Development Policy Review, 2005, 23 (3): 333-349

Gender Dimensions in the Analysis of Macro-Poverty Linkages

*Marzia Fontana and Yana van der Meulen Rodgers**

Women and men experience poverty differently. Taking gender inequalities into consideration in the design of CGE models can significantly improve our understanding of the mechanisms through which macroeconomic policies affect poverty. This article reviews current approaches to gender modelling and suggests ways in which CGE models can be further developed to include gender features The ideal combination of such features in a CGE model will vary, depending on the issues analysed, the country context and data availability. At a minimum, a gender-aware model should incorporate segmentation in labour markets and some representation of the unpaid household economy.

1 Introduction

Macroeconomic policies affect poverty through many channels. Because macroeconomic reforms can have different effects for men and women, gender-based analysis is an important tool for understanding the interaction between economic reforms and poverty. Gender inequalities are observable in several aspects of economic life: employment segregation in the labour market, division of labour between paid and unpaid work, distribution of resources within households, and access to public services.

Gender relations interact with economic processes, with consequences both for the distribution of costs and benefits of policies between women and men and for the achievement of macroeconomic objectives. Women are often more likely to be malnourished, less educated and overworked relative to men. They are more vulnerable to fall into, and to remain in, poverty than men.

Gender equality is increasingly recognised as a prerequisite for poverty elimination. However, the analysis of how gender intersects with poverty is not always expressed clearly or consistently. This article argues that gender-aware computable general equilibrium (CGE) models can offer an opportunity for improved analysis in this area.

The arguments for the suitability of a CGE approach in analysing the poverty and gender impact of economic reforms are compelling. Macroeconomic policies and shocks reverberate throughout both market and non-market sectors, with feedback effects through numerous channels. CGE models are an ideal tool to analyse the complexity of linkages between different markets and sectors. The ultimate objective in

* Marzia Fontana (m.fontana@sussex.ac.uk) is at the Department of Economics, University of Sussex, Brighton, BN1 9RH, UK, and Yana van der Meulen Rodgers (yrodgers@rci.rutgers.edu) is at the Department of Women's and Gender Studies, Rutgers University, New Brunswick, NJ, USA. This is a merged version of two separate notes prepared for the EPIAM workshop of October 2003, with Rodgers the key author of Section 2 and Fontana the key author of Section 3. They wish to thank Debbie Budlender and workshop participants for useful comments.

© Overseas Development Institute, 2005.

Published by Blackwell Publishing, Oxford OX4 2DQ, UK and 350 Main Street, Malden, MA 02148, USA.

developing and applying CGE models to assess the poverty impact of macroeconomic policies is a more informed policy debate. The main constraints in achieving this objective include the lack of agreed standards and methodologies, as well as gaps in addressing issues related to the environment, quality of life, and gender. This article concentrates on gender and is organised as follows. Section 2 examines existing empirical evidence for why gender matters in the analysis of macro-poverty linkages. Section 3 describes recent efforts in gender-aware modelling and offers suggestions for improvement in both data and model specifications. Section 4 concludes.

2 Gender and macro-poverty linkages: the evidence

Gender inequalities in access to resources often prevent an adequate response to market incentives, thus leading to inefficient outcomes. For example, closing the gender gap in schooling in sub-Saharan Africa, South Asia, the Middle East, and North Africa would accelerate economic growth in these regions by up to 0.9 percentage points per year (World Bank, 2001). Moreover, a study by Udry (1996) shows that rigidities in the division of responsibilities and power among household members in Burkina Faso prevents labour being reallocated between women and men, leading to absolute losses and sub-optimal responses to price signals. These examples illustrate that reducing gender inequality has a real impact on economic growth, which in turn is a key force behind sustained poverty reduction. Gender inequalities must be addressed also for equity reasons and because of the negative impacts on well-being and standards of living. Countries with greater gender inequality in rights and access to resources show evidence of higher female mortality rates, higher HIV infection rates, greater violence against women, lower-quality health outcomes for children, and more poverty.

A thorough evaluation of policy impacts on poverty necessarily involves accounting for differences between men and women in their access to resources such as education and land, their protection under formal rights, and their performance of tasks in the labour market and at home. A rich body of empirical work, much of which is reviewed in World Bank (2001), documents gender inequality across these dimensions. Furthermore, the Bank argues that gender discrepancies, which tend to be greater among the poor, tend to lessen with economic growth.

As one of numerous examples, the distribution of workers across occupations in the formal labour markets of middle- and high-income economies is noticeably different for men and women. Using differences in employment shares as an indicator of relative concentration, women are clustered in clerical jobs in most economies. Women also have a relatively strong presence among service and sales workers, and among elementary occupations. Men, however, dominate production work in crafts and trades, as well as plant and machine operation. More important, the high-paid legislative and managerial posts are male-dominated across these economies. In low-income economies, the majority of women are still concentrated in the agricultural sector, often in subsistence activities.

The most commonly used statistic to measure such occupational segregation is the Duncan Index, which yields the percentage of all female workers who would have to switch jobs in order to equalise the employment distributions between men and women. The index is defined as $DI = \frac{1}{2} \Gamma_i |\alpha_{mi} - \alpha_{fi}|$, where α_{mi} is the share of males in the sample employed in occupation i, α_{fi} is the share of females in the sample employed in the same

occupation, and *i* sums across all occupations. Table 1, which reports Duncan Indices for a sample of 41 developed and developing countries, shows a high incidence of occupational segregation around the world. The unweighted average is 0.58, where zero represents complete integration and one represents complete segregation. The table also shows striking differences across regions, with relatively less occupational segregation in Asia and the highest degree of segregation in the Middle East and North Africa.[1]

Table 1: Duncan indices of segregation across 75 occupations in Selected Countries

Country	Duncan Index	Country	Duncan Index
OECD	*.563*	*Asia, Pacific*	*.476*
Australia	.581	China	.363
Austria	.607	Fiji	.603
Canada	.541	Hong Kong	.493
Cyprus	.570	India	.446
Finland	.616	Japan	.502
France	.556	South Korea	.432
Germany	.523	Malaysia	.489
Italy	.449	*Mid. East, N. Africa*	*.683*
Luxembourg	.589	Bahrain	.627
Netherlands	.567	Egypt	.587
New Zealand	.582	Iran	.681
Norway	.573	Jordan	.776
Spain	.569	Kuwait	.733
Sweden	.630	Tunisia	.695
Switzerland	.581	*Other developing*	*.635*
United Kingdom	.567	Angola	.656
United States	.463	Costa Rica	.598
Transition	*.558*	Ghana	.710
Bulgaria	.541	Haiti	.669
Hungary	.558	Mauritius	.593
Poland	.592	Netherlands Antilles	.644
Former Yugoslavia	.540	Senegal	.573

Source: Anker (1998: 176-7).

The literature also offers substantial evidence on the real gender-differentiated impact of macroeconomic policies and shocks in areas such as trade liberalisation, capital flows, exchange-rate shocks, and privatisation. Such *ex-post* analysis, invaluable

1. Even in Asia, however, there is wide variation between countries. Occupational segregation in Bangladesh and Pakistan (which are not included in the sample) is likely to be much higher than the average value of the Duncan Index for the region.

in its own right, can help in informing the specification of *ex-ante* tools that describe the importance of gender in the economy and make predictions for future outcomes. The remainder of this section offers a brief summary of recent empirical evidence on the impact of macroeconomic reforms on gender inequality.

Trade liberalisation and structural shifts in the economy have led to substantial challenges for female workers. According to neoclassical trade theory, trade expansion in developing countries is predicted to increase the demand for relatively abundant, lower-skilled labour and reduce wage disparities between higher- and lower-skilled workers. Because women tend to be more concentrated in lower-skilled jobs and men in higher-skilled jobs, trade-induced changes in skill demand are expected to reduce the gender pay gap in lower-income countries. Trade can affect gender differences in employment and pay through a second channel whereby trade acts as an instrument of industry competitiveness. Trade is expected to create increasing pressures on employers to undergo cost-cutting practices, particularly if sex discrimination plays a role in their hiring and wage decisions. If discrimination is costly, as described in neoclassical theory, then increased competition from international trade will reduce the ability of employers to pay discriminatory wages to women. Thus over time, stronger competition from trade will reduce the wage gap via an expansion in demand for female labour. In contrast, non-neoclassical approaches to discrimination argue that wage discrimination can persist in the face of growing competition from abroad, if women work in an environment of employment segregation and limited ability to negotiate for wage gains in bargaining situations.[2]

Empirical evidence indicates that in the manufacturing sectors of middle- and higher-income economies, women tend to be clustered in industries that have begun to shed their workforce, to upgrade, and even to move abroad to lower-wage countries (see Anker, 1998). Women in lower-wage countries, in turn, have felt the impact of globalisation as their employers face pressures in international markets to keep costs low. In developing countries, greater openness to trade is generally linked to an increase in the proportion of paid workers who are female. However, this change has not been accompanied by increased job security, as more jobs are casual, temporary, and flexible in nature. Evidence for gender wage gaps is also mixed. Several new studies have found some evidence supporting neoclassical theory, but the results are not very robust across specifications.[3] Other case studies focusing on individual East Asian economies have found that greater integration in the world economy has proved less beneficial for women. For example, in Taiwan, the male-female wage gap, even after controlling for gender differences in worker skills, appears to have grown in industries that became relatively more open to international trade (Berik et al., 2004). In South Korea, large conglomerates appear to have paid female workers in export industries lower wages in order to support continued export competitiveness and to maintain profitable operations in the more capital-intensive firms (see, for example, Seguino, 1997 and Cheng and

2. Another channel through which trade liberalisation can affect gender equality is through the reduction in tariff revenues, which, in turn, may have gender-specific effects on the size and composition of government expenditures.
3. These studies include Black and Brainerd (2002); Artecona and Cunningham (2002) and Oostendorp (2003).

Hsiung, 1994). At the household level, there is little evidence that trade liberalisation has been accompanied by a reduction in women's share of unpaid caring work.[4]

Not only have global changes in recent decades involved dramatic growth in the international trade of goods and services, but physical capital has also flowed increasingly across borders in the form of foreign direct investment (FDI). A major consequence of FDI that has particularly large effects on female workers is the subcontracting by final-goods producers – both foreign and domestically owned – towards smaller-scale, sometimes home-based operations. These smaller-scale operations are appealing to larger firms because of their low labour costs: workers, predominantly female, are paid lower wages and typically remain uncovered by costly labour regulations that stipulate certain benefits and the right to organise. Such jobs are characterised by low pay that is often piece-rate, limited or no benefits, long working hours, and poor workplace conditions. These jobs tend to be filled by women who are displaced from the formal sector, or by new labour-market entrants who need to work while caring for their children at the same time (Balakrishnan, 2002).

World integration in financial capital markets has contributed to increased vulnerability to financial crisis and exchange-rate shocks. Empirical work is beginning to show that the burden of financial crisis falls disproportionately on women through a number of channels. Wages fall in the face of rising hours worked in market-based activities, coupled with increased obligations at home. New evidence from the 1997-8 East Asian crisis indicates that the largest effects in the short term occurred in the region's labour markets.[5] In Indonesia and the Philippines, more women entered into paid work and a larger share of women worked long weeks to help households cope financially. In Korea, both women and men experienced large declines in regular jobs, but women saw a sizeable increase in job openings for less secure positions as day labourers. The lower-income economies in East Asia also saw short-term withdrawals from school, particularly for girls of primary-school age.

While these impacts of increased international trade and capital flows on gender inequality apply to many developing countries, we need to bear in mind that some countries have been excluded from the ongoing economic integration. For example, as shown in Gunter and van der Hoeven (2004), the ratio of exports to GDP fell more than 20 percentage points between 1985 and 2002 in twelve developing countries, reflecting massive trade disintegration. Hence, the above description of positive and negative impacts of trade integration on gender inequality does not apply to marginalised countries. Yet, it seems unlikely that the impacts of this marginalisation had a positive impact on gender. Hence, while increased trade integration and capital flows may have aggravated gender inequality, trade disintegration is unlikely to have contributed to gender equality.

The privatisation of public services and public enterprises, widespread since the 1980s, constitutes an integral part of broad economic reform strategies. Privatisation will hurt workers in the short term as they experience layoffs and earnings losses, particularly when governments are unable to support displaced workers with adequate compensation packages. Public-sector downsizing is likely to affect women differently

4. For more discussion and evidence see Fontana (2003); Cagatay (2001) and World Bank (2001).
5. Studies on financial crisis and gender inequality include Lim (2000); Singh and Zammit (2000) and Aslanbeigui and Summerfield (2000).

from men. Downsizing often involves layoffs for those workers with lower levels of tenure, education, and other qualifications. Women are disproportionately affected by downsizing if, on average, they are less well qualified than men.

Once they have lost their public-sector jobs, women may face relatively larger obstacles in finding comparable formal private-sector jobs, forcing them to turn to low-paid and informal-sector work, or to detach from the labour market altogether. Such obstacles include employer preferences for hiring temporary and part-time workers in order to avoid labour market regulations that raise the cost of hiring female workers, as well as outright sex-based discrimination in employment. Privatisation has become an important force behind the persistently large informal sectors in many developing economies. Although some female employment in the informal sector is temporary as countries undergo adjustment, women with low levels of education and skills may be displaced to the informal sector for a longer period of time. For example, Rodgers (1999) finds that Vietnam's transition from a centrally planned to a more market-based economy has led to a disproportionate share of women shifting from public-sector work into unpaid work, or leaving the labour market altogether. Women experienced an additional setback when co-operative-provided childcare services ended with the economic reforms, thus making their attempts to find and hold paid jobs more difficult.

Despite the importance attached to fiscal policy in alleviating poverty, most national budgets are devised without much attention to gender equality. Yet a gender-sensitive fiscal budget can be used to monitor and even influence the allocation of resources across demographic groups (Elson, 1998). A first step is to prioritise spending on sectors that are relatively important for women, in particular health and education. A small number of countries, including South Africa, Sri Lanka, Canada, and Australia, have begun to adopt tools that incorporate gender analysis into plans for the delivery of public services and even into the overall budget planning process. In South Africa, the gender analysis, which was incorporated into existing work, yielded a more informative summary of disaggregated expenditures in terms of the impact on men and women (Budlender, 2000).

In summary, the empirical evidence shows overwhelmingly that men and women are indeed affected differently by macroeconomic policies and shocks. This basic finding provides a strong rationale for making gender dimensions a standard feature in quantitative analyses of macro-poverty linkages.

3 Gender as an analytical category in CGE models

The previous section argued that a proper assessment of the poverty impact of macro-policies must take into account gender inequalities in the distribution of resources, rights and responsibilities. This section discusses ways to operationalise gender relations in CGE models. It first reviews current efforts in gender-aware modelling and then provides suggestions for further developments.

Two special issues of *World Development* (Cagatay et al., 1995, 2000) show how a gender dimension can be added to macroeconomic models.[6] They usefully distinguish three main types of approaches: the 'gender disaggregation' method, which involves

6. Both are the fruits of the efforts of the International Working Group on Engendering Macroeconomics and Trade co-ordinated by Nilufer Cagatay, Diane Elson and Caren Grown.

disaggregating macroeconomic variables by gender on the assumption that men and women have a different behaviour in terms of investment, consumption, and so on; the 'gendered macroeconomic variable' method, which introduces economic variables that capture the structure of gender relations, such as the degree of gender inequality in labour markets; and the 'two sector/system' method, which represents the world in terms of two systems, one of which comprises traditional economic variables while the other can be the unpaid reproductive economy or any other non-macroeconomic system in the domain of gender variables.

The two special issues illustrate various examples of these approaches, with several models often combining two or more approaches together. For example, Darity (1995) builds a two-sector model of a gender-segregated agrarian economy. A subsistence sector, where production is carried out exclusively by women, is linked with a cash-crop sector, where both women and men work, but men control the production and income. Men seek to maximise their income by extracting contributions from women to the production of the cash crop through coercion, co-operation and compensation. The model is used to explore how the loss of female labour to the cash crop sector affects the output of the subsistence sector. Erturk and Cagatay (1995) construct a growth model which assumes that rises in the female share of the labour force boost investment, while rises in the female intensity of household work stimulate savings. They show that economies are more likely to recover from recession if female labour market participation increases more rapidly than women's time inputs in household work. Another model developed by Braunstein (2000) is used to explore how different gender regimes, defined relative to family structure and reservation wages, affect foreign direct investment in a semi-industrialised economy.

All these models offer effective new ways of thinking of the macroeconomy as a gendered structure. The 2000 *World Development* special issue also describes two gendered CGE models. The advantage of CGE models over the other macro-models is that they are 'applied'; they allow a greater level of detail at the sectoral level, based on empirical data. The other macroeconomic models look at the economy as a whole, and attempt to relate events in the market economy to events in the household economy, but do not permit connections to be made with events in specific sectors. The CGE approach can fill this gap by allowing all individual sectors, and the linkages among them, and between them and the household economy, to be analysed simultaneously.

3.1 Current work

Arndt and Tarp (2000) and Fontana and Wood (2000) appear to be the first examples of CGE models incorporating gender features.[7] These models are both adaptations of the same IFPRI standard model (Lofgren et al., 2002). Many features of this model have the potential to be used for an improved gender analysis.

Both the Arndt-Tarp (AT) and the Fontana-Wood (FW) models are gendered in the sense of distinguishing between men and women in the labour market (although AT limits this feature to the agricultural sectors). The main innovation of the FW model is the inclusion of the unpaid sphere of social reproduction or household work. Leisure is

7. A similar approach has been followed more recently by Fofana et al. (2003) on Nepal. More work is also planned for other countries.

also accounted for, separately for women and men. The distinctive feature of the AT model is the treatment of risk-taking as an endogenous variable that affects the gender allocation of labour in agriculture.

The AT model is used to analyse the gender effects of technological innovation in agriculture in Mozambique. A reduction in marketing margins is also simulated. The model distinguishes eight agricultural activities and differentiates agricultural labour into male and female categories. Subsistence production as well as market-oriented agriculture are included. Labour employed by the non-agricultural sector is segmented and is not differentiated by gender.

The gender disaggregation of the agricultural sectors singles out cassava production as the most female-intensive activity. Cassava is a non-traded good (with neither exports nor imports) and is produced mainly for home consumption. Because of its properties, cassava is also a risk-reducing crop. This is modelled by adding to the equations for cassava production an endogenous variable representing a risk premium, which is set greater than one in the base case. This premium results in more female farmers being allocated to production than profit maximisation would require, and thus in returns to female labour being lower.

Simulations are run with and without the risk variable. The findings are that technological innovation increases overall production and reduces risk, and hence favours the reallocation of female labour away from cassava – a different outcome from when risk is not modelled. Female participation in market-oriented crops rises and so does the female wage. As the authors note, however, this positive outcome might not take place in the real world because of constraints (other than risk-aversion) preventing women farmers from undertaking market work. These other constraints, such as household obligations or limited female access to agricultural inputs, are not taken into account in the model.

The FW model simulates the uneven effects of changes in various trade policies on women and men in Bangladesh and Zambia. Both the Bangladesh and Zambia social accounting matrices (SAMs) have several market sectors, differentiate workers by education as well as gender, and account for land as well as capital. They distinguish several household types and estimate household work and leisure for each of them. Employment in the SAMs is measured in hours and time spent on household work and leisure is valued at the average market wage, separately for men and women. The two non-market sectors are assumed to behave qualitatively like market sectors but to differ quantitatively from them, in particular with household activities employing mainly women and being less responsive to price changes.

Simulations include a decline in garment exports and a rise in the world price of grains in Bangladesh, a rise in the world price of copper and an increase in non-traditional agricultural exports in Zambia, and tariff liberalisation in both countries. The effects of trade liberalisation appear to be more favourable in Bangladesh than in Zambia because of the higher female intensity of the export-oriented sector in the former country.[8] Details of the experiments are not provided here (for more see Fontana, 2001, 2002, and 2003) but some of the lessons learnt are summarised.

8. Fofana et al. (2003) applies a similar approach to that of FW to Nepal and finds that tariff abolition increases women's market participation and their wages relative to men's, but has ambiguous effects on leisure and home production. The paper's main methodological contribution is to develop a calibration

The great level of detail in the disaggregation of factors, sectors and households permits an understanding of how the effects of economic changes on women vary, depending on their characteristics and circumstances. It was possible to highlight, in both Bangladesh and Zambia, how trade policy measures have a differentiated impact on female workers, depending on whether or not they have skills, live in urban or rural areas, and are or are not head of their household.

The simulations showed how important it is to include household work and leisure as sectors. This allowed improved analysis by endogenising labour supply – which is treated as fixed in most models – and by including dimensions of welfare other than those resulting from income gains. For example, tariff liberalisation in Bangladesh is shown to increase both the market participation and wages of semi-skilled women, but also to cause a decline both in their household time and in their leisure.

Experiments were re-run with alternative parameter values to test the sensitivity of the results to different degrees of responsiveness of gendered aspects of the division of labour to economic change – how much the amount of time women spend on household activities falls in response to improvements in their market wage or employment opportunities. Depending on the values assigned to the elasticity of substitution between male and female labour in market and non-market production, and to the price elasticity of demand for household work, the magnitudes of the effects of the simulations varied. This is yet another important aspect to consider when designing policies.

The limitations of the AT and FW models should be noted. The main weakness in both is the lack of analysis of the allocation of intra-household resources and the neglect of possible dynamic effects. AT does not include any representation of the household. In FW the behaviour of the household and leisure sectors resembles that in the unitary model of the household. Moreover, even though some consideration is given to the welfare effects of changes in household activities and leisure, an explicit link between the provision of care and the productivity of the labour force is not modelled.

The AT and FW approaches provide only two of many ways in which CGE models could be made gender-aware. Some more ideas to improve the design of gender-aware models are offered in the next subsection.

3.2 Suggestions for further developments

Our understanding of the linkages between macroeconomic policy and gender has improved in recent years, but much remains to be done. In making CGE models gender-aware, both data and theory can be improved. The first part of this section suggests ways in which a SAM – the database for any CGE model – can be extended to provide a more detailed description of gendered aspects of reality. The second part discusses model specifications.

A frequently used approach in the analysis of gender inequalities is that of distinguishing a ‘macro’, a ‘meso’ and a ‘micro’ level (Elson et al., 1997). Macro-level analysis involves examining the gender division of the labour force between the different productive market sectors and the reproductive sectors. Meso-level analysis looks at the institutions that help structure the distribution of resources and activities at

---

procedure for leisure that uses empirical estimates of the income elasticity of labour supply, separately for women and men.

the micro level. It involves examining gender inequalities in public provision as well as gender biases in the operating rules of labour, commodity and other markets. Micro-level analysis examines in greater detail the gender division of labour, resources and decision-making, particularly within the household. SAMs and CGE models describe macro-aggregates but also can, and often do, incorporate a considerable level of detail for both 'meso' and 'micro' dimensions. Thus, they provide the opportunity to capture gender distortions at many levels.

SAM extensions

By providing insights into the different roles of women and men in the generation and distribution of income, and the interactions between households and the market economy, SAMs can allow a better understanding of the gender effects of economic policies. SAMs can be extended by providing a greater level of detail for existing accounts, for example by further disaggregating agricultural sectors into female-intensive and male-intensive crops, if the issue of concern is gender relations in rural settings ('internal satellite accounts'). Some other extensions involve adding new data and broadening definitions of what constitutes production or assets ('external satellite accounts'). Examples of external satellite accounts are those that provide a valuation of a household's own activities. Some of these disaggregations could in principle be easily implemented but in practice are not because of lack of data. Even though it has become standard to report gender-disaggregated statistics in most surveys, data are still often incomplete and not reliable. Suggestions on how to extend SAMs to permit a richer gender analysis are listed in Table 2.

Table 2: A macro-meso-micro approach to making a SAM gender-aware

Level	Account extensions
Macro	• Valuation of reproductive activities • Gender disaggregation of both productive and reproductive sectors
Meso	• Gender disaggregation of public expenditure and taxes • Gender disaggregation of transaction costs • Distinction between formal and informal markets
Micro	• Consumption by household member • Asset ownership by household member • Indicators of dependants' welfare

At the macro level, analysis with a gender focus requires that the market sectors (agriculture, manufacturing, and services) in the SAM be disaggregated into male-intensive and female-intensive sectors. More importantly, the SAM should include a monetary valuation of caring and other household activities that are undertaken in the reproductive economy. The development of satellite time-use modules, which keep a record of how much time people spend on various tasks and impute a monetary value to non-market time, is of particular relevance to gender analysis. Evaluations of this kind, however, are data demanding and often methodologically difficult. Only a few

developed countries provide satellite accounts of this type regularly.[9] Ideally, the household sector would need to be broken up into many sub-sectors, such as childcare, meal preparation, shopping and repairing the house. This classification would allow a better understanding of gender roles within the household and would help identify which aspects of women's reproductive labour are likely to be most affected when their involvement in market activities increases.

At the meso level, a gendered SAM could be extended in the following ways. Items of public expenditure could be accounted separately, for example by distinguishing between health, education and other infrastructure. Attempts should be made to trace by individual, not by household, who benefits from the government provision of public services. It would also be useful to record gender differences in taxation. For example, Nyanzi (2000) uses a SAM for Uganda, in which households are differentiated by gender of the household's head, to assess the gender implications of changes in both direct and indirect taxation, given that female-headed and male-headed households appear to have markedly different sources of income and consumption patterns. Distinguishing between formal and informal activities should be given priority, given that women often constitute the majority of workers in the informal sector (for example, see Sinha (2000) on a SAM for India). It would also be useful for SAMs to provide information on marketing margins and other transaction costs. These costs are often higher for women than for men, which might explain, for example, why a high proportion of agricultural production by women remains non-marketed.[10]

At the micro level, a gender-aware approach to SAMs would require including accounts for individuals as subsets of household accounts. Consumption expenditure could be recorded for each household member. It would also be useful to know who benefits from such expenditures – to track down, for example, what the impact of female income is on children's nutritional status, and other welfare outcomes. Recording assets, separately for female and male household members, as well as any transfers of wealth between them, would help identify sources of bargaining power (Quisumbing and de la Briere, 2000).[11] These two pieces of information combined would permit analysis of how policies might have different implications for the consumption levels of different family members, and for overall demand, depending on who in the household has decision-making power.

Household-caring activities have positive social effects and important implications for the well-being of the future workforce. It would be useful to know the impact of time re-allocation on dependants when women take up paid market work. Information could be incorporated, for example, on children's labour by gender, to monitor whether girls and boys are kept out of school to undertake household tasks that their employed mothers no longer have time to complete.[12] Some indicators could also be constructed to link care provision to social outcomes, using, for instance, health statistics or educational levels of the workforce.

---

9. For example, van de Ven et al. (2000) and Ironmonger (2000).
10. Evidence is provided in Malmberg-Calvo (1994).
11. Even if in some contexts/countries it might not be possible to distinguish individual ownership of assets, some indicators of individual bargaining power could be found.
12. See, for example, Katz (1995). In some other cases it is other adult female members of the household, such as aunts and grandmothers, who take on household tasks relinquished by women who have to go out to work.

Going a step further, the SAM format could also be used as the organising principle for describing intra-household allocation of resources, time and power for each representative household. This could be provided by constructing household-level SAMs – as many as the household types in the corresponding economy-wide SAM. In each of the household SAMs, the household would be treated as if it were a national economy. Various non-traded goods would be produced within the household for home consumption, using male and female labour and 'imported' intermediate goods. Exports and imports would be the household's cash transactions with the rest of the economy. Household members would be represented in the same way as 'institutions' in the larger SAM, each with separately recorded sources of income, assets, consumption expenditures and transfers to other institutions/household members. Taylor and Adelman (1995) develop a SAM framework for village economies, which are described with their own specific institutions and socio-cultural structures. Their study seeks to analyse the functioning of the village economy as well as economic interactions between different villages and between villages and the wider economy. The construction of household SAMs could be seen as a way of taking the idea of the village SAM to one finer level of disaggregation.

Model specification

If all of these SAM extensions were implemented, the range of issues for analysis would widen significantly. Different explanations are possible for the same facts described in the SAM. The next task for the modeller is to specify the connections and the nature of the interactions between all these facts by choosing the most plausible theory. Adding a gender dimension to a CGE involves relating the values of key parameters and the form of closure of the model to the nature and degree of gender inequality.

Table 3 provides examples of gender-specific constraints that the modeller should consider when specifying her model. Some of the points listed in the table are further discussed in the following paragraphs. The 'right' combination of gendered specifications in a CGE will vary, depending on the particular issues being analysed, the country context, and, of course, data availability. At a minimum, however, a gender-aware model should incorporate gender segmentation in labour markets and some representation of the non-market sphere.

A specification to allow for different degrees of mobility among labour categories, and for different levels of substitution between female and male workers across sectors, should be included. Alternative equilibrating mechanisms should be modelled when there is evidence that different labour markets operate differently. For example, one possible working hypothesis for modelling formal and informal sectors could be to assume an increasing wage-employment curve in the formal sector, with wages in the informal sector set to absorb all the labour not employed in the formal sectors.

An important step, treating male and female labour as distinct factors of production, is to include some behavioural specifications to account for unequal wages for female and male workers (with the same skills). Several alternatives are possible. For instance, wage determination mechanisms that reflect bargaining between workers and employers – with differences in level of unionisation (and hence power) between male and female workers – might be the most appropriate specification in most cases. In other cases the gender wage gap would be better modelled as resulting from employers'

taste for discrimination, that leads them to hire women only at wages lower than their productivity. In yet other cases, differences in earnings could be specified as the effect of women in varying degrees being indeed less productive in the market economy than men, because of their many other commitments in the household.

Table 3: Checklist for the 'gender-sensitive CGE modeller'

Sectors/markets	Modelling questions
Production activities	• Do female-intensive sectors differ significantly from others in the organisation of production? • Is the technology of female-intensive production different from that in other sectors? (e.g., informal vs. formal.) • Are there activities carried out simultaneously? (e.g., women undertaking agricultural work at the same time as looking after their children.) • Does the elasticity of substitution between male and female labour vary across (both market and non-market) sectors?
Labour markets	• What is the most plausible explanation for the gender wage gap? Are women less unionised? Less productive? • Is unemployment higher among women than among men? • Is there a large informal labour market? Is this female-intensive? What are its rules of operation/links with other market and non-market sectors?
Household	• What is the gender division of labour in household work? How likely is the reallocation of tasks between females and males in response to new incentives? • Do different household types behave differently with respect to female labour? (e.g., low female labour supply to market activities in families with high dependency ratios, higher elasticities in poor female-headed households, etc.) • What is the evidence on intra-household allocation of resources and decision-making power? Do women and men have different consumption preferences? Are transfers between them based on coercion or co-operation? • Are there market substitutes for child care and other household services? • What is the impact of changes in the care economy on the productivity of the labour force?
Other features	• How do marketing systems function? (e.g., are transaction costs higher for women than for men?) • Do preferences for risk-taking differ by gender?

Still on the labour market, a mechanism should be designed to link explicitly the productivity of the labour force to the provision of care. This has never been tried before in a CGE model. It would provide an opportunity to address the concern of many feminist economists that labour needs to be considered as a 'produced' factor of production. Social reproduction (or household work) should be represented not only as a constraint on women's time that affects their market participation decisions (as in the

FW model), but also as an input into the 'production' of the labour force. A possible way of implementing this could be by considering a sequence of equilibria. In each period the composition of the labour force is updated, and the extent of change in its skill and gender composition is a function of variation in the level of household caring provided, or a similar such hypothesis. The same specification could also be used to model other dynamic effects – for example, the impact of changing social attitudes towards girls' education.

Few studies have taken a micro-foundations approach to the analysis of a large macroeconomic shock or policy change. Labour economists approach the effect of trade on wages and employment with methods based on a single aggregate output sector in a partial equilibrium framework. Trade economists approach the same issue with a multi-sector analysis in which the national labour-demand schedule is determined by changes in the output mix and wages (Elliott and Lindley, 2001). However, partly because most trade economists emphasise long-run gains over short-term adjustment costs and partly because of data and computational problems, efforts to incorporate labour-market adjustments into a general-equilibrium framework have been few (the excellent work by Bourguignon et al. (2003) is a notable exception). New research in this area will provide a better understanding of the social impacts of macroeconomic shocks and thus help in designing development policies that adequately safeguard an economy's human resources, both female and male

Several studies (most notably Floro and Miles, 1999) document that many household activities are carried out at the same time. This phenomenon appears to be more frequent among women, who experience greater intensity of work, but not necessarily an increase in working hours, when taking up paid employment. It would not be possible to disentangle the simultaneous undertaking of many activities such as cooking, housekeeping and child care, but perhaps modelling an activity as producing joint outputs could help to understand better some of these aspects.

An important aspect, neglected in both the FW and AT models, is that of intra-household resource allocation. With all household data further disaggregated by individuals, as suggested in a previous section, it would be possible to explore intra-household allocation aspects by simply assigning different weights to individual utility functions of women and men, based on the value of their individually owned assets or other measures of bargaining power. It might be desirable to take intra-household analysis a step further, by nesting a fully developed household model within the CGE framework. This would allow consideration of more interactions and constraints than in a standard CGE model (with individual disaggregations), but would have the disadvantage of high computational complexity. Another option could be to keep a simpler gendered CGE structure, but to develop an independent household module outside the model to be used for post-simulations calculations. This might be easier to implement, but should be used only when feedback effects are expected to be small.

4 Conclusion

Efforts are growing to incorporate detailed labour-market and household-level adjustment processes into a general-equilibrium theoretical framework. But attempts to incorporate a gender dimension have thus far been limited. New modelling

developments in this area will improve our understanding of the poverty impact of macroeconomic reforms and lead to a better design of development policies.

Some of the suggestions in this article might appear rather ambitious. Implementing them might require effort, but would greatly help our understanding of the economy as a gendered structure. Including gender as an analytical category in the quantitative analysis of macro-poverty linkages can help to foster policies that promote both economic growth and gender equality. Such policies include strengthening women's control over assets, expanding women's access to credit, promoting skill development through better education and vocational training, providing financial assistance for out-of-home child care, and investing in water and power infrastructure in rural areas. There are potentially great benefits to building new models of macro-poverty linkages centred on gender relations in the market and in the home.

References

Anker, Richard (1998) *Gender and Jobs: Sex Segregation of Occupations in the World*. Geneva: International Labour Office.

Arndt, Channing and Tarp, Finn (2000) 'Agricultural Technology, Risk, and Gender: A CGE Analysis of Mozambique', *World Development* 28 (7): 1307-26.

Artecona, Raquel and Cunningham, Wendy (2002) *Effects of Trade Liberalization on the Gender Wage Gap in Mexico*. Gender and Development Working Paper No. 21. Washington, DC: World Bank.

Aslanbeigui, Nahid and Summerfield, Gale (2000) 'The Asian Crisis, Gender, and the International Financial Architecture', *Feminist Economics* 6 (3): 81-103.

Balakrishnan, Radhika (ed.) (2002) *The Hidden Assembly Line: Gender Dynamics of Subcontracted Work in a Global Economy.* Bloomfield, CT: Kumarian Press.

Berik, Günseli; Rodgers, Yana and Zveglich, Joseph (2004) 'International Trade and Gender Wage Discrimination: Evidence from East Asia', *Review of Development Economics* 8 (2): 237-54.

Black, Sandra E. and Brainerd, Elizabeth (2004) 'Importing Equality? The Impact of Globalization on Gender Discrimination', *Industrial and Labor Relations Review* 57 (4): 540-59.

Bourguignon, Francois; Robilliard, Anne-Sophie and Robinson, Sherman (2003) *Representative versus Real Households in the Macro-Economic Modeling of Inequality*. Working Paper DT/2003-10. Paris: Développement et insertion internationale (DIAL) (available at http://www.dial.prd.fr/dial_publications/PDF/Doc_travail/2003-10.pdf).

Braunstein, Elissa (2000) 'Engendering Foreign Direct Investment: Family Structure, Labor Markets and International Capital Mobility', *World Development* 28 (7): 1157-72.

Budlender, Debbie (2000) 'The Political Economy of Women's Budgets in the South', *World Development* 28 (7): 1365-78.

Cagatay, Nilufer (2001) *Trade, Gender, and Poverty*. Background Paper. New York: UNDP.

Cagatay, Nilufer, Elson, Diane, and Grown, Caren (eds) (1995) Special issue on 'Gender, Adjustment and Macroeconomics', *World Development* 23 (11).

Cagatay, Nilufer, Elson, Diane, and Grown, Caren (eds) (2000) Special issue on 'Growth, Trade, Finance, and Gender Inequality', *World Development* 28 (7).

Cheng, Lucie and Hsiung, Ping-Chun (1994) 'Women, Export-Oriented Growth, and the State: The Case of Taiwan', in Joel Aberbach, David Dollar and Kenneth Sokoloff (eds), *The Role of the State in Taiwan's Development*. Armonk, NY: M.E. Sharpe.

Darity, William (1995) 'The Formal Structure of a Gender-Segregated Low-Income Economy', *World Development* 23 (11): 1963-8.

Elliott, Robert and Lindley, Joanne (2001) *Intra-Sectoral Labour Mobility and Adjustment Costs*. Working Paper No. 2001/38. Nottingham: Leverhulme Centre for Research on Globalization and Economic Policy.

Elson, Diane (1998) 'Integrating Gender Issues into National Budgetary Policies and Procedures: Some Policy Options', *Journal of International Development* 10 (7): 929-41.

Elson, Diane; Evers, Barbara and Gideon, Jasmine (1997) *Gender Aware Country Economic Reports: Concepts and Sources*. GENECON Unit Working Paper 1. Manchester: University of Manchester.

Erturk, Korkut and Cagatay, Nilufer (1995) 'Macroeconomic Consequences of Cyclical and Secular Changes in Feminization: An Experiment at Gendered Macromodeling', *World Development* 23 (11): 1969-77.

Floro, Maria, and Miles, Marjorie (2003) 'Time Use, Work and Overlapping Activities: Evidence from Australia', *Cambridge Journal of Economics* 27 (6): 881-904.

Fofana, Ismaël; Cockburn, John and Decaluwé, Bernard (2003) 'Developing Country Superwomen: Impacts of Trade Liberalization on Female Market and Domestic Work'. Paper presented at the third annual conference 'Les Journées du CIRPÉE', Manoir des Sables Mont-Orford/Magog, Canada, 17-18 October (available at http://132.203.59.36/PEP/Group/mpia-train/Gender_fichiers/Gender4.pdf).

Fontana, Marzia (2001) *Modelling the Effects of Trade on Women: a Closer Look at Bangladesh*. IDS Working Paper 139. Brighton: Institute of Development Studies at the University of Sussex.

Fontana, Marzia (2002) *Modelling the Effects of Trade on Women: The Case of Zambia*. IDS Working Paper 155. Brighton: Institute of Development Studies at the University of Sussex.

Fontana, Marzia (2003) *Modeling the Effects of Trade on Women, at Work and at Home: A Comparative Perspective*. TMD Discussion Paper No. 110. Washington, DC: International Food Policy Research Institute.

Fontana, Marzia and Wood, Adrian (2000) 'Modeling the Effects of Trade on Women, at Work and at Home', *World Development* 28 (7): 1173-90.

Gunter, Bernhard G. and van der Hoeven, Rolph (2004) 'The Social Dimension of Globalization: A Review of the Literature', *International Labour Review* 143 (1-2): 7-43.

Ironmonger, Duncan (2000) *Household Production and the Household Economy*. Department of Economics Research Paper No. 759. Melbourne: University of Melbourne (available at http://www.economics.unimelb.edu.au/research/working papers/wp00_01/759.pdf).

Katz, Elizabeth (1995) 'Gender and Trade Within the Household: Observations from Rural Guatemala', *World Development* 23 (2): 327-42.

Lim, Joseph (2000) 'The Effects of the East Asian Crisis on the Employment of Women and Men: The Philippine Case', *World Development* 28 (7): 1285-1306.

Lofgren, Hans; Harris, Rebecca Lee and Robinson, Sherman (2002) *A Standard Computable General Equilibrium (CGE) Model in GAMS*. TMD Discussion Paper No. 75. Washington, DC: International Food Policy Research Institute.

Malmberg-Calvo, Christina (1994) *Case Study on the Role of Women in Rural Transport: Access of Women to Domestic Facilities*. SSATP Working Paper No. 11. Washington, DC: World Bank.

Nyanzi, Tom (2000) 'Evaluation of the 1997 Tax Reforms in Uganda: An Engendered General Equilibrium Model'. Ph.D. Dissertation. Bath: University of Bath (mimeo).

Oostendorp, Remco (2003) 'Globalization and the Gender Wage Gap', Amsterdam: Free University of Amsterdam (mimeo).

Quisumbing, Agnes and de la Briere, Benedicte (2000) *Women's Assets and Intra-Household Allocation in Rural Bangladesh: Testing Measures of Bargaining Power*. FCND Discussion Paper No. 86. Washington, DC: International Food Policy Research Institute.

Rodgers, Yana (1999) *Protecting Women and Promoting Equality in the Labor Market: Theory and Evidence*. Gender and Development Working Paper No. 6. Wasghinton, DC: World Bank.

Seguino, Stephanie (1997) 'Gender Wage Inequality and Export-Led Growth in South Korea', *Journal of Development Studies* 34 (2): 102-32.

Singh, Ajit and Zammit, Ann (2000) 'International Capital Flows: Identifying the Gender Dimension', *World Development* 28 (7): 1249-68.

Sinha, A. (2000) 'Value Added from the Informal Sector: Lessons from a SAM with Formal-Informal Disaggregation for India'. New Delhi: NCAER (mimeo).

Taylor, J. Edward and Adelman, Irma (1996) *Village Economies*. New York: Cambridge University Press.

Udry, Christopher (1996) 'Gender, Agricultural Production, and the Theory of the Household', *Journal of Political Economy* 104 (5): 1010-46.

van de Ven, Peter; Kazemier, Brugt and Keuning, Steven (2000) 'Measuring Well-Being with an Integrated System of Economic and Social Accounts'. Paper prepared for a Conference on Methods of Aggregating Indicators of Social and Economic Well-Being, Cologne, Germany, 3-6 October (available at http://www.gesis.org/dauerbeobachtung/sozialindikatoren/veranstaltungen/PDFs/RC33_Ven.pdf).

World Bank (2001) *Engendering Development: Through Gender Equality in Rights, Resources, and Voice*. Oxford: Oxford University Press for the World Bank.