Estimating the macroeconomic loss due to violence against women using the Social Accounting framework: The case of Viet Nam

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ABSTRACT

Violence Against Women (VAW) is now acknowledged as a global problem with significant economic costs. However, the current estimates of costs in the literature provide the aggregate loss of income, but not the macroeconomic loss in terms of output and demand in so far as they fail to consider the structural interlinkages of the economy. In this paper, we propose an approach based on the social accounting matrix (SAM) to estimate the macroeconomic loss due to violence. The SAM approach provides an analytical framework to study the differential impact of VAW across the sectors of the economy, which not only illuminates the sector specific loss, but also quantifies the loss arising from the way in which the impact of violence permeates through the economy. In this paper we estimate the income and multiplier loss for the case of Viet Nam using Viet Nam's 2011 SAM.

KEYWORDS

Violence against women, Social Accounting Matrix, Macroeconomic loss, Multiplier loss, Macroeconomic policy, Economic Development

JEL codes

J16, E19, E00

1. Introduction

Violence against women (VAW) is now recognized as a global issue that is prevalent in all societies at all levels of development. Globally the leading form of VAW is intimate partner violence (IPV) with more than 1 in 3 reporting experiencing it in their lifetime (WHO 2013). A widely accepted definition of IPV is 'physical violence, sexual violence, stalking and psychological aggression (including coercive acts) by a current or former intimate partner'(Mathew Breiding, Kathleen Baslie, Sharon Smith, Michele Black and Reshma Mahendra 2015). Available research suggests that the different types of violence can occur simultaneously, are often interconnected and can have cumulative impact (Ann Coker, Paige Smith, Robert McKweon and Melissa King 2000, Kathleen Baslie and Jeffrey Hall 2011). For example psychological aggression often co-occurs with physical or sexual violence; additionally it is often considered a predictor for physical or sexual violence (K. Daniel O'Leary 2000; Lori Heise 2012).

Even though VAW (and thus IPV) is widely accepted as a fundamental human rights issue and public health issue, there has been considerable inertia in acknowledging it as a development issue. The recent UN declaration on the new Sustainable Developmental Goals (the 2030 Agenda for Sustainable Development) is the first time that the issue has been explicitly incorporated in the global development policy agenda. However, carrying through the expressed commitment endorsed by governments around the world to concrete policy action on VAW, particularly in the context where economic reasoning weighing more than all other considerations in policy making, remains the next challenge. In this context, it is important to stress that despite the growing evidence of economic costs associated with VAW, the economic

impact of VAW is neither acknowledged nor considered in economic policy deliberations. A main reason why the issue of VAW does not enter the policy discourse is the lack of quantitative translation of the individual specific micro level costs that arise in the incidents of violence to the macroeconomic level.

In the literature, the approach for estimating the economic cost of VAW is one of aggregating the specific monetary costs arising at an individual level. Although this approach provides an aggregate estimate of the loss of income, they do not reflect the *macroeconomic loss* due to VAW in so far as they fail to take into account the consequent loss of output and demand in the economy. The loss of income at an individual level has both direct and indirect effects due to the interlinkages of the economy. The aim of this paper is to provide an approach to estimate the overall loss to the economy, i.e. macroeconomic loss, by taking into account the interlinkages of the economy as described by a Social Accounting Matrix (SAM). We implement our approach to the case of the Viet Namese economy using the 2011 SAM for Viet Nam. We show that our approach provides a way to estimate both the direct loss in the *level* of income and the indirect loss due to intersectoral linkages, i.e. the multiplier effect (i.e., henceforth referred to as *multiplier loss* for short).

Although multiplier loss as a concept is recognized in the VAW literature, to our knowledge this is the first paper to propose a method for estimating such a loss. Furthermore, including the intersectoral linkages of production in the economy in the estimation, provides a way to estimate the loss of income, output and demand due to VAW in a macroeconomic setting. In other words, the SAM framework provides a way to estimate the *leakage* due to VAW in the circular flow of income in the

economy. We argue that the estimates reported in this paper, based on the missed days of work due to violence, abstracting from other issues such as the loss of productivity, provide a compelling argument for considering the issue of VAW in the macroeconomic policy deliberations.

2. Economic Costs of Violence against Women: Literature

The social and economic impacts of violence against women and girls manifest as multiple impacts at the individual and household level. The immediate impacts are missing work (paid and unpaid), poor physical and mental health status, poor reproductive outcomes, out of pocket expenditures for accessing services, and replacement costs for lost property. It also has long-term impacts on outcomes such as accumulation of education, expanding skills, experience, and upward mobility within the workforce, chronic disability, and the stability of family life. Research on health impacts provides evidence of increased risk of mortality and morbidity, HIV, chronic pain, and range of physical disorders (Rachel Jewkes, Mzi Nduna, James Levin, Nabisa Jama, Kristin Dunkle, Adrien Puren and Nata Duvvury, 2008; Kate Rees, Virginia Zweigenthal, and Kate Joyner, 2014). The economic impacts highlighted in the literature include lowered participation in the long-run, employment instability and lowered earnings (Amy Moe and Myrtle Bell, 2004; Sarah Crowne, Hee-Son Juon, Margaret Ensminger, Lori Burrell, Elisabeth McFarlane, andAnne Duggan, 2011; and Jorge Aguero, 2012). Trauma and poor mental health seem to be the mediating pathways for both health and work impacts (Joseph Sabia, Angela Dills and Jeffrey DeSimone, 2013).

In addition to these multiple impacts at the individual and household level, VAW also has costs for communities including low community cohesion, loss of economic output for businesses and expenditures incurred by national and local NGOs. Governments incur costs in both providing services to survivors (and, to varying degrees, perpetrators) of violence, investing in programs to prevent violence as well as incurring loss of taxes due to lower income for households and lower economic output for businesses (Amy Envall and Annika Eriksson, 2006).

Many of these consequences of VAW can be classified into distinct categories of costs and a common classification is direct tangible, indirect tangible, direct intangible and indirect intangible (Tannis Day, Catherine McKenna, and Audra Bowlus 2005). Several meta reviews of costing studies (Nata Duvvury, Caren Grown and Jennifer Redner 2004; Andrew Morrison and Maria Beatriz Orlando, 2004; Day, McKenna and Bowlus 2005; and Alys Willman 2009) have identified some distinct approaches or methodologies to cost VAWG including direct accounting methodology, human capital approaches including propensity score matching, willingness to pay/contingent valuation, disability adjusted life years and gender responsive budgeting. Over 40 studies have used one or more methodologies to establish direct and intangible costs and also direct intangible costs of pain, suffering and/or loss of quality of life in high, middle and low income countries.

The majority of the studies focus on industrialized countries and estimates vary widely depending on the specific costs included in the analysis (see Nata Duvvury, Aoife Callan, Patricia Carney and Srinivas Raghavendra 2013 for a detailed review). One comprehensive study on costs undertaken by Access Economics in Australia in

2004 suggests that the annual cost of IPV is AUD$8.1 billion (Access Economics 2004). A subsequent study in 2009 projected that the cost would rise to AUD$15.6 billion by 2021-22 if no action is taken (National Council to Reduce Violence Against Women 2009).

In the case of low and middle-income countries, the studies on the direct costs are rare due to the low level of help-seeking by women as well as the high level of non recording of such cases by health and law enforcement, who are the frontline service providers. Indirect costs particularly the costs of missed work and lower productivity have been estimated in several countries. An early study by Andrew Morrison and Maria Beatriz Orlando (1999) estimated that the loss of earning capacity of women experiencing intimate partner violence was approximately 2 percent of GDP in Chile. Using data from the Tanzania National Panel Survey, Seema Vyas (2013) found that weekly income was 29 percent lower among currently abused women compared to women who had never been abused - a figure that rose to over 40 percent when considering severe abuse. A household survey in Viet Nam undertaken in 2012 estimated that missed paid and unpaid work amounted to 0.94 percent of GDP. The study also found reduced earnings for women experiencing domestic violence amounting to US$2.26 billion or about 1.78 percent of 2011 GDP (Nata Duvvury, Minh Nguyen and Patricia Carney 2012). A Peruvian study by Aristides Vara Horna (2013) estimated that the productivity loss (due to absenteeism and presenteeism) for businesses was equivalent to 3.7 percent of GDP.

However, most of these studies provide an aggregate estimate of the loss of income, but not the *macroeconomic loss* in terms of output and demand in so far as they fail to consider the structural interlinkages of the economy. The loss of income at an

individual level has both direct and indirect effects due to the structural interlinkages of the economy, which translates the micro level loss to the level of the macroeconomy. Therefore, the consideration of the structure of production in the estimation of loss due to violence would not only bring out the level of loss in individual sectors but would also help to quantify the impact of loss in one sector on the other sectors of the economy through the multiplier effect. This idea is not new and it has been recognized in the literature that the loss estimates should have multiplier effects, (for example, Myra Buvinic and Andrew Morrison 1999), but, to our knowledge, no one has explicitly provided comprehensive estimates that take into account both the categories of loss, sectoral and intersectoral, due to violence. In an earlier paper, Duvvury, et al (2013), attempted the first iteration of estimating the sectoral loss of output due to violence, but were constrained in drawing robust conclusions given the lack of specification of intersectoral linkages. In this paper, we attempt to estimate the loss in the level of income and the multiplier loss using the framework of the social accounting matrix, which allows us to consider the intersectoral linkages in a direct manner.

3. Data

In this paper, we use two sources of data. First, the primary data on the prevalence, incidence types of violence and missed days of work etc., are drawn from the Viet Nam field study of Duvvury et al. (2012).[1] Second, we use the secondary data on sectoral employment patterns in Viet Nam and the Viet Nam 2011 social accounting matrix to estimate the macroeconomic loss due to VAW. The following sub-sections provide a brief description of the data used in this study.

3.1 Viet Nam field study on Intimate Partner Violence

We draw on survey data from a study on the cotsts of domestic violence in Viet Nam to estimate the prevalence and incidences of violence. The Viet Nam study conduted by Duvvury et al., 2012, surveyed 1,053 women across both urban and rural regions and collected detailed information on incidents of intimate partner violence reported by women in the past 15 months.[2] Each woman was asked how many incidents of violence she experienced in the previous 15 months, followed by detailed questions on the most recent incidents that she recalled. There were three key types of violence considered within the study: psychological (verbal abuse, humiliation and intimidation, or threat of violence), physical (slapping, beating, hitting, kicking, etc.) and sexual violence (forced sex or other forms of coerced sex when the women did not want it or did not like the way it was done) suffered by women during the last 12 months (to obtain current prevalence) and also during their lifetime (to obtain lifetime prevalence). Of the 1,053 women surveyed, 63.7 percent (or 671) of women reported experiencing at least one behavior of psychological, physical, or sexual violence ever in their lifetime, with 39 percent (or 414) of women experiencing at least one type of violence in the last 12 months. Multiple incidents of violence were reported by women within the survey: 436 women reported a total of 9,815 incidents of IPV in the last 15 months and provided detailed information on 1,041 of the most recent incidents.[3]

To estimate the income loss at the individual level, the study estimates days taken off work by *both* women and men. As stated by Duvvury et al. (2012), domestic violence impacts the family causing disruption in the daily life of women, men and children. As a result, detailed questions on the impact of violence on women's *as well as* men's

paid work was explored. Of the total number of incidents reported by women, 14 percent of incidents (or 148 incidents) required women to take time off work, with an average of 5.5 days per incident taken off work across all reported incidents. Women also reported that in 7 percent of incidents (or 74 incidents), their husbands/partners also missed paid work, with an average of 6.5 days taken off per incident.[4]

With the empirical data available from the Viet Nam study, there are some caveats to the analysis that should be noted. First, we are not able to establish the effects by type of violence as the majority of women experienced multiple forms in an incident, making detailed analysis by type problematic due to the small sample size. Second, women reported men missing paid or unpaid work and thus we cannot assure with certainty that men did so because of the violence per se. Third, the study was a follow-up to a national prevalence study on violence to gather additional information on costs incurred by women and thus had limited representativeness.

3.2 General structure of the Viet Namese economy

The GDP for Viet Nam in 2011 was US$135.5 billion (or,VDN2,779tn, i.e. 2,779 trillion VietNamese Dong), which corresponded to a growth rate of 6.2 percent from the previous year (World Bank DataBank, 2011). Viet Nam exported US$107 billion (or, VDN2,207 trillion) and imported US$113 billion (or VDN2,322 trillion) worth of goods and services in 2011. In terms of the percentage of GDP, exports accounted for 80 percent while imports accounted for 84 percent. The composition of GDP in Viet Nam was dominated by the services sector[5] which accounted for 42 percent of GDP in 2011. The agricultural sector on the other hand accounted for 20.1 percent with the

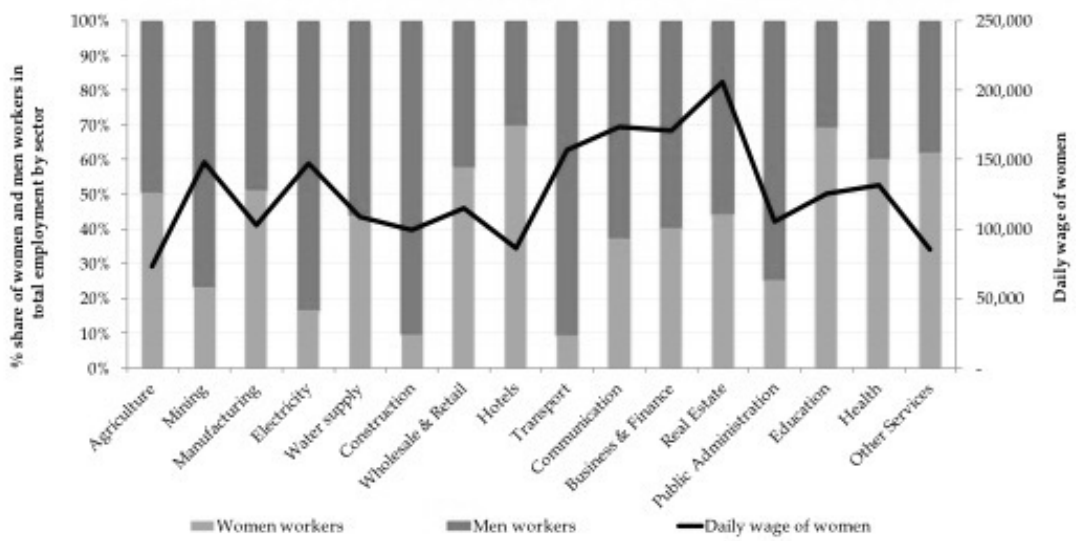
manufacturing industry accounting for 18 percent of GDP. The remaining 19.9 percent was composed of a number of other industries. Unemployment in Viet Nam is low at 2 percent in 2011, with male unemployment of 1.9 percent and female unemployment of 2.1 percent (World Bank DataBank, 2011).

3.2.1. Employment pattern

We analyzed the employment distribution, percentage share of women and men in various sectors, and the daily wage distribution of women in Viet Nam for the year 2011. Viet Nam has high female work force participation with about 73 percent of women (aged 15 and above) engaged in economic activity (World Bank Databank, 2011). As shown in Figure 1, women's employment is distributed across both agricultural and non-agricultural sectors. In terms of the distribution, about 51.6 percent of women are in agriculture with another 15 percent in manufacturing and 14 percent in retail and wholesale. Together these sectors account for more than three quarters of female employment in Viet Nam, i.e. 80.6 percent of the total number of women employed. In terms of public sector employment (i.e. sectors of public administration, education, and health), the three sectors together account for about 7.8 percent of total female employment (detailed table available online, Table A).

In terms of the concentration of women workers in the total number of people (both men and women) employed, seven sectors stand out in Figure 1. We note that these sectors are agriculture, manufacturing, retail and wholesale, hotel, education, health, and other services, where the percentage share of women in the total employed is above 50 percent. Among these, the education and hotel sectors have the highest

concentration of women, for instance, in education it is about 69.7 percent, and in hotels it is 69.8 percent[6].



Source: General Statistics Office of Viet Nam

Figure 1: Share of women and men workers & daily wages (VND)

Overall, Viet Nam is a low-wage economy as both women and men are concentrated in low wage sectors. Women are concentrated in low-wage sectors such as agriculture, wholesale and retail, hotels, and other services. Men are equally concentrated in low-wage sectors such as agriculture, construction, water, and public administration. However, in the few sectors where the wages of women are high (such as communication, finance, and real estate), men account for higher wages and share of employment. Overall, this would suggest that men's incomes are likely to be higher than women's incomes generally, which could impact the level of loss of income due to violence.

3.2.2. Viet Nam SAM 2011

Viet Nam's 2011 SAM is a square data-matrix of 169 rows and 169 columns.[7] It broadly follows the basic structure of a SAM presented in Table 1. Its structure can be

described by three main categories: sectoral production and foreign trade, factor income generation and distribution, and household expenditure. In the case of the Viet Nam SAM 2011, the activities column (column A in Table 1) is disaggregated into 63 sub-sectors, which are aggregated from Viet Nam's 2011 Supply-Use Table (SUT). Of these 63 sectors, 13 relate to agriculture (including for example, paddy rice, sugarcane, poultry, coffee, etc.), 37 relate to industry (including, for example, manufacturing, mining, and utilities), and 13 relate to services (including, for example, transportation, education, and financial services). The factor account (F in Table 1), i.e. the factors of production, is disaggregated into 11 factors of production, including six types of labor (which are classified by geography (urban-rural) and education levels (primary, secondary and tertiary)) and, two types of capital (agricultural and non-agricultural), land, livestock and fisheries capital. The household account (H) is disaggregated into 20 types of household, which are classified by three criterion, urban-rural; agricultural and non-agricultural; and five income quintiles (from the poorest (quintile 1) to the richest (quintile 5)).

Table 1: Basic structure of a SAM

	Activities	Commodities	Factors	Households	Government	Saving and Investment	Rest of World	Total
Activities		Domestic Supply						Activity income
Commodities	Intermediate Demand			Consumption spending (C)	Recurrent spending (G)	Investment demand (I)	Exports earnings (E)	Total demand
Factors	Value-added							Total factor income
Households			Factor payments to households		Social transfers		Foreign remittances	Total household income
Government		Sales and import tariffs					Foreign loans and grants	Government income
Saving and Investment				Private savings	Fiscal surplus		Current account balance	Total savings
Rest of World		Import payments (M)						Foreign exchange outflow
Total	Gross output	Total supply	Total factor spending	Total household spending	Government expenditure	Total investment spending	Foreign exchange inflow	

4. Methodology

The framework of the social accounting matrix (SAM) has been extensively used in macroeconomic policy analysis. SAM is a particular representation of a macroeconomic system that incorporates a considerable level of information about the transfers, transactions, and relationships between macro and meso level economic categories or accounts (Graham Pyatt and Jeffrey Round 1985). There are three main reasons why SAM is particularly useful in macroeconomic policy analysis. First, disaggregated household groups as a distinct set of institutional accounts makes the use of SAM more distinctive since it allows one to study their interaction with other institutions, such as factors of production, across various production activities coordinated by product, and labor markets. Second, the structural interdependencies between macro and meso accounts in the context of highly interlinked production is highlighted by the SAM, which provides an accounting framework to study the consequences for income generation and distribution. Third, the accounting framework of SAM provides an analytical way to study how the impact of shocks percolate the system through direct and indirect linkages between various institutional accounts of the macroeconomy, which is pertinent for macroeconomic policy making.

The general organization of a SAM can be described as follows: it is a square matrix that represents the transactions taking place in an economy during an accounting period, usually one year. The macroeconomy is usually divided in to various institutions, production activities, consumption of commodities, factors of production, households, private corporate enterprises, government, rest of the world etc. Each account is represented twice; once as a row (showing receipts) and once as a column (showing payments). The entry in cell, say (T_{ij}), shows the payment flow from the

j^{th} account to the i^{th} account as in the standard accounting convention of the input-output table. The transactions between accounts display their interconnections between the sectors in an explicit way. Since these transactions adhere to the accounting framework, where the row total and column total must be equal, the analysis is tractable.

In the literature on gender and macroeconomic policy, SAM has been used as an input to the 'computable general equilibrium' (CGE) framework for macroeconomic policy analysis. In particular, one of the early papers that developed the 'gendered SAM' (GSAM) extended the standard social accounting matrix by incorporating a monetized (market) and non-monetized (social reproduction and leisure) part of the economy and disaggregated variables by gender. Furthermore, GSAM was used to model a 'gendered CGE' (GCGE) model for Pakistan to study the effect of macroeconomic shocks such as trade liberalization on employment patterns, time allocation in market production and household work, and the gender gap in wages (Rehana Siddiqui 2004). In a recent study, a SAM-based analysis was developed to study the impact of economic growth on the deepening of gender inequalities through the process of the casualization of labor, particularly in the manufacturing sector in Kenya (Bernadette Wanjala and Maureen Were 2009). The study, using simulation techniques, investigated the effect of exogenous injections in the sub-sectors that have high backward and forward linkages on compensation of employees, distribution of factor incomes across households, and employment creation.

However, to our knowledge, ours is the first attempt in using the SAM-based multiplier analysis to estimate the macroeconomic loss due to violence against

women. An obvious question that may arise would be of not extending this analysis to the CGE setting. One of the issues with the CGE framework is that in the context of violence, particularly in the case of intimate partner violence, the equilibrium characterization of the household production can be problematic. Even though there are extensions of CGE with 'home production' (see Ismael Fofana, John Cockburn and Bernard Decaluwe 2003), it is difficult to see how the equiulibrium conditions regarding the marginal utility of time for each gender would hold under violence. Given that the underlying micro-behavioral approach of the CGE framework can be problematic in the context of violence against women, the macro-structural SAM approach is explored in an attempt to estimate the macroeconomic loss due to violence. We believe that the proposed SAM-based multiplier method to quantify the multiplier loss due to violence is a novel contribution of this paper.

4.1. A stylized two-sector SAM

In this section, we explain the method that is being adopted in this paper for the estimation, using a simple two-sector (production sectors) social accounting matrix (see Appendix A1 for the general model). A stylized SAM for an economy with two production sectors is given in Table 2. The production sectors are the activities A_1 and A_2 producing commodities C_1 and C_2 respectively. In this stylized version, we denote the factor account by F and factors earn V_1 and V_2 in the production activities. We denote the household account by H and the households' consumption expenditure on the commodities is denoted as C_1 and C_2 as consumption expenditures. All the exogenous accounts, such as the government account, investment account, and rest of the world are grouped together for simplicity and denoted by E.

Table 2: A stylized two-sector SAM

	Activities		Commodities		Factors	Households	Exogenous Demand	**Total**	
	A1	A2	C1	C2	F	H	E		
A1			X_1					$\mathbf{X_1}$	**Activity income**
A2				X_2				$\mathbf{X_2}$	
C1	Z_{11}	Z_{12}				C_1	E_1	$\mathbf{Z_1}$	**Total demand**
C2	Z_{21}	Z_{22}				C_2	E_2	$\mathbf{Z_2}$	
F	V_1	V_2						**V**	**Total factor income**
H					V_1	V_2		**Y**	**Total household income**
E			l_1	l_2		S		**E**	**Total exogenous income**
Total	$\mathbf{X_1}$	$\mathbf{X_2}$	$\mathbf{Z_1}$	$\mathbf{Z_2}$	**V**	**Y**	**E**		
	Gross output		**Total supply**		**Total factor spending**	**Total household expenditure**	**Total exogenous expenditure**		

The total demand Z for the two-sector economy is given by

$$Z_1 = a_{11}X_1 + a_{12}X_2 + c_1Y + E_1 \quad (1)$$
$$Z_2 = a_{21}X_1 + a_{22}X_2 + c_2Y + E_2 \quad (2)$$

where a is the technical coefficient (i.e., input or intermediate shares in production), (X) is gross output, c is the share of household consumption expenditures in total household expenditure (Y).

The gross output (X) is only part of total demand (Z) and we can express it as,

$$X_1 = b_1Z_1;\ X_2 = b_2Z_2 \quad (3)$$

where b is the share of domestic output in total demand.

The total household income depends on the share of factors' earnings in each sector, i.e.

$$Y = v_1X_1 + v_2X_2 \quad (4)$$

where v_1 and v_2 are the share of value-added or factor income in gross output.

Here we propose the modification of accounting for the loss of factor income due to violence in different sectors. In order to estimate the lost factor income due to

violence, we need to estimate the total days lost by women in various sectors of the economy. To calculate the total days lost by women and men after violent episodes, we draw on several key facts obtained from the Duvvury et al., 2012 study. One of the most revealing facts in this survey is that men too seem to lose work after violent episodes that they inflict on their intimate partners.[8] Other studies estimating costs, for example in Peru and Papua New Guinea, corroborate this finding (Vara Horna 2013; and Emily Darko, William, Smith and David Walker 2015). The main reasons for men missing work includes distress/trauma, depression, and attending to legal matters related to the incident. The Viet Nam study reported that the proportion of total incidents that resulted in missed work is 14 percent for women and 7 percent for men. Using the information on the labor force participation in each sector, the proportion of incidents that lead to loss of work, the prevalence and incidence of violence, and the days lost after violent episodes, we estimate the total days lost (TDL_i) by women and men in sector (i) as:

$$TDL_i = (W_i * IR * a_W * DL_W) + (M_i * IR * a_M * DL_M) \qquad (5)$$

where W_i and M_i is the total number of women and men working in sector *i,* IR is the number of incidents per women, a_W and a_M is the proportion of violent incidents out of total incidents that resulted in missed work for women and men respectively, and DL_W and DL_M is the average number of days missed per incident for women and men (5.5 days for women and 6.5 days for men)[9].

The loss of income, due to violence, for both women and men in each sector is calculated by multiplying the total workdays lost due to violence with their respective wage rates (wg_i^m) for women and (wg_i^m) for men, and is estimated as

$$TIL_i = (TDL_i^W * wg_i^W) + (TDL_i^M * wg_i^M) \qquad (6)$$

where wg_i^W and wg_i^M is the daily wage for women and men[10] working in sector *i* and is obtained, by sector, from the Viet Nam Labor Force Survey (2011).

Returning to our two sector model, based on (6) we can now modify the factor income earned by labor, both women and men, to account for the lost income due to violence in each sector as,

$$W_1 = [V_1 + (TIL_1)] \quad \text{and} \quad W_2 = [V_2 + (TIL_2)] \qquad (7)$$

where $TIL_1$is the total income lost by women in the two sectors, and TIL_2 is the total income lost by men in the two sectors.

Let

$$w_1 = \frac{W_1}{X_1} \text{ and } w_2 = \frac{W_2}{X_2} \qquad (8)$$

be the violence accounted factor income shares in gross output.

Now using (3) and (8) in (4), we can rewrite the total household income accounted for lost income due to violence as,

$$Y_v = w_1 b_1 Z_1 + w_2 b_2 Z_2 \qquad (9)$$

Finally, using (3) and (9), we can rewrite the total demand equations in (1) and (2) to take into account the violence accounted income and income shares as,

$$Z_1 = a_{11} b_1 Z_1 + a_{12} b_2 Z_2 + c_1 w_1 b_1 Z_1 + c_1 w_2 b_2 Z_2 + E_1$$

$$Z_2 = a_{21} b_1 Z_1 + a_{22} b_2 Z_2 + c_2 w_1 b_1 Z_1 + c_2 w_2 b_2 Z_2 + E_2$$

Rewriting the above final demand equations in matrix form and deriving the multiplier yields

$$\begin{bmatrix} 1 - a_{11}b_1 - c_1w_1b_1 & -a_{12}b_2 - c_1w_2b_2 \\ -a_{21}b_1 - c_2w_1b_1 & 1 - a_{22}b_2 - c_2w_2b_2 \end{bmatrix} \begin{bmatrix} Z_1 \\ Z_2 \end{bmatrix} = \begin{bmatrix} E_1 \\ E_2 \end{bmatrix}$$

i.e.,

$$Z_v = [I - M]^{-1}E \qquad (10)$$

Equation (10) yields the violence accounted total demand vector, i.e. is the total demand in the absence of violence, which can be thought of as the *potential* total demand (Z_v), and the corresponding multiplier provides the *potential* multiplier. The difference between the *potential* total demand and the *orginal* total demand, i.e. $Z^* = (Z_v - Z)$ yields the macroeconomic loss due to violence and the corresponding multiplier provides the multiplier loss due to violence against women.

5. Results and discussion

5.1 Economic loss of violence: Level of loss in factor incomes and in GDP

We estimated the loss of income for women and men employed in various sectors drawing on the employment distribution and using the estimates (see equations 5 and 6) derived from the Viet Nam field study (Duvvury et. al., 2012). These estimates are given in Table 3 below.

The calculations shows that the sectors where the income loss is higher are those that account for much of female employment. For example, the loss of income in the agricultural sector accounts for 39.5 percent of the total loss followed by the manufacturing (16 percent) and wholesale & retail (14.5 percent) sectors respectively. However, two interesting counter observations emerge from the distribution of the loss of income across sectors.

Table 3: Income loss due to VAW

	Women	Men	Total	Women's Share (%)	Sectoral loss (%)
Agriculture	5,171	3,856	9,027	57.3	39.5
Mining	56	132	188	29.8	0.8
Manufacturing	2,115	1,536	3,651	57.9	16.0
Electricity	20	61	81	24.5	0.4
Water supply	29	28	57	51.4	0.2
Construction	178	1,085	1,263	14.1	5.5
Wholesale and Retail	2,228	1,092	3,320	67.1	14.5
Hotels	692	251	943	73.4	4.1
Transport	118	672	790	15.0	3.5
Communication	100	106	206	48.5	0.9
Business and Finance	296	257	553	53.5	2.4
Real Estate	62	41	104	60.3	0.5
Public Administration	239	454	693	34.5	3.0
Education	869	260	1,129	77.0	4.9
Health	220	99	319	68.9	1.4
Other Services	341	198	540	66.3	2.4
Total	12,736	10,128	22,864	55.7[a]	6.3[a]

Note: Income loss in VND
a Average share across sectors

Source: Authors' calculations

First, there are sectors with low female employment that contribute more to the loss in the total income. For example, both the construction and the transport sectors, which have a low female employment share at 9.7 percent and 9.3 percent, contribute almost 5.5 percent and 3.5 percent to the loss in total income respectively. Second, in most of the sectors the women's share in the loss of income in that sector is proportionately higher than their share in that sectors' total employment. For example, in the hotel sector, where it is dominated by the activities of accommodation and food services, women's share in the total loss of income is 73 percent whereas their share in the total employment of that sector is 69.8 percent. Health is another sector where women's share in total employment is 60.6 percent and their share in total income loss is 68.9 percent. The first pattern could be due to the loss of income for men, whose employment share is above 90 percent of total employment in both the sectors, due to

missed work after incidents of violence. The second observation, although being influenced to some extent by the loss of income due to missed work by men, could be due to the casualization of female labor in those sectors where women may work in multiple businesses in that industry on the same day, i.e. the same women working in three different businesses would lose income from all three due to violence. However, these remain as plausible hypothesis at this point and requires further exploration.

Using the aggregate sectoral estimates of the loss of income presented in Table 3, we accounted for the lost income due to violence for the different types of labor factor in various sectors of production activities recorded in the Viet Nam SAM 2011. We first estimated the aggregate loss of income for each type of labor factor in each sector for the sixteen aggregate sectors as given Table 3. We then accounted for each type of labor factor, in every sub-sector, according to its contribution to overall income of the aggregate sector. For instance, the total loss of income in agriculture is attributed to each type of labor factor in every sub-sector according to the specific factor's contribution to the total labor factor income of the agriculture sector overall, i.e. the loss of income for the urban tertiary labor in the sub-sector of paddy is calculated by multiplying the share of this factor's income in the overall factor income with the total loss of income in agriculture. We performed this exercise and accounted for the lost income due to violence for each type of labor factor in all the 63 sub-sectors of the Viet Namese economy. Finally, we added the lost income due to violence for each type of labor to the original income reported in the Viet Nam SAM 2011 to arrive at the *violence accounted labor factor income* for all sub-sectors of the Vietnamese economy. This method is a conceptual departure from the usual formulation of cost to the national economy. Since, the current macroeconomic output and income figures already incorporate the missed days of work for women and men in their estimates,

we *add,* rather than deduct, the loss of income due to violence. We therefore estimate the *potential* income that could have been earned in the absence of violence.

The original total factor income and estimated violence accounted total factor incomes for different types of labor factors in the SAM 2011, urban labor with tertiary education, urban labor with secondary education etc., is shown in Table 4. The column, "Other factors" represent the income earned by other factors of production like capital (both agriculture capital and non-agriculture capital), livestock, land, and fish. In the last two columns, we calculate the total value added only by the labor factor from the original and the violence accounted income entries of the SAM 2011.

Our calculations reveal the extent of the macroeconomic loss due to violence. First, from the *potential* income that the Vietnamese economy could have earned in the absence of violence against women and the actual income it earned, the percentage loss in GDP at factor cost in 2011 is 0.96 percent. Second, the total income lost as a percentage of GDP at market prices is 0.82 percent (see Table 4). Thus, the macroeconomic income loss to the Vietnamese economy due to violence against women is 0.96 percent of GDP at factor cost and 0.82 percent of GDP at market prices respectively.

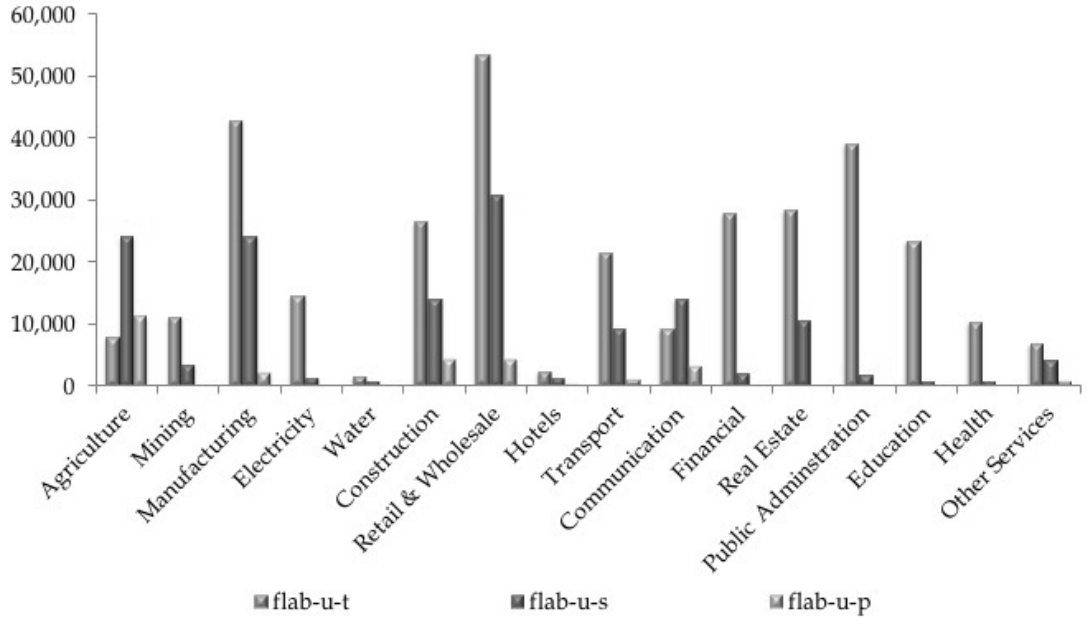
Table 4: Violence accounted labor factor incomes

(VND)

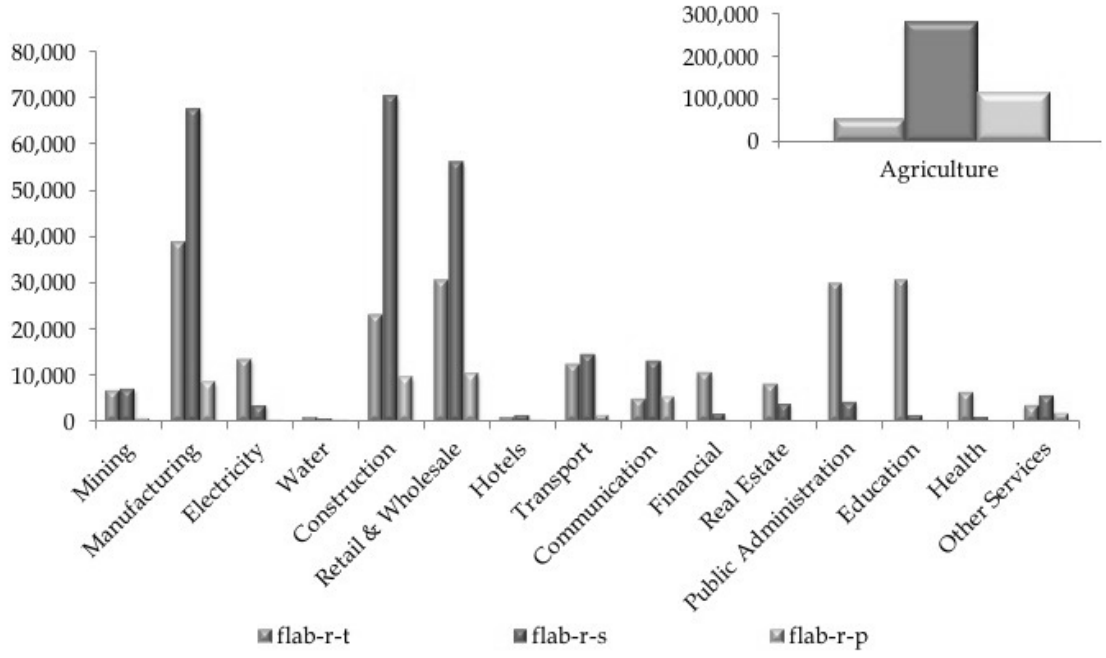
	Original	Violence accounted	Other factors	Total value added (Original)	Total value added (Violence accounted)
Agriculture	481,895	490,922	59,667	541,562	550,589
Mining	28,681	28,868	182,888	211,569	211,756
Manufacturing	179,705	183,357	234,038	413,743	417,394
Electricity	33,187	33,268	50,223	83,410	83,491
Water supply	4,343	4,400	3,771	8,114	8,172
Construction	146,352	147,616	44,957	191,309	192,573
Wholesale and Retail	181,834	185,154	98,880	280,714	284,034
Hotels	5,347	6,290	10,218	15,565	16,508
Transport	59,716	60,517	63,716	123,442	124,232
Communication	49,752	49,958	29,876	79,628	79,833
Business and Finance	41,984	42,537	55,766	97,750	98,303
Real Estate	50,795	50,898	46,362	97,157	97,261
Public Administration	74,187	74,880	20,617	94,804	95,497
Education	54,617	55,746	21,600	76,217	77,346
Health	18,216	18,535	6,300	24,516	24,835
Other Services	22,035	22,574	12,437	34,472	35,012
Violence accounted GDP at factor cost					2,396,836
Original GDP at factor cost					2,373,974
Percentage loss of GDP at factor cost					**0.96**
Total income loss for women and men					22,864
GDP at market prices					2,779,880
Percentage loss of GDP at market prices					**0.82**

Source: Authors' calculations

We further analyzed the level of loss of income for different types of labor factor, viz., urban and rural labor with tertiary, secondary, and primary education, in all the production sectors of the Vietnamese economy, and the results are presented in Figure 2[11]. Figures 2a and 2b shows the violence accounted income for the urban and rural factors in all the sectors. It is clear from Figure 2a that in terms of the urban labor categories, the urban tertiary labor (flab-u-t) loses the most in retail & wholesale, manufacturing, public administration, education, financial, real estate, construction, health, and other services. However, in the agriculture sector, the urban secondary labor (flab-u-s) loses the most due to violence.



(a)



(b)

Figure 2: Violence accounted labor factor incomes (in VND) for urban households (a) and rural households (b)

In the rural labor category, the rural secondary labor (flab-r-s) loses heavily in agriculture, manufacturing, construction, and retail & wholesale. Note that the loss suffered by the rural secondary labor in agriculture is large relative to all the other

sectors and we show it in the inset of Figure 2(b) on its own scale. It is interesting to note that the rural tertiary labor (flab-r-t) lose the most in the aggregate sectors of public administration, education, electricity, financial, real estate, and health.

5.2 Multiplier loss due to violence

In the next step, using the SAM 2011 we calculated the multiplier effects arising from both the income and consumption expenditure loss due to violence. As explained in Section 4.1, we estimated the actual total demand vector (Z) using the original SAM 2011. Then we estimated the potential total demand vector (Z_v) that accounts for the loss of income for factors of production and the corresponding potential loss in consumption expenditures incurred by the household categories. The difference between the potential and the actual total demand vector ($i.e., Z^* = Z_v - Z$) yields the multiplier loss due to violence. In Table 5, we show the estimated output, income and value added multiplier loss for different sectors of the Vietnamese economy for the year 2011. We note that we have taken only the labor factor in our value added multiplier calculations, i.e. value added by the labor factors only. The estimated loss in the output multiplier for agriculture owing to violence is 0.50 times the size of exogenous demand shocks for agricultural products. In other words, at the given level of the incident rate (IR), the output loss faced in agriculture for any exogenous shock, say for instance of 1 billion Vietnamese Dong export demand shock, would be equal to 0.50 times 1 billion Vietnamese Dong. This is taking in to account all the forward and backward linkages of agriculture with other sectors of the economy. The loss in household income and value added multipliers would be to the tune of 0.36 and 0.39 times the exogenous export demand shock worth of 1 billion Vietnamese Dong

respectively. Thus, the estimated total multiplier loss in agriculture would be to the extent of 1.26 times the size of the exogenous shock to the Vietnamese economy.

Table 5: Violence accounted multiplier loss

	Output Multiplier	Income Multiplier	Value Added Multiplier (labor)	Total
Agriculture	0.50	0.36	0.39	1.26
Mining	0.04	0.03	0.04	0.11
Manufacturing	0.48	0.35	0.38	1.21
Electricity	0.01	0.01	0.01	0.03
Water supply	0.02	0.01	0.02	0.05
Construction	0.02	0.01	0.01	0.04
Wholesale and Retail	0.03	0.02	0.02	0.08
Hotels	0.04	0.03	0.03	0.10
Transport	0.04	0.03	0.03	0.10
Communication	0.02	0.02	0.02	0.06
Business and Finance	0.03	0.02	0.02	0.08
Real Estate	0.01	0.01	0.01	0.03
Public Administration	0.03	0.02	0.02	0.06
Education	0.03	0.02	0.02	0.07
Health	0.02	0.02	0.02	0.06
Other Services	0.03	0.02	0.03	0.08

Source: Authors' calculations

Similarly, the total multiplier loss for the manufacturing sector would be to the extent of 1.21 times the size of the exogenous demand shock. The loss in output, household income, and the value added multipliers in manufacturing amounts to 0.48, 0.35, and 0.38 times the size of the exogenous demand shock, respectively. Other female dominated sectors such as hotels, retail and wholesale, education and other services sectors also show total multiplier loss in the range of 0.10 to 0.08. An interesting anomaly to this pattern are the two male dominated sectors of mining and transport with total multiplier losses of 0.11 and 0.10, respectively.

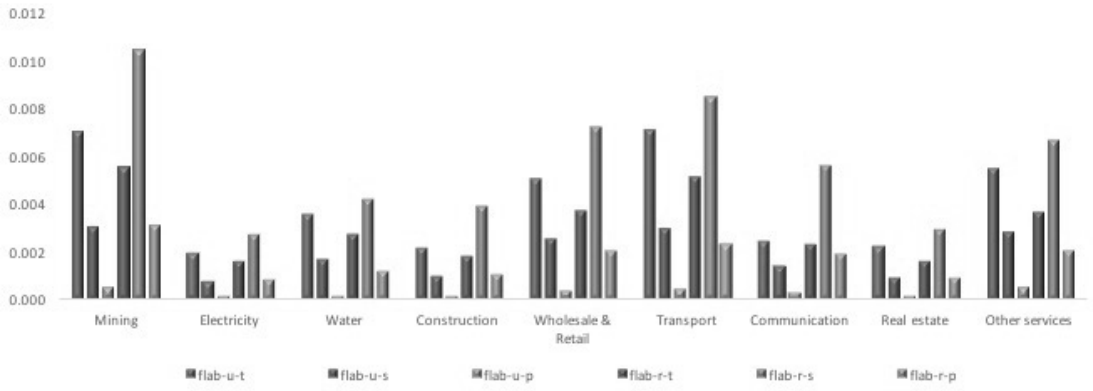
The low values of the total multiplier loss in the female dominated aggregate sectors other than agriculture and manufacturing could be due to their relatively lower backward and forward linkages with the rest of the Vietnamese economy. The other reason for the relatively lower values of the multiplier could be that these sectors may

have high import penetration, particularly if these sectors are labor intensive. Examples of such sectors are hotels (0.10), financial (0.08), education (0.08), and health (0.05), which exhibit high import penetration, viz., roughly 28 percent, 18 percent, 20 percent and 13 percent respectively. However, there are two counter examples to above pattern. First, in the mining sector, the total multiplier loss is 0.11, but it has a very low import penetration ratio (2.9 percent). Second, the manufacturing sector, which exhibits relatively high total multiplier loss, also has a high import penetration ratio. This could be due to the import of fuel and other intermediary capital goods, such as petroleum products (69 percent), vehicles (61 percent) etc. Overall, in terms of the total multiplier loss, the labor-intensive sectors with high backward and forward linkages and with low import penetration do seem to suffer higher loss of income than other sectors of the economy. In addition to the total multiplier loss, we also looked at the value-added multiplier loss, which provides an understanding of which type of labor suffers the most loss in various sectors of production.

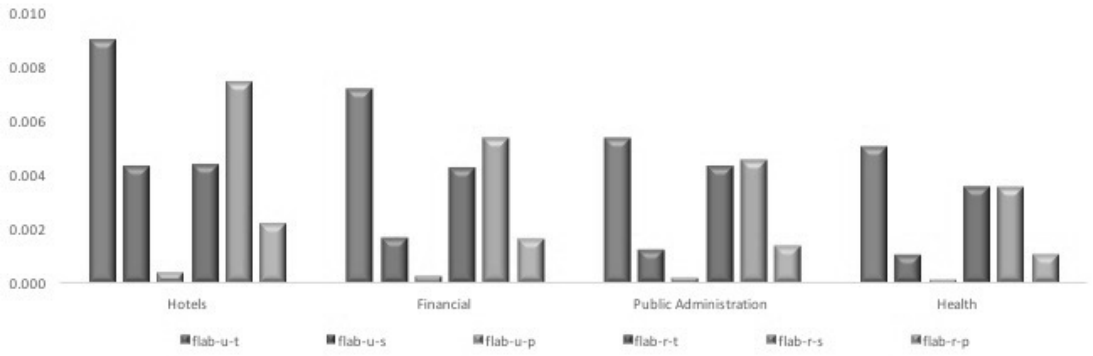
5.3. Loss in Value added multiplier by type of labor

To understand which type of labor suffered the most in terms of loss of income due to violence, we further analyzed the loss in the value added multiplier by the type of labor factor for the urban and rural categories. As noted before, the Viet Namese SAM has six types of labor, namely, urban labor with tertiary level of education (flab-u-t), urban labor with secondary level of education (flab-u-s), urban labor with primary level of education (flab-u-p), rural labor with tertiary level of education (flab-r-t), rural labor with secondary level of education (flab-r-s), and rural labor with primary level of education (flab-r-p). The analysis of which type of labor suffers the most in the total loss in the value added multiplier can be quite useful both from an

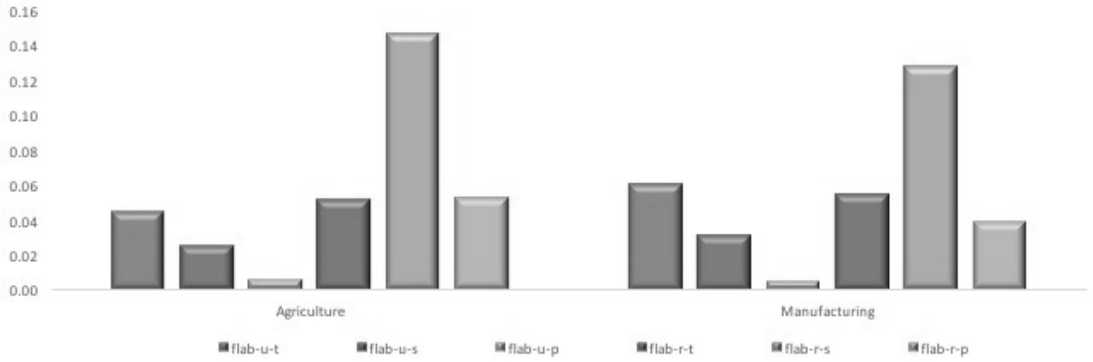
economic policy perspective and from the perspective of devising effective intervention strategies (see Table B in online tables). In Figure 3, we show the loss in the value added multiplier by the types of labor factor and they show which type of labor suffers the most in the overall loss in value added in various sectors owing to violence. [12]



(a)



(b)



(c)

Figure 3: Loss in value added multiplier: urban and rural labor categories

Three broad groups emerge. In the first group, shown in Figure 3a, the largest loss is suffered by rural secondary labor followed by urban tertiary and rural tertiary labor. The leading sectors where the rural secondary labor suffers the most seem to be mining, manufacturing, transport, retail and wholesale, communication, and other services. The second group, shown in Figure 3b, comprises of the most loss suffered by the urban tertiary labor followed by rural secondary and rural tertiary labor. The leading sectors in this group seem to include hotels, financial, public administration, and health. The third group, shown in Figure 3c, is comprised of sectors that don't exhibit a common pattern like the first and second group. For example in agriculture, loss is high for rural secondary followed by rural primary. Interestingly, the education sector is an anomaly, where the rural tertiary labor loses the most, followed by urban-tertiary, and rural-secondary labor in the loss in the value-added multiplier.

6. Conclusion

The main aim of this paper is to provide a methodology to estimate the economic cost of violence that takes into account the structural linkages of production, which contribute to the generation of employment and income for women and men in the real economy. To achieve this objective, we use the framework of the social accounting matrix to estimate not just the level of loss of income incurred by women in individual production sectors, and to quantify the indirect costs such as the impact of loss of income by women employed in one sector on the other via the sectoral interdependencies. Moreover, the social accounting framework allows us to estimate the loss in the consumption demand incurred by the households arising from the loss

in labor factor incomes. In this paper, we do a simple modification of the SAM-based multiplier analysis and develop a method to estimate both the direct and indirect costs of violence for the macroeconomy through the loss in factor incomes, loss in consumption demand at the household level, and the consequent loss in various multipliers across the production sectors of the economy.

Using a stylized two-sector SAM we explain the method of estimating the violence accounted *potential* total demand vector and the associated multiplier (Eq. 10). We estimated the lost income for women and men due to violence (using equations 5, 6, 7) and calculated the violence accounted factor incomes (Eq. 8) to derive the violence accounted potential total demand vector (Z_v)[13] and the associated multiplier (Eq. 10). The difference between the violence accounted and the original total demand and multipliers provide the magnitude of loss of both direct (the level) and the indirect (owing to the interlinkages) cost due to violence against women across the economy. Our data was derived from two sources: employment and wage data for the Viet Namese economy and the data from the field survey in Viet Nam conducted by Duvvury et al. (2012). Two limitations of the analysis needs to be noted. First, we do not have disaggregated incidence rate and workdays lost by sector, location and education that would have given a more precise picture of the magnitude of loss by types of labor factor. Second, the estimation does not consider the productivity loss due to violence and to that extent our loss estimates underestimate the true scale of loss due to violence. We now summarize the main findings and discuss some implications.

The macroeconomic loss due to violence is estimated to be 0.96 percent of GDP at factor cost and 0.82 percent of the GDP at market prices (Table 4). In terms of the sectoral contribution to the total income loss, the agricultural sector accounts for almost 40 percent of the total loss followed by manufacturing (16 percent), and retail and wholesale (14.5 percent), as given in Table 3. Our analysis also provides further insight into the loss of income incurred due to violence by the different types of labor, viz., urban and rural labor with tertiary, secondary, and primary education, in all the production sectors of the Vietnamese economy (see Figure 2). The result shows that except in agriculture and construction, where both urban secondary and rural secondary labor lose the most, the urban tertiary labor and rural tertiary labor suffer losses in sectors like retail & wholesale, manufacturing, public administration, education, financial, real estate, construction, health, and other services. Thus, our analysis suggests that the loss of income due to violence against women is spread across both urban and rural areas involving both urban labor with tertiary education and rural labor with secondary education. The positive association with the level of education both in the urban and rural areas, notwithstanding the sectoral and geographical wage differentials is surprising. Further exploration is needed if this is only mirroring a positive association of education and wage or indeed reflects the fact that the levels of IPV do not in fact vary significantly across educational levels in Viet Nam (see Duvvury, Nguyen and Carney 2012).

We further analyzed the total multiplier loss, i.e. the difference between the violence accounted multiplier and the original multiplier, in all the aggregate sectors (Table 5). The loss is more pronounced in the major sectors which have high linkages with the rest of the eeconomy. For instance, the agriculture sector with the female employment

share in total employment at 50.8 percent, contributes about 39.5 percent to the total loss of income, and has a multiplier loss value of 1.26. Similarly, in the manufacturing sector with female employment share at 51.3 percent, contributes 16 percent to the total loss of income, and has a multiplier loss of 1.21. There are also other female labor dominated sectors such as education, hotels, health, wholesale & retail and business & finance, all exhibit total multiplier loss values ranging from 0.06 to 0.10.

Further disaggregation of the total multiplier loss into output and income multipliers highlights the ripple effect that the highly interlinked sectors would have on the rest of the economy. For example, the agriculture sector's output multiplier loss is estimated to be 0.50, which means that for any level of positive exogenous demand shock, the multiplier effect of the a positive demand shock in agriculture is halved due to violence against women. Viewed from this point, the loss due to violence against women can be seen as an *invisible leakage* that is permanently lost from the circular flow and limits the full realization of the multipliers due to the exogenous demand shock, be it export demand or government expenditure.

From the point of view of macroeconomic policy, the loss due to violence, i.e. 0.96 percent of GDP at factor cost and 0.82 percent of GDP at market prices and the associated multiplier losses, inflicts an invisible leakage to the circular flow, which can weaken and potentially neutralize the effect of expansionary government spending on social welfare programs. Since these estimates quantify the leakage in every dollar spent by government on social welfare, the economic loss arising from violence against women seems to act as an *endogenous destabilizer*. In other words,

the notion of economic efficiency that underpins the logic of the effectiveness of government welfare expenditure seems to hinge on minimizing the economic loss due to violence against women. This constraint is even more binding in the context of austerity, where efficiency gains on every dollar of government expenditure is sought, and where it would be considered not prudent if policy makers don't take into account the loss due to violence against women in their economic policy deliberations.

[1]See the detailed report of the Duvvury, et.al (2012) study for more systematic understanding of the cultural and gender norms that perpetuate violence against women in Vietnam, and intimate partner violence in particular. These norms of patriarchy and cultural understanding of a good woman also limit the extent to which women actually seek outside help, and thus making the costs of violence invisible.

[2] The sample was drawn from four provinces and three central cities of Viet Nam reflecting the seven regions considered in the 2009 National Study on Domestic Violence undertaken by the General Statitics Office and the WHO. The national survey had a sample of 4,300 women. Using the prevalence rate of the 2009 study of 10.9% for experience of physical and sexual violence in the last 12 months, a sample of 1050 was finalized (95% confidence with confidence interval of 3). Ultimately 1053 women were surveyed. The survey provided the unit cost per incident which were applied to the national prevalence rate from the 2009 study for estimating the macro costs.

[3] The survey asked the total number of incidents experienced in the last 12 months and women reported a total of 9815 incidents. The cost data for an incident of violence was collected in iteratively with woman first reporting on the most recent incident, then subsequent incident and so on until women could recall no more. Through this method, the survey collected detailed information on 1041 incidents and this data was used to derive average costs per incident.

[4] The information on missed days of work by men was based on women's respones to the question *"did your husband miss work after the incident of violence? If so how many days?"*. The fact that men may also miss work after an incident of violence is confirmed by several other studies including Vara Horna (2014) and ODI (2015). An earlier study in India (ICRW 2000) also reported that men on average missed higher number of days than women following an incident of violence. This was also reported in the Vara Hona (2014) Peru study in which annual days of missed work was 24 days for women and 35 day for men.

[5] Services include wholesale and retail trade (including hotels and restaurants), transport, government, financial, professional, and personal services such as education, health care and real estate services.

[6] The hotels sector includes accommodation and food service activities, a sector that has had an increase of 108 percent in the labor force between 2005 and 2010 (Breu, et al., 2012).

[7] CIEM-WIDER. 2014.

[8] It is important to note that women gave detailed information on all the incidents including the number of incidents which resulted in missed work for them and their intimate partners. From these detailed interviews, the proportion of incidents that resulted in missed work is calculated as 14 percent for women and 7 percent for men.

[9] We calculate the incident rate (IR) as the proportion of incidents that result in missed work, and the average number of days missed per incident (7.4 incidents per woman) is taken as representative across all sectors of the economy, since there is no sector specific incidence rate data available for Viet Nam.

[10] With almost full employment in Viet Nam in 2011, market wages are assumed to reasonably reflect the loss of income arising from days of work lost due to violence.

[11] See online Table B for detailed estimates.

[12] See online Table C for detailed estimates.

[13] Note that we also account for the consequent consumption demand shares of the households

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Appendix A1: **General Model of SAM**

Table A1: General Model of SAM

	$\boldsymbol{P_A}$	$\boldsymbol{C}$	$\boldsymbol{F}$	$\boldsymbol{H}$	$\boldsymbol{E}$	$\boldsymbol{T}$
$\boldsymbol{P_A}$	$\mathbf{0}$	$\widehat{\boldsymbol{x}}$	0	$\mathbf{0}$	$\mathbf{0}$	x
$\boldsymbol{C}$	$\mathbf{Z}$	$\hat{0}$	$\mathbf{0}$	$\mathbf{c}$	$\mathbf{e}$	$\mathbf{z}$
$\boldsymbol{F}$	$\boldsymbol{v^T}$	$\mathbf{0^T}$	0	0	0	V
$\boldsymbol{H}$	$\mathbf{0^T}$	$\mathbf{0^T}$	$\boldsymbol{v^T}\mathbf{1}$	0	0	Y
$\boldsymbol{E}$	$\mathbf{0^T}$	$\boldsymbol{l^T}$	0	S	0	E
$\boldsymbol{T}$	$\boldsymbol{x^T}$	$\boldsymbol{z^T}$	V	Y	E	

In terms of various accounts, we denote P_A for production activities, C for commodities, F for factors, H for households, and E for exogenous sectors. The upper-case boldface characters indicate matrices (e.g. **Z** is the intermediate demand matrix**),** the lower-case boldface characters indicate vectors (e.g. **z** is the final demand vector**)** and vectors with a hat ($e.g.\ \widehat{\boldsymbol{x}}$) indicates a diagonal matrix with vectors (e.g. **x**) on its main diagonal. All vectors are column vectors unless explicitly transposed (e.g. $\boldsymbol{v^T}$) and **1** is the sum vector. Non-boldface characters indicate scalar magnitudes (e.g. Y, E etc.).

The income of the respective accounts (columns) is given by,

$$\boldsymbol{x^T} = \mathbf{1}^T\boldsymbol{Z} + \boldsymbol{v^T};\ \boldsymbol{z^T} = \mathbf{1}^T\widehat{\boldsymbol{x}} + 1^T;\ V = \boldsymbol{v^T}\mathbf{1};\ Y = \mathbf{1}^T c + S;\ E = \mathbf{1}^T e$$

And the expenditure side (rows) is given by,

$$x = \widehat{\boldsymbol{x}}1;\ z = \boldsymbol{Z}1 + \boldsymbol{c} + \boldsymbol{e};\ V = \boldsymbol{v}^T\mathbf{1};\ Y = \boldsymbol{v}^T\mathbf{1};\ E = \boldsymbol{l}^T\mathbf{1} + S$$

The assumptions used here are as follows:

1. Gross output by activity is at basic prices of x.

2. Total demand by commodity z is at market prices, and it includes imported as well

as domestically produced commodities.

3. Intermediate consumption matrix $\boldsymbol{Z}$ (necessarily) includes both domestically produced and imported commodities, and so does, therefore, the technical input matrix A.

4. There is no explicit treatment of investment.

5. There are no (net) taxes on production, i.e. on activities (there are only taxes on commodities).

6. Vector l^T stands for imports-cum-taxes on products.

The intensity (i.e. per unit of output, income, etc.) equations are:

$$\boldsymbol{A} = Z\hat{\boldsymbol{x}}^{-1};\ \boldsymbol{B} = \hat{x}\hat{z}^{-1};\ \widehat{\boldsymbol{a}}_{\boldsymbol{l}} = \hat{l}\hat{z}^{-1};\ a_s = {}^{S}/_{Y};\ \boldsymbol{a_c} = {}^{C}/_{Y};\ \widehat{\boldsymbol{a}}_{\boldsymbol{v}} = \hat{v}\hat{\boldsymbol{x}}^{-1}$$

Using these intensity equations, the row/column accounting identities are given by:

$$\mathbf{1}^{\boldsymbol{T}} = \mathbf{1}^{\boldsymbol{T}}\boldsymbol{B} + \mathbf{1}^{\boldsymbol{T}}\hat{a}_l;\ x = \boldsymbol{Bz};\ \boldsymbol{z} = \boldsymbol{A}x + a_cY + \boldsymbol{e};\ 1 = \mathbf{1}^{\boldsymbol{T}}\boldsymbol{a_c} + a_s;\ E = \widehat{\boldsymbol{a}}_{\boldsymbol{l}}{}^{\boldsymbol{T}}\boldsymbol{z} + a_sY;$$
$$V = \widehat{\boldsymbol{a}}_{\boldsymbol{v}}{}^{\boldsymbol{T}}\boldsymbol{x};\ Y = V$$

Substituting and further simplification yields the system of equations,

$$\boldsymbol{z} = (\boldsymbol{I} - \boldsymbol{AB} - \boldsymbol{a_c}\boldsymbol{a_v}^{\boldsymbol{T}}\boldsymbol{B})^{-1}\boldsymbol{e} \qquad (\mathbf{1})$$
$$E = (\boldsymbol{a_l}^{\boldsymbol{T}} + (1 - \mathbf{1}^{T}\boldsymbol{a_c})\boldsymbol{a_v}^{\boldsymbol{T}}\boldsymbol{B})\boldsymbol{z}, \quad with \quad E = \mathbf{1}^{\boldsymbol{T}}\boldsymbol{e} \qquad (\mathbf{2})$$

Equation (1) is the multiplier equation and yields the resultant total demand for given (level and sectoral composition) exogenous expenditure. Equation (2) is the consistency relation which states that given the vector of exogenous expenditure there is a consistency relation between total demand and exogenous expenditure induced by imports (a_l) and the propensity to save ($a_s = 1 - \mathbf{1}^{\boldsymbol{T}}\boldsymbol{a_c}$), as in the aggregate simple Keynesian multiplier setting. If we denote, $\boldsymbol{\lambda}^T = (\boldsymbol{a_l}^{\boldsymbol{T}} + (1 - \mathbf{1}^{T}\boldsymbol{a_c})\boldsymbol{a_v}^{\boldsymbol{T}}\boldsymbol{B})$, we would have $E = \boldsymbol{\lambda}^T\boldsymbol{z}$, which in a scalar context is expressed as a multiplier relation $Z = {}^{E}/_{\lambda}$,

where Z total demand generated by the exogenous outlays E with the multiplier represented by the leakages λ.

The method we adopt in this paper is to include the lost income due to violence against women by *augmenting* factor incomes (**v)** by an amount corresponding to an estimate of income foregone. This would alter $\widehat{\boldsymbol{a}}_{\boldsymbol{v}}^{\boldsymbol{T}}$ that enters into the inverse matrix of the multiplier equation (1). But in a demand-induced setting like this (where we have the exogenous expenditure **e** as the demand inducing variable), modifying factor incomes without necessarily changing expenditure may be problematic. For instance, changing factor incomes (**v)** at the same level of **Z**, the intermediate inputs, increases the gross output (**x**) to the same extent. This would imply that the additional hours of work leads to additional purchasing power for each round of *existing* expenditure.

Here, assuming that the additional hours of work would conform to the current technical conditions and we account for the additional expenditure (consumption expenditure) that would have been generated in the economy. In particular, we consider that the additional income (W_v) is partially consumed (and partially saved), given by the consumption coefficients

$$C_v = (1 - a_s)W_v$$

Let $\boldsymbol{\theta}_c$ be the vector of proportional distribution of consumption, i.e. in the two-sector case $\boldsymbol{\theta}_c = \begin{bmatrix}\theta_{c_1}\\ \theta_{c_2}\end{bmatrix}$, where $\theta_{c_1} = C_1/(C_1 + C_2)$ and $\theta_{c_2} = C_2/(C_1 + C_2)$, so that the additional expenditure in each product is given by

$$\boldsymbol{e}_v = \begin{bmatrix}E_{v_1}\\ E_{v_2}\end{bmatrix} = \begin{bmatrix}\theta_{c_1}C_v\\ \theta_{c_2}C_v\end{bmatrix}$$

Thus, we estimate $\boldsymbol{e_v}$ is the vector of additional consumption expenditure from the factor incomes due to the lost hours.

Therefore, we can compute the additional total demand, i.e. the potential demand, by accounting for expenditure foregone due to violence as,

$$\Delta \boldsymbol{z} = \boldsymbol{z_v} = (\boldsymbol{I} - \boldsymbol{AB} - \boldsymbol{a_c a_v}^{\boldsymbol{T}} \boldsymbol{B})^{-1} \boldsymbol{e_v} \qquad (3)$$

Equation (3) can be thought of as the violence accounted final demand, or violence accounted multiplier ($\boldsymbol{z_v}$), and the difference between the actual multiplier (1) and the potential multiplier (3), $\boldsymbol{z}^* = (\boldsymbol{z_v} - \boldsymbol{z})$, would provide us the multiplier loss due to violence.

We can also calculate the additional net income, i.e. potential macroeconomic income, by accounting for expenditure foregone due to violence

$$Y_v = \boldsymbol{a_v}^{\boldsymbol{T}} \boldsymbol{B z_v} \qquad (4)$$

Thus, from (1), (3) and (4) we can estimate the macroeconomic loss, both the level and the multiplier loss arising from lost work due to violence against women.