

Modelling the gender effects of trade: current findings and ways forward¹

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Abstract-- A number of general equilibrium models have been developed in recent years to study the effects of trade liberalisation on gender inequalities in developing countries. This note analyses the main insights from these studies, highlights strengths and limitations of the current approaches and provides suggestions for further developments.

¹ This note is very tentative and draws heavily on earlier work (especially Fontana and Wood, 2000 and Fontana, 2004)

I. Introduction

Macroeconomic analysis that omits consideration of household work and assumes women's unpaid labour to be infinitely elastic paints a seriously incomplete picture of the impact of changes in policies on the welfare of women, men and their dependents.

The many unpaid services provided within households are not only vital for social well-being and human development but also supplied mainly by women – and occupy much of women's time. To make these services visible is thus important in itself as an ingredient of a gender aware economic model. In addition, it allows consideration of more constraints and interactions than with standard models, particularly interactions between behaviour inside and outside the household which are crucial to understanding issues such as the response of female labour force participation to reform of economic policies.

An accurate assessment of the gendered impact of economic policy changes also requires explicit consideration of time spent on rest and recreation. This is because there are sharp differences in the extent of leisure time between women and men (with women generally spending more of their waking hours on work of all kinds), and because changes in the market can alter the amount of time spent on leisure, thus affecting welfare in ways that are overlooked in standard economic models. For example, an increase in female earnings from greater participation in the market economy might on balance reduce social welfare if it also resulted in a substantial decline in leisure time for women.²

A few studies of the welfare effects of tax reforms (for example de Melo and Tarr, 1992; Rousslang and Tokarick, 1995; and Ballard, 1988) have used CGE models that incorporate non-market time but they treat it all just as 'leisure', without distinguishing between its uses. Nor do they differentiate between men and women as providers of labour inputs. Piggott and Whalley (1996) differentiate between home production and leisure, and between 'primary workers' (presumably men) and 'secondary workers' (presumably women). However none of these models give explicit consideration to

² Whether women are better off with more cash income and less leisure depends on whether they have chosen this outcome or been forced into it.

gender inequalities in the allocation of time and to their welfare implications. Gender is not recognised in these models as a relevant analytical category.

Yet, by providing a comprehensive framework that emphasises linkages among sectors and actors, and various feedback effects, computable general equilibrium (CGE) models can provide a useful tool for gender analysis. When appropriately disaggregated, a social accounting matrix (SAM) – the data base for any CGE model -- can provide 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. 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, spent on household activities and on other activities, is of particular relevance.

Evaluations of this kind, however, are data-demanding and often methodologically difficult, which helps to explain why only a few empirical models incorporating the unpaid sector have been developed to date. Fontana and Wood (2000) construct an archetype gendered model of Bangladesh that includes household work (or social reproduction) and leisure as well as distinguishing between male and female labour. Fontana (2003, 2004) applies the Fontana and Wood approach to two detailed data sets of Bangladesh and Zambia, thus illustrating the range and variety of effects that can be captured by modelling specific countries (and also the complexity of applying the model to real data).

The purpose of this note is to discuss strengths and limitations of this approach and to provide suggestions for further developments. Section 2 describes the Fontana and Wood approach. Section 3 presents results from selected simulations to illustrate the insights gained by adding gender features to a CGE model. Section 4 provides suggestions for further development.

II. Modelling the non-market sector

The approach followed by Fontana and Wood (2000) is to model female and male labour as imperfect substitutes and to include two non-market sectors, social reproduction (or household work) and leisure, in addition to the usual market sectors. This requires both extending the social accounting matrix underlying the model and

modifying some of its equations. These two steps are presented here in turn. Other model details are described in Fontana (2003)

II.1. Extending the accounting framework

A gender aware SAM must have at least three features. It should distinguish between female and male labour, both in the labour market and in the distribution of value added in each sector. It should include the household and leisure sectors, rather than being confined to the market economy. It should measure labour use in terms of hours rather than persons, since most people are involved in both market and non-market activities. The next few paragraphs discuss the principles and the data used in creating these features.

The household sector covers *services* produced and consumed within households. These are activities which the standard System of National Accounts (SNA) defines as ‘economic’ but not ‘productive’ (United Nations, 1993). Any activity which could be delegated to someone else is ‘economic’: for example, making a shirt or preparing a meal. The SNA defines as productive (and includes in GDP) not only the economic activities which produce goods and services for sale, but also those which produce *material goods* for own-consumption within households – food, clothing and other articles. Services provided within households for own-consumption, however, are defined as non-productive, and it is these which we label social reproduction: cooking and cleaning; repairing the house, furniture and clothes; care of children, the sick and the elderly; and personal, social and community support services.

Following this SNA convention has advantages in terms of availability and comparability of data, but also some disadvantages. The division of household activities between ‘productive’ material goods and ‘non-productive’ services is arbitrary – since most of these services, like the goods, have substitutes in the market economy (restaurants, laundries and childcare, for example) – and it gets in the way of an integrated treatment of the economic behaviour of households.

Leisure is the time that remains after market oriented and social reproduction work (net of time for sleeping, eating and personal hygiene). The leisure sector contains activities which the SNA defines as ‘non-economic’ (for example, one cannot send someone else

to watch a film on one's behalf), but is only a subset of these activities. Leisure is distinguished from 'personal care', which is defined as the minimum time needed for sleeping, eating, personal hygiene, and medical treatment. Amounts of time spent on these activities in excess of the minima – for example, spending most of the day in bed or at a feast – are categorised as leisure, in addition to activities such as watching TV, listening to music, engaging in hobbies or sports, parties, ceremonies and religious observance. All these leisure activities are included in the SAM, while personal care is excluded. Clearly, the division between leisure and personal care is a bit arbitrary, as is that between leisure and market activities, but some such distinctions seem necessary.

The key building block for the construction of the household and leisure sectors is an estimate of the average allocation of women's and men's time, in hours per week, among the various activities. Data sources and assumptions vary depending on the availability of information in the country concerned but, usually, the estimate, which covers all 168 (7 x 24) hours of the week, is based partly on standard labour force data (which record the number of people working in each of the market sectors and at times include information on some unpaid non-market work as well) and partly on time-use data, coupled with the assumption that 10 hours per day are needed for minimal personal care. The 10-hour figure relates to minimum requirements, not to actual use of time, and is simply an assumption. Some studies (for example Biddle and Hamermesh, 1990) have suggested that time spent on sleep responds too to changes in economic variables and, in turn, affects labour productivity. It is therefore inaccurate to treat it as a predetermined deduction from people's own allotment of time. We neglect this aspect because of lack of data. For the same reason, we have to assume that time spent eating and sleeping does not vary by gender. However some studies, such as Zaman (1995) in Bangladesh, suggest otherwise. This way of measuring employment does not permit, consideration of activities which are undertaken simultaneously (and which, evidence suggests, are more frequent among women than among men (Floro and Miles, 1999)).³

Social accounting matrices usually describes various type of households which differ by socio-economic characteristics (for example low income versus high income, or rural versus urban). A household sector and a leisure sector need thus to be constructed for

³ In a more elaborated accounting framework, and if better data were available, it should be possible to record an activity in the SAM as producing joint outputs.

each household type in the SAM. Members of each type of household ‘produce’ particular kinds of social reproduction and leisure (reflecting each household type’s educational and gender composition), which are not traded among households but ‘consumed’ by the members of that household category only.

Once the allocation of women’s and men’s time is estimated, the output in the household and leisure sectors is derived by valuing labour, for each skill and gender category, at its average market wage (considered to be the opportunity cost of each worker’s time), assuming that non-market sectors use neither capital (nor land) nor intermediate inputs. The estimated outputs of social reproduction and leisure appear in the SAM both in the production accounts and in final demand (as part of household consumption).

Estimating the allocation of women’s and men’s time between market and non-market activities is not an easy task, as data on time-use in many developing countries are sparse and cover neither all tasks nor all geographical areas. The task is further complicated by the number of categories of both workers and household types in the SAM, requiring knowledge, for instance, of how the time allocation of a given type of worker varies according to the type of household they belong to. For example, do women in rural households devote as much time to social reproduction as women of same skill in urban households? Such information is rare.

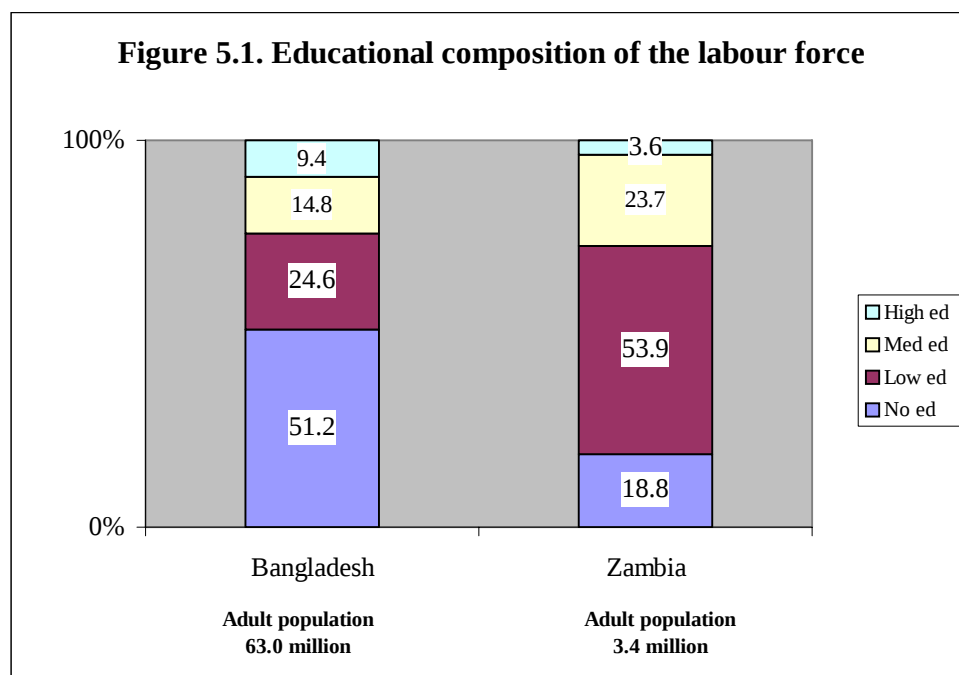
Two social accounting matrices for Bangladesh and Zambia were extended using this approach. Several calculations and assumptions were required to correct for missing observations and other problems. These are documented in Fontana (2004). Some of the gender features of these two SAMs are compared in the following section.

II.1.1. Bangladesh and Zambia

The gendered social accounting matrices for Bangladesh and Zambia described in this section both refer to a similar time period, 1994 for Bangladesh and 1995 for Zambia. They were constructed by integrating existing data sets with additional information on the gender structure of the economy, both in the labour market and at the household level.

Bangladesh is far more populous than Zambia, with an adult population of about 63 million compared with 3 million in Zambia. This big difference in the size of the two countries is reflected in their different degree of openness. The share of exports and imports in GDP is higher in Zambia (77 per cent) than in Bangladesh (20 per cent). Hence one would expect the impact of changes in trade policies on the domestic labour market to be smaller in Bangladesh than in Zambia.

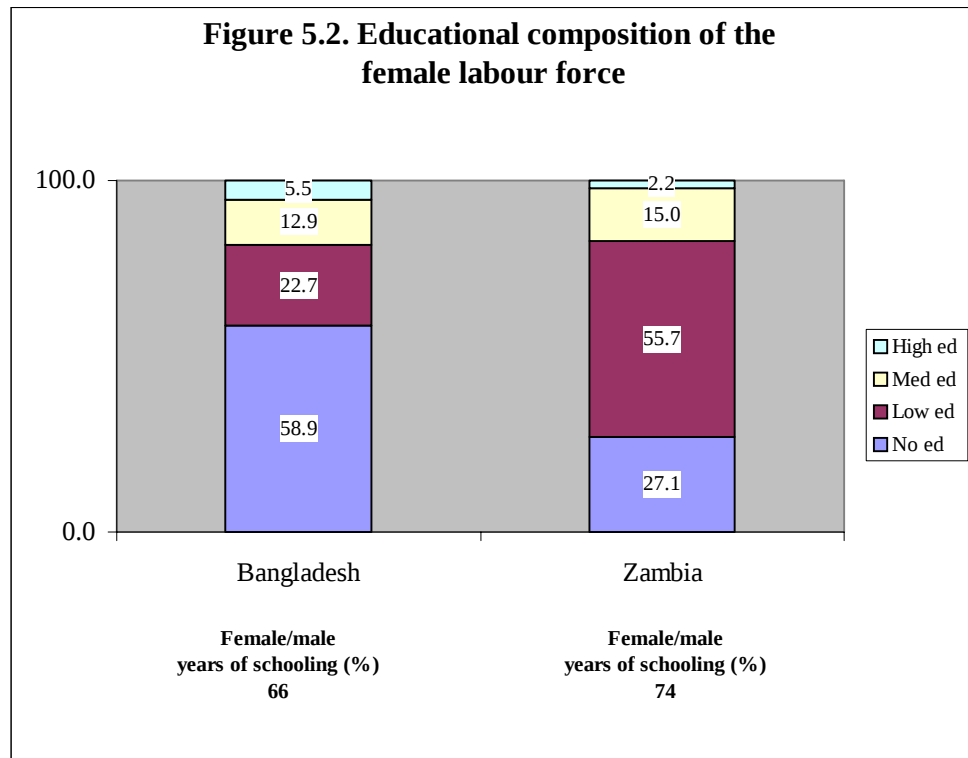
On average the adult population is better educated in Zambia than in Bangladesh. More than 50 per cent of the working population has no education in Bangladesh while in Zambia the share of illiterates is only 19 percent, as illustrated in figure 5.1.



Source: 1994 Bangladesh and 1995 Zambia gendered SAMs

The proportion of the workforce with primary or secondary education is 77 per cent in Zambia and 39 per cent in Bangladesh. The level of education of women is lower than that of the total population in both countries, as shown in figure 5.2. Although Bangladesh has a much larger share of its adult population with no schooling than Zambia, it also has a higher proportion of highly educated workers (9 per cent compared with 3 per cent in Zambia). For both reasons the Gini coefficient for educational distribution reveals greater inequality in Bangladesh (57.9) than in Zambia (27.4). The Gini coefficient for income distribution is however higher in Zambia (52.4) than in

Bangladesh (28.3).⁴ In Bangladesh the educational distribution of the adult population is more unequal not only across educational categories but also (though to a lesser extent) across genders: average years of schooling for women are about 66 percent of average years for men in Bangladesh, and 74 percent in Zambia.



Source: 1994 Bangladesh and 1995 Zambia SAMs

Gender inequality is larger in Bangladesh than in Zambia also as far as wages are concerned. This is described in table 5.2. Women with no education, for example, earn less than 50 per cent of what men of the same group earn in Bangladesh compared with 65 per cent in Zambia. The gender wage gap narrows with tertiary education in both Bangladesh and Zambia, to 70 per cent and 95 per cent respectively. This information should however be taken with caution as reliable data on wages are not available. Wage estimates from various labour force surveys had to be adjusted in both SAMs to correct for discrepancies between value added data and employment data.⁵ Other data (for example WISTAT data, United Nations, 1995) however seem also to indicate that

⁴ Gini coefficients for educational distribution were calculated by the author (the illiterate were included in the calculations and assumed to have an average of three months of schooling) and Gini coefficients for income distribution are taken from Deininger and Squire (1998).

⁵ This is a common problem when constructing SAMs, since information for different accounts is derived from various sources which do not always use same definitions and measurements.

gender wage inequalities are wider in Bangladesh than in Zambia. The smaller gap in earnings between female and male workers with university education can be explained by the fact that most highly educated women in both countries are employed by the public sector, where gender disparities in wages are less marked than in other sectors.

Table 5.2. Female/male wage gap by educational level

	No ed	Low ed	Med ed	High ed
Bangladesh				
Average female hourly wages as percentage of male wages	48	54	45	70
Market employment (million hours per year)				
Female	133	47	22	11
Male	302	184	113	84
Zambia				
Average female hourly wages as percentage of male wages	65	59	95	95
Market employment (million hours per year)				
Female	906	2471	232	36
Male	557	2365	814	106

Source: 1994 Bangladesh and 1995 Zambia gendered SAMs

As shown in table 5.3, on average, the adult population of both Bangladesh and Zambia spend about 38 per cent of time on leisure and 62 per cent working. There are however differences between the two countries in how the work is distributed between the market and the household, with people in Bangladesh spending 28 per cent of the time on market work compared with 43 per cent in Zambia, and 34 per cent on social reproduction compared with 19 per cent in Zambia. These different patterns mainly reflect women's lower market participation in Bangladesh, which results in more time overall being devoted to household work. Men spend the same share of time on market work in the two countries (42 per cent) but enjoy more leisure in Zambia (52 per cent of total time compared with 42 per cent in Bangladesh). A possible interpretation is that, because of rigid socio-cultural norms that encourage women to stay within the homestead, in Bangladesh men are more likely to get involved in household tasks such as food shopping, or anything else that involves 'being seen'. Fafchamps and Quisumbing (1999) find this type of specialisation in rural Pakistan, where men dominate in 'outside' housekeeping tasks such as firewood collection or visiting the market.

Table 5.3. Allocation of time between market and non-market activities (%)

Bangladesh			
	Total	Female	Male
Market	27.8	13.3	42.0
Social reproduction	34.4	53.2	16.1
Leisure	37.8	33.6	41.9
Total	100.0	100.0	100.0

Zambia			
	Total	Female	Male
Market	43.4	44.9	42.0
Social reproduction	18.5	32.9	5.7
Leisure	38.1	22.2	52.3
Total	100.0	100.0	100.0

Source: 1994 Bangladesh and 1995 Zambia gendered SAMs

It is not certain whether the time allocation surveys for the two countries adopt the same definition of household work.⁶ These different patterns, however, are consistent with other evidence on time allocation in South Asia and Sub-Saharan Africa. Studies reviewed in Ilahi (2000) show that in Africa women spend longer hours in both agricultural and non-agricultural activities than do men, while in Asia (and Latin America) the picture is one of a more marked gender division of labour, with men concentrating on income-generating work and women on housework.

Comparison of table 5.3 with table 5.2 reveals another pattern: lower women's participation in market activities relative to men's is associated with a wider gender wage gap. It is not clear what is the direction of causation between these two facts - whether women spend more time on household work in Bangladesh because of higher wage discrimination in the labour market (which makes it less attractive for them to work outside their home), or whether the gender wage gap reflects stronger family norms that require women to perform more burdensome work at home, hence reducing

⁶ Estimating the allocation of women's and men's time between market and non-market activities was not easy, as data on time-use, in both Bangladesh and Zambia, are sparse and cover neither all tasks nor all geographical areas (no detailed time-use study was available for the urban areas, for example). Subsistence agriculture is included in market work.

their energy and flexibility in the job. Even if it were possible to determine that the initial reason for the wage differential was more on the supply side than the demand side, or vice versa, the observed differential is most likely to be a mixture of the two. Research on interactions between the household and the labour market is growing, but mostly limited to developed countries (for example Bonke *et al.*, 2002 on Denmark, Lazaro *et al.*, 2002 on Spain, and Anxo and Carlin, 2002 on France) where richer data on time use are available. These studies vary in their findings but, overall, suggest that, despite significant increases in female market participation, the gender division of labour within the household remains fairly unequal. Women's level of education and the availability of market substitutes for household goods and services (such as utilities and child care) seem to be important determinants of the gender allocation of time.

Tables 5.4 and 5.5 show that the skill and gender composition of both market and non-market sectors varies between Bangladesh and Zambia. Of the two non-market sectors, social reproduction is somewhat more female intensive in Zambia (female time is 84 per cent of total labour time) than in Bangladesh (76 per cent of total). Moreover, while in Zambia social reproduction is more female intensive than any market sector, in Bangladesh there is one market sector, garments, which is more female intensive than social reproduction (83 per cent of total time is female).⁷ The garment sector is also the most export oriented sector (88 per cent of its output is exported, as indicated in the third column of table 5.6) and one of the most labour-intensive sectors (labour accounts for 77 per cent of total value added as shown in the second column of table 5.6).

⁷ This is true also when social reproduction is considered by household type, with the sole exception of social reproduction in rural female-headed households, in which female time is 92 per cent of the total.

Table 5.4. Educational and gender structure of SAM sectors, Bangladesh

	Shares of sectoral employment (% of female labour)				Females (% of total labour)
	No ed	Low ed	Med ed	High ed	
Grains	59	26	12	4	17
Commercial crops	57	28	11	4	3
Livestock&horticulture	61	25	11	3	47
Fishing	36	17	28	19	29
Food processing	48	26	18	9	30
Garments	43	34	17	7	83
Other textiles	31	35	20	14	12
Other manufacturing	37	31	20	12	16
Infrastructure	48	27	12	13	5
Trade	30	29	24	18	5
Transport	56	26	11	7	1
Public services	5	8	17	70	20
Financial services	3	9	13	75	6
Domestic services	48	25	17	9	43
All market sectors	49	26	15	11	24
All social reproduction	55	23	14	8	76
All leisure	50	25	15	10	44
ALL	51	25	15	9	49

Source: 1994 Bangladesh SAM

Table 5.5. Educational and gender structure of the SAM sectors, Zambia

	Shares of sectoral employment (% of female labour)				Females (% of total labour)
	No ed	Low ed	Med ed	High ed	
Maize	7	88	5	0	54
Commercial crops	6	94	0	0	41
Horticulture and groundnuts	19	54	24	4	60
Food and livestock	60	40	0	0	70
Fishing and forestry	12	78	10	0	7
Mining	10	45	41	4	7
Labour-intensive mfg	7	31	57	5	43
Capital-intensive mfg	43	49	7	1	4
Construction and utilities	20	80	0	0	3
Trade and transport	18	46	33	4	51
Public services	35	49	15	1	29
Market services	6	36	52	6	32
All market sectors	7	22	53	18	49
All social reproduction	20	65	14	2	84
All leisure	25	55	18	3	27
ALL	19	54	24	4	47

Source: 1995 Zambia SAM

Leisure is more male intensive in Zambia (only 27 per cent of total leisure time is female) than in Bangladesh (female share is 44 per cent). Indeed, in Bangladesh leisure is more female intensive than most market sectors (with the exception of livestock and horticulture and, of course, garments). Conversely, in Zambia, most market sectors (except for mining, capital-intensive manufacturing, infrastructure and forestry) are more female intensive than leisure. The most female-intensive sectors in Zambia are the agricultural sectors, especially food and livestock (in which 70 per cent of total time is female) and horticulture and groundnuts (60 per cent). These sectors are the least skill-intensive sectors in the market economy in Zambia (although on average they are more skill-intensive than similar sectors in Bangladesh, reflecting the higher average educational level of the workforce in Zambia). Other relatively female-intensive sectors in Zambia are trade and transport, with female time being 51 per cent of total time. The same sectors in Bangladesh are very male intensive (less than 5 per cent of total time is female). Mining, which is by far the most open sector in Zambia (more than 93 per cent of its output is exported), is highly male intensive, with a female share in total time of only 7 per cent. Mining is also the most capital-intensive sector (capital contributes 86 per cent of total value added).

In both countries the output of the household sector is quite large, 36 per cent of conventional GDP in Bangladesh and 21 per cent in Zambia. This is similar in size to other estimates for developing countries (Goldschmidt-Clermont, 1987).

Table 5.6. Sectoral structure of Bangladesh and Zambia

	Net output (% of GDP)	Labour (% of tot VA)	Export intensity*	Import penetration*	Tariff revenue (% of imports)
Bangladesh					
Grains	8.8	54.8	-	2.3	12.5
Commercial crops	3.6	33.2	0.1	6.6	2.0
Livestock and horticulture	6.9	44.5	0.2	1.9	8.5
Fishing	2.8	6.3	10.0	-	-
Food processing	4.5	13.1	1.4	1.8	61.4
Garments	1.5	84.9	87.5	8.2	4.1
Other textiles	2.7	72.2	18.5	28.3	11.8
Other manufacturing	3.9	42.2	1.9	45.8	20.8
Infrastructure	12.2	17.5	-	-	-
Trade	16.7	76.6	-	-	-
Transport	14.5	35.4	-	-	-
Public services	12.2	32.2	-	-	-
Financial services	5.5	20.4	-	-	-
Domestic services	3.9	92.7	-	-	-
All market sectors	100.0	43.6	11.4	19.6	18.4
All social reproduction	36.6	100.0	-	-	-
All leisure	52.6	100.0	-	-	-
Total	189.2				-
Zambia					
Maize	4.3	69.5	4.3	15.0	3.1
Commercial crops	1.4	55.6	15.6	16.9	0.4
Horticulture and groundnuts	5.6	90.6	2.9	2.7	21.0
Food and livestock	6.7	80.7	1.9	4.7	18.6
Fishing and forestry	4.8	55.7	-	0.2	15.9
Mining	17.3	13.9	93.3	23.3	20.3
Labour-intensive manufacturing	9.6	51.7	4.0	13.0	11.8
Capital-intensive manufacturing	3.1	35.2	9.1	65.0	14.1
Construction and utilities	6.4	17.7	10.1	0.2	19.5
Trade and transport	20.6	57.9	-	7.7	13.4
Public services	7.3	77.1	-	-	-
Market services	13.0	52.8	8.6	25.2	13.4
All market	100.0	50.9	16.5	20.3	13.4
All social reproduction	20.8	100.0			
All leisure	67.8	100.0			
Total	188.6				

Source: 1994 Bangladesh and 1995 Zambia SAMs.

Note: *Export intensity is measured as the share of exports in gross output and import penetration is measured as the share of imports in domestic use.

II.2. Model equations

The production and consumption equations in the model need to be modified to reflect changes in the accounting framework.

In the Fontana and Wood model, the two non-market sectors are assumed to behave qualitatively like market sectors. Each of them has a production function, which converts inputs of labour (mainly female in reproduction and male in leisure) into an output – reproduction services and leisure activities respectively. This output is demanded only domestically. Demand for it, relative to other goods, depends on household preferences, and is a decreasing function of its relative price. This price, like those of other goods, depends on the cost of production, and more specifically on the opportunity cost of the wages that people forgo by spending time on reproduction or leisure rather than working in the market economy. Given the price of this output, the demand for it determines how much is produced, which in turn determines how much labour is employed in the sector.

While assuming the household and leisure sectors to behave in qualitatively the same way as market sectors, important quantitative differences in setting the values of the parameters in each sector are described. For example, the demand for (and so the supply of) household services is less responsive to changes in their price than in the case of most market goods, because many of these services are necessities, but this can be captured by setting a lower price elasticity of demand in the reproduction sector.⁸ Similarly, we can capture the greater rigidity of the gender division of labour in reproduction than in market sectors by setting a lower elasticity of substitution between female and male labour. It may ultimately be possible to go deeper by making the values of these and other parameters the endogenous outcome of differences between female and male preferences, resources and bargaining power, but appropriately chosen exogenous values can convey much of the reality of how a gendered economy operates.

The production function is a multi-level CES (constant elasticity of substitution) functions. At the lower level, female labour and male labour are aggregated into

⁸ The linear expenditure system (LES) describing consumer demand in our model implies a close relationship between price and income elasticities. Hence, in this context, a low income elasticity means also a low price elasticity.

composite labour.⁹ The ratio of female to male labour depends on the share parameter of this aggregation function, which differs across sectors, and varies with changes in the wage rate of women relative to men, which induce substitution between them. To reflect the rigidity of gender roles, particularly within the household, we limit female/male substitution by setting elasticities lower than is usual in CGE models: -0.5 in the market sectors and -0.25 in reproduction and leisure. At an intermediate educational types are aggregate male/female composite labour into one larger labour bundle. Composite labour is the ‘output’ of the reproduction and leisure sectors, which in our SAM use neither capital nor intermediate inputs. In the market sectors, however, the production function has an upper level, with a substitution elasticity of unity, which combines composite labour and capital to produce net output (which is then combined in fixed proportions with intermediate inputs to make gross output).

The relative quantities of female and male labour and capital demanded vary inversely with relative factor prices (due to substitution), while the absolute quantities demanded in each sector depend mainly on the level of demand for the sector’s output. The supply of capital in each sector is fixed (so profit rates may vary across sectors), but labour is mobile, so that the supply to each sector responds freely to demand, within limits set by the fixed total supplies of female and male labour.¹⁰ Although labour is mobile, wage rates are not equalised across sectors. Relative sectoral wage rates are fixed in the pattern observed in the SAM, which is assumed to reflect variation in the skill composition of the labour force or in working conditions. Economy-wide average factor prices are set to clear factor markets – that is, to employ all factors fully – and so vary with the economy-wide demand for each factor, relative to its fixed supply. The average wage of women and men, relative to the average profit rate, thus depends on the sum of all the sectoral demands for composite labour, relative to those for capital. The wage of women, relative to men, likewise depends on the sum of all the sectoral demands for female labour, relative to male labour.

⁹ This is not simple addition: the two categories of labour are weighted by their relative marginal products, as reflected in their wage rates. The lower wage of women than men is thus implicitly assumed, in calibrating the model, to be the result of women being less productive than men, which causes the economy-wide demand for their labour to be lower than for that of men.

¹⁰ It is possible, for longer term analysis, to allow capital also to be mobile across sectors.

The consumption function is a linear expenditure system (LES), in which the demand for each good consists of a subsistence minimum (which may be zero) plus a fixed share of the residual income after meeting all the minima. An extended form of the LES that includes leisure as well as market goods has been used in previous work by Deaton and Mullbauer (1980) and de Melo and Tarr (1992). Our extended LES system incorporates social reproduction as well as leisure as non-market commodities consumed alongside market goods and services. In the absence of any better information, the price elasticity of demand for social reproduction is set quite low at -0.4 . In reality, how much households alter the amount of time spent on reproduction activities in response to changes in market wages varies with their composition and circumstances – less adjustment being possible, for instance, in families with more children or elderly dependents – but with only one type of household in our model, we have to use an average. Details of parameter calibration for each specific country are provided in Fontana (2004).

The linear expenditure system (LES) is a frequently used system in empirical analyses of demand. Even though LES functions are more flexible than Cobb-Douglas, they too have several restrictive features: they do not allow for inferior goods, they permit every good to be only a net substitute for every other good and they implies a close relationship between price and expenditure elasticities. To correct for some of these problems a more flexible form, the almost ideal demand system (AIDS), was developed by Deaton and Mullbauer (1980). Yet another system is the generalised almost ideal demand system (GAIDS) that combines the LES and AIDS, preserving the concept of committed and supernumerary expenditures of the LES while adding flexibility to the estimated elasticities. AIDS and GAIDS systems are more difficult to include in a CGE framework than the LES.

III. New insights

This section discusses how the ‘gender- augmented’ CGE modelling approach improves our understanding of the welfare effects of macroeconomic reforms. It describes selected results from simulations run with the Bangladesh and Zambia models. The experiments simulate changes in trade policies and are analysed in detail in Fontana and Wood (2000) and Fontana (2003, 2004).

a) Effects on standard macroeconomic variables

By excluding the household and leisure sectors, conventional CGE models omit important information about women’s activities and well-being, but also are likely to yield inaccurate results about the impact of policy changes on standard market variables. Not accounting for non-market work leads to an underestimation of the total quantity of goods and services produced by a country and to inaccurate predictions about the supply of labour to the market.

For example, a three fold increase in female intensive manufactured exports in Bangladesh (Fontana and Wood, 2000) shows that women’s participation in market activities increases by nine percent but there is a six percent reduction in their leisure time. It also shows that time spent on household work by women and men falls by three percent. If there were greater rigidity in gender roles, the increase in female labour force participation would be only five percent, while the decline in their leisure time would be greater, nine percent. If a non gendered model were used, the same experiment of increased export-orientation of manufacturing would cause less of a rise in manufacturing employment (and in manufactured exports and output), while employment and output in other market sectors would fall more. The restriction of the supply particularly of female labour would also cause the wage rate of women, relative to that of men, to rise much more. This is because, in a model that does not include social reproduction and leisure, the supply of labour to the market economy would be less flexible. This would be especially so for female labour, because the excluded non-market sectors contain far more women than men. Comparison between the two variants of the experiment (with and without non-market sectors) also highlights that the increase in market output mostly result from reallocation of labour resources from the non market sectors to the market sectors, with the net change in the total quantity of goods and services produced (both market and non-market) being slight.

Table here with data comparing experiment results with and without non-market sectors Table 2.6 in Fontana 2000

b) A broader definition of well-being

More complete national accounts that include some consideration of the amount of leisure time that people enjoy and of the time devoted to those caring activities that contribute to the production of human capabilities provide a better picture of the quality of life.

In the experiments run with the Bangladesh and Zambia models no attempt is made to construct a single index of welfare. The approach is to point to changes in relative wages between female and male workers (as a way of capturing gender inequalities in the labour market), to the female wage bill (taken as a proxy for women's control over their earnings) and, importantly, to the allocation of time between the market and the household. Each of these measures provides insights into both individual and social well-being but does not allow us to come to conclusive results. The effects of certain policy shocks are often ambiguous and emphasise that while there are gains in some dimensions there might be losses in others.

For example, an increase in female earnings from greater participation in the market economy might on balance reduce social welfare if it also resulted in a substantial decline in leisure time for women. Whether women are better off with more cash income and less leisure depends on whether they have chosen this outcome or been forced into it. Similarly whether the decline in social reproduction has a negative impact on the production of human capabilities depends on the extent to which substitutes (for instance paid child care or state subsidised care) exist.

c) A wider range of outcomes

One of the most important advantages of CGE modelling over other methods is its ability to include a wide range of macroeconomic, sectoral and social impacts and to provide economy-wide quantification of these effects. It is important to know whether effects of a specific policy measure are big or small and what are the main causal chains. A finer level of detail in the gender disaggregation of factors, sectors and

households permits a better understanding of how the differential impact of policy changes on female and male workers varies, depending on whether or not the workers concerned have education, live in urban areas or in rural areas, and are or are not head of their households.

For example, the experiment of a decline in garment exports with the 1994 disaggregated Bangladesh model highlights that women with low and medium education are more adversely affected than women of other skill levels, particularly if they live in poor rural households. The experiment of an introduction of incentives in non-traditional agricultural exports in Zambia makes apparent that women are favoured more by expansion of horticulture and groundnuts than by expansion of commercial crops. It also makes visible differences among women, between female workers with primary education, who are employed relatively more intensively in horticulture, and female workers with no education, who work largely as unpaid family labour in commercial crops.

d) Different gender structures

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 important to consider when designing policies. For example, the experiment of a decline in textile exports in Bangladesh highlighted that a less rigid gender division of labour in the market sectors would mitigate the negative impact of a decline in the garment industry on women.

■

▪ **IV- Suggestions for future work**

a) A detailed break down of the non-market sectors

Services included in household work do not have all the same characteristics. Some activities, such as looking after the children, are leisure up to a point and then become work. Parents derive intrinsic satisfaction from much of the care they provide but, after a certain limit, they are willing to buy substitutes for it. Other activities, like for example washing dishes, could be presumed to bring little direct utility to the individuals performing them. Some tasks, such as taking the children to school, must be undertaken at specific times while others, such as food shopping, are more time flexible. Certain household activities are carried out simultaneously-- for example looking after the children while cleaning the house. Most household activities -- to include emotional care as well as doing the laundry or cooking meals-- have both a consumption and investment component: they are critical both to the day-to-day and to the long-run reproduction of the labour force.

Distinguishing among these activities is important from a policy perspective since each of them involves different ways of organising production and input mix requirements which are gender differentiated, and has different repercussions on well-being. Time allocation studies of developed countries show that women usually perform the household tasks which are most energy-intensive and time inflexible, with important implications for their job performance and their health (Bonke *et al.*, 2002). Overlapping of tasks 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 (Bittman and Wajcman, 2004; Floro and Miles, 1999).

Breaking the household sector up into several sub-sectors would thus contribute to a more accurate modelling of the interactions between the household and the market economy. This would include both consumption and production behaviour. On the consumption side, for example, it would be possible to differentiate between low and high substitutability (or complementarities in some cases) of market-produced and home produced goods and services. On the production side, it would be possible to make a distinction among activities that use labour time, capital and intermediate inputs with different intensities (with time-inputs-only activities being just a sub-sector of household services).

A breakdown of the sector ‘leisure’ would also be necessary. In most models to date time spent on leisure is treated as a residual category—what remains after market and household work-- and can thus be a function of lack of employment. This mostly reflects a problem with data since in conventional time use surveys no distinction is usually made between ‘free time’ – which one chooses to spend without working, and ‘idle time’ – which one is forced to spend without working.

Evidently this distinction has important implications for the way in which leisure is valued. Setting the opportunity cost of people’s leisure equal to the wage rate (as in most current studies) assumes no constraints on people’s ability to sell their time in the labour market. In the presence of unemployment or underemployment, each individual’s subjective price for her time would no longer be equal to its market price, leading to different behaviour than with well functioning markets. Knowing how much of leisure time is true leisure and how much is forced idle time (or time spent looking for job opportunities) would help in providing more accurate evaluations. Some of these limitations are starting to be redressed. For example, in a recent model of South Africa (Fofana, Cokburn, Decaluwe, Mabugu and Chitiga, ‘Does Trade Liberalization leave women behind in South Africa? Paper presented at the 4th PEP Research Network Meeting, Sri Lanka, June 2005) the price used to value leisure is calculated by adjusting the market wage by the probability of being unemployed which is estimated separately for men and women as a function of a set of socio-economic characteristics. .

As for overlapping activities, it would not be possible to disentangle the simultaneous undertaking of many activities such as cooking, housekeeping and childcare, but perhaps a way to model an activity as producing joint outputs could be found.

It would also be helpful to account separately for items of public expenditure (health, education, etc.) and to trace by individual, and not by household, who benefits from government provision of public services. These pieces of information combined would permit analysis of how policies might have different implications for consumption levels of different family members, and for overall demand, depending on who in the household has decision-making power.

All these further disaggregations 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 time inputs to market activities increase.

b) The effects of care on the labour force

The household can be viewed as a supplier of intermediate labour inputs to the market economy, as highlighted by Folbre (1994). Most household activities -- to include emotional care as well as doing the laundry or cooking meals-- have a consumption and an investment component: they are critical to the day-to-day as well as the long-run reproduction of the labour force.

The Fontana and Wood approach (as well as other later gender-aware CGE modelling work), for simplicity, treat social reproduction as a final consumption service that enters directly the utility function of household members, and has effects on their current welfare. However, it would be important to also emphasise the investment aspect of care. A mechanism could be modelled to explicitly link the provision of care to the productivity of the labour force over time. A possible way of implementing this could be by adding a dynamic component to the model through a sequence of equilibria. The skill and gender composition of the labour force in each period would be updated as a function of the level of caring activities provided.

These aspects merit further analysis but more data are required. A first attempt at quantifying such effects could draw on recent studies on the impact of maternal care on children's nutritional status and their school attainments (for example some work undertaken by the Food and Consumption division of IFPRI and reviewed in Quisumbing, 2003). Greater inputs of maternal child care time are often shown to improve children's school performance (Stafford for the USA, 1987, other IFPRI work?) and children's health with possibly important consequences for their labour productivity as adults. Time use studies that incorporate information on children's labour by gender would also help in understanding the impact of time re-allocation on dependents when women take up paid market work—for example whether girls and boys are kept out of school to undertake household tasks that their employed mothers no longer have time to complete (Katz, 1995).

c) **Intra-household dynamics**

An important aspect neglected in current models is that of intra-household resource allocation. A growing body of literature (for example Haddad *et al.*, 1997) shows that resources are rarely distributed equally within the household and that preferences are not likely to be the same among family members. It is not realistic to assume that the welfare of each individual in the household changes proportionately to that of the whole. Bargaining household models – in which family members have distinct preferences and personal economic constraints – are likely to be more realistic than the unitary model. Bargaining models have advantages from the point of view of studying gender relations as they accommodate greater diversity in decision-making and introduce the idea of unequal power. However constructing a bargaining model is much more demanding in terms of data.

Extending general equilibrium modelling to include household dynamics could be attempted in three ways:

- 1) by adding a micro-simulation component to the general equilibrium framework that specifies as many individuals as there are in the population. CGE models based on observed rather than representative households do exist but no CGE model to date go further to include information on individual household members. If all assets and expenditure data were disaggregated by individuals 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 (taken as a measure of bargaining power).
- 2) by nesting a fully developed bargaining 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.
- 3) by developing an independent household module outside the main CGE model to be used for post-simulations calculations. This would keep a simpler gendered CGE structure and might be easier to implement, but should be used only when feedback effects are known to be small.

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