

# Intra-household Bargaining, Resource Allocation and Cost of Gender-Based Violence in Egypt: The Role of Asset Ownership and Gender Role Attitudes

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# **Intra-household Bargaining, Resource Allocation and Cost of Gender-Based Violence in Egypt: The Role of Asset Ownership and Gender Role Attitudes**

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## **Abstract**

Wives' violent abuse is a common and widely acknowledged issue. However, the subject has received little empirical research in the developing world. This study explores the intra-household inequalities in Egypt, considering the gender role attitudes, female asset ownership and the domestic violence wives experience from their husbands. We apply a standard intra-household collective model and estimate the spouses' labour supply equations. The empirical analysis relies on the Egypt Economic Cost of Gender-Based Violence Survey (ECGBVS) conducted in 2015. The findings showed that if the wife's wage increases by 1 Egyptian pound, then she transfers 0.18 to 0.23 to her partner, while husbands, under the same increase, transfer 0.16 to 0.20 pounds to their wives. Moreover, an increase of one Egyptian pound in the household non-labour income increases by 0.62-0.72 the wife's non-labour income. Also, the wife's share in non-labour income rises by 0.62-0.72 Egyptian pounds for every pound increase in the household's non-labour income. Focusing on the distribution factors, we find that the difference between the couples' age, conservative gender role attitudes and violence reduce women's bargaining power. The reduction in the annual wage ranges between 230 and 400 pounds per year with increases in age differences and gender role attitudes. It might reach 2,500 pounds per year if women have undergone any form of domestic violence from their partner, including physical, psychological, or sexual abuse. On the other hand, female asset ownership empowers women and enhances their bargaining power.

**Keywords:** Domestic Violence; Cost of Violence; Egypt; Employment Loss; Gender Role Attitudes; Intra-Household Allocation; Women Empowerment

**JEL Codes:** D13, D63, J12, J16, J22, R2

## **1. Introduction**

One of the most prevalent gender-based violence (GBV) types is intimate partner violence (IPV). It is one of today's most critical social issues (Garcia-Moreno et al., 2006; Vyas and Watts, 2009), and it occurs in all societies, regardless of economic status and the country's development stage, and among people of all races and ethnicities. In particular, if regional customs, local traditions, cultural norms, and the legal system uphold men's superiority over women, then women everywhere carry a disproportionate share of the world's burdens and are more susceptible to abuse and various forms of demeaning violence (Krug et al., 2022; Schuler et al., 2006; World Health Organization & Pan American Health Organization, 2012; Mshweshwe, 2020).

It primarily affects women and girls, having numerous short-run and long-run physical, psychological, sexual, and emotional effects. GBV negatively impacts women's well-being and quality of life and prevents them from participating in the labour market and socio-cultural events and contributing to society. Violence harms not only women but also their families, the community, and the country as a whole, associated with significant expenditures, including increased health care and legal fees, as well as productivity losses, which influence the overall development (Violence, W. I. G. B., 1999; Cruz and Klinger, 2011; Duvvury et al., 2022).

According to studies, IPV is a substantial obstacle to development since it negatively impacts employment outcomes, particularly for women, thereby reducing their opportunities to participate in the labour market, earn an income, and make their own choices regarding their families and children's health and education (Gibson-Davis et al., 2005; Vyas and Watts, 2009) independently. IPV also has a wide range of harmful effects on women's reproductive, mental, and physical health, as well as an elevated risk of HIV/AIDS (Campbell, 2002; Dunkle et al., 2006; Dillon et al., 2013).

This study intends to shed some insights into the relationship between domestic abuse, violence and women's empowerment, which is important because investing in the female labour force should be a priority of policymakers and societies overall. To fuel the economy's further expansion in the future, human capital, mainly in the form of women's investments in their children's health, education and quality of life, is essential (Schultz, 2002). Women's economic participation is beneficial because it encourages growth, increases diversity, reduces income inequality, and strengthens the financial system (Gonzales et al., 2015; Kochhar et al., 2017; IMF, 2018).

The study aims to employ an intra-household collective model to investigate the impact of violence on spouses' labour supply and sharing rule. Numerous studies have implemented intra-household collective models to examine the labour supply, allocation of expenditures and consumption, sharing rule and the bargaining power between spouses (Chiappori, 1988, 1992, 1997; Lundberg et al., 1997; Chiappori et al., 2002; Attanasio and Lechene, 2002; Arias et al., 2004; Blundell et al., 2005, 2007; Browning et al., 1994, 2009; Hendy and Sofer, 2010; Menon and Perali, 2012; Chavas et al., 2018). We adhere to the framework used by Rapoport et al. (2011), Giovanis and Ozdamar (2019), and Molina et al. (2022). To the best of our knowledge, no study has yet been conducted on intra-household inequality in Egypt, examining the impact and costs of gender domestic violence on labour supply. Moreover, we examine three distinct forms of domestic violence: physical, psychological, and sexual. Another contribution of the study is that we consider the ownership of assets and property and gender role attitudes as distribution factors, along with those used commonly in the literature, such as differences in partners' ages.

We will estimate the joint labour supply equations of wives and husbands using the Generalized Methods of Moments (GMM) method. The empirical work relies on the Egypt Economic Cost of Gender-Based Violence Survey (ECGBVS) 2015. The findings support the collective household model, as the sharing rule and bargaining power of spouses depend not only on their characteristics but also on their partners' characteristics, such as wage, education, and age. In general, domestic violence negatively affects the bargaining power of wives who hold conservative gender role attitudes that legitimize their husbands' violent behaviour in particular situations. The harmful effects of violence stemming from physical contact are the most severe, followed by those stemming from sexual and psychological abuse. On the contrary, female asset ownership enhances wives' bargaining power.

The remaining sections of the paper are organized as follows: In section 2, we present the literature evaluation on domestic violence and its costs. In section 3, we describe the methodology and data, and in section 4, we report the empirical findings. The fifth section addresses the study's findings, policy implications, and concluding remarks.

## 2. Literature Review

Domestic violence against women has substantial social and economic repercussions and is associated with significant health expenditures and loss of productivity. According to the last report by the WHO (2021), IPV is an essential source of stress, depression, and suicidality among women. It also causes reproductive and sexual health problems and injuries. According to estimates, between 38 and 40 per cent of female homicides are committed by intimate partners. IPV against women affects children's health outcomes, such as low birth weight and development issues (WHO, 2021). The Center for Disease Control in the United States estimates the yearly expenditures associated with IPV hospitalization, medical care, and lost productivity at \$5.8 (Aizer, 2010).

Prior research has primarily concentrated on intimate partner violence (IPV) in North America and Europe, followed by studies conducted in Asia. Still, relatively few studies examine domestic violence in the countries of the Middle East and North Africa (MENA) region (Alhabib et al., 2010). Previous research indicates that women's participation in economic activities can sustainably contribute to human capital growth. Using the Demography and Health Survey (DHS) across 36 South Asian, Latin American, Caribbean and Sub-Saharan African nations, Smith (2003) found a significant correlation between female decision-making power and children's nutrition. Using data from the 1995 DHS for Egypt and multivariate analysis, Kishor (2000) demonstrated strong relationships between women's empowerment and child health.

Sanin (2022) conducted an intriguing study using the Difference-in-Differences (DiD) method and found that following the installation of a coffee mill in Rwanda, women in the catchment areas are 18 per cent more likely to work for cash. They are also 26 per cent less likely to have reported any domestic abuse or violence from their partner over the past 12 months. In addition, hospitals in the catchment regions are 20 per cent less likely to record admissions of a patient who is a victim of domestic violence during a harvest month compared to one month before the commencement of the harvest season. In contrast, the study by Au Yong Lyn (2021) implies the opposite. More specifically, the author investigated the effect of the gold mining boom on women's bargaining power in Mexico, using as an exogenous event the financial crisis of 2007-2008. The findings indicate that residents of gold-endowed localities have greater bargaining and decision-making power but are more likely to face domestic abuse from their partners.

Overall, previous studies have developed various economic theories and have applied models to incorporate theories from psychology and sociology related to domestic violence. The expressive violence theory refers to the effect of income. In this situation, expressive violence does not necessarily involve physical abuse, but the husband may be able to vent economic tension through non-physical means (Tauchen et al., 1991). Specifically, increasing women's income may alleviate husbands' financial strain and lessen domestic violence (Kruk et al., 2004; Angelucci, 2008; Arenas-Arroyo et al., 2021; Bhalotra et al., 2021). This finding is further explored and clarified in the study by Haushofer et al. (2019), who point out that since violence and the husband's wealth are substitutes in the expressive component of his utility, they are also substitutes in his overall utility. Consequently, rises in the husband's salary reduce instances of aggression against the wife.

The second theory is the outside option. Previous studies have incorporated household bargaining and found that employment opportunities boosting wives' income enhance their outside options and their bargaining power and thereby reduce domestic violence (Tauchen et al., 1991; Farmer and Tiefenthaler, 1997; Aizer, 2010; Anderberg et al., 2016; Hidrobo et al., 2016; Haushofer et al., 2019). Similar to the outside option is exposure reduction. This is a theory developed by criminologists who contend that a rise in female work may lessen domestic violence due to a decline in the amount of time couples spend together, hence reducing the amount of time a woman is exposed to her husband (Dugan et al., 1999; Chin, 2011).

There are, however, theories that imply a positive association between women's resources and domestic violence. The first theory is the Male Backlash developed by sociologists who argue that an increase in women's income may lead to a rise in domestic violence because female employment may undermine the husband's conventional gender role as the "breadwinner", resulting in domestic violence (Macmillan and Gartner, 1999; Angelucci, 2008; Alesina et al., 2020; Au Yong Lyn, 2021). The second theory is instrumental violence or resource extraction, in which the husband exploits his spouse to extract resources for material gain by using physical force or the threat of violence. In this instance, he is attempting to improve his bargaining power; consequently, according to the theory of instrumental violence, a rise in women's resources may also cause more instances of domestic violence from their spouses (Bloch and Rao, 2002; Bobonis et al., 2013; Bhalotra et al., 2021). Although both theories suggest a positive association between women's resources and domestic violence, the Male Backlash hypothesis does not necessarily propose that the husband's motivation for exposing violence is to extract resources from his partner.

This paper contributes to the literature by investigating the costs of Gender-Based Violence (GBV) and inequalities in Egypt using an intra-household collective model and estimating the sharing rules for three types of domestic violence; psychological, physical and sexual. Another contribution is we explore gender role attitudes and the importance of female asset ownership.

### 3. Methodology and Data

#### 3.1 Methodology

The assumption of the model we estimate relies on the assumption that household decisions are Pareto-efficient (Apps and Rees, 1988; Chiappori, 1988, 1992; Browning et al., 1994; Bourguignon et al., 2009). Following Chiappori et al. (2002) and other studies (Rapoport et al., 2011; Giovanis and Ozdamar, 2019; Molina et al., 2022), we use a semi-logarithmic specification for the female and male labour supply equations:

$$h^f = f_0 + f_1 \ln w_f + f_2 \ln w_m + f_3 y + f_4 \ln w_f \ln w_m + f' s + \gamma' \mathbf{z} \quad (1)$$

$$h^m = m_0 + m_1 \ln w_f + m_2 \ln w_m + m_3 y + m_4 \ln w_f \ln w_m + m' s + \delta' \mathbf{z} \quad (2)$$

In the structural system (1)-(2), the  $h$  denotes the working hours per year for males and females represented by  $m$  and  $f$  respectively,  $w$ ,  $y$  and  $s$  denote the wage, non-labour income and the distributional factors, respectively, while  $\mathbf{z}$  is a vector of individual and household characteristics, such as spouses' education level and urban-rural region. From (1)-(2), we can compute the partial derivatives with respect to spouses' wages, non-labour income and the distribution factors and then find the sharing rule. Since we employ many distribution factors, the estimated coefficients of  $s$  in equations (1)-(2) are defined, respectively, by  $f'$  and  $m'$ .

As we have highlighted, we will consider various distribution factors. The first is the common factor employed in previous studies and is the difference in age between men and women (Aronsson et al., 2001). The second distribution factor is the ownership of an asset, real estate or property, such as land, apartment, livestock, jewellery, car or truck, shop, factory, aquafarming, building, or valuable movables. The third distribution factor is gender role attitudes. This factor is an index constructed using ten variables and applying the principal component analysis. The

questions refer to “whether the husband has the right to beat his wife” under various circumstances, such as if she neglects household chores, if she burns the food, if she neglects children, if she is sceptical, if she replies back, or if she is wasteful and others.

The fourth distribution factor involves domestic violence, and we will consider three types: psychological, physical, and sexual. Because some respondents have not experienced all kinds of violence, we will perform three regressions for each type to avoid multicollinearity issues. Therefore, using the gender role attitudes, ownership and domestic violence, we will compare the female labour supply and the sharing rule between those who have experienced abuse and violence with the women’s labour supply who did not have that experience. For instance, women who have been victims of violence may have abandoned or lost their job, reduced working hours, or increased absenteeism because of domestic violence and any potential injury associated with it. Violence and injuries may ultimately affect the sharing rule and, thus, the intra-household resource allocation and inequalities. Since this model is well-documented in previous studies (Chiappori, 1992; Chiappori et al., 2002; Rapoport et al., 2011; Giovanis and Ozdamar, 2019; Molina et al., 2022), we provide more details about the maximization problem and the derivation of sharing rules in the Appendices.

We will estimate the simultaneous equations (1)-(2) by using the Generalized Method of Moments (GMM) with instruments for wages and income employed in previous studies (Chiappori, 1992; Rapoport et al., 2011; Giovanis and Ozdamar, 2019; Molina et al., 2022), as well as with additional instruments proposed in this study. More specifically, we use the Qism Markaz, which is the geographical level beneath the governorates we described earlier, the type of marriage (e.g. customary, legal or civil), the squared terms of spouses’ ages, the number of marriages, whether the respondent agreed with the marriage, and whether she lives with the parents-in-law or any of the husband’s relatives. Household wealth indicators are other instruments employed, including questions on whether the household owns a radio, television, gas and electric stove, refrigerator, computer, air conditioner, motorcycle, private car, land, stock and bank account, and a commercial or industrial establishment. Other instruments include the confidentiality and the cooperation of the interview, such as whether the degree of cooperation was weak, medium, good or very good.

The intra-household model described in Appendix A and equations (1)-(2) requires that both partners participate in the labour market and earn a wage. Thus, we extend the analysis by also



accounting for female labour market non-participation. Furthermore, economists have long been concerned about selection bias in observed wages. The selection equation for labour market participation is:

$$p_f = a_0 + a_1age_f + a_2age_m + a_3y + b'education_f + \gamma'education_m + a'z + u_f \quad (3)$$

Variable  $y$  is the household income, and subscripts  $f$  and  $m$  denote, respectively, females and males. We consider only married respondents and restrict the sample to couples participating in the labour market and earning wages. We also consider females that do not participate. We also insert quadratic terms on age, allowing for a flexible function form. Since education level is a categorical variable, we will estimate the set of coefficients by  $b'$  and  $\gamma'$  for women's and men's education.

Vector  $z$  includes other individual and household characteristics, and in particular, the ownership of real estate or property and whether the area is rural or urban. Other variables include the ratio of females in the household, whether the wife lives together with her parents and relatives or with the parents-in-law and husband's relatives, and whether she participates in any social activity. We assume that earnings do not vary based on the spouse's characteristics, and the female wage equation using the standard approach of human capital is as follows:

$$\ln w_f = b_0 + b_1age_f + b_2age_f^2 + b'education_f + \gamma'z + e_f \quad (4)$$

Where  $w$  is defined as the wage in equations (1)-(2), while age and education are key components of human capital and two of the most significant determinants of wage. We will implement the two-step Heckman selection model (Heckman, 1979) to correct sample selection and predict wages. Vector  $z$  also contains the instruments excluded from the participation equation that refers to the geographical level beneath governorates, the Qism Markaz. Therefore, following previous studies, we include female and male characteristics in labour force participation, such as age and education level, as they may influence women's decision to participate in the labour market. On the other hand, we include only female and household characteristics in the wage equation (Nicodemo and Waldmann, 2009; Giovanis and Ozdamar, 2019).

Thus, in the first stage, we estimate the participation equation (3) using the Probit method, and then we obtain the estimated parameters to calculate the inverse Mills ratio (IMR). Then, in the second step, we include this ratio as a dependent variable in the wage equation (4), estimated using ordinary least squares (OLS). If the IMR is insignificant, then we accept the null hypothesis that the errors are uncorrelated, implying that there is no selection bias.

### 3.2 Data

The empirical analysis relies on the 2015 Egypt Economic Cost of Gender-Based Violence Survey (ECGBVS), which is accessible for academic purposes through the ERF NADA portal<sup>1</sup>. The sample was designed to provide representative governorate-level estimates using a 95% level of confidence. Design elements included a two-stage cluster sample. The initial sampling selected 1,000 enumeration areas (EAs) using a master sampling frame prepared by the Central Agency for Public Mobilization and Statistics (CAPMAS) in January 2010, which was based on the 2006 population census and then revised in 2013. In the second phase, 22 households were methodically selected from each EA in the rural and urban areas, and data from 21,448 households were collected. Women aged 18-64 who had resided in the household for at least a month prior to the survey were eligible for the interviews, and only one woman per family was selected for the interview (see UNFPA, 2016 for further details on the sampling design).

In Table 1, we present the summary statistics for the incidence of domestic violence and the characteristics at the individual and household levels, such as age, education level, wages and labour supply, household size and area. We will estimate the regressions using three types of domestic violence. The first is psychological and emotional, which includes insults or making her sad, constantly doubting her, limiting her communication with friends, insisting on knowing her whereabouts, refuse to give her money for household needs. The second type is physical violence, such as burning, beating, slapping, and hitting. The third type is sexual violence, which includes forced sexual intercourse, degrading or demeaning sexual acts, and other forms of sexual coercion.

In panel A, we report the spouses' characteristics, which include wages, age, education level and labour supply. We should highlight that wage rates and labour supply are expressed annually.

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<sup>1</sup> For more details on the questionnaire and data access, please see <http://www.erfdataportal.com/index.php/catalog/238>

Wage rates are measured on Egyptian pounds and labour supply on working days per year. We also report the *t-statistics hypothesis* tests of equality between the couples of the variables. We reject the null hypothesis of equality in means between female and male wages, labour supply and age.

Moreover, the *t-statistic* in these cases is positive, indicating that males are, on average older, working more days and earning a higher salary. On the contrary, we accept the null hypothesis in the education level between husbands and wives, except for secondary school and above intermediate. In this case, we find a negative *t-statistic* implying that women are more likely to complete these levels of educational attainment. In panel B, we report the proportions of women experiencing domestic violence from their husbands. A higher percentage has experienced psychological violence at 41.80 per cent, followed by physical at 31.13, and 11.76 per cent of the sample has experienced sexual violence. In Panel C, we report the household size, which is 4.4 on average and the area, where almost 44.80 per cent lives in urban areas.

(Insert Table 1)

In Table 2, we report the correlation matrix. We show that psychological violence is more related to physical violence than sexual violence is connected to either one of them. Furthermore, we find that gender role attitudes are positively correlated to the incidence of all types of violence. As described in the methodology section, we construct gender role attitudes as an index using a set of questions about whether the husband has the right to beat his wife under various circumstances. Higher values imply more conservative roles and are more likely the respondent (wife) will justify her husband beating her. Therefore, we may conclude that wives characterised by traditional gender role values are more likely to allow their husbands to beat them and, thus, more likely to experience any type of domestic violence.

We find that male and female wages, labour supply, education attainment and age are related negatively to all types of violence, except for salaries and sexual violence, which seems there is no significant correlation. Moreover, female asset ownership is negatively related to violence, except for psychological violence, which is insignificant and may require more investigation. We also show a negative relationship between gender roles and wages, labour supply and education, implying that wealthier and more educated couples are less likely to report conservative gender role attitudes and, thus, less likely to experience domestic violence. As was expected, education is

positively related to wages and labour supply. Nevertheless, it is interesting that female and male education is not associated with female labour supply.

Furthermore, we find a negative relationship between female asset ownership, wages and education level. These findings may seem surprising, as more educated people can be wealthier, as we have shown earlier. We should highlight that this variable takes a value of 1 if the wife owns an asset or property and 0 otherwise. However, the survey records the detailed responses of those who answered that they possess an asset by type, such as land, apartment, car or truck, livestock or poultry. Thus, the statistics show a negative relationship between those who own land, livestock and poultry and education, but we find a positive relationship between ownership of an apartment and education. This finding can be explained by the fact that women who own land or livestock are likelier to be farmers. Thus, they have completed lower education attainment, and earn lower wages, while more educated people earning a higher wage are less likely to be farmers and own land and are more likely to purchase an apartment. Furthermore, wives who own the land and livestock could have inherited them from their families. Nevertheless, the negative association between female asset ownership, wages and education level are that most of the wives in the sample that own land, almost 51 per cent, 33 per cent own an apartment, and only between 0.5-7.5 per cent own a car, truck, building, shop, or factory.

(Insert Table 2)

## **4. Empirical Results**

### 4.1 Heckman selection model

The first section of the results refers to the two-step Heckman selection model for female labour market participation, estimating equations (3)-(4). We estimated a two-step Heckman selection model (Heckman, 1979) to investigate the factors influencing women's labour force participation and wages. In the first column, we report the decision of labour market participation, which both spouses' characteristics can influence. In the second column, we present the estimates of the second stage, the wage regression, which is related to individual female characteristics. We find that wife's and husband's age shows a non-monotonic relationship with the labour market participation,

depicted by an inverted U-shaped curve. Specifically, this suggests that increases in age are associated with a greater likelihood of participation in the labour market, with a turning point for men aged 41 and 50 years old for women. The correlation between the education level of both couples and the probability of labour market participation is positive. Thus, highly educated women have acquired more skills and have better employment opportunities.

Nevertheless, regarding the husband's education level, the results show that wives are more likely to participate whose husband has completed postgraduate studies. We find an insignificant estimated coefficient of the non-labour income and the urban area, while the household size is negatively related to participation. We see a positive linear relationship between female age and wages in the wage equation. Although we were expecting an inverted U-shaped curve, as in the case of the participation equation, the estimated coefficient of the quadratic term in age becomes insignificant. University undergraduates and postgraduates report higher wages compared to the reference category, the primary school, and the other educational attainment levels. The area of the respondent's residence is insignificantly related to wages, as we found in the participation equation.

We conclude that the estimated coefficients are jointly significant based on the *Wald chi-square* statistic and its corresponding *p-value*. Thus, the overall performance of the regression overall is satisfying. The last coefficient we present is the Inverse Mills Ratio (IMR), which is estimated using the Probit estimation in the first stage, the participation equation. We observe the IMR is insignificant, and hence, we accept the null hypothesis that the errors are uncorrelated, implying that there is no selection bias.

(Insert Table 3)

#### 4.2 Labour Supply Regressions and Cost of Gender-Based Violence

In Panel A of Table 4, we present the estimated coefficients of the labour supply regressions (1)-(2), and in panel B, we report the sharing rules. Furthermore, panels A1-A3 and B1-B3 present the regressions for each type of violence. Interestingly, we find in all regressions that the wife's workdays are negatively related to her and her husband's earnings. We observe the same for the husbands, where male and female wages are negatively related to husbands' labour supply. This finding shows evidence against the income-pooling property, which assumes that an increase of one euro to the family income should have the same effect on spousal behaviour, no matter who

earned that money. Thus, the estimates in Table 2 reject the unitary model because they reject the income pooling property.

Regarding the interaction of spouses' wages, we find a positive relationship between male and female labour supply. Regarding household non-labour income, we see the opposite results. In all regressions, non-labour income is negatively related to the female labour supply but is positive in the male labour supply. In the case of the wives, an increase in non-labour income by 1 Egyptian pound decreases their labour supply by 0.6 days in the case of physical and psychological violence regressions and by 0.7 days in the sexual violence regression. In contrast, an increase in the non-labour income by 1 Egyptian pound increases the male labour supply by 0.48 to 0.55 days. We should recall that the survey records the working days per year, not hours per day, days per week, or months.

Regarding educational attainment, it is interesting that female education is positively associated with the female labour supply and negatively associated with the male labour supply. We find the inverse situation for male education. We should highlight that while the education level is a categorical variable in Table 3 and the results of the Heckman selection model in Table 4, we define as one those who have completed above intermediate, an undergraduate or a postgraduate degree and 0 otherwise, or those who have completed primary, preparatory or secondary school.

Focusing on the distribution factors, we find a negative association between female labour supply, the difference in spouses' ages, gender role attitudes and violence. Thus, these distribution factors reduce the female labour supply while increasing the male labour supply, implying that women's bargaining power reduces. However, we demonstrate an insignificant association between violence and male labour supply, but violence affects only women's labour supply negatively. Moreover, the difference in spouses' ages is negligible in husbands' labour supply regressions.

On the contrary, we find a positive relationship between female asset ownership and female labour supply but a negative association with the male labour supply, even though we found no correlation in Table 2. In this case, female asset ownership increases the female labour supply by 0.24 to 0.35 days per year and reduces the male labour supply by 0.5 to 0.6 days per year. According to the *Hansen J statistic test*, we do not reject the null hypotheses of the no-endogeneity and accept the validity of the instruments employed in the empirical work. In particular, we report the *Chi-square* values for 102 degrees of freedom and compare them with the critical value of *chi-square*,

which is 126.573 at the 95% confidence level. The chi-square values range between 98 and 111 and are lower than the critical chi-square value, implying that we cannot reject the null hypothesis. We reach the same conclusion if we consider the *p-values*, which are 0.2440, 0.5884 and 0.4269, respectively, in the physical, psychological and sexual violence regressions and are lower than the 5% and 1%. (Insert Table 4)

Next, we present the sharing rules in panel B, which depicts the effect of a marginal change in one variable on the non-labour income accruing to the wife following sharing. When we consider the physical violence regression in panel B1, for an increase in wage by 1 pound, women transfer 0.28 pounds to their partner, while men transfer 0.15 to their wives. We find higher values of the sharing rules in the regressions of psychological and sexual violence. Specifically, women transfer around 0.5 pounds of their additional wage to their partner, while husbands share approximately 0.30 pounds. The findings show that women share a larger fraction of their income than men and, thus, behave more altruistically. Moreover, the results highlight the importance of the type of domestic violence explored. In particular, we observe that women's sharing rule, and thus, the bargaining power is lower in the physical violence regressions, as the men transfer half of the amount to their spouse than we found in the regressions of psychological and sexual violence. Also, women retain almost half of their increase in wages, which is 0.28 compared to 0.5. Regarding the non-labour income, the sharing rule ranges between 0.62 in the psychological violence regression to 0.72 in the physical violence regression. This finding shows that a 1 Egyptian pound increase in the household non-labour income will increase the wife's non-labour income by 0.62 to 0.72 pounds or by 62 to 72 piastres, or ersh, which is equivalent to one-hundredth of the pound.

The sharing rules of distribution factors and, in particular, the difference in ages, gender role attitudes and violence are negative, indicating that women are losing or transferring their income to their husbands. If we consider the average female wage rate in Table 1, then the age difference reduces the female labour supply by 0.0125 days per year in the physical violence regression or by 124 pounds per year. We derive similar results from the other violence regressions. If we consider gender role attitudes, the cost of wage loss is 375 pounds per year in the physical violence regression and around 230 pounds in the psychological and sexual violence regressions. The third distribution factor and most important is the experience of domestic violence. For instance, the sharing rule for women who have experienced physical violence is -0.2550 and taking the annual average wage of 9,878 in Table 1, this type of violence results in a wage loss of around 2,500

pounds per year compared to the wives who have not experienced physical violence. The costs are lower for those who have experienced sexual violence at 1,960 pounds, followed by psychological violence at 1,720. On the contrary, asset ownership increases the bargaining power of women and the income for the wives who own an asset or property increases their income by 3,260 more than those with no ownership.

## **5. Discussion**

The findings of this study have various implications. First, the labour supply estimates are compatible with the household collective model. This implies that we reject the unitary model, which assumes the household behaves as a single unit. Still, the results suggest that Egyptian households behave cooperatively. The results are consistent with previous studies where household members' decisions do not depend only on their own characteristics but also on their partner's characteristics, such as wage, age, education, and perception of gender role attitudes (Chiappori, 1988, 1992, Chiappori et al., 2002; Attanasio and Lechene, 2002; Arias et al., 2004; Blundell et al., 2007; Browning et al., 1994, 2009; Hendy and Sofer, 2010; Rapoport et al., 2011; Menon and Perali, 2012; Cherchye et al., 2015; Chavas et al., 2018; Giovanis and Ozdamar, 2019; Molina et al., 2022). For instance, Molina et al. (2022) found that women in Spanish households behave more altruistically than men, as shown in this study. Second, we found that education plays a significant role in the female labour supply. Previous studies have found that education can be protective against abuse (Garcia-Moreno et al., 2006; Amegbor and Rosenberg, 2019). This finding can be explained by the fact that educated women are more likely to participate in the labour market and have more employment opportunities that enhance their bargaining and decision-making power. Therefore, policies and strategies encouraging girls' education may reduce the education gender gap and constrict the control of men.

Third, the findings highlight the role of gender role attitudes and domestic violence in women's bargaining power. While we have not explored the role of laws, it would be critical to investigate in Egypt and the MENA region in general whether women's bargaining and decision-making power can be strengthened with the design and enforcement of laws against domestic violence. Previous research has demonstrated that these regulations and laws are vital for preventing violence



against women, protecting them, and promoting their labour market participation. (Ouedraogo and Stenzel, 2021; Dugan, 2022). On the other hand, the results showed that female asset ownership enhances women's bargaining power. This finding may indicate that asset ownership can signal sufficient economic independence, discourage domestic violence, and increase the female labour supply.

However, the analysis has certain drawbacks. The first limitation is that the empirical research relied on cross-sectional data. On the one hand, this may imply that our results represent correlation, even though we have used instrumental variables. Second, and more importantly, using cross-sectional data, the results are static, and we cannot perform dynamic analysis to explore the response of spouses to economic environment changes. Another limitation is that we have not examined whether the respondent had psychological or physical injuries following the violence. While the survey records this information, the analysis will rely only upon those who have experienced domestic violence. More specifically, we could have limited the sample only to those who have been victims of domestic violence and then investigated the effect of injuries on the sharing rule—in particular, comparing those with injuries and those with no injuries. Other information recorded in the survey is whether the victim has received any health treatment and the money she spent. However, the number of respondents receiving treatment is minimal, which does not allow for robust analysis, and highlights the possibility that women may prefer not to receive this type of service.

## **6. Conclusions**

The results show that the unitary model fails to meet the criterion of individualism, and the collective model is more appropriate, where the decision-making and empowerment of household members are not solely determined by their utility functions. Still, their choices are also influenced by the characteristics of the other household members. This assumption can be critical to policymaking, especially regarding welfare indicators and policies targeting the reduction of inequalities and poverty. This is also the case of the domestic violence women face from their partners, which can negatively affect their participation in the labour market, and they may experience absenteeism in the workplace and loss in productivity and wages.

The findings may provide some practical conclusions. First, the collective model can serve as a guide on policy evaluation, such as cash transfers, and whether the wife, husband or children should receive them or should we treat the household as a unit. Second, the results suggest that intra-household behaviour is asymmetric. More specifically, even though we found similar transfers from the extra wage increases, women behave slightly more altruistically than men. Third, we found that domestic violence and difference in spouses' age negatively affect women's sharing rule and bargaining power, but there is no influence on men.

Regarding gender role attitudes, we found that women with more conservative values present lower bargaining power. One of the most effective ways to reduce poverty and inequality and promote sustainable development is through gender inequality, the advancement of women's rights and their empowerment (IMF, 2013). Policies can be valuable for women to realise their full potential and participate in economic activities. In particular, enacting policies promoting women's employment and education, eliminating labour market inefficiencies, designing mechanisms that prevent female domestic violence, and providing services to women who have experienced such abuse.

Another aspect that we have not explored is whether male unemployment inflicts violence on women. Moreover, the paper has not investigated the impact of domestic violence on female unemployment or labour market participation. Nevertheless, the study aimed to employ a standard intra-household collective model for married couples and highlight the inequalities in sharing rules and bargaining power influenced by gender role attitudes and domestic violence. Therefore, future studies may further investigate and answer these research questions.

Furthermore, the study has not thoroughly explored the theories discussed in the literature review, such as whether the increase in women's income has reduced husbands' economic stress and, consequently, domestic violence or whether outside option enhances women's bargaining power. Similarly, we have not examined the instrumental violence and Male Backlash theories, arguing that the husband uses violence as a bargaining tool to extract resources from the wife. Finally, another aspect that we could have explored is, apart from the participation in the labour market and household chores, the time spent on housework chores, such as cleaning, ironing, shopping, and caring for children. Nevertheless, we propose this in future studies. Overall, additional surveys should be conducted in Egypt and other countries of the MENA region

worldwide, recording information about spouses' wages, hours or days of work, and additional variables required to develop and estimate collective household models.

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**Table 1. Summary Statistics for Married Couples in Egypt**

<b>Panel A: Spouses characteristics</b>				
<b>Variables</b>	<b>Males</b>	<b>Females</b>	<b>T-statistic</b>	<b>P-value</b>
Annual Wage in Egyptian	20,016.12 (12,401.83)	9,878.694 (18,056.40)	32.805	0.000
Age	45.897 (11.973)	39.123 (10.984)	48.273	0.000
<b>Education</b>				
Primary	0.2035 (0.4025)	0.1994 (0.3996)	0.8227	0.4107
Preparatory	0.1202 (0.3252)	0.1250 (0.3306)	-1.2032	0.2289
Secondary	0.4066 (0.4912)	0.4208 (0.4937)	-2.3732	-0.0176
Above Intermediate	0.0527 (0.2233)	0.0464 (0.2102)	2.4126	0.0158
University Degree	0.2065 (0.4047)	0.1988 (0.3991)	1.5811	0.1139
Postgraduate Studies and Higher	0.0105 (0.1021)	0.0096 (0.0976)	0.7606	0.4469
Annual Working Days	300.206 (68.698)	253.543 (106.623)	17.638	0.000
<b>Panel B: Incidence of Violence</b>				
Violence	<b>Yes</b>	<b>No</b>		
Physical	31.13	68.87		
Psychological	41.80	58.20		
Sexual	11.76	88.24		
<b>Panel C: Household characteristics</b>				
<b>Variables</b>	<b>Average</b>	<b>Standard Deviation</b>	<b>Minimum</b>	<b>Maximum</b>
Household Size	4.445	1.714	1	12
Urban Area	0.448	0.4973	0	1

Notes: Standard Deviation within the brackets, wage rates and labour supply are expressed on annual basis.

**Table 2. Correlation Matrix**

	Physical violence	Psychological violence	Sexual violence	Female Wage	Male Wage	Female Labour Supply	Male Labour Supply	Female Age	Male Age	Gender Roles	Female Asset Ownership	Female Education
Psychological violence	0.6674*** (0.000)											
Sexual violence	0.3876*** (0.000)	0.3891*** (0.000)										
Female Wage	-0.0301*** (0.0012)	-0.0448*** (0.000)	-0.0087 (0.3499)									
Male Wage	-0.0360*** (0.0001)	-0.0485*** (0.000)	0.0083 (0.3757)	0.1211*** (0.000)								
Female Labour Supply	-0.0223*** (0.000)	-0.0209*** (0.000)	-0.0095*** (0.0004)	-0.0698*** (0.000)	-0.1305*** (0.0051)							
Male Labour Supply	-0.0716*** (0.000)	-0.0668*** (0.000)	-0.0328*** (0.0009)	0.0423*** (0.0002)	0.0395*** (0.018)	0.3172*** (0.000)						
Female Age	-0.0497*** (0.000)	-0.0320*** (0.0001)	-0.0386*** (0.000)	0.4867*** (0.000)	0.0011 (0.9898)	0.0191 (0.6420)	0.0417*** (0.000)					
Male Age	-0.0489*** (0.000)	-0.0381*** (0.0001)	-0.0431*** (0.000)	0.4382*** (0.000)	-0.0019 (0.8425)	0.0433 (0.2932)	0.0356*** (0.0003)	0.8943*** (0.000)				
Gender Roles	0.1269*** (0.000)	0.1389*** (0.000)	0.0988*** (0.000)	-0.0238** (0.0105)	-0.1093*** (0.000)	-0.0515** (0.0107)	-0.1014*** (0.000)	0.0331*** (0.000)	0.0410*** (0.000)			
Female Asset Ownership	-0.0145* (0.0674)	-0.0066 (0.4066)	-0.0360*** (0.000)	-0.0980*** (0.000)	-0.0336*** (0.0004)	0.0447 (0.2776)	-0.0121 (0.2213)	-0.0628*** (0.000)	-0.0613*** (0.000)	0.0045 (0.5709)		
Female Education	-0.1055*** (0.000)	-0.1320*** (0.000)	-0.0317*** (0.000)	0.0318** (0.0006)	0.2324*** (0.000)	0.0629 (0.2509)	0.1304*** (0.000)	-0.1236*** (0.000)	-0.1596*** (0.000)	-0.1615*** (0.000)	-0.0683*** (0.000)	
Male Education	-0.1158*** (0.000)	-0.1407*** (0.000)	-0.0445*** (0.000)	0.1125*** (0.000)	0.2460*** (0.000)	0.0321 (0.5279)	0.1572*** (0.000)	-0.0706*** (0.000)	-0.0695*** (0.000)	-0.1704*** (0.000)	-0.0592*** (0.000)	0.6036*** (0.000)

P-values within the brackets, \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level.



**Table 3.** Heckman Selection Model for Female Wages

VARIABLES	Participation Equation	Wage Equation
Female Age	0.2103*** (0.0217)	0.0201*** (0.0034)
Female Age Squared	-0.0021*** (0.0002)	
Male Age	0.0410 (0.0200)	
Male Age Squared	-0.0005*** (0.0002)	
Female Education Level (reference=Primary)		
Female Education Level (Preparatory)	-0.0986 (0.1107)	0.2780 (0.1748)
Female Education Level (Secondary)	0.8322*** (0.0744)	-0.0928 (0.1276)
Female Education Level (Above Intermediate)	1.1624*** (0.0968)	-0.0054 (0.1622)
Female Education Level (University Degree)	1.7309*** (0.0851)	0.2785*** (0.0731)
Female Education Level (Postgraduate Studies and Higher)	2.3531*** (0.1579)	0.2974*** (0.1049)
Male Education Level (reference= Primary)		
Male Education Level (Preparatory)	-0.0894 (0.0887)	
Male Education Level (Secondary)	0.0369 (0.0674)	
Male Education Level (Above Intermediate)	0.0791 (0.0898)	
Male Education Level (University Degree)	0.0591 (0.0749)	
Male Education Level (Postgraduate Studies and Higher)	0.2180** (0.1036)	
Household Non-Labour Income	-0.0804 (0.0598)	
Household Size	-0.0698*** (0.0149)	
Urban Area	0.1017 (0.0706)	0.1048 (0.7090)
Observations	10,482	
Wald chi-square statistic		521.70 [0.000]
Inverse Mills Ratio		-0.0310 (0.1088)

Standard errors within brackets, p-values within square brackets, \*\*\* and \*\* denote significance at the 1% and 5% level.

**Table 4. GMM Estimates of the Labour Supply Equations**

<b>Panel A: GMM Estimates</b>						
	<b>Panel A1: Physical Violence</b>		<b>Panel A2: Psychological Violence</b>		<b>Panel A3: Sexual Violence</b>	
<b>Variables</b>	<b>Wife</b>	<b>Husband</b>	<b>Wife</b>	<b>Husband</b>	<b>Wife</b>	<b>Husband</b>
Log of female wage $\ln w_f$	-1.1667** (0.5860)	-2.4631** (0.9971)	-1.6429*** (0.5791)	-1.9565** (0.8839)	-2.0535*** (0.6591)	-2.4101*** (0.9137)
Log of male wage $\ln w_m$	-0.9606* (0.5097)	-2.0012** (0.7795)	-1.2313** (0.5029)	-1.7229** (0.7772)	-1.6311*** (0.5706)	-2.1301*** (0.8038)
Interaction of spouse' wages $\ln w_m \times \ln w_f$	0.1392* (0.0801)	0.3145** (0.1227)	0.2012** (0.0791)	0.2721** (0.1209)	0.2568*** (0.0901)	0.3356*** (0.1250)
Household Non-labour income (y) /1000	-0.6061*** (0.0891)	0.5168*** (0.1427)	-0.5949*** (0.0873)	0.4839*** (0.1369)	-0.8135*** (0.1065)	0.5462*** (0.1452)
Difference in Age	-0.0104** (0.0046)	0.0088 (0.0076)	-0.0141** (0.0062)	0.0084 (0.0073)	-0.0135*** (0.0051)	0.0072 (0.0051)
Female Education	0.2367*** (0.0487)	-0.2343*** (0.0795)	0.2004*** (0.0479)	-0.2513*** (0.0776)	0.1731*** (0.0517)	-0.2173*** (0.0789)
Male Education	-0.1205*** (0.0421)	0.3331*** (0.0702)	-0.1440*** (0.0422)	0.3494*** (0.0701)	-0.0861** (0.0435)	0.3170*** (0.0707)
Gender Role Attitudes	-0.0320** (0.0144)	0.0464** (0.0232)	-0.0221** (0.0102)	0.0405* (0.0233)	-0.0259* (0.0156)	0.0482** (0.0240)
Female Asset Ownership	0.2768*** (0.0701)	-0.6641*** (0.1168)	0.3575*** (0.0692)	-0.6352*** (0.1144)	0.2380*** (0.0749)	-0.6927*** (0.1195)
Violence	-0.2129*** (0.0169)	-0.0236 (0.0309)	-0.1659*** (0.0124)	-0.0346 (0.0230)	-0.2446*** (0.0270)	-0.0051 (0.0082)
No. observations	6,277		6,277		6,277	
Hansen's J statistic Chi-Square Test (102)	111.524 [0.2440]		98.188 [0.5884]		103.978 [0.4269]	
<b>Panel B: Sharing Rules for Wife</b>						
	<b>Panel B1: Physical Violence</b>		<b>Panel B2: Psychological Violence</b>		<b>Panel B3: Sexual Violence</b>	
$w_f$	0.2804** (0.1232)		0.5186*** (0.0453)		0.4974*** (0.0418)	
$w_m$	0.1530** (0.0676)		0.2923*** (0.0399)		0.3244*** (0.3687)	
Non-labour income	0.7260*** (0.1629)		0.6243*** (0.1625)		0.6605*** (0.1330)	
Difference in Age	-0.0125** (0.0058)		-0.0149** (0.0063)		-0.0110** (0.0043)	
Gender Role Attitudes	-0.0384* (0.0208)		-0.0232** (0.0107)		-0.0211* (0.0114)	
Female Asset Ownership	0.3316*** (0.1201)		0.3752*** (0.1403)		0.1933** (0.0769)	
Violence	-0.2550*** (0.0638)		-0.1741*** (0.0483)		-0.1986*** (0.0457)	

Standard errors within brackets, p-values within square brackets, \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level.

## Appendix A. Theoretical Framework

Under the separability assumption on individuals' preferences, the Pareto efficiency implies that the intra-household collective process can be interpreted as a two-stage process (Chiappori 1992; Chiappori et al., 2002). In the first stage the spouses share the non-labour income according to an unobservable and exogenous sharing rule that reflects the bargaining power of each member in the household. In the second stage once the household non-labour income has been allocated between the members. The model assumes that households consist of two spouses,  $i = f, m$ , denoting respectively female and male with individual utility:

$$U_i = U_i(1-h_i, C_i, \mathbf{z}) \quad (\text{A1})$$

Where  $h_i$  represents the paid work time, and leisure is defined as  $l_i=T-h_i$ , where  $T$  is the total time.  $C_i$  denotes the consumption of a Hicksian good with unitary price, and  $\mathbf{z}$  is a vector of preference factors. According to the hypotheses of the model, the allocation of the household resources is determined by the spouses' bargaining power in household decision-making. Then, the Pareto weight, which is unobserved but depends on observable factors is:

$$\mu = \mu(w_f, w_m, y, \mathbf{z}, s) \in (0,1) \quad (\text{A2})$$

$w$  and  $y$  denote the wage and non-labour household income respectively, and  $s$  represents the set of distribution factors. Then the household solves the following program:

$$\max_{\{C_i, h_i\}} \mu U_f + (1-\mu)U_m \quad (\text{A3})$$

Subject to the budget constraint:

$$w_f h_f + w_m h_m + y = C_f + C_m \quad (\text{A4})$$

As we mentioned earlier, the maximization problem A3 is equivalent to a decentralized two-stage process, where first, spouses bargain the allocation of household income according to a sharing rule  $\varphi=\varphi(\mu)$ , such that female agent  $f$  receives  $\varphi_f=\varphi$  and male agent receives  $\varphi_m=y-\varphi$ . For more detailed demonstration see Chiappori (1992) and Chiappori et al. (2002). Each spouse then maximizes the following program.

$$\max_{\{C_i, l_i\}} U_i(C_i, l_i, \mathbf{z}) \quad (\text{A5})$$

Subject to the budget constraint:

$$C_i = h_i w_i + \phi_i(\mu) \quad (\text{A6})$$

In constraint (A6)  $\phi_i$  denotes  $i$ 's non-labour market income and

$$\phi_f + \phi_m = y \quad (\text{A7})$$

As we described earlier  $\phi_f$  is a function of  $w_f, w_m, y, s$ . Therefore, the shares will be a function of wages, non-labour income, preferences and distribution factors and as a result, for interior solutions, the total labour supplies will have the form:

$$h^f = h^f(w_f, \phi(w_f, w_m, y, s, \mathbf{z}) \mathbf{z}) \quad (\text{A8})$$

$$h^m = h^m(w_m, y - \phi(w_f, w_m, y, s, \mathbf{z}) \mathbf{z}) \quad (\text{A9})$$

In equation A8, we present female labour supply which is a function of the wage rate, the share, which is a function spouses' wages, the non-labour income the distribution and preference factors.

## Appendix B. Differentiation of the labour supply equations and sharing rule

Considering the labour supply functions (1)-(2) in the main text we define:

$$A = \frac{h_{w_m}^f}{h_y^f} = \frac{f_2 + f_4 \ln w_f}{f_3 w_m} \quad (\text{B1})$$

$$B = \frac{h_{w_m}^m}{h_y^m} = \frac{m_1 + m_4 \ln w_m}{m_3 w_f} \quad (\text{B2})$$

$$C = \frac{h_s^f}{h_y^f} = \frac{f'}{f_3} \quad (\text{B3})$$

$$D = \frac{h_s^m}{h_y^m} = \frac{m'}{m_3} \quad (\text{B4})$$

In this study we assume more than one distribution factor described in the text. Thus, in B3 and B4 we define  $f'$  and  $m'$  as the estimated coefficients of distribution factors described in the paper. The partial derivatives with respect to non-labour income, distribution factor and wages will be:

$$\frac{\partial \phi}{\partial y} = \frac{D}{D - C} \quad (\text{B5})$$

$$\frac{\partial \phi}{\partial s} = \frac{CD}{D - C} \quad (\text{B6})$$

$$\frac{\partial \phi}{\partial w_m} = \frac{AD}{D - C} \quad (\text{B7})$$

$$\frac{\partial \phi}{\partial w_f} = \frac{BC}{D - C} \quad (\text{B8})$$

From the Hottelling's lemma the sharing rules are: (Chiappori et al., 2002):

$$\phi_y = \frac{D}{D - C} = \frac{f_3 m_4}{\Delta} \quad (\text{B9})$$

$$\phi_s = \frac{CD}{D-C} = \frac{m_4 f'}{\Delta} \quad (\text{B10})$$

$$\phi_m = \frac{AD}{D-C} = \frac{m_4 f_2 + f_4 \ln w_f}{\Delta w_m} \quad (\text{B11})$$

$$\phi_f = \frac{BC}{D-C} = \frac{f_4 m_1 + m_4 \ln w_m}{\Delta w_f} \quad (\text{B12})$$

Where  $\Delta = f_3 m_4 - m_3 f_4$ . Solving the system of differential equations B9-B12, we derive the sharing rule equation:

$$\phi = \frac{1}{\Delta} (m_1 f_4 \ln w_f + f_2 m_4 \ln w_m + f_4 m_4 \ln w_f \ln w_m + f_3 m_4 y + f' m_4 s) \quad (\text{B13})$$

As we have highlighted earlier, and in the main text, we consider more than one distribution factor, and thus the sharing rule is defined as  $f' m_4 s / \Delta$ , where  $f'$  represents the set of the estimated coefficients of the distribution factors explored.