotage may occur on the home front when a man tries to reinforce his wife's responsibility for traditional female duties or accuses her of neglecting the family.

Interference with work effort by abusive males appears to be commonplace. Tolman and Rosen (2001) in a study of 753 female welfare recipients in Michigan document that 48 percent of those who

[5]It is increasingly common to come across articles in popular magazines as varied as *Forbes* or *Elle* about "sabotaging husbands" using tactics of rumor, innuendo or discrediting against their employed wives (Bazelon, 2009).

had experienced severe violence in the preceding 12 months also reported some form of direct work interference. Similarly, in a study of 1,082 applicants for public assistance in Colorado, Pearson et. al (1999) found that 44 percent of domestic violence victims reported that their abusive partners had prevented them from working.

Our work is related to two different strands of research on household behavior, on domestic violence and non-cooperative family decision-making. The main theories of domestic violence that have been put forward or used in the recent economic literature can be broadly placed into three categories: "bargaining theory", "signaling theory", and "cue-triggered theory". Bargaining theory (Tauchen et al., 1991; Farmer and Thiefenthaler, 1997; Aizer, 2010) posits that some males have preferences for inflicting pain or injury onto their female partners, and emphasizes intra-household bargains whereby husbands effectively bribe their wives into accepting some level of physical violence by offering side payments in return. Thus, acts of violence may become part of a Pareto-improving trade between spouses. The key prediction of bargaining theories is that increasing a woman's relative wage increases her bargaining power and monotonically decreases the level of violence by improving her outside option. In signaling theory (Bloch and Rao, 2002), a male's "satisfaction" with his marriage is private information. While satisfied husbands would never engage in violence, dissatisfied husbands have less aversion towards using violence and may do so in order to signal their dissatisfaction, thereby extracting transfers from the wife's family. In the behavioral "cue-triggered theory" (Card and Dahl, 2011), males may fundamentally have a preference against being abusive but may become violent as a result of "losing control" in response to some negative cues, the exposure to which they control in order to maximize their own ex ante utility.

Our approach to modeling economic abuse entails characterizing family decision-making as non-cooperative.[6] We advocate this approach even through the dominant premise in the theory of the family is that households are able to reach efficient outcomes (Becker 1991; Manser and Brown, 1980; McElroy and Horney, 1981; Chiappori, 1992; Chiappori et al., 2002). Indeed, in our setting, households will reach (near) efficient outcomes if their caring is (nearly) complete. Complete or near complete caring may well characterize a large proportion of existing couples, thus implying that assuming efficiency is a reasonable first approximation of typical household behaviour in other settings. It does not, however, imply that assuming efficiency is a useful approach to modeling intrahousehold sabotage. The key point that we would stress here is an obvious one, namely that the idea that domestic abuse of any kind is efficient and welfare enhancing is at odds with the universal view that it is a harmful activity that society should try to prevent.

The paper proceeds as follows. In Section 2 we set out our model of economic abuse, discuss our assumptions, and analyze the equilibrium of the model. We then in Section 3 investigate policy. The main focus here will be to show that welfare policies shift the incidence of domestic violence in predictable ways. Section 4 provides a simple Cobb-Douglas example which illustrates our results. Section 5 concludes with a discussion of the empirical relevance of our results and some pointers for future research.

[6] Various kinds of non-cooperative models have been put forward in the literature, e.g. by Bergstrom, 1989; Lundberg and Pollak, 1993; Konrad and Lommerund, 1995; Chen and Woolley, 2001; and Anderberg, 2007.

2. The Model

2.1. The Formal Setup

Consider an economy consisting of households, where, in each household, there is a husband (h) and a wife (s). Each partner i ($i = h, s$) obtains utility from private consumption, c_i, and a home-produced household public good, Q. For simplicity we assume separable preferences with a common utility function over the household public good. Formally, let the preferences of partner i be represented by

$$u_i(c_i, Q) = v_i(c_i) + Z(Q), \tag{1}$$

where v_i is twice continuously differentiable, strictly increasing, strictly concave and $\lim_{c_i \to \infty} v_i'(c_i) = 0$ and $\lim_{c_i \to 0} v_i'(c_i) = \infty$. Each spouse has a unit of active time endowment, to be allocated between market work, ℓ_i, and home production, $q_i \equiv 1 - \ell_i$. We denote the household production function by $Q = Q(q_h, q_s)$. The properties of $Z(\cdot)$ and $Q(\cdot, \cdot)$ are discussed below.

We assume "caring preferences": each partner puts a weight of $\mu \in (0, 1/2)$ on the private utility of the spouse and a (larger) weight $(1 - \mu)$ on own private utility. The total preferences of partner i are thus

$$U_i(c_i, c_{-i}, Q) = (1 - \mu)u_i(c_i, Q) + \mu u_{-i}(c_{-i}, Q). \tag{2}$$

Note that the limit as μ approaches one-half corresponds to a situation of full cooperation. In this case, the partners pursue the same objectives and hence will operate on the Pareto frontier. Conversely, the limit as μ approaches zero corresponds to a situation of pure noncooperation. Our model, therefore, also allows consideration of how the incidence of domestic abuse varies with the degree of (non)cooperation within a partnership.

When working in the labor market, partner i can earn a wage $w_i \in W_i \equiv [\underline{w}_i, \overline{w}_i]$, $i = h, s$. We will refer to the wage profile (w_h, w_s) as a couple's "type" and assume that couple-types are distributed according to some continuous distribution G on the support $W_h \times W_s$ (with positive density on the entire support).

The model also allows for unearned income y_i. However, for the baseline scenario, we assume $y_i = 0$. Positive unearned income will be considered in the context of welfare policy in Section 3. Finally, partner i can make a transfer $t_i \geq 0$ to the spouse, and we let $t \equiv t_h - t_s$ denote the net transfer from the husband to the wife.

By substituting for u_i and Q in (2), individual i's total preferences can be written as

$$U_i(c_i, c_{-i}, \ell_i, \ell_{-i}) = (1 - \mu)v_i(c_i) + \mu v_{-i}(c_{-i}) + z(1 - \ell_h, 1 - \ell_s), \tag{3}$$

where $z(q_h, q_s) \equiv Z(Q(q_h, q_s))$ is the composition of the utility from Q with the household production function. We assume that the partners' time inputs into household production are "independent":

Assumption 1 (Household Production Technology)**.** *The composite function $z(q_h, q_s)$ is additively separable,*

$$z(q_h, q_s) = z_h(q_h) + z_s(q_s),$$

with each $z_i(\cdot)$ being twice continuously differentiable, strictly increasing and strictly concave and with $\lim_{q_i \to 0} z_i'(q_i) = \infty$ ($i = h, s$).

Throughout the analysis we view household time allocation choices as being associated with a Nash equilibrium point. By contrast, much of the existing literature on household behavior

implicitly appeals to folk theorems to argue that efficient resource allocations can be sustained through repeated interaction. This argument ignores, however, that these results apply if and only if individuals are infinitely patient, i.e., in the limit as discount factors tend to one. If one allows more realistically for heterogeneity of discount factors, then families would sort endogenously into cooperative and non-cooperative resource allocation regimes. Recent econometric evidence from a intrahousehold time allocation model which allows for this type of heterogeneity suggests that a sizeable proportion of couples—roughly 25 percent—behaves non-cooperatively (Del Boca and Flinn, 2012). There are other issues in the analysis of repeated games (e.g., finiteness of interactions, renegotiation proofness, completeness of information) which imply that it cannot be taken for granted that households generally achieve Pareto-efficient outcomes. Thus, it is important to allow for non-cooperative behavior when analyzing the behavior of couples, especially in the context of wasteful and destructive phenomena such as abuse or sabotage.

We adopt the following timing of events. First, the husband chooses whether or not to engage in sabotage. Second, the spouses simultaneously and non-cooperatively choose transfers. Finally, the spouses simultaneously and non-cooperatively decide on how to allocate their unit time endowment between market work and the production of the household public good. The analysis that follows assumes complete information and characterizes the choices of the two family members in reverse order. The only fundamental gender asymmetry in our model is with respect to the husband's ability to sabotage the wife's labor market activities. We assume that sabotage behavior has no other direct effect than lowering the wife's earnings potential. For example, a husband might undermine his wife's job prospects and wage by being rude to her employer or coworkers or by deliberately limiting her transportation choices. While physical abuse may sometimes also serve as an instrument for sabotage, we are not considering severe forms of violence that harm both the victim's job prospects and productivity in home production. Since sabotage behavior interferes with the victim's potential wage in the labor market, it may be thought of as instrumental behavior by the husband to achieve some control over the time allocation of the wife.

2.2. The Time Allocation

Taking unearned incomes, transfers and the spouse's time allocation as given, partner i solves

$$\max_{\ell_i \in [0,1]} \left\{ U_i \left(c_i, c_{-i}, \ell_i, \ell_{-i} \right) | c_i = w_i \ell_i + Y_i \right\}, \tag{4}$$

where

$$Y_i \equiv y_i - t_i + t_{-i}. \tag{5}$$

The first-order condition for an interior optimum reads

$$(1 - \mu)\, v_i'(w_i \ell_i + Y_i) w_i \leq z_i'(1 - \ell_i). \tag{6}$$

Note that (6), which will hold with equality when $\ell_i > 0$ and with inequality when $\ell_i = 0$, only involves the "own" wage and unearned income. Thus, each partner has a strictly dominant time allocation strategy, which we denote $\ell_i \left(w_i, Y_i \right)$. By Assumption 1, we can be sure that neither partner will fully specialize in market work.

In general, the effect of i's own wage on ℓ_i is ambiguous due to conflicting income and substitution effects. We will assume, however, that the substitution effect dominates so that individual i's labor supply is non-decreasing in the own wage. This assumption captures the idea that the husband can reduce the wife's formal labour supply by interfering with her earnings capacity.

Assumption 2 (Effect of Own Wage on Labor Supply)**.** *The substitution effect dominates the income effect so that individual i's labor supply is non-decreasing in her own wage:*

$$\frac{\partial \ell_i(w_i, Y_i)}{\partial w_i} \geq 0 \quad \textit{for} \quad i = h, s.$$

We denote the wage elasticity of labour supply by

$$\varepsilon_i(w_i, Y_i) \equiv \frac{\partial \ell_i(w_i, Y_i)}{\partial w_i} \frac{w_i}{\ell_i(w_i, Y_i)} \quad \text{for} \quad i = h, s, \tag{7}$$

which, by Assumption 2, is also positive. We define the individual's earnings function as

$$m_i(w_i, Y_i) \equiv w_i \ell_i(w_i, Y_i) \quad \text{for} \quad i = h, s. \tag{8}$$

While the individual's earnings will be decreasing in Y_i, it must be that

$$\frac{\partial m_i(w_i, Y_i)}{\partial Y_i} \in (-1, 0). \tag{9}$$

This follows immediately from the fact that, with separable preferences, the individual's consumption must be increasing in Y_i. The fact that partner i's earnings are decreasing in Y_i reflect that his/her labor supply is decreasing in Y_i. Looking ahead towards the transfer decisions, this implies that each partner i can induce the other to reduce his/her labor supply by increasing the transfer t_i.

It is also straightforward to demonstrate that partner i's labor supply is decreasing in the caring parameter μ. This follows from the fact that, at any $\mu < 1/2$, there is an inefficiency in the chosen labor supplies. In particular, each partner works "too much" from the perspective of the spouse. To see this, note that partner i values an increase in the earnings of partner $-i$ at $\mu v'_{-i}(c_{-i})$ whereas partner $-i$ values it more highly at $(1-\mu) v'_{-i}(c_{-i})$. The closer μ is to one-half, the more each partner "internalizes" this effect and hence chooses a lower level of market work.

We will also make a set of further assumptions which we impose directly on the labor supply functions rather than on the primitives as the corresponding assumptions on the primitives would be highly involved and contain difficult-to-interpret third derivatives of $v(\cdot)$ and $z(\cdot)$.

Assumption 3 (Second Derivatives of Labor Supply)**.**

1. *Convexity of labor supply and earnings in unearned income:*

$$\frac{\partial^2 \ell_i(w_i, Y_i)}{\partial Y_i^2} \geq 0;$$

2. *Positive cross-partial for earnings:*

$$\frac{\partial^2 \ell_i(w_i, Y_i)}{\partial Y_i \partial w_i} \geq -\frac{1}{w_i} \frac{\partial \ell_i(w_i, Y_i)}{\partial Y_i}.$$

3. *Concavity of labor supply in wage — decreasing labor supply elasticity:*

$$\frac{\partial^2 \ell_i(w_i, Y_i)}{\partial w_i^2} \leq -\frac{(1 - \varepsilon_i(w_i, Y_i))\, \varepsilon_i(w_i, Y_i)}{w_i^2 / \ell(w_i, Y_i)};$$

Part (i), which is *equivalent* to earnings being a weakly convex function of unearned income, is used below to demonstrate that, if one partner is making a transfer to the other, then the donor's utility is a concave function of the transfer. Many common utility specifications, including the Cobb-Douglas and CES case (see below), satisfy this assumption through $\ell_i(w_i, Y_i)$ being linear in Y_i.

Part (ii) is *equivalent* to the cross-partial of the earnings function $m(w, Y)$ being non-negative. This assumption is a sufficient (but not necessary) condition for the transfer given from partner i to $-i$ being decreasing in the recipient's wage when the recipient is working. This condition is satisfied with equality in the Cobb-Douglas case and holds in the CES case if and only if the elasticity of substitution exceeds unity.

Part (iii) says that the individual's labour supply is a sufficiently concave function of the wage. The particular assumption is *equivalent* to the wage elasticity $\varepsilon_i(w_i, Y_i)$ being decreasing in w_i.[7] This is used below to argue that the husband's incentives for abuse eventually diminish as the wife's wage grows. The assumption is satisfied by Cobb-Douglas and CES preferences whenever $Y_i \geq 0$. Taken together, the assumptions also imply that the elasticity $\varepsilon_i(w_i, Y_i)$ is increasing in unearned income.[8]

2.3. The Transfer Decision

Each partner has two potential motives for transferring income to the spouse. First, to support the spouse's consumption. Second, to induce the spouse to work less in the labor market. We will characterize here the transfer t_i from partner i to the spouse $-i$ under the assumption that $-i$ is not making any transfer back, i.e. that $t_{-i} = 0$ (and under the maintained assumption of zero unearned income for both partners). Below we will verify that, indeed, in equilibrium at most one partner will be making a positive transfer.

We will demonstrate that partner i's choice of t_i, when viewed as a function of the spouse's wage w_{-i}, has four "regimes". First, in the **low-wage regime**, partner i makes a pure "*benevolent transfer*", denoted $t_i^0(w_i, w_{-i})$, and $-i$ *strictly* prefers not to work. Second, in the **low-to-medium wage regime**, partner i makes a "*crowding out*" transfer, denoted $t_i^1(w_i, w_{-i})$, and $-i$ *just* prefers not to work. Third, in the **medium-to-high wage regime**, partner i makes a positive transfer, denoted $t_i^2(w_i, w_{-i})$, and $-i$ works some strictly positive amount of time. Finally, in **high wage regime**, partner i does not make a transfer and $-i$ works some strictly positive amount of time. The following proposition formalizes partner i's transfer behavior:

Proposition 1 (Individual Transfer Choices)**.** *For given $w_i > 0$ (and given $y_i = y_{-i} = 0$ and $t_{-i} = 0$) there exist three critical wages for the spouse, $w_{-i}^k(w_i), k = 0, 1, 2$, ranked increasingly in k and each strictly increasing in w_i, such that:*

1. *When $w_{-i} < w_{-i}^0(w_i)$, partner i makes a ("benevolent") transfer $t_i^* = t_i^0(w_i, w_{-i})$, which is strictly increasing in w_i and independent of w_{-i}, and $-i$ (strictly) fully specializes in household production, $\ell_{-i}^* = 0$.*

[7] To see this, note that differentiating (7) yields that $w_i \frac{\partial \varepsilon_i}{\partial w_i} = \frac{\partial^2 \ell_i}{\partial w_i^2} \frac{w_i^2}{\ell_i} + \frac{\partial \ell_i}{\partial w_i} \frac{w_i}{\ell_i} \left(1 - \frac{w}{\ell_i} \frac{\partial \ell_i}{\partial w_i}\right)$.

[8] Differentiating (7) yields that $\ell_i \frac{\partial \varepsilon_i^w}{\partial Y_i} = \frac{\partial^2 m_i}{\partial Y_i \partial w_i} - \frac{\partial \ell_i}{\partial Y_i} \left(1 + \frac{\partial \ell_i}{\partial w_i} \frac{w_i}{\ell_i}\right)$ which is positive due to the cross-partial of the earnings function being positive, and $\partial \ell_i / \partial Y_i < 0$ and $\partial \ell_i / \partial w_i > 0$.

2. *When* $w_{-i} \in [w^0_{-i}(w_i), w^1_{-i}(w_i)]$, *partner* i *makes a ("crowding-out") transfer* $t^*_i = t^1_i(w_i, w_{-i})$, *which is independent of* w_i *and strictly increasing in* w_{-i}, *and* $-i$ *(just) fully specializes in household production,* $\ell^*_{-i} = 0$.
3. *When* $w_{-i} \in [w^1_{-i}(w_i), w^2_{-i}(w_i)]$, *partner* i *makes an ("interior") transfer* $t^*_i = t^2_i(w_i, w_{-i})$, *which is strictly increasing in* w_i *and strictly decreasing* w_{-i}, *and* $-i$ *works positive hours,* $\ell^*_{-i} > 0$.
4. *When* $w_{-i} \geq w^2_{-i}(w_i)$, *partner* i *makes no transfer* $t^*_i = 0$, *and* $-i$ *works positive hours,* $\ell^*_{-i} > 0$.

The benevolent transfer $t^0_i(w_i, w_{-i})$ equalizes the marginal utility of each partner's consumption as viewed from the perspective of i's preferences under the assumption that the spouse has no earnings,

$$(1-\mu)v'_i(c_i) = \mu v'_{-i}(c_{-i}). \tag{10}$$

This is an equilibrium when the spouse chooses not to work when provided with the benevolent transfer. Indeed, the first critical wage, $w^0_{-i}(w_i)$, is defined as the highest w_{-i} at which $-i$ prefers not to work upon receiving $t^0_i(w_i, w_{-i})$.

Whenever $w_{-i} > w^0_{-i}(w_i)$, $-i$ would choose to work some strictly positive hours if provided with $t^0_i(w_i, w_{-i})$. For a range of w_{-i}, up to a second critical wage $w^1_{-i}(w_i)$, partner i then increases the transfer t_i so as to (just) ensure that the spouse chooses not to work. Thus, the "crowding out" transfer $t^1_i(w_i, w_{-i})$ is characterized by the first order condition for $-i$'s labor supply (6) holding with equality at $\ell_{-i} = 0$. As an increase in w_{-i} strengthens $-i$'s labor supply incentives, it also increases $t^1_i(w_i, w_{-i})$. As the spouse's wage increases further, it eventually no longer becomes optimal for partner i to completely crowd out the spouse's labor supply. However, the transfer chosen by partner i even in this case will be aimed in part at reducing the spouse's labor supply. The first order condition characterizing the "interior" $t^2_i(w_i, w_{-i})$ transfer is

$$(1-\mu)\, v'_i(c_i) = v'_{-i}(c_{-i}) \left[\mu - (1-2\mu)\, \frac{\partial m_{-i}}{\partial Y_{-i}}\right]. \tag{11}$$

Note that $t^2_i(w_i, w_{-i})$ contains both a benevolent aspect and a labor supply reducing aspect. The two remaining critical wages, $w^1_{-i}(w_i)$ and $w^2_{-i}(w_i)$, are characterized by the recipient's labor supply at the interior transfer going down to zero and the interior transfer itself going down to zero, respectively.

Figure 1 illustrates the transfer made by partner i as a function of the spouse's wage w_{-i} for a given own wage w_i. Note in particular how the transfer is a non-monotonic function of w_{-i}.

The hatched line in Figure 1 shows the effect of an increase in the own wage w_i. From Proposition 1 we know that an increase in w_i increases both the benevolent transfer $t^0_i(w_i, w_{-i})$ and the interior transfer $t^2_i(w_i, w_{-i})$ which in turn increases all three critical wages, $w^k_{-i}(w_i), k = 0, 1, 2$. As the figure illustrates, this implies that the equilibrium transfer made by partner i, denoted $t^*_i(w_i, w_{-i})$ is (weakly) increasing in the own wage w_i.

Lemma 1 (Effect of Own Wage on Transfers)**.** *The equilibrium transfer* $t^*_i(w_i, w_{-i}) > 0$ *is weakly increasing in* w_i.

In characterizing the transfer made by partner i we have assumed that no simultaneous transfer was made from the spouse back to partner i. This can be easily verified.

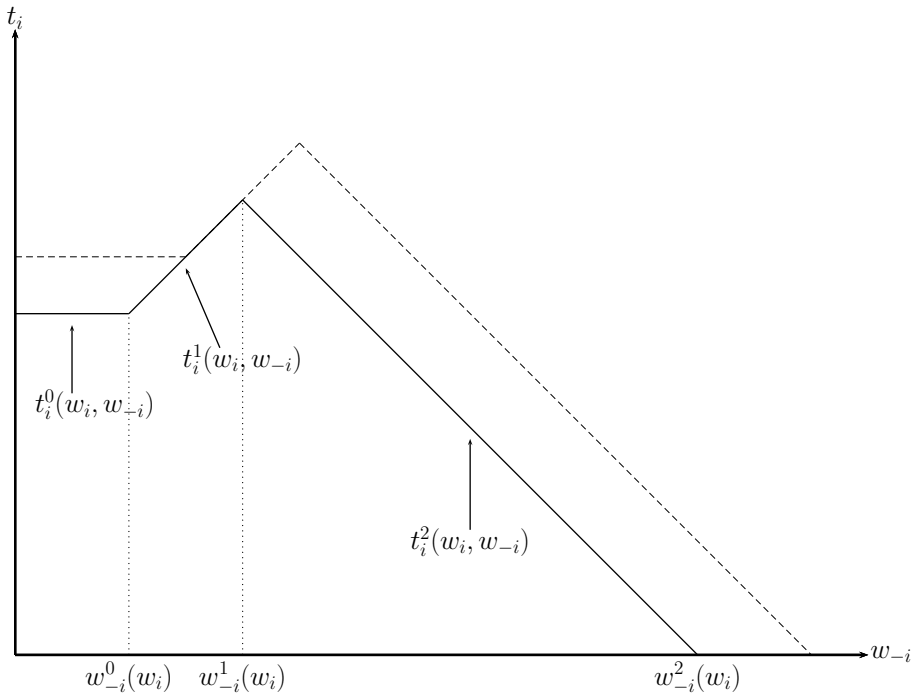


Figure 1: The transfer made by partner i as a function of the spouse's wage

Lemma 2 (No Simultaneous Transfers)**.** *If partner i makes a positive equilibrium transfer, $t_i^*(w_i, w_{-i}) > 0$, then the spouse $-i$* strictly *prefers not to make a transfer, $t_{-i}^*(w_{-i}, w_i) = 0$.*

Indeed, the proof of Lemma 2 demonstrates that, for any given w_i there will exist a *range* of spousal wages w_{-i} such that both i and $-i$ choose not to make any transfer in equilibrium. Hence in a population of couples with a distribution of wage-profile types, equilibrium transfers will be zero for a positive measure of couples. In the limiting case of complete caring ($\mu = 1/2$) the measure of couples who make no transfers reduces to zero as, in the limit, the partners agree on the consumption allocation and this allocation will, generically, not coincide with the partners' income profile.

To summarize, if one partner makes an equilibrium transfer to the spouse, he/she does so to support the spouse's private consumption and to influence the spouse's time allocation away from market work. We now ask *whether* and *when* the husband has an incentive to resort to an additional means of influence, namely economic abuse.

2.4. Incentives for Intrahousehold Sabotage

We identify incentives for economic abuse with the husband's equilibrium utility being locally decreasing in the wife's earnings capacity. The following result, which is interpreted after its statement, reveals that the risk of intrahousehold sabotage is present when the economic roles within the partnership, in a sense, "hang in the balance".

Proposition 2 (Economic Incentives for Sabotage)**.** *For a given w_h (and given $y_h = y_s = 0$) there exists a critical wage $w_s^*(w_h)$ such that the husband has an incentive to engage in sabotage behavior when $w_s \in (w_s^0(w_h), w_s^*(w_h))$. The critical wage $w_s^*(w_h)$ strictly exceeds $w_s^1(w_h)$ and is weakly increasing in w_h.*

The proposition states that the husband's incentives for economic abuse kick in when his benevolent transfer is not sufficient to induce the wife to fully specialize in household production, i.e. when $w_s > w_s^0(w_h)$, and they continue up to some level of the wife's wage at which she is working in equilibrium. The result has a simple intuition. For any $w_s \leq w_s^0(w_h)$, the husband makes the "benevolent transfer" $t_h^* = t_h^0(w_h, w_s)$, which is sufficient to induce the wife to fully specialize in household production. Her wage is low enough to be, in effect, irrelevant and any further reduction in w_s would leave the equilibrium entirely unchanged. Thus, the relationship will remain abuse free.

Consider then the case where $w_s \in (w_s^0(w_h), w_s^1(w_h))$, implying that the husband chooses the crowding out transfer $t_h^* = t_h^1(w_h, w_s)$. In this case, the husband is making a transfer which exceeds the one he would voluntarily make, but the wife is still not working in equilibrium. The husband's equilibrium utility would be increased by a reduction in the wife's wage as this would allow him to reduce his transfer towards his benevolent transfer. Thus, he has an economic incentive to sabotage her earnings potential.

Finally, consider the case where $w_s > w_s^1(w_h)$ so that, in equilibrium, the wife works and the husband either makes the "interior" transfer $t_h^2(w_h, w_s)$ or no transfer at all. In this case, the impact of a marginal increase in the wife's wage on the husband's equilibrium utility can be written as

$$v_s'(c_s^*)\ell_s^* \left[\mu - (1-2\mu)\,\varepsilon_s\left(w_s, t_h^*\right)\right], \tag{12}$$

and it can be demonstrated that this expression is strictly negative as w_s approaches $w_s^1(w_h)$ from above (see proof of Proposition 2). This establishes that incentives for economic abuse will also be present for some couples where the wife works. The expression in (12) is negative if and only if

$$\mu < \frac{\varepsilon_s\left(w_s, t_h^*\right)}{\left[1 + 2\varepsilon_s\left(w_s, t_h^*\right)\right]}. \tag{13}$$

As the wife's wage increases, her labour supply responsiveness decreases, thus decreasing the right hand side.[9] Instead, for a high enough wife's wage, his equilibrium utility will be increasing in her wage as he benefits, through caring, from her higher earnings.

Note that in characterizing the husband's incentives for economic abuse, we have ignored any potential transfer from the wife to the husband. However, it should be clear enough that any transfers from the wife to the husband will weaken the husband's abuse incentives as we know from Lemma 1 that the transfer that the wife makes to the husband will be increasing in her wage. Hence by interfering with her earnings capacity, the husband would also reduce the transfer that he obtains from her.

Finally, note that economic incentives for intrahousehold sabotage obtain from the inefficiency in public good provision associated with incomplete caring. The following result shows that, when partners behave nearly "completely cooperative", then they will abstain from abuse altogether:

Proposition 3 (Household Mode of Behavior and Intrahousehold Sabotage)**.** *In the limit with complete caring, $\mu \to \frac{1}{2}$, the set of wages profiles $w_s \in (w_s^0(w_h), w_s^*(w_h))$ at which the husband has incentives to engage in sabotage behavior reduces to the empty set.*

[9] When the husband is making the interior transfer $t_h^2(w_h, w_s)$ this effect is further reinforced by this transfer decreasing in w_s.

While this result is highly intuitive, it is at same time in stark contrast to the insights provided by bargaining theories of domestic violence. Indeed, our framework implies that, with complete caring, couples pursue a common objective and the household operates at an agreed point on the Pareto frontier. In this cooperative-like setup, an act of sabotage which reduces the wife's earnings capacity would then simply reduce the utility possibility set and would hence never increase the husband's equilibrium utility. In bargaining theories, by contrast, acts of violence occur when they increase the utility possibility set and consequently become part of a Pareto-improving trade (involving compensating side-payments) between spouses.

3. The Effect of Welfare Policy

Our analysis provides an instrumental basis for behavior which many others attribute to a taste for sadism or a pleasure of exercising power. This is important because tastes are hard to manipulate, while incentives are less so. Thus, our theoretical structure allows to get a clear sense of the margins where we may see a change in the incidence of economic abuse when a government intervenes with families. In this section, we will consider two very simple examples of policy interventions: a wage subsidy policy and a flat-rate benefit policy, with either policy potentially being gender-specific.

Consider first a wage subsidy policy and let $\sigma_i \geq 0$ denote the subsidy rate that applies to partner i, $i = h, s$. The *effective wage* for partner i is hence $\widetilde{w}_i \equiv (1 + \sigma_i)\, w_i$, and we refer to w_i as the individual's *primary wage*. We are interested in understanding how a wage subsidy offered to either gender affects the range of wife's primary wages at which the husband engages in abusive behavior.

The analysis of wage subsidies is much simplified by the insight that what matters for abuse incentives are the partners' effective wages. This immediately implies that a wage subsidy provided to women will shift downwards the set of wives' primary wages at which the husband has incentives for sabotage. For example, a woman whose primary wage is low enough that she, in the absence of a wage subsidy, would choose not to work at the husband's benevolent transfer may find that, once provided with a wage subsidy, she would prefer to work given the same transfer. Hence a wage subsidy provided to women may expose some low wage women to the risk of abuse. Conversely, a woman whose primary wage would not be high enough to put her beyond the risk of economic abuse, may find that a positive wage subsidy increases her effective wage enough to do so.

Similarly, since the boundaries of the abuse region, $w_s^0(w_h)$ and $w_s^*(w_h)$, are increasing in the husband's wage, it follows that a wage subsidy provided to the husband shifts upwards the set of wives' primary wages at which the husband has incentives for sabotage. Hence, a wage subsidy provided to the husband will reduce economic abuse against some low wage women who, with the husband's subsidy, will choose not to work at his benevolent transfer. Conversely, by reducing the women's relative wage, a wage subsidy provided to males, will put into the abuse region some women whose wages would otherwise have been sufficiently large to put them beyond the risk of economic abuse.

Proposition 4 (Effect of Wage Subsidies)**.**

1. *A wage subsidy given to the husband, $\sigma_h > 0$, increases both the lower- and the upper bound, $w_s^0(w_h)$ and $w_s^*(w_h)$, of the set of wage profiles at which the husband has equilibrium incentives to engage in sabotage behavior.*

2. *A wage subsidy given to the wife, $\sigma_s > 0$, decreases both the lower- and the upper bound, $w_s^0(w_h)$ and $w_s^*(w_h)$, of the set of wage profiles at which the husband has equilibrium incentives to engage in sabotage behavior.*

While the effect of wage subsidies are highly intuitive, the effect of flat-rate benefits are perhaps somewhat more surprising. So far we have focused on the case where the unearned income for each partner was zero, $y_i = 0$ $(i = h, s)$. We will now look at how a marginal increase, starting from zero, in either partner's unearned income affects the equilibrium in general and abuse incentives in particular, and will refer to this as the effect of an *introduction* of a gender-specific flat rate benefit. A crucial aspect for understanding the impact of flat rate benefits on abuse incentives is whether, in equilibrium, there is a positive transfer from either partner to the spouse. If, in equilibrium, either partner is making a positive transfer, a local "income pooling property" applies:

Lemma 3 (Income Pooling)**.** *If, in equilibrium, partner i is making a positive transfer to the spouse, $t_i^* > 0$, then $\partial t_i^*/\partial y_i - \partial t_i^*/\partial y_{-i} = 1$.*

The key implication of local income pooling is that, locally (i.e. for small variations), only *total* household unearned income, $y_h + y_s$, matters for the equilibrium outcome. This in turn implies that the effect of the introduction of a flat-rate benefit is necessarily the same irrespective of which partner it is given to.

Consider then first the effect of the introduction of a flat-rate benefit on the lower bound on the set of wife's wages at which the husband has incentives for economic abuse, $w_s^0(w_h)$. At the wage profile $\left(w_h, w_s^0(w_h)\right)$ the husband is making a positive (benevolent) equilibrium transfer (see Proposition 1), and hence there is local income pooling. Moreover, as intuition suggests, providing the husband with a flat rate benefit will make him increase his benevolent transfer, which in turn will expand the set of wife's wages at which she will have no incentive to work, thus raising the lower bound $w_s^0(w_h)$ on the abuse region. Due to income pooling, the effect of the introduction of a flat rate benefit provided to the wife is identical.

Consider next the impact of a small flat benefit on the upper bound on the set of wife's wages at which the husband has incentives for economic abuse, $w_s^*(w_h)$. If $w_s^*(w_h) < w_s^2(w_h)$ then the husband is making a positive (interior) transfer at the wage profile $(w_h, w_s^*(w_h))$ (see Proposition 1), and hence there is again local income pooling. If the husband is provided with small flat benefit he will increase his transfer. The indirect effect of this additional unearned income accruing to the wife is to increase the her labour supply wage responsiveness, which enhances the husband's sabotage incentives, thus increasing $w_s^*(w_h)$. From local income pooling, we know that the effect of a flat rate benefit to the wife is the same. If $w_s^*(w_h) < w_s^2(w_h)$, then the husband is not making any transfer at the wage profile $(w_h, w_s^*(w_h))$. In this case a flat benefit provided to the husband has no impact on $w_s^*(w_h)$. In contrast, a flat benefit provided to the wife directly increases her wage responsiveness, giving the husband stronger abuse incentives, thus again increasing $w_s^*(w_h)$.

Proposition 5 (Effect of Flat Rate Benefits)**.**

1. *The introduction of a flat rate benefit y_i, provided either to the husband or to the wife, equally strictly increases the lower bound $w_s^0(w_h)$ of the set of wife's wages at which the husband has incentives to engage in sabotage behavior.*
2. *If $w_s^*(w_h) < w_s^2(w_h)$, the introduction of a flat rate benefit y_i, provided either to the husband or to the wife, equally strictly increases the upper bound $w_s^*(w_h)$ of the set of wife's wages at which the husband has incentives to engage in sabotage behavior.*

3. *If* $w_s^*(w_h) > w_s^2(w_h)$*, the introduction of a flat rate benefit* y_s *provided to the wife strictly increases* $w_s^*(w_h)$ *whereas a corresponding flat rate benefit* y_h *provided to the husband has no effect on* $w_s^*(w_h)$*.*

Our results, so far, suggest that welfare policies may shift the incidence of economic abuse without necessarily reducing it: wage subsidies to women shift the incidence of economic abuse downwards in the female wage distribution. Conversely, unconditional family cash benefits shift shift the incidence of economic abuse upwards in the female wage distribution. Each policy in isolation may, therefore, have undesirable effects on the risk of domestic abuse for some women. These observations permit us to deduce what type of policy mix would, according to the model, reduce the incidence of economic abuse. Such a policy mix would require: (1) cash benefits to couples in the low-wage and low-to-medium wage regime, which would allow males to prevent the inefficiency of non-cooperative equilibrium by means of a benevolent transfer instead of sabotage; and (2) wage subsidies to women in the medium-to-high wage regime, which would reinforce the importance of female earnings for the household, and so induce males to abstain from sabotage behavior.

4. A Cobb-Douglas Example

In this section we provide a simple Cobb-Douglas example which, in addition to illustrating the model, allows us to highlight a few more of its features. Hence we let

$$u_i(c_i, Q) = \ln c_i + 2\alpha \ln Q \quad \text{and} \quad Q(q_h, q_s) = q_h^{1/2} q_s^{1/2}. \tag{14}$$

In this specification we include the parameter $\alpha > 0$ as a measure of the relative importance of the household produced good.

A feature of the Cobb-Douglas specification (with zero exogenous unearned incomes) is that the nature of the household equilibrium depends only on the *relative wages* w_s/w_h, not on wage *levels*. In particular, maintaining the assumption that $y_h = y_s = 0$, the critical wages partitioning the transfer regimes can all be written in the form

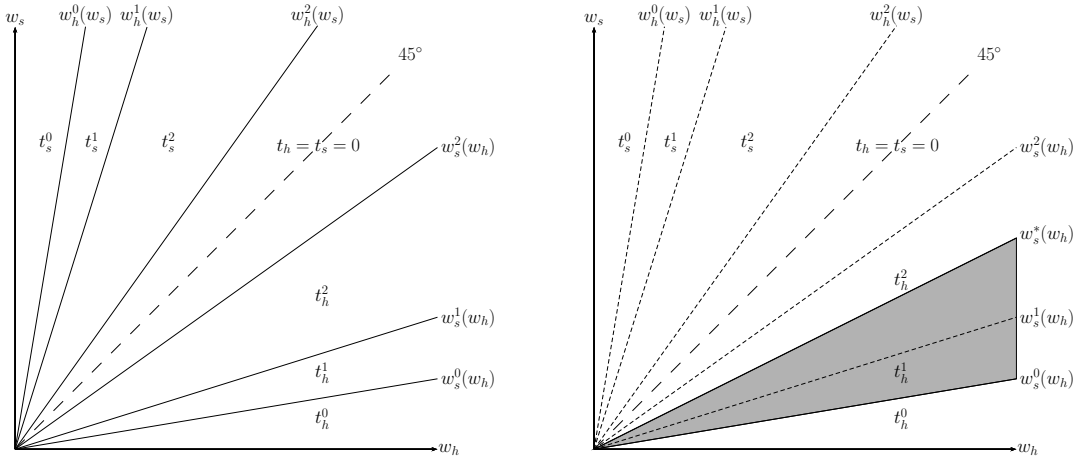
$$w_{-i}^k(w_i) = C^k(\mu, \alpha)\, w_i, \tag{15}$$

with

$$\begin{aligned} C^0(\mu, \alpha) &= \frac{\alpha\mu}{(\alpha+1)(1-\mu)} \\ C^1(\mu, \alpha) &= \frac{\alpha(\alpha+\mu)}{3\alpha(1-\mu) - \mu + \alpha^2 + 1} \\ C^2(\mu, \alpha) &= \frac{(\alpha+\mu)}{(1+\alpha-\mu)}. \end{aligned} \tag{16}$$

In a similar way, the upper boundary on the set of wife's wages at which the husband has incentives for economic abuse can be written in the form

$$w_s^*(w_h) = C^*(\alpha)\, w_h \quad \text{with} \quad C^*(\alpha) = \frac{\alpha}{\alpha+1}. \tag{17}$$



(a) Regions by transfer regime and labor supply

(b) Region with incentives for intrahousehold sabotage

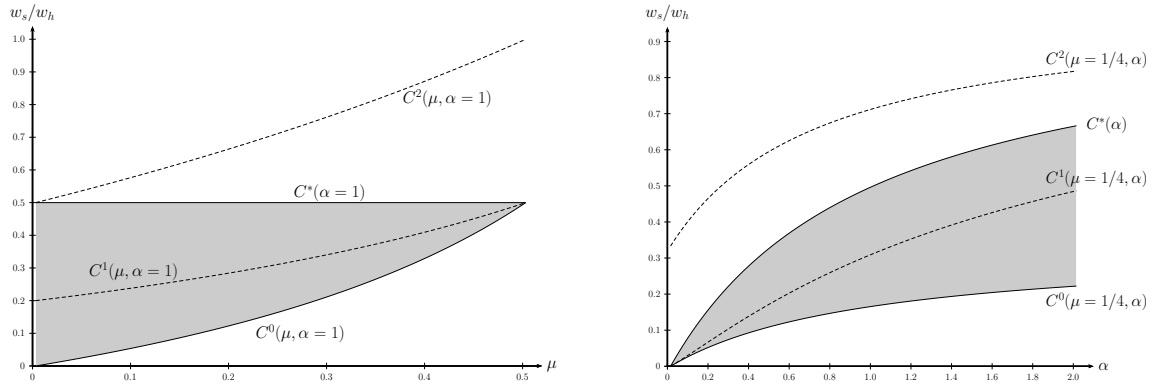
Figure 2: Illustration of the equilibrium.

As (17) indicates, in the Cobb-Douglas example, the upper bound on the set of wife's relative wages at which the husband has incentives for economic abuse wage does not actually depend on μ but depends positively on α. Note that $C^2(\mu, \alpha) > C^*(\alpha)$. Hence in the Cobb-Douglas case, economic abuse always coexist with positive transfers from the husband to the wife. This result follows from the fact that, with Cobb-Douglas preferences and with $y_s = 0$, the wife's labour supply responsiveness, $\varepsilon_s(w_s, t_h)$, drops to zero when she does not receive a transfer from the husband. Hence the husband cannot influence the wife's labour supply by saboting her wage unless he also makes a positive transfer.

Figure 2(a) illustrates how the space of wage-profiles is partitioned into regions with different nature/direction of transfers and labour supply status for the case of $\mu = 1/4$ and $\alpha = 1$. At $w_s < w_s^0(w_h)$ the husband makes the "benevolent" transfer $t_h^0(w_h, w_s)$ and the wife strictly prefers not to work. At $w_s \in \left(w_s^0(w_h), w_s^1(w_h)\right)$ the husband makes the "crowding out" transfer $t_h^1(w_h, w_s)$ and the wife just chooses not to work. At $w_s \in \left(w_s^1(w_h), w_s^2(w_h)\right)$ the husband makes an "interior" transfer $t_h^2(w_h, w_s)$ and the wife works positive hours. At higher wife's wages, the husband does make any transfer to the wife. As, in this example, preferences are symmetric across the two genders, corresponding regions apply when the wife's wage exceeds the husbands.

Figure 2(b) illustrates in the same example the set of wage profiles at which the husband has incentives to engage in sabotage behavior. The figure illustrates how incentives for sabotage obtain for a set of wage profiles around those where the wife enters the labour market.

The Cobb-Douglas example can also be used to illustrate the impact of caring and of the relative importance of household produced goods. Figure 3(a) illustrates the three critical relative wages $C^k(\mu, \alpha)$, $k = 0, 1, 2$ as well as $C^*(\alpha)$ as a function of the caring parameter μ when $\alpha = 1$. The example illustrates how an increase in μ decreases the set of wage profiles (w_h, w_s) at which the husband has equilibrium abuse incentives. The example also illustrates how the incentives for economic abuse disappear when μ approaches $1/2$. In the limit where $\mu = 1/2$ the couple has a common objective and the household operates on the Pareto frontier. An act of sabotage which reduces w_s would then simply reduce the utility possibility set and would hence never increase the husband's equilibrium utility.



(a) Transfer and sabotage regions as a function of caring

(b) Transfer and sabotage regions as a function of the importance of household production

Figure 3: Comparative statics.

Figure 3(b) illustrates the same critical relative wage functions, now as a function of α given $\mu = 1/4$. This figure highlights how an increase in the relative importance of household production, as parameterized by α, tends to increase the incentives for economic abuse. This reflects how, in the current model, economically abusive behavior obtains as a result of disagreements between the two partners regarding the allocation of time in the presence of household production: if the importance of household produced goods diminish, so do the incentives for sabotage.

Above we outlined some general results regarding the effect of wage subsidies and flat-rate benefits on the incidence of economic abuse. In line with the result that only relative wages matter in the Cobb-Douglas, it is only the relative subsidy rate that matters for abuse incentives.[10]

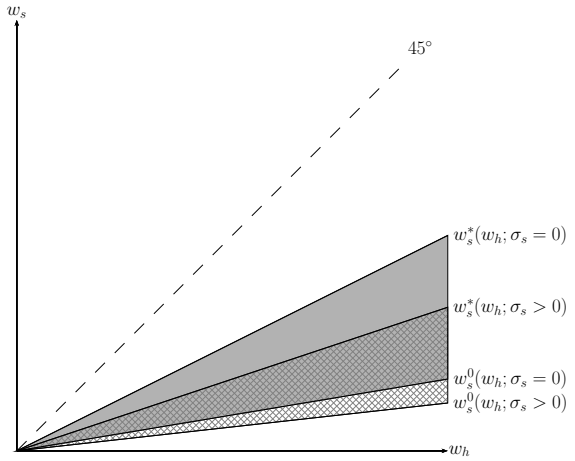
Figure 4(a) illustrates the effect of a 50 percent relative subsidy to women ($\sigma_s = 1/2$, $\sigma_h = 0$). A corresponding relative wage subsidy to men would shift the abuse region in the opposite direction.

Figure 4(b) illustrates the effect of a small flat rate benefit. Noting that $w_s^*(w_h) < w_s^2(w_h)$ holds in the Cobb-Douglas case, it follows that the effect of the introduction of a flat rate benefit is the same irrespective of to which partner it is provided.[11] In line with Proposition 5 the figure illustrates how a small benefit $y_i > 0$ (provided to either partner) shifts the abuse region upwards.

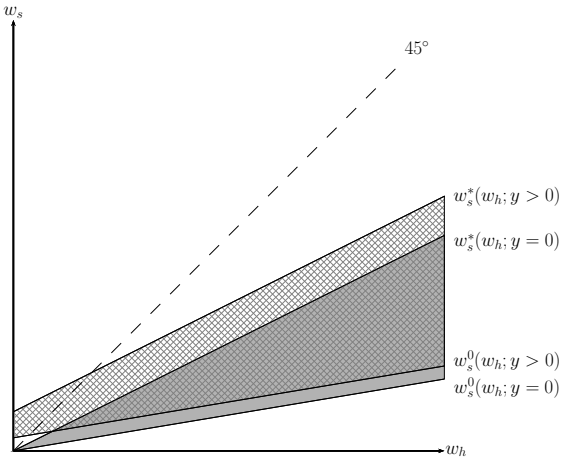
One potential objection to the above analysis would be that we have neglected the possibility that some households would find it advantageous to purchase market-produced substitutes for household production. Hence we ask here: What would happen if partners could buy market substitutes for the their own time input into household production? Intuitively, we might expect that sabotage will not occur among couples who find it advantageous to replace their own time input into household production with market-based substitutes, since the contentious issue within

[10] In particular in the presence of wage subsidies σ_h and σ_s, each of the critical relative wages in (16) and (17) are rescaled by a factor $(1 + \sigma_h) / (1 + \sigma_s)$.

[11] It should be noted that the analysis above was for the case case of $y_i = 0$ in order to ensure that someone in the household always chooses to work in equilibrium and to ensure that a partner's benevolent transfer to the spouse will be positive. It was for the same reason that the claims in Proposition 5 focused on the introduction of a "small" flat benefit starting from zero unearned income, that is, the derivatives of the equilibrium with respect to y_i taken at the point where $y_i = 0$. Figure 4b is drawn from a small strictly positive amount of unearned income, but ignores the possibility of both partners not working and of a zero benevolent transfers. Hence the figure should be considered only as illustrative and it should be recognized that it is not entirely complete for couples with wage profiles where one or both partners have very low wages.



(a) A wage subsidy $\sigma_s > 0$ to women shifts the sabotage region towards lower-wage females



(b) A flat rate benefit $y_i > 0$ provided to either partner shifts the sabotage region towards higher-wage females

Figure 4: Comparative statics.

the partnership then no longer revolves around labor supply decisions but around public good expenditures.

To see this formally, consider a household production function where each partner can choose both own time (q_i) and a bought-in market good (x_i) as inputs into household production. In line with the particular form of the partners' utility functions and the household production function used above, let

$$u_i(c_i, Q) = \ln c_i + 2\alpha \ln Q \quad \text{and} \quad Q = (q_h + \pi x_h)^{\frac{1}{2}}(q_s + \pi x_s)^{\frac{1}{2}},$$

where $\pi > 0$ is the marginal productivity of the bought-in market good relative to own time. The budget constraint now becomes

$$c_i + px_i + w_i q_i = w_i + Y_i$$

with p the price of the market input.

This modification on the household production side allows a higher degree of heterogeneity in the division of labor within the household. In particular, the nature of the household equilibrium now depends both on *relative wages* and on *wage levels*:

- On the one hand, high-wage individuals ($w_i \geqslant \frac{p}{\pi}$) will optimally choose to work full-time ($q_i^* = 0$) and to allocate their earnings partly to buying in household services. Formally:

$$c_i^* = \left[\frac{1-\mu}{1-\mu+\alpha}\right]\left[w_i + Y_i\right] \quad \text{and} \quad px_i^* = \left[\frac{\alpha}{1-\mu+\alpha}\right]\left[w_i + Y_i\right]$$

  High-wage individuals may still receive a transfer from their partners, provided their relative wage is sufficiently low.[12] Transfers now serve no purpose beyond supporting the partner's private consumption and encouraging expenditures on bought-in market goods.

[12] Formally, partner $-i$ will receive a positive transfer from partner i as long as $w_{-i} < C^2(\mu, \alpha)w_i$ [see equation

- On the other hand, low-wage individuals ($w_i < \frac{p}{\pi}$) will optimally refrain from buying in market substitutes ($x_i^* = 0$). The time allocation choices of low-wage individuals—as well as the transfers they receive from their partners—are identical to those in the baseline model.

Incentives for labor market sabotage survive in equilibrium when males are partnered with low-wage women ($w_s < \frac{p}{\pi}$). As in the baseline model, these incentives are non-monotonic with respect to relative wages.[13] However, the option to substitute market-based services for their own time in home production eliminates the risk of sabotage for high-wage women ($w_s \geqslant \frac{p}{\pi}$). The intuition is simple. With market-based services being optimally substituted for time in household production, the contentious issue within the household becomes expenditures on bought-in market goods. Indeed, each partner would like the other to spend less on own consumption and more on household-related services. But sabotage behavior targeted at female wages only works to reduce expenditures on bought-in market goods further. Thus, males do not have an incentive to interfere with their partners' earnings capacity. Overall, therefore, the above analysis emphasizes that it is when females face low wages in an absolute sense that their partners may have incentive to sabotage their economic activity.

5. Conclusion

Research in economics on domestic abuse has taken off in the last two decades and has produced insightful theory and empirical evidence. However, research in this field to date has, almost exclusively, focused rather narrowly on physical violence. Research outside economics, by contrast, has long emphasized that a typical pattern of domestic abuse also includes economic abuse as a tactic used by abusers to control their partners' behavior. Economic abuse includes sabotage actions that act as barriers to the employability and job performance of the victim. We believe that economics has much to add to the study of this type of behavior, and our specific concern in this paper has been to understand why some husbands sabotage their partner's work efforts.

To that end, we have proposed a theoretical framework which revolves around the notion of economic abuse being instrumental and directly related towards women's participation in employment. At the heart of the model is an intra-household disagreement about the allocation of time between market work and home production. We have shown that this mechanism generates a non-monotonic relationship between the gender wage gap and the incidence of economic abuse. With a low relative wage, it is individually rational for a woman—being supported financially by her partner—to fully specialize at home. The woman's chosen allocation of time coincides with her partner's preferred choice, and the relationship stays free of economically abusive behavior. With an intermediate relative wage, it is privately rational for a woman to look for work and enter employment (at the level of financial support that her husband would voluntarily provide her with), but the husband's preferred choice is for her to stay specialized in household production. While he will increase his financial support in order to induce her not to enter the labour force, he also

(16)]. The equilibrium level of the transfer is given by

$$t_i^* = \frac{w_i(\mu + \alpha) - w_{-i}(1 - \mu + \alpha)}{1 + 2\alpha}.$$

[13]Formally, if $w_s < \frac{p}{\pi}$, incentives for sabotage continue to be present for relative wages in the interval $(w_s^0(w_h), w_s^*(w_h))$.

has an incentive to directly interfere with her labour market opportunities and hence resorts to sabotage tactics. Finally, with a high relative wage, a woman's earned income is too important for a male partner to interfere with her earnings capacity. Overall, therefore, our model predicts that economic abuse in the form of labor market sabotage is associated with a woman's labor supply being contentious and economic roles in the family hanging in the balance.

In addition to suggesting an interpretation for the economic abuse component of domestic violence, our analysis also serves to highlight some policy dilemmas. Our results suggest that policies aimed at improving the economic situation of families may shift the incidence of economic abuse without necessarily reducing it. For example, unconditional family cash benefits shift the incidence of economic abuse upwards in the female wage distribution, while wages subsidies to women may have the opposite effect. In order to reduce the risk of economic abuse, therefore, different types of households have to be targeted with different types of policy measures. This underlines the complexities policy makers have to negotiate when facing the problem of economic abuse, which many analysts consider to be just as harmful as other forms of domestic abuse.

It is important to acknowledge that this paper is a purely theoretical exercise. In general, we know precious little about the empirical importance of the channels identified by our theory. Most of the empirical literature has taken as its null hypothesis that the risk of domestic violence monotonically decreases with women's relative wages. This paper establishes an alternative hypothesis based on the idea that men may have an incentive to impose negative outcomes on their partners when spousal preferences regarding the intrahousehold allocation of time are misaligned. This alternative hypothesis explains existing evidence on economically abusive behavior and gives direction for future empirical research.

There are several directions in which our analysis could be expanded. From a theoretical perspective, it would be interesting to embed the present framework in a model where women have the option of quitting abusive relationships and use the unifying model to examine how the internal organization of the family and outside options interact in shaping the incidence of domestic abuse. From an empirical perspective, it would be interesting to use survey data to deduce some of the key parameters of our model and to generate quantitative predictions from the estimated parameter values. This would allow us to get a feel for the empirical relevance of the non-monotonic relationship between the gender wage gap and the incidence of abuse as predicted by the theory. These and other issues are important and challenging topics for future research. In the meantime, our analysis demonstrates the value of going beyond preference-based bargaining models of domestic violence and to incorporate instrumental incentives into economic explanations of spousal abuse against women.

References

Adams, A., Sullivan, C., Bybee, D. and Greeson, M. (2008). Development of the scale of economic abuse. *Violence Against Women*, **14** (5), 563–588.

Aizer, A. (2010). The gender wage gap and domestic violence. *American Economic Review*, **100**, 1847–1859.

Anderberg, D. (2007). Inefficient households and the mix of government spending. *Public Choice*, **131**, 127–140.

Bazelon, E. (2009). The sabotaging husband. *Forbes,* available at http://www.forbes.com/2008/10/13/0929_FLEW087.html.

Becker, G. S. (1991). *A Treatise on the Family*. Harvard Universtiy Press.

Bergstrom, T. (1989). A fresh look at the rotten kid theorem. *Journal of Political Economy*, **97**, 1138–1159.

Bloch, F. and Rao, V. (2002). Terror as a bargaining instrument: A case study of dowry violence in rural India. *American Economic Review*, **92**.

Brandwein, R. and Filiano, D. (2000). Toward realwelfare reform: The voices of battered women. *Affilia*, **15** (2), 224–243.

Card, D. and Dahl, G. (2011). Family violence and football: The effect of unexpected emotional cues on violent behavior. *Quarterly Journal of Economics*, forthcoming.

Chen, Z. and Woolley, F. (2001). A cournot-nash model of family decision making. *Economic Journal*, **111**, 722–748.

Chiappori, P. A. (1992). Collective labor supply and welfare. *Journal of Political Economy*, **100**, 437–462.

—, Fortin, B. and Lacroix, G. (202). Marriage market, divorce legislation, and household labor supply. *Journal of Political Economy*, **110**, 37–72.

Del Boca, D. and Flinn, C. (2012). Endogeneous household interaction. *Journal of Econometrics*, **166** (1), 49–65.

Farmer, A. and Tiefenthaler, J. (1997). An economic analysis of domestic violence. *Review of Social Economy*, **55**, 337–358.

Johnson, H. (1995). The truth about white-collar domestic violence. *Working Woman*, **20**, 54–57.

Kondrad, K. A. and Lommerud, K. E. (1995). Family policy with non-cooperative families. *Scandinavian Journal of Economics*, **97**, 581–601.

Lundberg, S. and Pollak, R. (1993). Separate spheres bargaining and the marriage market. *Journal of Political Economy*, **101**, 988–1010.

Manser, M. and Brown, M. (1980). Marriage and household decision-making: A bargaining analysis. *International Economic Review*, **21** (1), 31–44.

McElroy, M. and Horney, M. (1981). Nash-bargained household decisions: Toward a generalization of the theory of demand. *International Economic Review*, **22** (2), 333–349.

Pearson, J., Theonnes, N. and Griswold, E. A. (1999). Child support and domestic violence: The victims speak out. *Violence Against Women*, **5**, 427–448.

Raphael, J. (1995). Domestic violence: Telling the untold welfare-to-work story. Taylor Institute, 915 N. Wolcott, Chicago, IL 60222.

— (1996). Prisoners of abuse: Domestic violence and welfare receipt. Taylor Institute, 915 N. Wolcott, Chicago, IL 60222.

Riger, S., Ahrens, C. and Blickenstaff, A. (2000). Measuring interference with employment and education reported by women with abusive partners: Preliminary data. *Violence and Victims*, **15**, 161–172.

Swanberg, J. and Logan, T. (2004). Intimate partner violence, women and work: Findings from the first wave of a longitudinal study. *Unpublished Manuscript, University of Kentucky*.

— and Macke, C. (2006). Intimate partner violence and the workplace: Consequences and disclosures. *Journal of Women and Social Work*, **21** (4), 391–406.

Tauchen, H. V., Witte, A. D. and Long, S. K. (1991). Violence in the family: A non-random affair. *International Economic Review*, **32**, 491–511.

Tjaden, P. and Thoennes, N. (1998). The prevalence, incidence and consequences of violence against women: Findings from the national violence against women survey. Washington DC: US Department of Justice, OJP. Report No: NCJ 172837.

Tolman, R. and Rosen, D. (2001). Domestic violence in the lives of women receiving welfare: Mental health, health, and economic well-being. *Violence Against Women*, **7**, 141–158.

Tolman, R. M. and Raphael, J. (2000). A review of research on welfare and domestic violence. *Journal of Social Issues*, **56**, 655–682.

Zachary, M. (2000). Labor law for supervisors: Domestic violence as a workplace issue. *Supervision*, **61** (4), 23–26.

Appendix

Proof of Proposition 1. It should be noted that the proposition is derived under the assumption of zero unearned income for each partner. Hence while we retain the general notation for unearned incomes, y_i and y_{-i}, all equations etc. in the proof of the current proposition should are evaluated at $y_i = y_{-i} = 0$.

The proposition is proven through a series of lemmas. First, define the "benevolent" transfer, $t_i^0(w_i, w_{-i})$, from partner i to $-i$ implicitly as the solution to the following equation:

$$(1-\mu)\, v_i'\left(m_i\left(w_i, y_i - t_i^0(w_i, w_{-i})\right) + y_i - t_i^0(w_i, w_{-i})\right) = \mu v_{-i}'\left(y_{-i} + t_i^0(w_i, w_{-i})\right). \tag{A1}$$

Lemma A.1. *The benevolent transfer $t_i^0(w_i, w_{-i})$ is (i) a uniquely identified continuous function with $t_i^0(w_i, w_{-i}) \in (0, w_i)$, (ii) strictly increasing in w_i and independent of w_{-i}.*

Proof. Both sides of (A1) are continuous functions of t_i. Using (9) it follows that the left hand side is strictly increasing in t_i. The right hand side is strictly decreasing in t_i. Moreover, as t_i approaches either 0 the right hand side approaches infinity whereas if t_i approaches w_i, the left hand side approaches infinity. Hence (A1) must have a unique solution in the interval $(0, w_i)$. The effect of an increase in w_i follows from the fact that $\partial m_i/\partial w_i > 0$. Independence of w_{-i} follows from the fact that it does not feature directly in (A1). □

Next, define the "crowding out" transfer, $t_i^1(w_i, w_{-i})$, from partner i to $-i$ implicitly as the transfer at which $-i$ just chooses zero labour supply:

$$v_{-i}'\left(y_{-i} + t_i^1(w_i, w_{-i})\right) = \frac{1}{w_{-i}} \frac{z_{-i}'(1)}{(1-\mu)}. \tag{A2}$$

Lemma A.2. *The crowding out transfer $t_i^1(w_i, w_{-i})$ is (i) a uniquely identified continuous function, (ii) strictly increasing in w_{-i}, independent of w_i,(iii) approaches 0 as w_{-i} approaches 0.*

Proof. Uniqueness and continuity follow immediately from differentiability and strict concavity of $v_{-i}(\cdot)$. Monotonicity in w_{-i} follows from strict concavity of $v_{-i}(\cdot)$. Independence of w_i follows from the fact that w_i does not feature directly in (A2). Finally, note that as $w_{-i} \to 0^+$, any positive transfer will strictly induce $-i$ not to work. Hence $t_i^1(w_i, w_{-i})$ (which is the smallest transfer at which $-i$ chooses not to work) must approach zero. □

For large enough w_{-i}, the crowding out transfer will not be "affordable" to i. Hence we implicitly define $w_{-i}^{\max}(w_i)$ as the w_{-i} at which the crowding out transfer corresponds to i's maximum earnings.

$$t_i^1\left(w_i, w_{-i}^{\max}(w_i)\right) = w_i. \tag{A3}$$

From the properties of $t_i^1(w_i, w_{-i})$ in Lemma A.2 it follows that $w_{-i}^{\max}(w_i)$ is uniquely identified and strictly increasing in w_i.

We next define $w_{-i}^0(w_i)$ as w_{-i} which equates the benevolent and the crowding out transfer,

$$t_i^0\left(w_i, w_{-i}^0(w_i)\right) = t_i^1\left(w_i, w_{-i}^0(w_i)\right). \tag{A4}$$

Lemma A.3. *The critical wage $w_{-i}^0(w_i)$ is a uniquely identified continuous and strictly increasing function of w_i, and $w_{-i} < (>)\, w_{-i}^0(w_i)$ implies $t_i^0(w_i, w_{-i}) > (<)\, t_i^1(w_i, w_{-i})$.*

Proof. Immediate from the properties of $t_i^0(w_i, w_{-i})$ and $t_i^1(w_i, w_{-i})$ given in Lemma A.1 and A.2. □

In order to analyze the transfer decision it is useful to write $-i$'s utility as a (continuous) function of t_i in the following way

$$\begin{aligned} U_i\left(t_i; w_i, w_{-i}\right) \equiv\ & (1-\mu)\, v_i\left(m_i\left(w_i, y_i - t_i\right) + y_i - t_i\right) + \mu v_{-i}\left(m_{-i}\left(w_{-i}, y_{-i} + t_i\right) + y_{-i} + t_i\right) \\ & + z\left(1 - \frac{m_i\left(w_i, y_i - t_i\right)}{w_i}, 1 - \frac{m_{-i}\left(w_{-i}, y_{-i} + t_i\right)}{w_{-i}}\right), \end{aligned} \tag{A5}$$

remembering that for any $t_i \geq t_i^1\left(w_i, w_{-i}\right)$ the recipient, $-i$, chooses zero labor supply. We can now establish strict concavity of $-i$'s utility in t_i.

Lemma A.4. *$U_i\left(t_i; w_i, w_{-i}\right)$ is strictly a strictly concave function of t_i with a "downward kink" at $t_i = t_i^1\left(w_i, w_{-i}\right)$.*

Proof. Differentiating (A5) with respect to t_i and evaluating at some $t_i < t_i^1\left(w_i, w_{-i}\right)$ yields, after substituting using (6),

$$\frac{\partial U_i\left(t_i; w_i, w_{-i}\right)}{\partial t_i} = -\left(1-\mu\right) v_i'\left(c_i\right) + v_{-i}'\left(c_{-i}\right)\left[\mu - \left(1-2\mu\right)\frac{\partial m_{-i}}{\partial Y_{-i}}\right]. \tag{A6}$$

When evaluating at some $t_i > t_i^1\left(w_i, w_{-i}\right)$, the same expression holds but with $\partial m_{-i}/\partial Y_{-i} = 0$ as $-i$ strictly prefers not to work at such a transfer. At $t_i = t_i^1\left(w_i, w_{-i}\right)$, the derivative (A6) does not exist. However, the left and the right derivatives both exist and are given by (A6), with and without the $\partial m_{-i}/\partial Y_{-i}$ term included respectively. Since $\partial m_{-i}/\partial Y_{-i} < 0$ (see eq. (9)), the left derivative exceeds the right derivative.

Differentiating a second time and evaluating at some $t_i < t_i^1\left(w_i, w_{-i}\right)$ yields

$$\begin{aligned} \frac{\partial^2 U_i\left(t_i; w_i, w_{-i}\right)}{\partial t_i^2} =\ & \left(1-\mu\right) v_i''\left(c_i\right)\left(1 + \frac{\partial m_i}{\partial Y_i}\right) + v_{-i}''\left(c_{-i}\right)\left(1 + \frac{\partial m_{-i}}{\partial Y_{-i}}\right)\left[\mu - \left(1-2\mu\right)\frac{\partial m_{-i}}{\partial Y_{-i}}\right] \\ & - v_{-i}'\left(c_{-i}\right)\left(1-2\mu\right)\frac{\partial^2 m_{-i}}{\partial Y_{-i}^2}. \end{aligned} \tag{A7}$$

When evaluating at some $t_i > t_i^1\left(w_i, w_{-i}\right)$, the same expression holds but with $\partial m_{-i}/\partial Y_{-i} = 0$ etc. It follows from (9) and Assumption 3, that (A7) is strictly negative at any $t_i \neq t_i^1\left(w_i, w_{-i}\right)$. □

From Lemma A.4 it follows that i's optimal transfer (if positive) is either characterized by $t_i \neq t_i^1\left(w_i, w_{-i}\right)$ and (A6) being equal to zero, or by $t_i = t_i^1\left(w_i, w_{-i}\right)$ and (A6) being strictly positive at all $t_i < t_i^1\left(w_i, w_{-i}\right)$ and strictly negative at all $t_i > t_i^1\left(w_i, w_{-i}\right)$). For future reference it is also useful to note that, when evaluated at some $t_i < t_i^1\left(w_i, w_{-i}\right)$,

$$\frac{\partial^2 U_i\left(t_i; w_i, w_{-i}\right)}{\partial t_i \partial w_{-i}} = v_{-i}''\left(c_{-i}\right)\frac{\partial m_{-i}}{\partial w_{-i}}\left[\mu - \left(1-2\mu\right)\frac{\partial m_{-i}}{\partial Y_{-i}}\right] - v_{-i}'\left(c_{-i}\right)\left(1-2\mu\right)\frac{\partial^2 m_{-i}}{\partial Y_{-i}\partial w_{-i}} < 0, \tag{A8}$$

where the inequality follows from Assumption 3. When evaluated at some $t_i > t_i^1\left(w_i, w_{-i}\right)$ the expression in (A8) is identically equal to zero as $-i$ then strictly prefer to not work. Note also that

$$\frac{\partial^2 U_i\left(t_i; w_i, w_{-i}\right)}{\partial t_i \partial w_i} = -\left(1-\mu\right) v_i''\left(c_i\right)\frac{\partial m_i}{\partial w_i} > 0. \tag{A9}$$

Lemma A.5. *At $w_{-i} \leq w_{-i}^0\left(w_i\right)$, i's optimal transfer is the benevolent transfer $t_i^0\left(w_i, w_{-i}\right)$.*

Proof. Suppose that $w_{-i} \leq w_{-i}^0\left(w_i\right)$ and i chooses $t_i = t_i^0\left(w_i, w_{-i}\right)$. Since $t_i^0\left(w_i, w_{-i}\right) \geq t_i^1\left(w_i, w_{-i}\right)$ (see Lemma A.3), it follows from the definition of the benevolent transfer in (A1) that $\partial U_i/\partial t_i$ given by (A6) equals zero at this transfer, thus confirming that it is an optimal choice for i. □

Next we define implicitly a second critical recipient's wage. To this end, consider the left derivative of (A5) with respect to t_i, evaluated at the limit point $t_i = t_i^1(w_i, w_{-i})$,

$$\frac{\partial U_i\left(t_i^1(w_i,w_{-i});w_i,w_{-i}\right)}{\partial t_i^-}=0, \tag{A10}$$

where we note that the left derivative is given by (A6) with the inclusion of the $\partial m_{-i}/\partial Y_{-i}$ term. The second critical wage, denoted $w_{-i}^1(w_i)$, is implicitly defined as the w_{-i} at which (A10) equals zero.

Lemma A.6. *The critical wage $w_{-i}^1(w_i)$ (i) is a uniquely identified continuous and strictly increasing function of w_i, and (ii) is strictly larger than $w_{-i}^0(w_i)$.*

Proof. Evaluating at $w_{-i} \leq w_{-i}^0(w_i)$, and using that, at any such recipient's wage, $t_i^1(w_i,w_{-i}) \leq t_i^0(w_i,w_{-i})$, one can easily verify that the left hand side of (A10) is positive. For large enough w_{-i}, (A10) will, on the other hand, be negative. To see this, note that when w_{-i} approaches $w_{-i}^{\max}(w_i)$, $t_i^1(w_i,w_{-i})$ approaches w_i, implying that i's consumption approaches zero. Given continuity of the left hand side of (A10) in w_{-i} at least one solution to the equation in (A10) exists, and any solution strictly exceeds $w_{-i}^0(w_i)$.

To demonstrate uniqueness of $w_{-i}^1(w_i)$, note that (A10) is strictly decreasing in w_{-i} both directly (see eq. A8), and indirectly via $t_i^1(w_i,w_{-i})$ being increasing in w_{-i} (Lemma A.2) and concavity of U_i in t_i (Lemma A.4). Finally, that $w_{-i}^1(w_i)$ is increasing in w_i follows from simple comparative statics using (A9) and recalling that $t_i^1(w_i,w_{-i})$ is independent of w_i (Lemma A.2) □

Lemma A.7. *At $w_{-i} \in \left(w_{-i}^0(w_i), w_{-i}^1(w_i)\right)$, i's optimal transfer is the crowding-out transfer $t_i^1(w_i,w_{-i})$.*

Proof. For $w_{-i} \in \left(w_{-i}^0(w_i), w_{-i}^1(w_i)\right)$ we now have that the right derivative of $U_i(t_i;w_i,w_{-i})$ with respect to t_i evaluated at $t_i = t_i^1(w_i,w_{-i})$ is strictly negative (since, for such w_{-i}, $t_i^1(w_i,w_{-i}) > t_i^0(w_i,w_{-i})$) while the left derivative is strictly positive. Hence, by global concavity of $U_i(t_i;w_i,w_{-i})$ in t_i (Lemma A.4) it follows that $t_i^1(w_i,w_{-i})$ is i's optimal transfer. □

We define a third critical recipient's wage, denoted $w_{-i}^2(w_i)$, as the smallest w_{-i} at which i chooses to make a zero transfer. Specifically, we define $w_{-i}^2(w_i)$ implicitly through the following equation,

$$\frac{\partial U_i\left(0;w_i,w_{-i}^2(w_i)\right)}{\partial t_i}=0. \tag{A11}$$

Lemma A.8. *The critical wage $w_{-i}^2(w_i)$ (i) is a uniquely identified continuous and strictly increasing function of w_i, and (ii) is strictly larger than $w_{-i}^1(w_i)$.*

Proof. From Lemmas A.5 and A.7, we know that for any $w_{-i} \leq w_{-i}^1(w_i)$, i's optimal transfer is either $t_i^1(w_i,w_{-i})$ or, if $w_{-i} \leq w_{-i}^0(w_i)$, $t_i^0(w_i,w_{-i})$ which then exceeds $t_i^1(w_i,w_{-i})$. Hence for any $w_{-i} \leq w_{-i}^1(w_i)$, i's optimal transfer is strictly positive, implying that $\partial U_i(0;w_i,w_{-i})/\partial t_i$ is strictly positive at any such w_{-i}. Next we note that $\partial U_i(0;w_i,w_{-i})/\partial t_i$ is strictly decreasing in w_{-i} as $-i$'s earnings are increasing in w_{-i} and due to Assumption 3 (and, under natural conditions, for large enough w_{-i} the derivative becomes negative). This demonstrates that $w_{-i}^2(w_i)$ is unique and exceeds $w_{-i}^1(w_i)$. That $w_{-i}^2(w_i)$ increases in w_i follows from (A9). □

Lemma A.9. *At $w_{-i} \in \left(w_{-i}^1(w_i), w_{-i}^2(w_i)\right)$, i's optimal transfer is an "interior" transfer $t_i^2(w_i,w_{-i})$, where $t_i^2(w_i,w_{-i}) \in \left(0, t_i^1(w_i,w_{-i})\right)$ and is strictly increasing in w_i and strictly decreasing in w_{-i}. At $w_{-i} \geq w_{-i}^2(w_i)$, i's optimal transfer is the zero transfer.*

Proof. For $w_{-i} > w_{-i}^1(w_i)$, the left derivative of $U_i(t_i;w_i,w_{-i})$ with respect to t_i evaluated at $t_i = t_i^1(w_i,w_{-i})$ is strictly negative, implying that i's optimal transfer is given by some $t_i < t_i^1(w_i,w_{-i})$ (at which the recipient works some positive amount of time). The optimal transfer in this case is either strictly positive and characterized by the derivative in (A6) being equal to zero, or equal to zero with the derivative

in (A6) being non-positive at $t_i = 0$. Per definition, $w^2_{-i}(w_i)$ is the unique recipient's wage above which the derivative of $U_i(t_i; w_i, w_{-i})$ with respect to t_i evaluated at $t_i = 0$ is negative. We denote the strictly positive transfer made at $w_{-i} \in \left(w^1_{-i}(w_i), w^2_{-i}(w_i)\right)$ by $t^2_i(w_i, w_{-i})$. Monotonicity of $t^2_i(w_i, w_{-i})$ in w_i and w_{-i} then follows immediately from (A8) and (A9). □

Proposition 1 follows in a straightforward manner, using Lemmas A.1 to A.9.

□

Proof of Lemma 2. Suppose that, in equilibrium, partner i is making a positive transfer to partner $-i$. It then follows that

$$(1-\mu)\, v'_i(c_i) \leq v'_{-i}(c_{-i}) \left[\mu - (1-2\mu)\frac{\partial m_{-i}}{\partial Y_{-i}}\right]. \tag{A12}$$

To see this, note that if i makes an interior transfer $t^2_i(w_i, w_{-i})$ to $-i$, then (A12) holds with equality as it is the first order condition characterizing the interior transfer. If i makes a benevolent transfer $t^0_i(w_i, w_{-i})$ to $-i$, then (A12) holds with equality, but with $\partial m_{-i}/\partial Y_{-i} = 0$ as $-i$ strictly prefers not to work. Finally, if i is making the crowding out transfer $t^1_i(w_i, w_{-i})$ to $-i$, then (A12) holds with inequality as the left derivative of U_i with respect t_i at $t^1_i(w_i, w_{-i})$ is positive (see proof of Proposition 1). If partner $-i$ is then also making a positive transfer to i, the same inequality with i and $-i$ interchanged also holds. Combining the two inequalities to eliminate the marginal utilities yields that

$$(1-\mu)^2 \leq \left[\mu - (1-2\mu)\frac{\partial m_i}{\partial Y_i}\right]\left[\mu - (1-2\mu)\frac{\partial m_{-i}}{\partial Y_{-i}}\right]. \tag{A13}$$

However, this is a contradiction since the right hand side is, for any $\mu \in [0, 1/2)$ and $\left(\frac{\partial m_h}{\partial Y_h}, \frac{\partial m_h}{\partial Y_h}\right) \in (-1, 0) \times (-1, 0)$, in the open interval $\left(\mu^2, (1-\mu)^2\right)$. □

Proof of Proposition 2. Let $U^*_i(w_i, w_{-i})$ denote the equilibrium utility of partner i. At any $w_s \leq w^0_s(w_h)$, the husband makes the "benevolent transfer" $t^0_h(w_h, w_s)$ which is independent of w_s, and the wife strictly prefers not to work in equilibrium. A marginal reduction w_s does not affect any aspect of the equilibrium, and hence, in particular, does not increase the husband's equilibrium utility $U^*_h(w_h, w_s)$.

At any $w_s \in \left(w^0_s(w_h), w^1_s(w_h)\right]$ the husband chooses the "crowding-out transfer" $t^1_h(w_h, w_s)$ and, in equilibrium, the wife just chooses not to work. At such a w_s it follows that

$$\frac{\partial U^*_h(w_h, w_s)}{\partial w_s} = -\left[(1-\mu)\, v'_h(c^*_h) - \mu v'_s(c^*_s)\right]\frac{\partial t^1_h(w_h, w_s)}{\partial w_s} < 0, \tag{A14}$$

where the sign follows from the fact that, as $w_s > w^0_s(w_h)$, $t^1_h(w_h, w_s) > t^0_h(w_h, w_s)$ (see Lemma A.3), implying that the term in brackets is positive.

At any wage $w_s \in \left(w^1_s(w_h), w^2_s(w_h)\right)$ the husband chooses the "interior transfer" $t^2_h(w_h, w_s)$ and, in equilibrium, the wife is working some positive amount of time in the labour market. At such a w_s it can be shown, after simplifying using the first order conditions for labour supplies and the characterization of the "interior" transfer, that

$$\frac{\partial U^*_h(w_h, w_s)}{\partial w_s} = \mu v'_s(c^*_s)\left[w_s \frac{\partial \ell^*_s}{\partial w_s} + \ell^*_s\right] - z'_s(q^*_s)\frac{\partial \ell^*_s}{\partial w_s} \tag{A15}$$

Substituting for $z'_s(q^*_s)$ in the final term using the first order condition for the wife's labour supply and collecting terms, this can be rewritten as

$$\frac{\partial U^*_h(w_h, w_s)}{\partial w_s} = v'_s(c^*_s)\, \ell^*_s \left\{\mu - (1-2\mu)\, \varepsilon_s(w_s, y_s + t^*_h)\right\}. \tag{A16}$$

It should be noted that the husband's incentives for abuse are "smooth" at $w_s = w_s^1(w_h)$: taking the limit of (A14) as $w_s \to w_s^1(w_h)^-$ and the limit of (A16) as $w_s \to w_s^1(w_h)^+$, and using simple comparative statics, yields that

$$\lim_{w_s \nearrow w_s^1(w_h)} \frac{\partial U_h^*(w_h, w_s)}{\partial w_s} = \lim_{w_s \searrow w_s^1(w_h)} \frac{\partial U_h^*(w_h, w_s)}{\partial w_s} = -v_s'(c_s^*)(1-2\mu) w_s \frac{\partial \ell_s^*}{\partial w_s} < 0. \tag{A17}$$

Thus the husband's incentives for abuse extend to some w_s at which the wife works in equilibrium. Moreover, equation (A16) holds also at any $w_s \geq w_s^2(w_h)$, at which the husband makes no transfer to the wife and the wife works in equilibrium.

From (A16) it follows that, for $w_s > w_s^1(w_h)$, the husband has equilibrium incentives for abuse until

$$\frac{\mu}{(1-2\mu)} = \varepsilon_s\left(w_s^*(w_h), y_s + t_h^2(w_h, w_s^*(w_h))\right). \tag{A18}$$

Note, by Assumption 3.2, ε_s directly decreases in w_s and increases in Y_s. Moreover, as $w_s > w_s^1(w_h)$, the husband is either making the interior transfer $t_h^2(w_h, w_s)$, which by Lemma A.9 is decreasing in w_s, or a zero transfer. If the husband is making the interior transfer, then an increase in w_s further leads to a reduction in ε_s through the reduction in the wife's total unearned income. Hence the right hand side of (A18) is a decreasing function of w_s, implying that if, given w_h, it first fails at some $w_s^*(w_h) > w_s^1(w_h)$, it also fails at any $w_s' > w_s^*(w_h)$.

Finally, to see that $w_s^*(w_h)$ weakly increases in w_h, note that w_h only enters (A18) via the husband's interior transfer. If $w_s^*(w_h) > w_s^2(w_h)$, then the husband is making zero transfer at $w_s = w_s^*(w_h)$ in which case marginal variations in w_h has no impact on the critical wage $w_s^*(w_h)$. If $w_s \in \left(w_s^1(w_h), w_s^2(w_h)\right)$, then the husband is making a positive transfer at $w_s = w_s^*(w_h)$ which, by Lemma A.9, is increasing in w_h. A marginal increase in w_h then increases Y_s via the husband's equilibrium transfer, and thus increases ε_s and $w_s^*(w_h)$. □

Proof of Proposition 3. Consider the allocation problem

$$\max_{(c_i, \ell_i)} \left\{ \frac{1}{2}\left[v_h(c_h) + v_s(c_s)\right] + z(1-\ell_h, 1-\ell_s) \,|\, c_h + c_s = w_h\ell_h + w_s\ell_s + y_h + y_s \right\} \tag{A19}$$

the first order conditions for which imply

$$v_h'(c_h) = v_s'(c_s) \tag{A20}$$

$$\frac{w_i}{2} v_i'(c_i) \leq z_i'(1-\ell_i) \tag{A21}$$

where the latter condition holds with equality when $\ell_i > 0$. The solution to the above problem has a "reservation wage property". In particular, the wife does not work at the solution to (A19) if and only if $w_s \leq w_s^r(w_h)$ for some $w_s^r(w_h)$.

The non-cooperative equilibrium in the limiting case where $\mu \to 1/2$ corresponds to the solution to (A19). Note in particular, that the characterization of both the "benevolent" transfer and the "interior" transfer reduce to the "equalized marginal utility" condition (A20), and the labour supply condition (A21) corresponds to the limit of (6). (As will be clear shortly, in the limit, "crowding out" transfers will not occur). Recalling that $w_s^0(w_h)$ is defined as the highest w_s wage at which the wife chooses not to work at the husband's benevolent transfer, it follows that $w_s^0(w_h) \to w_s^r(w_h)$ as $\mu \to 1/2$. Consider then $w_s^*(w_h)$ defined as the highest wife's wage at which $\partial U_h^*/\partial w_s$ given in (A16) is strictly negative. Note however that, in the limit as $\mu \to 1/2$, $\partial U_h^*/\partial w_s \to v_s'(c_s^*)\ell_s^*/2$ which is thus positive for any w_s at which the wife is working. Hence it follows that $w_s^*(w_h) \to w_s^r(w_h)$ as $\mu \to 1/2$. The abuse region $\left(w_s^0(w_h), w_s^*(w_h)\right)$ thus reduces to the empty set as as $\mu \to 1/2$.

□

Proof of Proposition 4. Extend the notation to include the subsidy rates $\sigma_i, i = h, s$ in the notation for the lower and upper bound on the interval of wife's wages at which the husband has equilibrium incentives for abuse, $w_s^0(w_h; \sigma_h, \sigma_s)$ and $w_s^*(w_h; \sigma_h, \sigma_s)$. What matters for the equilibrium outcome are the partners' "effective wages" $\widetilde{w}_i \equiv (1+\sigma_i) w_i, i = h, s$. This implies that the following two equations hold as identities

$$w_s^0(w_h, \sigma_h, \sigma_s) = \frac{w_s^0(w_h(1+\sigma_h), 0, 0)}{(1+\sigma_s)} \qquad \text{and} \qquad w_s^*(w_h, \sigma_h, \sigma_s) = \frac{w_s^*(w_h(1+\sigma_h), 0, 0)}{(1+\sigma_s)}. \tag{A22}$$

It immediately follows that both critical wages are decreasing in σ_s. To see that both critical wages are also increasing in σ_h recall that both $w_s^0(w_h)$ and $w_s^*(w_h)$ are increasing in w_h (see Lemma A.3 and Proposition 2). □

Proof of Lemma 3. Recall that $Y_i \equiv y_i - t_i + t_{-i}$ denotes i's total unearned income (inclusive of transfers). If partner i is making an equilibrium transfer $t_i^* > 0$ to $-i$ (implying that $t_{-i}^* = 0$, see Lemma 2), then individual i is effectively choosing, on the margin, the intra-household allocation of total unearned income subject to $Y_i + Y_{-i} = y_i + y_{-i}$. As y_i and y_{-i} only feature in the form of their sum it follows that $\partial Y_i^*/\partial y_i = \partial Y_i^*/\partial y_{-i}$, or equivalently, $1 - \partial t_i^*/\partial y_i = -\partial t_i^*/\partial y_{-i}$. Note that this holds irrespective of whether i's transfer is "benevolent", "crowding-out", or "interior". □

Proof of Proposition 5. Using the definition of $w_s^0(w_h)$ in (A4) and differentiating with respect to unearned income for partner k yields

$$\frac{\partial t_h^0}{\partial w_s}\frac{\partial w_s^0(w_h)}{\partial y_k} + \frac{\partial t_h^0}{\partial y_k} = \frac{\partial t_h^1}{\partial w_s}\frac{\partial w_s^0(w_h)}{\partial y_k} + \frac{\partial t_h^1}{\partial y_k}. \tag{A23}$$

When $k = h$, the first term on the left hand side and the second term on the right hand side are, by Proposition 1, both equal to zero. Hence

$$\frac{\partial w_s^0(w_h)}{\partial y_h} = \frac{\partial t_h^0/\partial y_h}{\partial t_h^1/\partial w_s} > 0, \tag{A24}$$

where the sign follows from simple comparative statics which shows that $t_h^0(w_h, w_s)$ strictly increases in y_h and, from Proposition 1. By local income pooling, $\partial w_s^0(w_h)/\partial y_s = \partial w_s^0(w_h)/\partial y_h$.

When $w_s^*(w_h) < w_s^2(w_h)$ the upper bound $w_s^*(w_h)$ is implicitly defined by (A18). Differentiating with respect to the wife's unearned income yields, after using Lemma 3,

$$\frac{\partial w_s^*(w_h)}{\partial y_s} = -\frac{\frac{\partial t_h^2}{\partial y_h}}{\frac{\partial \varepsilon_s}{\partial w_s}/\frac{\partial \varepsilon_s}{\partial Y_s} + \frac{\partial t_h^2}{\partial w_s}} > 0, \tag{A25}$$

where we note that the denominator is strictly negative by Assumption 3 and Proposition 1, and simple comparative statics show that the numerator is strictly positive. By local income pooling the introduction of y_h must have the same positive effect on w_s^* as y_s.

When $w_s^*(w_h) > w_s^2(w_h)$ equation (A18) reduces to $\mu/(1-\mu) = \varepsilon_s(w_s^*(w_s), y_s)$. As y_h does not feature in this equation it immediately follows that a (small) y_h has no impact on $w_s^*(w_h)$. Moreover, by Assumption 3 the labour supply elasticity is decreasing in the own wage and increasing in unearned income, which together imply that $w_s^*(w_h)$ increases in y_s. □