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MODELING GENDER EFFECTS OF PAKISTAN'S TRADE LIBERALIZATION

Rizwana Siddiqui

ABSTRACT

This study uses a computable general equilibrium (CGE) model specially constructed for investigating gender dimensions of the effects of trade liberalization in Pakistan in both production and consumption. The model employs various indicators to measure the gendered impacts, including income poverty (Foster-Greer-Thorbecke [FGT] Indices), time poverty (leisure), capability poverty (literacy and infant mortality), and welfare (Equivalent Variation [EV]). The simulation results show that revenue-neutral trade liberalization in Pakistan increased women's employment in unskilled jobs and increased women's real wage income more than men's for all types of labor, but kept the division of labor biased against women. The study finds that Pakistan's trade liberalization adversely affected women in relatively poor households by increasing their workload, deteriorating capabilities, and increasing relative income poverty. However, the effects remained gender neutral or favored women in the richest group of households.

KEYWORDS
Capabilities, gender, poverty, trade liberalization

JEL Codes: C68, J16, O24

INTRODUCTION

Many developing countries have benefited from trade liberalization for two main reasons. First, lower import tariffs in developing countries have reduced the prices of consumer goods as well as the prices of producer inputs. Second, lower tariffs in developed country destination markets have raised the demand for developing country exports. However, some developing countries have gained relatively little or made no gain from trade liberalization (reducing tariff and quota restrictions) because developed countries restrict market access and show preferential treatment to least developed countries, giving these few countries greater access to their markets (Thomas W. Hertel and L. Alan Winters 2005; Rizwana Siddiqui 2008c). For instance, Bangladesh reaps the benefits of this preferential treatment by increasing its trade in textiles, while other developing countries face quota restrictions on their textile exports under the multi-fiber agreement (MFA) that was put in place before 2005.

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Under the structural adjustment program recommended by World Bank, Pakistan has also undertaken extensive trade liberalization during the last three decades. Quotas were replaced with tariffs in the 1980s and the tariff structure rationalized in the 1990s.[1] This benefited Pakistan by accelerating growth, increasing share of industrial goods in both exports and imports with the former mainly driven by an increase in textile exports, reducing income poverty, and improving welfare at the national level, as shown in numerous studies (for example, see Rizwana Siddiqui and Abdur-Razzaque Kemal [2006], Rizwana Siddiqui [2008b, 2009], and Rizwana Siddiqui et al. [2008]). However, these studies do not measure effects by gender. This study fills this gap and measures the impact of trade liberalization by gender.

The major factor that determines gender differences in economic and social roles is the difference in the division of labor. Reproductive tasks are predominantly considered women's responsibilities in the majority of developing countries. In addition, in Pakistan low literacy rates and low health status due to bias in resource allocation make women more vulnerable to the change in policies. The relationship to the means of production is also highly gendered, and women bear a disproportionate responsibility for unpaid household work, whereas men are largely engaged in paid market work (Rizwana Siddiqui 2005). Women are also engaged in market work but generally have low-paying jobs. Within industry, women's labor at all skill levels is concentrated in Pakistan's export-oriented industries. On average, women earn less than men.[2]

Hence, I expect differential effects from liberalization on time allocation for market and nonmarket activities, income, income poverty, welfare, and capability poverty. For instance, the expansion of export-oriented industries could impinge on women's leisure time if a rise in women's employment is not accompanied by a reduction in their unpaid household work. Similarly, if economic reforms increased the prices of goods largely consumed by women and/or reduced real income, there would be an adverse effect on consumption by women compared to men. The study measured this effect through the capability indicator infant mortality rate (IMR), which reveals the most basic dimensions of deprivation, in nutrition intake, education, and health, and can be defined on the basis of gender.

Using Pakistan as a case study, I explore the major research question of whether or not women and men share equally in the effects (positive or negative) of trade liberalization using a computable general equilibrium (CGE) framework, which is widely used for trade policy analysis in both developed and developing countries.[3] A CGE model can capture gender effects if it includes the linkages between market and nonmarket economies – domestic activities and leisure (see Marzia Fontana and Adrian Wood [2000]; World Bank [2001]; Ismail Fofana, John Cockburn, and Bernard Decaluwé [2003]; Naila Kabeer [2003]; Ismail Fofana, John Cockburn, and Bernard Decaluwé [2005]; and Siddiqui [2005]). This study presents a gender-aware CGE model for analyzing revenue-neutral trade liberalization policies in Pakistan.[4] In my review of the literature, I identify previous models that have adopted a similar approach to mine in this study. However, my contribution extends the analysis by incorporating consumption and poverty indicators by gender. I also measure impact at the household welfare level in two ways: using consumption of market goods only and using consumption of both market and nonmarket goods. This study uses three indicators of poverty – capability,[5] income, and time – to measure gender-specific impacts and welfare indicators EV1 and EV2 (Equivalent Variation). I also highlight gender features of the model, discuss simulation results, and draw conclusions about the differential effects of trade liberalization in Pakistan on women and men. The results of this study will also help other developing countries in general and South Asian countries in particular to minimize gender biases.

REVIEW OF LITERATURE

I group studies of gender inequalities into the following categories: (1) Studies that explore the micro–macro linkages using household survey data focused on market economy or subsectors of the economy (Zeba Sathar and Shahnaz Kazi 1997; Rehana Siddiqui et al. 2003; Rehana Siddiqui et al. 2006); (2) Economy-wide CGE models that only introduce gender into the labor market (Channing Arndt and Finn Tarp 2003; Jeevika Weerahewa 2002; Anushree Sinha and N. Sangita 2003; Channing Arndt, Sherman Robinson, and Finn Tarp 2006); (3) Studies that integrate nonmarket activities into the above-mentioned CGE framework (Fontana and Wood 2000; Marzia Fontana 2001, 2002; Fofana, Cockburn, and Decaluwé 2003, 2005; Siddiqui 2005).

Since they exclude the household unpaid economy, studies in the first two categories cannot capture all gender effects. The group of studies in category (C) overcomes this problem. The first such study, Fontana and Wood (2000), focuses on technical issues such as how distinctions are made between household, market, and leisure activities, and how rigidities in social reproduction and market production can be introduced.[6] In a later study, Fontana (2001, 2002) develops detailed gendered CGE models for Bangladesh and Zambia respectively. Subsequently, Fofana, Cockburn, and Decaluwé (2003, 2005) and Siddiqui (2005) develop gender-aware CGE models for Nepal, South Africa, and Pakistan, respectively.[7] All of these studies introduce gender-related rigidities by assuming low elasticities of substitution between the labor of men and women. They show that explicitly modeling leisure and the household economy changes findings regarding the impact of trade liberalization policies such as tariff reduction on women's employment and wages. The increase in women's employment reduces women's leisure time. Fontana and Wood (2000) suggest that greater flexibility in gender roles in the nonmarket sphere reduces the negative impact on women. Similarly, Fofana, Cockburn, and Decaluwé (2003) demonstrate that an increased role for men in household production reduces the adverse impact of trade liberalization on women. This type of counterfactual analysis is very important for building a gender-aware policy framework. All of these studies focus on the production side of the economy and ignore consumption effects.

On the consumption side the increase in prices not only reduces consumption at the household level and changes the structure of demand by shifting toward cheaper goods, it also changes intrahousehold allocation of resources. Various studies show that price changes due to reduction in tariffs reallocate resources within a household,[8] which may affect men and women in different ways (Lawrence Haddad and Ravi Kanbur 1990; Lawrence Haddad, John Hoddinott, and Harold Alderman 1994; Angus Deaton 1997; Martin Browning, Pierri-Andre Chiappori, and Arthur Lewbel 2003; Jeremy Lise and Shannon Seitz 2004). For instance, Deaton (1997) and Howard White and Edoardo Masset (2002) both analyze intrahousehold allocation estimating Engles and Rothbarth models and demand systems using micro household survey data but arrive at different conclusions. Deaton (1997) finds no evidence of discrimination in allocation of resources between boys and girls within households, while White and Masset (2002) find positive discrimination in consumption against female children in rural, male-headed households. Therefore, analysis of intrahousehold allocation of resources would improve our understanding of the mechanisms through which macroeconomic policies such as trade liberalization affect different dimensions of poverty, income poverty, capability poverty, and time poverty, by gender.

Income poverty is measured by Foster-Grear-Thorbecke (FGT) indices, which are gender neutral, but relative income poverty is measured by gender – the change in the share of poor women relative to poor men. The study measures capability poverty through literacy rates and infant mortality rates, which can be defined by gender. These indicators have not been included in the earlier analysis. These indicators are included particularly to measure the impact of bias in intrahousehold allocation of resources. Time poverty is measured by change in leisure time by gender.

TRADE LIBERALIZATION IN PAKISTAN

Since independence, Pakistan has adopted an import substitution strategy to protect its infant industries. In 1980, under the recommendation of the World Bank, a structural adjustment program was implemented to correct imbalances in the economy and improve the level of efficiency to achieve accelerated growth. Pakistan implemented trade liberalization in 1980–1 by reducing non-tariff barriers (quota and licensing) and replaced them with tariffs. In the 1990s, Pakistan adopted a more open and liberal trade policy. During liberalization, bans on imports into the country were removed except those restricting items for religious or health purposes. Import duties were also reduced, as were the number of duty rates. As a result, the effective rate of protection (ERP) in Pakistan was reduced from 42.5 to 27.4 percent during the 1990–2002 period (Rizwana Siddiqui et al. 2008).

Tariff reduction has enormously reduced government revenue. To compensate for this, Pakistan introduced a general sales tax (GST) of 12 percent on both imports and domestic products in 1989–90. In the subsequent years, government broadened the GST basis and adopted a uniform rate of 15 percent, but a large number of commodities and services are still exempted from the sales tax, thus reducing the average sales tax on imports to 5.6 percent and on domestic production to 5 percent (Rizwana Siddiqui et al. 2008). On average, tariff revenue as a percentage of GDP fell from 4.5 percent to 1.7 percent, whereas the share of sales tax revenue went up to compensate for losses in revenue from international trade. We disaggregate consumption by gender to measure the impact on consumption of men and women.

INTRAHOUSEHOLD ALLOCATION OF RESOURCES

The literature documents that the allocation of household resources in South Asia is generally biased against women (White and Masset 2002; Sunny Jose 2003). This inequality is also reflected in the low female literacy rate and child mortality rate. The Pakistan Human Condition Report shows that the female literacy rate was 32.6 percent for 1999, and the female child and maternal mortality rates were 24.3 per 1,000 live births for 1997–2000 and 300–400 per 100,000 live births for 1998 respectively (Centre for Research on Poverty Reduction and Income Distribution [CRPRID] 2002). Therefore, the estimation of the aggregate consumption function may generate biased results and hide the costs (such as the reduction of meals in response to price increases) borne by women (Diane Elson 1995; Kabeer 2003).

The Federal Bureau of Statistics (1993a) conducted the Household Integrated Economic Surveys (HIES) to collect data on consumption expenditure at the household level. This study uses HIES data to test a number of hypotheses for differences between the consumption of women and men in Pakistan. To calculate the share of women's and men's consumption in total household consumption, I define first an equation in Working-Lesser form linking expenditure to household income and demographic characteristics in the following way:

$$W_i = \beta_o + \beta_m M_{ades} + \beta_f F_{ades} + \beta_y Ln(Y_{ades}) + \sum_k \beta_s S \qquad (1)$$

where W= Household consumption share of i^{th} commodity in total expenditure,
Y_{ades} = Household income per adult equivalent,[9]
M_{ades} = Number of adult equivalent males,
F_{ades} = Number of adult equivalent females,
S = is a vector of socioeconomic characteristics such as occupation and education level.

Although it is an oversimplification to assume that all individuals behave in a similar fashion, I have aggregated households by the education and employment status of the head of household. In urban areas, households are categorized on the basis of the education of the head of the household. In rural areas households are first categorized by gender as female- and male-headed households, and then male-headed households are further distinguished by the employment status of the head of the household – employee, employer, self-employed, and "others," which contains miscellaneous households. I estimated the consumption function for each representative household assuming that all households in a group are normally distributed and, on average, behave homogenously. Therefore, I dropped the last term in Equation (1) in the actual estimation. I estimated this equation for each commodity and for each type of household separately using data from the HIES (Federal Bureau of Statistics 1993a). The coefficients β_f and β_m, represent the change in the share of household consumption of good i with an increase in one adult man and one adult woman holding all other things constant.

I tested the following hypotheses:

$$\mathrm{H_O} : \beta_f = \beta_m \text{ against } \mathrm{H_1} = \beta_\mathrm{f} \neq \beta_\mathrm{m}$$

If the null hypothesis is rejected, this means that the share of good i in total expenditure rises by a different amount for an increase of one adult equivalent female as compared to one adult equivalent male. I calculated the share of women's consumption in household expenditure on i^{th} good by normalizing the coefficients by one of the coefficients; for β_f, I got:

$$\beta_\mathrm{f}/\beta_\mathrm{f} = 1 \qquad (2)$$

and

$$\beta_\mathrm{m}/\beta_\mathrm{f} = \mathrm{Z} \qquad (3)$$

If $Z > 1$, then the male consumption share of good i is greater than that of women and vice versa. I broke down a household's total consumption of commodity i (C_i) for women (C_i^F) and men (C_i^M) as:

$$C_i^F = (\frac{1}{1+Z}) * C_i * F_{ades} \tag{4}$$

$$C_i^M = (\frac{Z}{1+Z}) * C_i * M_{ades} \tag{5}$$

The following ratios determine the share of women (a_f) and men (a_m) in household consumption:

$$a_f = \frac{C_i^F}{C_i^F + C_i^M} \text{ and } a_m = \frac{C_i^M}{C_i^F + C_i^M} \text{ where } a_f + a_m = 1$$

Table 1 reports findings based on regression results for basic needs expenditures (food items, clothing, education, and health).[10] The values in the upper part of the table show that the share of consumption of these items is greater in poorer households in Pakistan.[11] The results also show that male consumption of these items is uniformly greater than that of females (except in rural female-headed households), a finding captured in the ratio in the bottom row of Table 1. Finally, the consumption differences by gender tend to be greater among poorer households.

Similar gender differences are shown in capability indicators, such as the literacy rate and the infant mortality rate, which are strongly associated with intrahousehold allocation of resources. For example, the female literacy rate in 1999 in Pakistan is less than two-thirds the male rate (32.6 to 56.5 percent), and the female child mortality rate in the 1997–2000 was 24.3 per 1,000 compared to 15.4 per 1,000 for male child mortality (CRPRID 2002).

TIME ALLOCATION BY GENDER

In organizing the data set to operationalize the CGE, I introduced gender in social accounting matrix (SAM) for the year 1990 by integrating market,[12] household, and leisure activities (for details see Rizwana Siddiqui [2007]). First, I compiled a matrix of time allocation between market, household (social reproduction), and leisure activities for the eight labor types in each of the nine representative households following the standard system of national accounts (SNA). The SNA considers activities as either productive (market) or non-productive (social reproduction and leisure). I deducted ten hours (minimum time used for self-care) from twenty-four hours to calculate fourteen hours available for market work, household

Table 1 Consumption by gender for basic needs goods

	Urban households by education of the head of household				*Rural households*				
						Male-headed households by employment status			
Goods	*Illiterate*	*Low education*	*Medium education*	*High education*	*Female-headed households*	*Employee*	*Self-employed*	*Others*	*Employer*
Percentage share of expenditure on basic needs goods in total household expenditure									
Men	34.0	34.3	32.2	28.2	24.0	36.7	39.6	38.2	34.2
Women	25.0	23.1	25.3	23.8	41.1	29.7	28.1	24.8	28.7
Total	59.0	57.4	57.5	52.0	65.1	66.4	67.7	63.0	62.9
Ratio of per adult equivalent expenditure									
Women/men	0.84	0.82	0.90	0.93	1.49	0.89	0.76	0.81	0.92

Notes: Low education = less than five years of education; medium education = five to nine years of education; high education = more than nine years of education.

work, and leisure.[13] I assumed these activities are separable.[14] Therefore, I calculated leisure by subtracting working hours (market and household) from fourteen hours. I valued the nonmarket activities at the weighted average wage of the labor used in these activities.

The results for Pakistan in Table 2 show that men allocate approximately half of their time to market work, and about 40 percent to leisure, usually spending 10 percent or less on domestic activities. Women spend less time on market activities, but market work still takes up about one-third of their total time, with a larger share going to domestic activities, leaving less than 20 percent of their time for leisure, that is, less than half that taken by men. The results at the disaggregated level show that, irrespective of the type of household and skill level, all women have more working hours than men.[15]

GENDER FEATURES OF THE CGE MODEL FOR PAKISTAN

The CGE model combines market, household, and leisure activities, and is a disaggregated version of that presented in Siddiqui (2005). In addition, it incorporates consumption and poverty indicators by gender.

The model is neoclassical in nature, assuming: (1) people with rational preferences; (2) full employment of factors of production; and (3) optimizing behavior: households maximize utility and firms maximize profit.[16] From a gender point of view, the limitation of the neoclassical model is that it does not allow for differences among the preferences of household members. While assuming rational utility-maximizing behavior, this study takes into account differences in consumption by men and women in Pakistan. Men and women derive maximum utility subject to the resources they receive, which depend upon total household income, total available time, and distribution factors.

Table 2 Time allocation of households between market and non-market activities (percentages)

	Women		*Men*	
	Minimum	*Maximum*	*Minimum*	*Maximum*
Urban				
Market	26.5	40.0	50.6	57.4
Social reproduction	34.1	45.3	2.9	10.7
Leisure	10.0	20.0	40.0	Above 40
Rural				
Market	34.1	45.3	47.5	53.3
Social reproduction	35.9	47.3	1.6	16.8
Leisure	10.0	20.0	40.0	About 40

Notes: Minimum–maximum is the range of time allocation of representative households among market, social reproduction, and leisure, so it does not total 100.

The model employs six blocks of equations: income and savings, production, demand, prices, trade, and equilibrium. Gender rigidities appear by assuming a low elasticity of substitution (0.3) between the labor of men and women. Nonmarket sectors (social reproduction and leisure) behave like market sectors and produce goods that are consumed by the households themselves. Social reproduction and leisure are joint products of all types of labor of both women and men in each representative household. I defined their production using a Constant Elasticity of Substitution (CES) technology. I derived the demand for labor in market and nonmarket sectors from the first order condition. The price of nonmarket goods (Ph) is the weighted average of the wages of the labor used in production.

I defined total income of a household (Y_T) as the sum of receipts from the market economy and the nonmarket economy. Maximizing a Stone-Geary utility function of market goods (C_i), home produced goods (C_H), and leisure (C_L) subject to total income and time constraints, I derived household demand for goods and services.

Model closure and calibration

The total supply of each type of labor is fixed, and the wage rate is adjusted to maintain labor market equilibrium for each type of labor. Capital stock is sector specific (that is, capital cannot move from one sector to the other) so returns to capital (profit) adjust in each sector to equalize supply and demand for capital at the sectoral level.[17]

The three blocks, savings-investment, government, and the rest of the world, are associated with the macro constraints of the model. Savings from domestic institutions and the rest of the world finance total investment. Household savings adjust to equilibrate investment and savings. The nominal exchange rate acts as the numeraire and the real exchange rate varies in order to keep the current account balance (CAB) fixed.[18] An increase in imports leads to a depreciation of the real exchange rate, which stimulates exports. This closure eliminates the possibility that external resources would finance domestic policies.

Given that Pakistan has a small open economy, world export prices and world import prices are exogenous. Loss in tariff revenue is compensated for by domestic tax, which adjusts uniformly on all commodities. Government consumption and investment are fixed in real terms, so an increase of household consumption is not at the expense of domestic investment or government consumption. The price indices for government consumption and investment adjust in response to a policy shock. The model is homogeneous of degree zero in volumes and degree one in prices. An exogenous increase in prices increases all nominal variables by the same percentage but does not increase the volumes.

First, I constructed the benchmark equilibrium data set in the SAM-framework to operationalize CGE. Then I specified the model's parameters – such as share and shift parameters in production, utility functions, constant elasticity of transformation (CET) function for the shift between export and domestic demand, and Armington functions for the substitution between imports and domestic goods (CES) – through the calibration procedure using SAM data to make the model operational. I also calculated tariff rates, tax rates, and savings from the SAM data. Elasticities are exogenous in the model. For the consumption function, I estimated household-specific income elasticities for each commodity based on the unitary household demand function using micro data from the HIES (Federal Bureau of Statistics 1993a). For the intrahousehold allocation of resources, I borrowed income elasticities from the unitary household demand function. This study sets income elasticities higher for women than for men by 2 percentage points, because as feminist economists emphasize, in the presence of discrimination female consumption is more vulnerable to changes in income and prices than male consumption (Elson 1995; Kabeer 2003). I took elasticities for the production function from Siddiqui and Kemal (2006). Elasticities that were not available from empirical studies are set at reasonable values consistent with those used in other CGE studies.

Calibration assumes that equilibrium exists in the economy under consideration in the presence of existing policies. Therefore, the procedure used in general equilibrium analysis is first to use the observed equilibrium to solve the model for parameter values such that the model reproduces the original equilibrium. I used the General Algebraic Modeling System (GAMS) software package to make these computations and solve and simulate the model to find new prices. These prices bring equilibrium in the market after the shock.

Poverty and welfare analysis

Macro policies affect poverty incidence that may differ by gender (Marzia Fontana and Yana van der Meulen Rodgers 2005). This study uses three indicators of poverty: capability,[19] income, and time to measure gender-specific impacts and welfare indicators EV1 and EV2 (Equivalent Variation). It measures impact at the household level using consumption of market goods only, and using consumption of market and nonmarket goods respectively.

Capability poverty

Infant mortality and literacy rates are the most appropriate capability indicators for a gender impact analysis because they measure composite effects of the satisfaction of basic needs (Kabeer 2003). The IMR captures satisfaction of several basic needs: nutrition intake, health services, shelter and safe drinking water, and sanitation facilities (Rizwana Siddiqui 2008a). The literacy rate (LR) measures the basic need for education, which enhances capabilities and choices. Both IMR and LR depend on per capita household expenditure (CH_{pc}) and per capita government expenditure on education and health (CG_{HEPC}). Using elasticities based on cross-district data (Siddiqui 2008a), I estimated the following indicators:

$$IMR = IMR_{\min} + \frac{(IMR_{base} - IMR_{\min})}{1 + A * CH^{\beta} * CG^{\gamma}} \tag{6}$$

$$LR = LR_{\max} - \frac{(LR_{\max} - LR_{base})}{1 + A * CH^{\beta} * CG^{\gamma}} \tag{7}$$

where β and γ are the elasticities with respect to per capita household expenditure (CH) and public expenditure on education and health (CG) respectively. IMR_{min} is the minimum value of IMR achieved worldwide.[20] LR_{max} is 100 – the maximum that can be achieved. I projected the base year values for IMR for each representative household using district-level estimates from Muhammad Arshad Mahmood (2003) and per capita household income. I calculated the literacy rate using HIES data (Federal Bureau of Statistics 1993a). With the logistic relationships between dependent and independent variables in equations (6) and (7), the gap between desired and actual levels of indicators decreases with increases in inputs.

Income poverty

Foster-Greer-Thorbecke (FGT) poverty indices (headcount ratio, poverty gap, and severity) have been calculated to measure the impact of trade liberalization on the poverty level prevailing in a country (James Foster, Joel Greer, and Erik Thorbecke 1984). The change in the gender composition of the poor population after the policy shock reveals the gender dimensions of income poverty.

I calculated the poverty level in the base year using a basic needs poverty line (V) based on an adult equivalent scale as follows:

$$\mathrm{V} = \Sigma C_{i0} * P^{i}_{c0} \tag{8}$$

where C_{io} is quantity of good i necessary to satisfy basic needs, and P^{i}_{c0} is the consumer price index (CPI) for the i^{th} good in the base period. I recalculated the poverty line after the shock with new consumer prices

$(C_{i0} {*} P_{c1}{}^{i})$. I used the following formula to calculate FGT indices (Foster, Greer, and Thorbecke 1984):

$$p_{\alpha} = \frac{1}{n} \sum_{j=1}^{j} [(V - Y_j)/Y]^{\alpha} \tag{9}$$

where n is the total number of households, Y_j is household income for those below the poverty line, α is a parameter that takes values of 0, 1, and 2 to distinguish different measures of poverty, namely headcount ratio, poverty gap, and severity. Using the vector of simulated incomes and the new poverty line, I calculated FGT indices,[21] using the Distributive Analyses/Analyse Distributive (DAD) program before and after the shock (for more on the DAD program see Duclos, Araar, and Fortin [2001]). I obtained the relative income poverty among women and men by calculating the population by gender in poor households before and after the shock.

Time poverty

I measured time poverty in relative terms. The change in leisure time relative to base year value and the change in leisure of women compared to men determined the change in time poverty.

Finally, EV measured welfare using base year and post-simulation prices and consumption of goods. First, welfare was measured on the consumption of market goods only. Second, it included both the consumption of market and nonmarket goods.

SIMULATION RESULTS

Tariff reduction on imports and sales tax adjustment

In the 1990s, industry and agriculture in Pakistan were protected with average tariffs of 25.7 and 6.9 percent respectively. However, these averages reflected substantial variation within the sectors. In agriculture, fisheries and horticulture were heavily protected with 60 and 67 percent tariff respectively, compared to the crop sector with a low tariff of just 5 percent. Industrial commodities were protected with an average tariff of 25.7 percent, but the service sector was not protected at all. Therefore, trade liberalization would affect these sectors differently and have a gender-differentiated impact. The simulation is based on the actual average tariff cuts of 50 percent, which are compensated by an endogenous adjustment in average domestic taxes of 3 percent (ranging between 0 and 20 percent in the base period) so there is no loss in government revenue.

Macro effects[22]

The immediate effect of reduction in tariffs is a drop in import prices and a rise in imports of 2.9 percent (Table 3). The depreciation in the real exchange rate brings about an increase in exports of 3.9 percent, the so-called export-push effect of trade liberalization (John Cockburn, Bernard Decaluwé, and Veronique Robichaud 2008). These effects are mainly driven by changes in two industrial sectors: textiles and machinery. The former is an export-oriented sector with an export intensity of 42 percent, and the latter is an import competing sector with an import penetration ratio of 61 percent. In these two sectors, imports rose by 4.7 and 3.5 percent and exports by 4.6 and 6 percent respectively (Table 3).

Agriculture, which has a lower degree of import penetration (M/Q) at 3.5 percent and a small export share (E/XS) at 1.1 percent, is less affected (Table 3). The increase in domestic taxes on services raises their import price, thus negatively affecting imports of services (Table 3).

The decline in import prices exerts a downward pressure on domestic prices, most notably in industry. Hence, output falls noticeably in the import competing sector producing machinery. The depreciation of the real exchange rate makes export-oriented sectors more competitive, with an increase in the production of textile commodities of 2.6 percent (more than domestic sales), and an increase in textile exports of 4.6 percent.

Factor market effects

The price changes bring about a sectoral reallocation of resources, with employment changes following the same pattern as output described above. The increase in employment is greatest in the textile sector, over 5 percent. The increase in female employment in the textile sector outweighs the negative impact on demand for female labor in other industrial sectors. Hence, women's industrial employment rises by 2.2 percent, compared to a fall in men's industrial employment by 1.2 percent (Table 4).

Employment in the less import-intensive agriculture and service sectors declines more for women than men (Table 4). As a result, revenue-neutral trade liberalization reduces women's employment by 0.7 percent overall, and men's employment by 0.4 percent, corresponding to a decline in labor demand in the market economy of 0.5 percent at the national level.

The effects of trade liberalization on time allocation to nonmarket activities also vary, not only by gender but also by type of household, rich or poor. This confirms the findings of Jongsoog Kim and Lydia Zepeda (2004) that the intrahousehold time allocation on US farms is gender specific and the father's economic status has the largest impact on the time allocation of household members. Urban households with no education and all

Table 3 Revenue-neutral trade liberalization and variation in macro variables and domestic prices (percentages)

						Trade liberalization							
Sectors	*Tariff base value*	*Tax base value*	*Tariff cut*	*Imports/ domestic absorption of composite good*	*Exports/ domestic supply or output*	*Consumer price*	*Import price*	*Domestic absorption of composite good*	*Demand for domestically produced goods*	*Imports*	*Exports*	*Value added*	*Returns to capital*
Agriculture	6.9	0.4	0.5	3.5	1.1	-1.3	-2.5	-0.2	-0.3	1.5	3.5	-0.2	-3.1
Industry	25.7	5.8	0.5	26.8	15.2	-4.0	-8.5	0.03	-1.2	3.4	4.34	-0.2	-5.6
Textile	25.4	0.4	0.3	3.8	42.0	-2.2	-5.4	1.2	1.0	4.7	4.6	2.6	-0.4
Machinery	28.7	0.8	0.5	61.5	3.5	-8.0	-9.5	1.2	-2.4	3.5	6.0	-2.1	-8.2
Services	0.0	1.7	0.0	4.9	6.1	-1.8	0.7	-0.4	-0.08	-3.0	2.2	-0.2	-2.7
Total	22.4	3.0(1.3)[a]	0.5	14.0	9.1	-2.1	-0.01	-0.2	-0.50	2.9	3.9	-0.2	-3.4

Notes: [a]Uniform Adjustment in Tax Rate.

Table 4 Trade liberalization and employment by gender (percentage change over base values)

	Female labor					*Male labor*					
Market sectors	*No education*	*Low education*	*Medium education*	*High education*	*Total*	*No education*	*Low education*	*Medium education*	*High education*	*Total*	*Total labor demand*
Agriculture	0.2	-1.9	-2.5	0.0	-1.1	0.9	-2.4	-0.7	-4.6	-0.1	-0.4
Industry	6.2	4.6	1.7	-0.7	2.2	1.0	-1.9	-0.4	-5.6	-1.2	-0.4
Textile	7.0	4.7	4.2	1.8	4.3	7.9	4.5	6.4	2.4	6.1	5.3
Services	-4.0	-1.0	-1.7	-3.5	-2.7	3.9	0.9	1.5	-1.5	-0.3	-0.5
Total	0.8	-1.0	-1.6	-2.3	-0.7	-1.2	-4.2	-2.6	-6.2	-0.4	-0.5
Real wage rate	-2.1	1.5	2.9	6.6		-3.2	1.8	-0.2	5.8		0.7
Nominal wage rate	-4.9	-1.4	-0.1	3.5	-1.6	-6.0	-1.1	-3.1	2.7	-1.6	-1.6

Notes: No education = no formal education; low education = less than five years of education; medium education = five to nine years of education; high education = more than nine years of education.

households in rural areas, except female-headed households, have reduced labor input in both social reproduction and leisure (Table 5). Leisure decreases for urban households with no education and for all rural households, except female-headed households and employer households.

These households are relatively poor (see Table 8 for poverty incidence in the base year) and generally rely on their own unskilled labor (indicated by the category ''no education'').[23] The demand for unskilled women's labor increases in all market sectors by 0.8 percent (Table 4). Skilled labor (including those with low, medium, and high education), which is concentrated in relatively rich urban households, faces a decline in demand in the market sectors and an increase in non-traded nonmarket activities, social reproduction, and leisure. In addition, female-headed households (that receive a larger share of their income from remittances) also face an increased labor demand in nonmarket activities. Irrespective of type of household, female leisure changes less favorably – it declines more or increases less – than male leisure (Table 5). The overall results show that in urban areas social reproduction and leisure increase by 0.5 and 1.8 percent, respectively; in rural areas, they decline by 0.4 and 1.4 percent, respectively.

Capital cannot move from one sector to the other; therefore, change in demand for capital results in change in returns to capital (Table 3). Tariff reduction has less impact on agriculture and services sectors. Hence, returns to capital in agriculture and services decline less (-3.1 and -2.7 percent, respectively) than returns to industrial capital (-5.6 percent). The returns to industrial capital decline the most in the metallic industry (-16.3 percent), which is the most protected sector with a 43.8 percent tariff and very high import penetration ratio of 52.2 percent. On average, returns to capital decline more than wages (-3.4 versus -1.6 percent respectively), implying that trade liberalization hits the capital owners the hardest. However, on the labor side, trade liberalization hit unskilled labor harder, as the wage rates of unskilled labor declined more than skilled labor. The net change in households' income depends on their ownership and income shares from different sources (labor, capital, remittances, and transfers from government and firms) in the base period.

Household income effects

The exogenous shock of trade liberalization reduces the nominal income of all representative households over the base year values (Table 6). Table 6 shows that the poorest households (categorized as ''no education'' and ''employee'') are hardest hit, as their income declines by 3.4 percent in both areas. The nominal wage rate for unskilled labor falls by 4.9 percent for women and by 6 percent for men (Table 4), which is greater than the change in the wage rate for skilled labor as well as that in the return to

Table 5 Trade liberalization and labor in non-market activities (percentage change over base value)

	Female labor				*Male labor*					
Households	*No education*	*Low education*	*Medium education*	*High education*	*No education*	*Low education*	*Medium education*	*High education*	*Total*	*Ph*[a]
Social reproduction										
Urban households by education of the head of the household									0.5	
No education	-1.0	-2.2	-2.1	-3.5	-0.6	-2.3	-1.2	-3.3	-1.5	-2.5
Low education	5.2	3.8	4.0	2.3	5.5	3.7	5.0	2.6	4.0	-1.4
Medium education	1.5	0.2	0.2	-1.1	1.9	0.1	1.1	-0.9	0.3	-1.5
High education	5.2	3.8	4.0	2.4	5.6	3.7	5.0	2.6	3.0	-0.5
Rural households									-0.4	
Female-headed	3.6	2.2	2.3	0.9	4.0	2.1	3.3	1.1	2.8	-2.2
Male-headed households by employment status										
Employee	-0.9	-2.1	-2.4	-3.5	-0.6	-2.2	-1.5	-3.3	-1.6	-2.6
Self-employed	-0.6	-1.9	-1.8	-3.2	-0.3	-2.0	-0.9	-3.0	-1.1	-2.7
Others	-0.2	-1.6	-1.4	-2.8	0.1	-1.7	-0.5	-2.6	-1.2	-1.9
Employer	1.6	0.2	-0.2	-1.0	2.0	0.0	0.7	-0.8	-0.8	0.02
Total									-0.02	
Leisure										
Urban households by education of the head of the household									1.8	
No education	-0.6	-1.7	-2.0	-3.1	-0.3	-1.7	-1.0	-2.9	-0.8	-3.2
Low education	7.6	6.3	6.2	4.7	7.9	6.2	7.2	5.0	6.4	-1.8
Medium education	2.7	1.5	1.0	0.1	3.1	1.4	2.0	0.3	1.6	-2.2
High education	6.2	5.0	5.0	3.5	6.6	4.9	5.9	3.7	3.9	-0.5

(*continued*)

Table 5 (*Continued*)

	Female labor				*Male labor*					
Households	*No education*	*Low education*	*Medium education*	*High education*	*No education*	*Low education*	*Medium education*	*High education*	*Total*	*Ph*[a]
Rural households									-1.4	
Female-headed	5.4	4.0	4.0	2.6	5.8	3.9	5.0	2.9	4.8	-2.5
Male-headed households by employment status										
Employee	-1.2	-2.3	-2.9	-3.7	-0.9	-2.4	-2.0	-3.5	-1.8	-2.9
Self-employed	-0.9	-2.1	-2.4	-3.5	-0.6	-2.2	-1.5	-3.3	-1.4	-2.9
Others	-0.5	-1.6	-2.0	-3.0	-0.2	-1.7	-1.1	-2.8	-1.5	-2.2
Employer	3.0	1.8	1.1	0.5	3.3	1.7	2.0	0.7	1.2	-1.2
Total									0.16	

Notes: No education = no formal education; low education = less than five years of education; medium education = five to nine years of education; high education = more than nine years of education. [a]Ph is the price of social reproduction and leisure.

Table 6 Income effects of trade liberalization (percentage variation over base values)

	Urban households				*Rural households*				
	Education of head of the households					*Male-headed households by employment status*			
	No education	*Low education*	*Medium education*	*High education*	*Female-headed*	*Employee*	*Self-employed*	*Others*	*Employer*
Income	-3.4	-2.7	-2.8	-1.8	-1.9	-3.4	-3.3	-2.6	-3.2
Female wage income (real)	1.3	2.6	3.0	4.1	1.5	0.8	0.9	2.0	5.2
Male wage income (real)	-1.2	0.9	0.5	4.1	0.0	-0.3	-0.5	0.7	1.8

Notes: No education = no formal education; low education = less than five years of education; medium education = five to nine years of education; high education = more than nine years of education.

capital. Female-headed households receive 37 percent of their income from remittances. The value of remittance income rises in terms of domestic currency. So female-headed households are among the least affected with a drop in income of 1.9 percent.

Since prices decline more than nominal wages, real wages increase. Overall, the results suggest that trade liberalization favors women by increasing their real wage income for all skill levels in both urban and rural households (Table 6), which is likely to increase the bargaining power of women in their households. However, this conclusion needs to be further explored in a separate study.

Households with high education observe the largest wage income increase, which is equal for men and women in urban areas and greater for women than men in rural areas (Table 6).

Consumption by gender effects

On the consumption side, rural households consume more agricultural goods, whereas urban households consume relatively more services. Therefore, changes in the consumer price index differ by household type depending on the household's consumption pattern. The change in net income (total income minus savings) and relative consumer prices determines the change in consumption of men and women due to trade liberalization.

Total consumption of relatively better off households increases and consumption of poor households decreases (Table 7).[24] Women's consumption has higher income elasticity and so is more sensitive to changes in income. These consumption effects also depend on initial consumption shares and price and income elasticities. The size of the consumption effect varies by household type and commodity. In general, the consumption of women is more strongly affected by the policy shock, but this is not the case in rich households (Table 7).

In urban households categorized as having high education, expenditure on women's education and health after trade liberalization increases more than that on men: 5.4 and 4.9 percent respectively (Table 7). This confirms that prosperity reduces the gender gap in capability development. However, bias may exist in these households in other forms that are not included in this paper.[25]

Poverty and welfare effects

Table 8 shows that poverty increases in the households grouped as no education, employee, other, and self-employed, and poverty decreases in urban and rural area households with educated heads (low, medium, and high education) and those with an employer. Poverty also declines in female-headed households that receive a dominant share of their income

Table 7 Trade liberalization and demand for basic-needs goods by gender at constant prices (percentage variation over base values)

	Urban households				*Rural households*				
	Education of the head of household					*Male-headed households classified by employment status*			
Goods	*No education*	*Low education*	*Medium education*	*High education*	*Female-headed households*	*Employee*	*Self-employed*	*Others*	*Employer*
Crop									
Women	-1.7	3.0	0.6	2.6	1.2	-1.1	-1.6	-0.9	1.1
Men	-1.6	3.1	0.5	2.7	1.0	-1.2	-1.6	-0.9	0.9
Livestock									
Women	-2.0	2.3	0.2	3.4	1.7	-1.7	-1.7	-0.9	1.1
Men	-2.1	2.3	0.1	3.5	1.7	-1.8	-1.8	-1.0	0.9
Fish									
Women	-1.4	3.3	0.5	4.4	2.8	-2.2	-1.3	-0.7	1.1
Mmen	-1.4	3.3	0.5	4.1	2.8	-2.2	-1.1	-0.8	1.2
Food manufacturing									
Women	-1.3	1.5	0.3	3.0	1.1	-1.3	-1.7	-0.9	1.3
Mmen	-1.3	1.5	0.3	2.9	1.1	-1.3	-1.8	-0.9	1.4

(*continued*)

Table 7 (*Continued*)

	Urban households				*Rural households*				
	Education of the head of household					*Male-headed households classified by employment status*			
Goods	*No education*	*Low education*	*Medium education*	*High education*	*Female-headed households*	*Employee*	*Self-employed*	*Others*	*Employer*
Textile									
Women	-1.9	4.3	0.7	4.2	3.4	-2.2	-1.1	-0.4	1.9
Men	-2.2	4.4	0.7	4.2	3.3	-2.3	-1.2	-0.4	2.0
Social sector									
Women	-2.9	3.9	0.5	5.4	2.5	-3.0	-1.8	-0.9	0.9
Men	-2.7	3.6	0.4	4.9	2.6	-3.0	-2.0	-1.0	0.9
Household consumption									
Total	-1.7	3.5	0.8	4.1	1.6	-1.6	-1.5	-0.7	1.7
Consumer price index (CPI)	-1.6	-1.6	-1.7	-1.6	-1.7	-1.7	-1.7	-1.8	-1.7

Notes: No education = no formal education; low education = less than five years of education; medium education = five to nine years of education; high education = more than nine years of education.

Table 8 Trade liberalization, poverty, and welfare (percentage variation over base values)

		FGT indices			*Share in poor population (relative poverty)*		*Welfare*	
		Head count	*Poverty gap*	*Severity*	*Men*	*Women*	*(EV1)*[a]	*(EV2)*[b]
Urban households	*Head count base year*							
No education	39.8	3.7	5.6	6.9	-0.1	0.1	0	-0.03
Low education	35.0	-11.8	-11.1	-12.5	-1	1	0.03	-0.03
Medium education	35.0	-1.4	-1.2	-3.6	0.03	-0.03	0.01	-0.02
High education	13.3	-14	-13.8	-13.3	0	0	0.03	0
Urban total	32.2	-3.6	-2.6	-2.5	-0.08	0.08	0.01	-0.04
Rural households								
Female-headed households	26.5	-3.3	-5.6	-5.9	0.08	-0.08	0.02	-0.05
Male-headed households								
Employee	35.9	3	6.2	7.7	0	0	-0.01	-0.02
Self-employed	26.7	2.8	5.2	5.6	-0.03	0.03	-0.01	-0.04
Others	19.7	1.7	2.2	7.1	-0.07	0.07	-0.01	-0.03
Employer	15.3	-3.5	-5.4	-8.3	0	0	0	0
Rural total	29.3	2.3	4.6	5.7	0.02	-0.02	-0.004	-0.04
Pakistan	30.6	-0.3	1.3	2	-0.03	0.03	0.004	-0.037

Notes: No education = no formal education; low education = less than five years of education; medium education = five to nine years of education; high education = more than nine years of education.

Base year urban poverty line is Rs318 per capita per month, and rural poverty line is Rs264 per capita per month. EV = Equivalent Variation.

[a] Indicates that the figure is based on the consumption of market goods only.

[b] Indicates that the figure is based on the consumption of all goods: market goods, household goods, and leisure goods.

from remittances, which increases in rupee terms with the depreciation of the real exchange rate. Poverty decreases at the national level by -0.3 percent despite an increase in poverty in rural areas. The other two measures, poverty gap and severity indices, show an increase in poverty in Pakistan (Table 8).

Even though trade liberalization reduces income poverty, relative poverty (the share of women relative to men in the poor population) increases among women by 0.03 percent at the national level due to an increase in the share of women in the poor population in households representing the categories no education, low education, self-employed, and others (see Table 8). In all other households, women's shares decline (medium education and female-headed households) or remain constant (high education and employer). Women's share in the poorest rural households group also remains constant, where absolute poverty increases the most in rural households.

Leisure time for men increases more or decreases less than for women in all urban and rural households except in high education households, where the reverse pattern is found (Table 9). As a result, absolute as well as relative time poverty increases among women, meaning women's leisure time decreases by 0.09 percent and men's leisure time increases by 0.2 percent.

Trade liberalization does not reduce the welfare of urban households. In rural areas, only female-headed households are better off. Welfare based on consumption of market goods improves at the national level (EV1 in Table 8). However, when consumption of nonmarket goods is taken into account, the country is worse off, with welfare loss for all households except rich households (high education and employer households) (EV2 in Table 8).

Similar to income poverty effects, capability poverty increases in households classified as no education, employee, self-employed, and others, and decreases among better-off households (low, medium, and high education, and employer and female-headed households) – see Table 9. The effect on the IMR of boys and girls is the same quantitatively except in households with high education, where IMR declines more for females than males. However, the female literacy rate increases/decreases more than the male rate. This exercise again shows that the impact of trade liberalization (negative or positive) is largely absorbed by women in relatively poor households (Table 9). At the national level, the negative effect dominates; IMR and LR deteriorate for both men and women.

All indicators of poverty and welfare suggest that trade liberalization hurts the poorest households and remains gender neutral in the richest households. Thus, education, income growth, and poverty-targeted policies can be the most appropriate tools to counter the negative impact of trade liberalization.

Table 9 Trade liberalization, capability indicators, and time poverty (percentage variation in base values)

	Infant mortality rate			*Literacy rate*			*Time poverty*	
	Total	*Female*	*Male*	*Total*	*Female*	*Male*	*Men*	*Women*
Urban households								
No education	0.08	0.07	0.07	-0.8	-0.92	-0.6	-0.7	-1.3
Low education	-0.2	-0.2	-0.2	0.46	0.95	0.24	6.4	6.3
Medium education	-0.06	-0.06	-0.06	0.09	0.17	0.04	1.7	1.2
High education	-0.24	-0.24	-0.23	0.05	0.08	0.02	3.8	4.3
Urban total	-0.06	-0.05	-0.08	-0.29	-0.33	-0.20	1.87	1.74
Rural households								
Female-headed households	-0.1	-0.11	-0.11	0.75	1.57	0.49	4.8	4.8
Male-headed households								
Employee	0.08	0.07	0.07	-1.59	-3.33	-0.92	-1.7	-1.9
Self-employed	0.07	0.07	0.07	-0.57	-1.12	-0.3	-1.3	-1.5
Others	0.03	0.02	0.02	-0.11	-0.1	-0.04	-1.4	-1.5
Employer	-0.11	-0.1	-0.1	0.29	0.59	0.15	1.7	0.6
Rural total	0.06	0.05	0.04	-0.81	-1.69	-0.37	-1.49	-1.68
Pakistan	0.004	0.01	0.03	-0.58	-1.11	-0.29	0.20	-0.09

Notes: No education = no formal education; low education = less than five years of education; medium education = five to nine years of education; high education = more than nine years of education.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

This study uses a CGE model specially constructed for investigating gender dimensions of the impact of trade liberalization in Pakistan. The model distinguishes not only women's from men's labor in four skill categories but also women's from men's consumption. Therefore, it examines the difference in the burden of trade liberalization for men and women from production and consumption aspects. It measures the impact by employing three indicators of poverty (capability poverty, income poverty, and time poverty), and it estimates welfare on the consumption of both market and nonmarket goods.

Revenue-neutral trade liberalization promises to increase the participation of unskilled female labor, but division of labor remains biased against them. The results indicate that the gender bias in the labor market participation of workers and in wage income decreases under revenue-neutral trade liberalization. With a greater increase in female wage income than male wage income for all categories, female income share in household income increases, which is likely to increase the bargaining power of women in their households – although this is not modeled explicitly in this study.

The results also show that the effects of trade liberalization on women and men differ in the richest and the poorest households. It adversely affects women in the poorest households by increasing their workload, reducing capabilities, and increasing relative income poverty. However, the effects remain gender neutral or favor women in the richest households, that is, households distinguished by high education and employer households.

The income poverty effects differ by area – rural or urban – and by type of household within the area. Trade liberalization reduces poverty in urban areas and increases it in rural areas. It benefits relatively rich households in urban areas (households grouped by low, medium, and high education). However, in rural areas poverty decreases in female-headed households (these receive a larger share of their income from remittances) and employer households (the richest households in rural areas); poverty increases in all other households. At the national level, trade liberalization reduces (absolute) income poverty. Despite decline in absolute poverty, relative income poverty among women increases. This indicates the need for disaggregated analysis to unveil the effects on the rich and the poor in rural and urban areas and by gender as well.

Trade liberalization improves welfare at the national level when measured with the consumption of market goods, but deteriorates when household work and leisure (nonmarket goods) are included in the analysis. The results confirm earlier policy recommendations for Pakistan and other developing countries that suggest the government should target poverty reduction, promote education, and make transfer payments or reduce taxes on basic needs to counter or even avoid the adverse impact of trade liberalization on poor households (see Siddiqui [2008a, 2008b, 2009]).

This work can be extended by incorporating the following: activities undertaken simultaneously by an individual; capital goods in home production; explicit modeling of the role of women not employed in market work; a linking of women's bargaining power with their earned income; and the feedback effect of capability development.

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NOTES

[1] Rationalization of the tariff structure involves the simplification of the tariff structure, which includes reducing tariffs and reducing the number of duty rates (these were reduced to four in the 1990s). However, on some items such as petroleum, tariffs have increased.

[2] Women earned 43 percent less than men in 1993–4. A 55 percent wage differential between men and women is due to discrimination in the labor market (Rehana Siddiqui and Rizwana Siddiqui 1998).

[3] For details, see Erik Thorbecke (1992); Bernard Decaluwé, Jean-Yves Christophe Dusmond, Luc Savard (1999); and Siddiqui et al. (2008).

[4] In 1989–90, the GOP introduced a general sales tax (GST) on both imports and domestic products to compensate for the loss in tariff revenue due to tariff reduction imports. Reduction in tariffs on imports along with tax rate adjustment on imported and domestic goods is called revenue-neutral trade liberalization.

[5] The satisfaction of basic needs reflects (in aggregates) individual capabilities such as a long and healthy life, acquisition of knowledge, and having enough resources to buy food and other necessities. Empirical studies measure individuals' capabilities by various indicators such as IMR, life expectancy (LE), and literacy rate (LR) (Ravi Kanbur 1987; Siddiqui 2008b; Sudhir Anand and Martin Ravallion 1993). Infant mortality rate (IMR) is the best indicator to measure aggregates of capabilities and welfare, among other outcomes, because it measures the availability of several basic needs. It is an outcome variable of inputs such as health, nutrition, clean water, and sanitation facilities. The second capability development indicator is the literacy rate (LR). It indicates accumulation of knowledge. An increase/decrease in IMR implies an increase/decrease in capability poverty.

[6] ''Social Reproduction'' describes household activities as classified by the system of national accounts such as cooking, cleaning, and looking after children and the elderly. However, my study includes fetching water as a household rather than market activity, and I use ''household work'' and ''social reproduction'' interchangeably.

[7] The major difference between the Fontana and Fofana approaches is in the modeling of leisure time. Fontana and Wood (2000) assume men and women's leisure can be substituted for each other. In this approach, the model is calibrated assuming fourteen available hours for work and leisure and ten hours for personal care. Fofana, Cockburn, and Decaluwé (2003, 2005) use an explicit labor supply function, calculating maximum time available for work or leisure by using elasticities of labor supply with respect to income. The problem with this approach is that elasticities are not generally available. However, in the absence of time-use data, this approach would be preferred.

[8] Trade liberalization such as tariff reduction on imports reduces domestic price of imports, and consumers increase the demand for imported goods and reduce demand for domestically produced goods. This reduces production in the domestic economy, and factors of production move toward relatively competitive sectors. The change in the structure of production changes the prices of domestic goods. As a result the prices of commodities produced in the domestic economy and the prices of factors of production change.

[9] I calculated number of adults in a household using adult equivalent scale (see Deaton [1997] for details).

[10] Other commodities such as housing, sanitation facilities, and utilities like water, electricity, and gas are public goods that men and women consume equally.

[11] Table 8 reports poverty based on head count ratios (Po). In the urban area, households are categorized on the basis of the education of the head of the household – no education, low education (less than five years), medium education (five to nine years), and high education (more than nine years). In the rural area, households are first categorized by gender as female- and male-headed households, and male-headed households are further distinguished by the employment status of the head of the household – employee, employer, self-employed, and ''others,'' which contains miscellaneous households.

These households are arranged on the basis of the incidence of poverty in ascending order as follows. Urban households: no education – poorest; low education – poor; medium education – poor; high education – richest. Rural households: employees – poorest; self-employed – poorer; female-headed – rich; others – richer; employer – richest. The ranking is based at the regional level.

[12] SAM consists of twenty market sectors in agriculture (crop, livestock, forestry, fisheries, and others); industry (mining, food and beverages, textile, wood and paper, chemical, non-metallic, metallic, machinery, and handicrafts); and services (utilities, wholesale, retail trade, education and health, other, sanitation and other, public administration, defense, and construction).

[13] For details of the social accounting matrix, see Appendix A.

[14] In practice, women frequently multi-task, in particular combining childcare with other tasks.

[15] Detailed results are available on request from the author.

[16] For a detailed discussion of neoclassical models and their assumptions, see Bernhard G. Gunter, Lance Taylor, and Eric Yeldan (2005) and Bernhard G. Gunter, Marc J. Cohen, and Hans Lofgren (2005).

[17] In the short run, we assume that capital cannot move from one sector to the other. If capital is also mobile (which is a long-run phenomenon), the country moves toward complete specialization.

[18] The real exchange rate is implicit in the model and is calculated in the following way: $er = e * (P^w/P_d)$, where er, e, P^W, and P_d, respectively, are the real exchange rate, the nominal exchange rate, world prices, and domestic prices.

[19] The satisfaction of basic needs reflects (in aggregates) individual capabilities such as the ability to have a long and healthy life, to acquire knowledge, and to have enough resources to buy food and other necessities. Empirical studies measure individual's capabilities by various indicators such as infant mortality rate (IMR), life expectancy (LE), and literacy rate (LR) (Kanbur 1987; Anand and Ravallion 1993; Siddiqui 2008b). Infant mortality rate (IMR) is the best indicator to measure aggregates of capabilities and welfare, because it measures the availability of several basic needs. It is an outcome variable of inputs, including health, nutrition, clean water, and sanitation facilities. Increase/decrease in IMR implies increase/decrease in capability poverty. The second capability development indicator is the literacy rate (LR). It indicates accumulation of knowledge.

[20] Japan achieved an IMR of 5 deaths per 1,000 live births in 1990 (World Bank 2005).

[21] For details of income poverty analysis in CGE, see Rizwana Siddiqui and Abdur-Razzaque Kemal (2006).

[22] Detailed results are available from the author.

[23] I have used skill and education interchangeably as follows: (1) no education = unskilled; (2) low education = low skill, medium education = medium skill, and high education = high skill.

[24] The same pattern is found in the consumption of basic needs items.

[25] Other forms may include mobility constraint, industrial and occupational choices, decision making, etc.

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APPENDIX

Salient features of gender-SAM

I prepared a detailed gender sensitive social accounting matrix for the year 1990 (SAM-1990). It has twenty market sectors with capital, eight types of labor identified by gender, and four education levels – no education, less than five years (low education), five to nine years (medium education), and ten years and above (high education). It has four institutions – households, government, firms, and rest of the world. In urban areas, I identified households by the education level (no education, low, medium, and high education) of the head of household. In rural areas, I grouped households as female-headed households and male-headed households. Then, I classified the male-headed households by employment status (employee, self-employed, employer, and others).

I compiled a matrix of time allocation among market, household (social reproduction), and leisure activities for the eight labor types in each of the nine representative households following the standard system of national accounts (SNA). The SNA defines productive activities (market activities) as those that produce goods and services for sale and for personal consumption (food, clothing, and other articles) and are included in GDP. The SNA defines social reproduction (household activities) as services that could be provided by others within households such as cooking, cleaning, collecting wood, fetching water, and looking after children and the elderly. These activities are defined as economic but not ''productive.'' Leisure is non-economic and non-productive as it cannot be delegated to someone else.

After deducting ten hours (minimum time used for self-care) from twenty-four hours, fourteen hours are available for market, household, and leisure activities. I calculated hours used in market work using data from Supply and Use Tables 1989–90 (Federal Bureau of Statistics 1996); Census of Agriculture 1990 (Agricultural Census Organization 1993); Household Integrated Economic Survey 1990–91 or HIES (Federal Bureau of Statistics 1993a); and Labor Force Survey 1990–91 or LFS (Federal Bureau of Statistics 1993b). I took data for social reproduction services from the LFS for women, the gender planning network survey (Rehana Siddiqui et al. 2006), and a small rural household survey for men (Amtul Hafeez 2000). I assumed that the activities are separable. Therefore, I subtracted working hours (market and household) from fourteen hours to get hours used in leisure for each category of labor. I calculated the values of nonmarket activities assuming that the cost of production is purely labor costs – the weighted average wage of the labor used in these activities.

I adjusted labor use in market activities by including labor of own-account workers – self-employed and employers – earlier labor income of own-account worker is included in capital income. I calculated the labor share of own-account workers using hourly wage rates. I assumed that the wage rate of paid workers is the implicit wage rate of all workers. I further combined women's labor data based on old definition with data collected by the Federal Bureau of Statistics with new techniques to get improved participation by women. These adjustments increase the rate of female labor force participation (FLFP) from 11 percent to about 50 percent, because of considerable increase in female labor force participation in the textile and construction sectors. Male labor force participation increases in wholesale and retail trade. As a result, the gross domestic product increases by over 5 percent.

In the market sectors, both men and women laborers with no education and low education are largely employed in agriculture (50 percent of men laborers and three-quarters of women laborers with no education and one-third and two-thirds of low-educated men and women workers). Women with high education are concentrated in the textile and education and health sectors (they make up 27 percent and 26.7 percent of each respective sector). The import competing sectors employ more men laborers of all education levels compared to women laborers; while, the service sector is the major employer of highly educated men and women laborers (75 percent and 62 percent of the total respectively). With the exception of the social and public administration sectors, all other service sectors are capital intensive (Siddiqui 2007).

Labor and capital income from production activities are distributed among institutions. All labor income accrues to households. In rural areas, employee households earn about 80 percent of their income from men's and women's labor. Female-headed households receive 38 percent of their income from remittances. This indicates that, in the absence of senior male members in the household, women become heads of household. Own-account workers (self-employed and employers) receive, respectively, 60.9 percent and 93.8 percent of their income from capital (which includes land and livestock). The share of rural households in total consumption is 52 percent for about 70 percent of the total population. The share of urban households – 30 percent of total households – is 48 percent of total household demand. Among all household groups, those with no education or an employee head of household receive a relatively larger share of their income from illiterate labor and have the highest incidence of poverty: 39.8 percent and 35.9 percent respectively. Rich households are high-education households in urban areas and households where the head of household is an employer in rural areas; here poverty is very low (13.3 percent and 15.3 percent respectively). For further details, see Siddiqui (2007).