



Munich Personal RePEc Archive

Trade Policy Reform and the Missing Revenue: A Gendered Analysis for Mozambique

Arndt, Channing and Tarp, Finn

June 2003

Online at <https://mpra.ub.uni-muenchen.de/62441/>
MPRA Paper No. 62441, posted 28 Feb 2015 18:39 UTC

Trade Policy Reform and the Missing Revenue: A Gendered Analysis for Mozambique¹

Channing Arndt
Purdue University

and

Finn Tarp
University of Copenhagen

Abstract

In this paper, we identify potential efficiency and equity gains from trade policy reforms in Mozambique. Particular attention is paid to reducing the observed high level of duty free importation and to studying whether differential gender specific impacts exist. Accordingly, the CGE model applied involves the simultaneous capturing of average and marginal tariff rates, and simulations include both a standard (non-gender) set of experiments as well as a set where returns to male and female labor are distinguished. Policy reforms benefit nearly everyone with the main exception being those who benefit from duty free imports in the base. On the gender side, it turns out that the impact of reforms is basically neutral across factors, suggesting that, at the level of aggregation used here, it is difficult to uncover any major differential gender impacts.

¹ This paper was presented at the 6th Annual Conference on Global Economic Analysis, June 12-14, 2003 in Scheveningen, The Netherlands and at the Nordic Conference on Economic Development, June 24-25, 2003 in Copenhagen, Denmark. The authors would like to thank participants for useful comments. The paper was prepared within a research project entitled “WTO Negotiations and Changes in Agricultural and Trade Policies: Consequences for Developing Countries”, implemented by the Danish Research Institute for Food Economics and the International Food Policy Research Institute (IFPRI). Financial support from Danida is gratefully acknowledged. Views expressed are those of the authors and should not be attributed to their affiliated institutions.

1. Introduction

In Mozambique, there are substantial differences between the policy stance indicated by published tariff rates and *de facto* trade policy. One way to see this difference is through the examination of tariff revenue. Multiplication of published tariff rates by estimated CIF import values for almost any product yields projected revenue levels that are substantially higher than the revenue actually collected. Overall, in 1997, we estimate that actual tariff revenue was about 40% of the level implied by *de jure* tariff rates and estimated import volumes. Mozambique is not alone in this respect. Tsikata (1999) and Pritchett and Sethi (1994) document large discrepancies when comparing revenues implied by published tariff rates and estimated import volumes with actual receipts for developing economies in Africa and elsewhere.² The differences are explained by a combination of (legal) exemptions, corruption/smuggling across official entry points (ports and roads), and smuggling across unofficial entry points (un-guarded borders).

This paper uses a gendered CGE model for Mozambique to consider the implications of trade policy reform. The paper makes use of two stylized facts. First, as indicated above, a substantial share of imports enters the country duty free, while the remainder pays tariffs at published rates. These duty free imports generate substantial rents, which, at least in a first order sense, accrue primarily to men. Second, women have substantially lower educational attainment than men and tend to represent a large share of the rural population. Women are far more likely to work as unskilled agricultural labor than men, and the overwhelming majority of women in the labor force work in the agricultural sector. Consequently, the implications of trade policy reform for agricultural labor, especially unskilled agricultural labor, are particularly important for women.

The paper is structured as follows. Section 2 examines the two stylized facts in more detail. Section 3 presents a simplified model of international trade in order to investigate theoretical issues associated with duty free imports. Section 4 discusses CGE models in general and presents the modifications to the CGE model necessary to add

² In the data presented by Tsikata, Zimbabwe and Tanzania do slightly better than Mozambique with revenue collection ratios at 44 and 53 percent respectively. Other countries in the region perform significantly better. For example, Malawi and Zambia had measured collection ratios of 70 and 87 percent respectively (Tsikata does not present data for Mozambique). However, these results are calculated on the basis of customs data and thus primarily reflect official duty exemptions. The inclusion of smuggling, as has been done for the Mozambican figure cited above, would drive down the average collection rate, likely placing the Mozambican figure roughly in the middle of the neighborhood of figures estimated for the region.

a gender dimension and handle duty free imports. Section 4 presents model simulations and results, while Section 5 summarizes and concludes.

2. Two Stylized Facts

2.1. Import Values, Tariff Revenues, and Rents

National accounts information combined with tariff rate data can be employed to derive an implicit estimate of the value of goods entering duty free as was done above. A direct attempt at valuing unrecorded trade flows for Mozambique was undertaken by Macamo (1998). He systematically attempted to observe unrecorded cross border trade at major border checkpoints with neighboring countries. He estimated \$98 million in illegal trade for the year 1996.³ This amounts to only about 10% of the value of total trade in 1996, which is considerably less than the level of duty-free importation implied by national accounts. However, some degree of differential is appropriate. Macamo focused on cross border trade with Mozambique's neighbors while significant imports also arrive from overseas. In addition, Macamo focused on small, relatively unsophisticated operators with larger presumably more sophisticated operators "not necessarily" included (Macamo, 1998, p. 12). Finally, Macamo did not observe legal exemptions, which constitute a significant share of duty free imports. So, while the degree of precision in all of these figures leaves much to be desired, these two estimates of unrecorded trade paint a qualitatively similar picture of large volumes of goods entering the country duty free.

Since substantial volumes of goods enter Mozambique duty free, the overall average tariff rate (total tariff revenue divided by the total CIF value of imports) in 1997 was relatively low at 6.9%. Nevertheless, substantial volumes of imports do arrive through official channels and pay duty at the published or marginal rate, which is typically well above the average rate. The marginal import appears to be tariff inclusive; so, the price of traded goods within the country reflects the world price and the associated marginal tariff rate. When tariff rates are high, significant benefits therefore accrue to those individuals with the ability to import duty free either through legal exemptions or through smuggling/corruption at official border points.

While benefits clearly accrue to those with the ability to import duty free, incentives also exist to incur substantially higher transportation costs in order to move goods clandestinely across official and unofficial entry points. In this case, some share of the

³ In fact, Macamo estimated unrecorded trade for the period December 1995 to November 1996.

rents associated with bringing a good into Mozambique without paying duty is absorbed in real resource costs. Macamo (1998) finds evidence for this. For example, border traders wishing to evade tariffs often divide goods into small lots and hire numerous transporters to bring the goods across the border before re-amassing the contraband for transport to consumption centers. This is clearly much more expensive than simply driving the goods across the border in a truck. However, the evidence collected by Macamo confirms that the large majority of unrecorded cross border transactions (with neighboring countries) either passes through or very close to official entry points.⁴ Some simply passes straight through in trucks with very minor to no increment in transport costs relative to official imports. Even when disassembled into smaller lots, the incremental transport cost appears to be small compared to the value of the tariffs avoided. Macamo considers beer head transported, which draws an incremental transport cost of only about 10-15% of the value of the tariffs avoided. Regarding international seaports, one would expect incremental transport costs to be relatively small since the options in terms of physical transport are much more limited. Incremental transport costs are almost surely about zero for officially exempted goods.

Table 1 shows import values and actual tariff revenue according to the commodity classification employed in the social accounting matrix (SAM) underlying the computable general equilibrium (CGE) model employed for analysis in this paper.⁵ About 44% of the value of imports entered the country duty free in 1997 despite positive posted tariff rates. However, as indicated in the Table, duty free imports tend to be concentrated in sectors with higher posted tariff rates.⁶ Therefore, as indicated above, tariff revenue forgone due to unrecorded trade and legal exemptions amounts to about 60% of the total tariff revenue implied by the multiplication of posted tariff rates with actual import volumes.

⁴ Given the underdeveloped state and characteristics of the existing transport infrastructure, this is not surprising.

⁵ The SAM can be obtained from the authors on request.

⁶ In many cases, the same posted tariff rate does not apply across all the goods comprising the aggregate commodities shown in Table 1. As a result, aggregation of posted tariff rates is necessary in order to determine the actual tariff rate that should be applied. A number of complex conceptual issues are associated with appropriate aggregation of tariff rates. These issues are explored in Bach, Martin and Stevens (1996), among other sources. In Table 1, the posted tariff rates reflect weighted averages of import volumes with a small corrective factor to account for the fact that higher tariffs tend to drive down import volumes.

Table 1. Import values, tariff rates, and tariff revenues for 1997 (in billions of me-tical).

Sector	Import Value	Published Tariff Rate (%)	Implied Tariff Revenue	Actual Tariff Revenue	Share Missing (%)
Primary Ag. Crops	662	10.0	66	60	9.6
Primary Ag. Livestock	85	10.0	8	6	29.5
Forestry and Firewood	5	46.1	2	2	0.0
Extraction	77	12.5	10	9	3.2
Food Processing	1,803	35.0	631	117	81.4
Beverages and Tobacco	298	35.0	104	17	83.4
Primary Product Processing	1,046	35.0	366	62	83.1
Chemicals	2,022	15.0	303	165	45.7
Other Manufactures	4,172	15.0	626	381	39.0
Other Services	168	0.0	0	0	0.0
Construction	0	0.0	0	0	0.0
Commerce	0	0.0	0	0	0.0
Transport and Communication	140	0.0	0	0	0.0
Insurance and Finance	1,308	0.0	0	0	0.0
Public Administration and Def.	0	0.0	0	0	0.0
Education	0	0.0	0	0	0.0
Health	0	0.0	0	0	0.0
Labor Intensive Services	0	0.0	0	0	0.0
Big Projects	0	0.0	0	0	0.0
Big Project Imports	45	0.0	0	0	0.0
Total or Weighted Average	11,831	17.9	2,117	820	61.3

Sources: National accounts for 1997 for import volumes and tariff revenues and *Pauta Aduaneira* for published tariff rates.

Notes: In 1997, there were approximately 11,406 Mt/USD.
Totals may not add up due to rounding.

Protection rates are highest for Food Processing, Beverages and Tobacco, and Primary Product Processing (which include textiles, clothing, and leather products). The rates for exemptions and unrecorded trade in these categories are estimated to be particularly high as well with more than 80% of the value of these products entering the country duty free (value shares and shares of tariff revenue foregone are the same in this instance since a flat rate of 35% was applied to all goods in these three categories). The commodity composition observed by Macamo also reflects this concentration of unrecorded trade in these three commodity categories.

Finally, it is worth noting that Processed Food, Beverages and Tobacco, and Primary Product Processing represent an important part of consumers' budgets. The 1997 SAM indicates that these products accounted for about 29% and 37% of total expenditure for rural and urban households respectively. Consequently, price changes for these commodities have the potential to impact household welfare fairly strongly.

The high volume of goods entering duty free and concomitant low revenue collection ratios have strong implications for the revenue effects from trade policy reform. In principle, the revenue-reducing effects of reducing peak rates could be offset by their application to a broader base through elimination of official exemptions and reductions in incentives to smuggle. In a review of detailed tariff line and collection rate data for three countries, Pritchett and Sethi (1994) find that reductions in peak rates would likely have minimal or even positive revenue effects. Under these circumstances, the allocative efficiencies of trade liberalization are realized (as long as marginal or published tariff rates define domestic prices) while government revenue remains essentially the same. The primary losers are individuals with the ability to import duty free and those receiving corruption payments. It can be safely assumed that the poor, including in particular poor women, are unlikely to figure prominently among this group.

2.2. Male and Female Labor

Data from the 1997 Mozambique census confirmed the widely held belief that women have significantly lower educational attainment than men (NIS, 1997). According to the census, women represented about one of three persons who had completed upper primary school (EP2) and only about one in four persons who had completed any level of secondary school. While current enrollment rates paint a slightly more favorable picture, enrollments of boys still substantially exceed enrollments of girls especially at higher levels in the school system. This implies that gender inequalities in educational attainment (and hence human capital) are likely to endure for a considerable period of time (MINED, 2001). The 1997 census also picked up continued strong demographic effects of the civil war (which ended in 1992) and work related migration. Due to these effects, women represented 55% of the working age population (defined as the population greater than 15) in rural areas in 1997.

Arndt (2003) used census data, national accounts data, labor force data, and education data to break the labor force in Mozambique into skill categories. Building on this work, we employed the same sources augmented by cross checks with the 2001 QUIBB survey (NIS, 2001) to disaggregate these categories by gender. The results are presented in Tables 2, 3, and 4. The categories correspond to functionally illiterate and enumerate (unskilled), literate and numerate up to secondary or technical school level (skilled), and tertiary educated (highly skilled). The Tables illustrate an econ-

omy with an extremely thin human capital base. Consistent with available data, the human capital base among women is particularly thin.⁷

Table 2. Employment by gender, sector, and skill class (in thousand)

	Femal	Male	Total
Unskilled Ag Labor	3,173	2,206	5,379
Skilled Ag Labor	88	258	346
Unskilled Non-Ag Labor	256	593	848
Skilled Non-Ag Labor	65	192	257
Highly Skilled Non-Ag Labor	15	45	60
Total	3,596	3,294	6,890

Source: Arndt (2203); 1997 census data; 1997 national accounts data; and authors' calculations.

Note: Totals may not add up due to rounding.

Table 3. Employment row shares (in %)

	Femal (%)	Male (%)	Total (%)
Unskilled Ag Labor	59.0	41.0	100.0
Skilled Ag Labor	25.3	74.7	100.0
Unskilled Non-Ag Labor	30.1	69.9	100.0
Skilled Non-Ag Labor	25.2	74.8	100.0
Highly Skilled Non-Ag Labor	25.3	74.7	100.0
Total	52.2	47.8	100.0

Table 4. Employment column shares (in %)

	Femal (%)	Male (%)	Total (%)
Unskilled Ag Labor	88.2	67.0	78.1
Skilled Ag Labor	2.4	7.8	5.0
Unskilled Non-Ag Labor	7.1	18.0	12.3
Skilled Non-Ag Labor	1.8	5.8	3.7
Highly Skilled Non-Ag Labor	0.4	1.4	0.9
Total	100.0	100.0	100.0

Note: Totals may not add up due to rounding.

Due to the predominance of women in rural areas and their lack of educational attainment, women represent 59% of the unskilled agricultural labor force (see Table 3). By the same basic logic, agricultural labor utterly dominates the economic activi-

⁷ More detail on gender issues can be found in UNDP (2002).

ties undertaken by women with nearly nine of 10 working women engaged in the agricultural sector. These figures indicate that the fortunes of women in Mozambique are, for the foreseeable future, strongly linked to the performance of the agricultural sector.

3. A Simple Model of Trade and Tariffs with Missing Revenue

In order to motivate the empirical modeling approach employed in the paper, a very simple model of international trade is developed in this section. The model contains three goods: an importable that is not produced domestically (M), an exportable that is produced but not consumed domestically (E), and a non-tradeable that is produced and consumed domestically (D). There are h households with identical Cobb-Douglas preferences. Each household has a labor endowment z_h . Production technology is linear in labor units, and the usual neoclassical behavioral assumptions apply.⁸ The mathematical form of the model is as follows:

Consumer demand for M	$M_h P_m = (1 - \alpha) Y_h$	(1)
Consumer demand for D	$D_h P_d = \alpha Y_h$	(2)
Consumer budget constraint	$Y_h = z_h W + T_h$	(3)
E production technology	$E = a L_E$	(4)
D production technology	$\sum_h D_h = b L_D$	(5)
E first order condition	$W = a p_{we} R$	(6)
D first order condition	$W = b p_d$	(7)
Trade balance	$p_{we} E = p_{wm} \sum_h D_h$	(8)
Price transmission	$P_m = p_{wm} (1 + t) R$	(9)
Government balance	$\sum_h T_h = t \sum_h M_h p_{wm} R$	(10)
Numeraire definition	$R \equiv 1$	(11)
Factor market balance	$L_E + L_D = \sum_h z_h + WAL$	(12)

where (ignoring subscripts) L represents labor allocations, W the wage, P prices (p_w indicates fixed world price), R the exchange rate, t the tariff rate applied to imports, α the share of household budget devoted to good D, and T transfers. Variables are in uppercase while parameters are in lower case. The variable WAL effectively drops the factor market balance equation (12) in accordance with Walras' law. Note that tariff revenue is distributed back to households in the form of direct transfers (equation

⁸ The model is motivated by the 1-2-3 model of Devarajan, Lewis, and Robinson (1990). This model is simplified by assuming perfect transformation between domestics (D) and exports (E).

10). Also note that the model, as given above, is incomplete as the distribution of transfers, T_h , across households has not yet been specified. Finally, note that by solving for P_m and P_d and substituting into equation sets (1) and (2), the model boils down to a system of linear equalities (assuming the allocation mechanism for transfers is linear). Accordingly, the model can be solved as long as the matrix of parameters is invertible.

For our purposes, the closed form solution is not strictly necessary. Rather, it suffices to note that all prices, including the wage, can be determined as a function of the tariff rate t , the production parameters a and b , world prices p_{we} and p_{wm} , and the exchange rate R , which is serving as the numeraire. As a result, from an individual household perspective, income is exogenously determined by the household specific labor endowment and the level of government transfer. Production side issues are essentially abstracted from and changes in welfare are determined uniquely by changes in prices (through, for example, changes in the tariff rate) and changes in transfer income.

The model is used to consider three separate situations, which are relevant for Mozambique.

- 1) A completely ineffective tariff.
- 2) A tariff with a legal exemption scheme under which some particular groups are allowed access to goods duty free.
- 3) Smuggling/corruption.

Situation 1 can be dealt with quickly. If the tariff is completely ineffective, then the operational tariff rate is zero. There is no revenue to distribute. And, the model arrives at the free trade solution. It is worth noting that the same solution can be obtained via an offsetting consumer subsidy. The addition of a consumer subsidy on the purchase of imports can be achieved by modifying two equations of the model as follows.

Consumer demand for M	$M_h P_m (1 - s) = (1 - \alpha) Y_h$	(1a)
Government balance	$\sum_h T_h = t \sum_h M_h p_{wm} R - s \sum_h M_h P_m$	(10a)

It is straightforward to show that, if $(1 - s)(1 + t) = 1$, the free trade equilibrium is re-established.

Situation 2 recognizes the existence of enclave entities that often receive special trade treatment. For example, expatriates and locals who travel frequently are frequently able to avoid paying import tariffs. Government often exempts itself from import tariffs, and large investment projects negotiate special import treatment. Here, the markets for imports are divided. Some groups import and consume with tariff laden prices while others import and consume at world prices. We focus on division of markets across households in our simplified model. This situation requires further modification to the model. The market division can be achieved in at least two ways. First, a subscript h could be added to the tariff rate, t . In this case, only certain groups pay the tariff. This modification also requires an h subscript on the domestic price of imports P_m . Alternatively, an offsetting consumption subsidy to specific households, s_h , can achieve the same outcome when a single tariff rate is applied in a manner completely analogous to the ineffective tariff situation considered above. These modifications are shown below.

$$\text{Consumer demand for } M \quad M_h P_{hm}(1 - s_h) = (1 - \alpha)Y_h \quad (1b)$$

$$\text{Price transmission} \quad P_{hm} = p_{wm}(1 + t_h)R \quad (9b)$$

$$\text{Government balance} \quad \sum_h T_h = t_h \sum_h M_h p_{wm}R - s_h \sum_h M_h P_{hm} \quad (10b)$$

Any given household j faces free trade prices if $(1 - s_j)(1 + t_j) = 1$. Further, in this simple model, if household j also receives zero transfers, then it faces the free trade equilibrium.

Situation 3 captures the basic elements of smuggling and/or corruption. Suppose that household j possesses the means and/or rights to import duty free. It both imports commodities duty free for direct consumption and imports and resells commodities at the tariff laden price. This situation can be modeled by setting $(1 - s_j)(1 + t_j) = 1$ (only for household j). Resale of imported products at the tariff laden price can be captured by imposing the posted rate tariff rate t on imports of these goods but directing the value of this tariff revenue to household j in the form of a transfer, T_j . Effectively, household j consumes at world prices and enjoys revenue by importing at world prices and selling at tariff laden domestic prices.

The world is, of course, much more complicated than the simple model presented above. However, the model above does capture the most important elements of tariff avoidance, namely who gets the benefits from this avoidance. In addition, the simple model provides insights into modeling strategies for a more complex empirical model. The simple neoclassical world where domestic prices are fixed by world prices is ana-

lytically convenient. It is also, in our view, appropriate for the case of the same good imported under different regimes. In other words, once safely within Mozambique, it seems logical to view smuggled beer and officially imported beer as indistinguishable products. These ideas are woven into a more complex empirical model of international trade, which is explained in the following section.

4. Modeling Approach

The basic purpose of trade liberalization is to alter relative prices, including factor prices, in order to expand production in sectors with comparative advantage. To expand production, these sectors must attract factors of production (land, labor, and capital). Under most conditions, other industries must release factors of production in order to permit those industries with comparative advantage to expand. Using this perspective, trade liberalization is inherently an economy-wide phenomenon. Here, we are particularly interested in analyzing trade policy reform that attempts to exploit the low import tariff coverage ratios observed in the data. At the same time, we wish to formally maintain a gender perspective. For these purposes, we opt to employ an economy-wide modeling perspective.

4.1. Economy-wide Models

Before describing the Mozambique economy-wide model specifically, it is perhaps worthwhile to review the basic characteristics of a standard static economy-wide model. These models are often referred to as computable general equilibrium (CGE) models. The specific features of the Mozambique model can then be highlighted. CGE models can be thought of as containing four basic elements:

- a) Behavioral specification;
- b) Accounting constraints;
- c) Treatment of imports and exports; and,
- d) Market closure.

These elements are treated in what follows in turn.

4.1.1. Behavioral Specification

In any economic model, the behavior of the agents must be specified. For example, firms are often assumed to maximize profits subject to available technology and taking prices for inputs and outputs as given. Likewise, households are regularly assumed to maximize utility subject to a budget constraint. These are also the most common assumptions applied to CGE models. In addition, other agents are usually contained in a CGE. For example, government receives revenue through taxes and other sources and purchases commodities. Enterprises earn financial profits (returns to capital) and either distribute dividends or retain the earnings for investment purposes. Investors, through the purchase of commodities in order to form capital, determine the commodity composition of investment. Just as for firms and households, expenditure allocation rules must be specified for these additional agents. The rules can be simple or complex. For a simple example, all agents could allocate available funds across uses in constant budget shares. More complex rules can also be applied to account for issues such as risk, imperfect competition, or returns to scale.

4.1.2. Accounting Constraints

The behavioral specifications within CGE models follow from economic theory and rarely set them apart from other economic models. The accounting equations, on the other hand, are a major distinguishing feature from partial equilibrium models. CGE models contain a number of identities that enforce consistency. For example:

- a) Households must respect their budget constraint;
- b) The domestic price of imports equals the CIF price multiplied by the exchange rate and the prevailing tariff rate plus any marketing margins or additional domestic sales taxes;
- c) The value of imports cannot exceed the availability of foreign exchange;
- d) Supply of commodities must equal demand for commodities (with inventory accumulation counted as demand);
- e) Firms cannot use more of any factor than the total availability in the economy;
- f) Investment must be financed via foreign or domestic savings; and,
- g) Government consumption must be financed through tax revenue, foreign grants (aid), or borrowing on domestic or foreign markets.

These propositions are in large measure a matter of accounting; however, they serve to circumscribe the range of possible outcomes, sometimes surprisingly tightly. For example, skilled labor is often fully employed. This implies that, for a given stock of skilled labor, if an industry expands output and uses more skilled labor in the process, other industries must use less skilled labor. To achieve equilibrium in the various factor and product markets, prices adjust to simultaneously satisfy the decision rules and the accounting constraints.

4.1.3. Exports and Imports

As in most models with foreign trade, exports and imports receive special treatment.⁹ While the ideal special treatment remains a matter of considerable debate, it is clearly incorrect to assume that a domestic commodity and the same commodity being imported or exported are homogeneous (with the possible exception of trade in bulk commodities such as rice between similar countries). For the vast majority of traded commodities, the empirical evidence is overwhelming that imports, exports, and domestic goods are differentiated products. The exact form of differentiation and the degree of differentiation remains contentious. The most common practice in CGE modeling is to adopt the “Armington assumption,” whereby products are distinguished by country of origin (Armington, 1969). Other assumptions are possible. For example, goods might be differentiated by firm. So Honda automobiles might be considered the same wherever they are produced, but they differ from Ford automobiles. In a single country CGE model employing the Armington assumption, there are three goods associated with each commodity: imports, exports, and domestically produced goods for domestic consumption.

4.1.4. Closure

The final issue, closure, pertains to the macroeconomic characteristics of the economy in question. Is a fixed or flexible exchange rate regime pursued? Do taxes adjust to maintain an arbitrary alignment between government revenue and expenditures or does the government deficit adjust? Are factors of production fully employed and are they mobile across productive activities? Is investment driven by the available savings pool, or do savings adjust somehow to accommodate an exogenous investment

⁹ Treatment of exports and imports really falls under the heading of behavioral specification. However, since the treatment of foreign trade is crucial to many applications, a separate section is devoted to this part of the model.

level? These questions are addressed through the choice of macroeconomic closure, a seminal paper being Sen (1963).

Results from CGE models are often sensitive to the choice of closure. This characteristic is sometimes cited as a weakness of CGE models. We see it as a strong point. Economic outcomes do vary substantially depending upon macroeconomic characteristics and policies. For example, if the defense build-up pursued by the United States under President Ronald Reagan had been tax financed rather than deficit financed, the economic structure of the United States towards the end of the 1980s would arguably have been very different (see, for example, McKibbin, 1992). Alternative closures permit the models to capture these alternative characteristics and outcomes.

In summary, CGE models combine behavioral specifications for a large number of agents in the economy with accounting constraints and a view of the macroeconomic policy regime and the nature of product differentiation in international trade.

4.2. The Mozambique CGE Model and SAM

The Mozambique CGE model is a fairly standard CGE model with a few special features. Relatively standard elements are discussed first. More novel features are then presented.

The model assumes profit maximization by producers under translog technology and utility maximization with Cobb-Douglas preferences by consumers. The government implicitly maximizes a Cobb-Douglas utility function (constant expenditure shares) while investment is allocated in a Leontief fashion (a fixed basket of goods). The Armington assumption is employed with constant elasticity of transformation functions on the export side and constant elasticity of substitution functions on the import side. The external sector of the model is closed by fixing foreign currency inflows (primarily aid) and allowing the exchange rate to adjust. Investment is driven by available savings. Finally, the government deficit is fixed (more details on government closure are provided in the simulations section). The model numeraire is the consumer price index.

A somewhat less standard feature is the division of labor types by sex. As mentioned above, the labor types included in the model are listed in Table 2. These labor types, differentiated by sex, constitute separate inputs into the translog production function. Elasticities of substitution between male and female labor of the same class were set

at the fairly high level of three. Elasticities across labor classes employ the values used by Arndt (2003) regardless of sex.

This approach formally captures the concentration of female labor in the agricultural sector, and explicitly brings the implications of trade policy reform for female labor into consideration. Arndt and Tarp (2000) employed a similar approach to examine the interactions between agricultural technology, risk, and gender. More detailed formulations have been developed. For example, Fontana and Wood (2000) present a fairly stylized model for Bangladesh, which explicitly considers household work (and leisure) along with the division between male and female labor.

While the incorporation of these aspects into macroeconomic models such as CGE models represents a step forward, ample room for progress remains. In particular, the authors are unaware of a macroeconomic model that explicitly addresses issues associated with intra-household resource allocation. Our model shares this deficiency. Consequently, we are unable to analyze the implications of trade policy reform for resource allocation within the household.¹⁰

Finally, detailed accounting for marketing margins is accomplished in the same manner as described in Arndt, Jensen, Robinson, and Tarp (2000) and Jensen and Tarp (2002). Löfgren, Harris and Robinson (2001) and Tarp, Arndt, Jensen, Robinson and Heltberg (2002) provide detailed explanations of the basic CGE model that was revised for the purposes of this analysis.

The novel feature of the Mozambique model as applied here involves the simultaneous capturing of average and marginal tariff rates when these diverge. As shown in Table 1, such differences are substantial in Mozambique. When confronted with this situation the CGE modeler has traditionally faced a choice. One can apply the average tariff rate, which gets revenue correct. This is clearly desirable in public finance applications. However, this approach understates the true import tariff wedge at the margin, which is in focus in trade policy analysis. Alternatively, one can apply the published rate, which overstates tariff revenue, but captures the distortions inherent in trade policy.

¹⁰ This is an area of research that could be accomplished. For the case of Mozambique, a major constraining factor is a dearth of information on how resources are allocated within the household (Bell, 2003). The analysis could be performed in a setting where more information is available. Alternatively, planned qualitative and quantitative research in Mozambique might provide an adequate empirical basis on which to proceed.

In practice, modeling goals (and expedience) have guided analytical choices. For example, GTAP data usually reflect published (marginal) tariff rates since most users are trade policy focused and the model is relatively poorly suited to public finance applications (McDougall and Dimaran, 2002). On the other hand, a series of studies of southern African economies conducted by the International Food Policy Research Institute typically employed average tariff rates since the public finance dimensions of these studies maintained a higher profile (see, for example, Tarp, Arndt, Jensen, Robinson and Heltberg, 2002).

While the choice has typically been one or the other, both the average and the marginal rates can in fact be captured in a CGE model using the analytical model derived above. In large part, the issue can also be viewed as a tariff rate quota where a certain volume of imports enters the country duty free and the remainder enters the country at a strictly positive tariff rate (i.e. the published tariff rate). As in the case of a tariff rate quota, the ability to import duty free (or at the within quota rate) has a value. For those with access to goods duty free, the tariff revenue foregone by the government effectively represents income in the form of either a rent or an implicit subsidy. With relatively few modifications, the basic machinery for modeling tariff rate quotas can be applied to the issue of low rates of tariff revenue collection in Mozambique (see Elbehri and Pearson (2000) for general equilibrium analysis of tariff rate quotas).

In this particular case, the implicit value of tariffs avoided is calculated for each commodity. The actual tariff inclusive import value of all commodities is then augmented by the respective amounts of tariff payments avoided through (legal or illegal) duty free importation in order to obtain the CIF value of imports augmented by the full amount of tariff revenue implied by published rates. From the theory discussion presented above, the destination of this virtual tariff revenue (the tariff revenue not actually collected by government) depends upon the use of the imported commodity. If it is imported and then consumed directly, the importing/consuming agent could be viewed as paying the import tariff and then receiving an exactly offsetting consumer subsidy. If the good is imported and then resold at tariff laden prices, then the importing agent could be viewed as receiving a transfer from the government equivalent to the value of the tariff revenue avoided.

There is very little information to indicate the share of duty free imports that is consumed directly and the corresponding share that is resold at tariff laden prices. Legal exemptions would tend to fall into the former category while smuggled goods would tend to fall into the latter. The available evidence indicates that both of these catego-

ries are important. However, for Beverages and Tobacco, Food Processing and Primary Product Processing, where tariff rates and tariff avoidance are the highest, the share that is resold at tariff laden prices likely predominates. In this light, we assume that 33% of duty free imports are consumed directly and the remaining 67% are imported and resold. Further, we assume that government, investment, and urban household accounts have some ability to import duty free and consume directly. Rents (modeled as transfers) from importing duty free and reselling at tariff-laden prices are assumed to accrue to urban households.¹¹ Rural households, on the other hand, are assumed not to have access to duty free goods.

In the model, price linkage equations remain exactly as before. So, for example, import prices are equal to the world price converted to domestic currency times the sum of one plus the marginal tariff rate (plus any marketing margins). The tariff revenue side differs. Similar to the perspective of duty free imports as a tariff rate quota, we assume, on a commodity by commodity basis, that a certain fraction of imports enters the country duty free while the remaining fraction pays marginal tariffs. Actual tariff revenue in the government revenue equation becomes this fraction multiplied by the value of tariffs implied by the full marginal tariff rate. The remaining amount, the value of tariffs avoided, is divided between consumption subsidies (relating to goods that are consumed directly) and direct transfers to urban households (relating to goods that are imported and then resold).

5. Simulations and Results

5.1. Simulations

Table 5 illustrates the simulations undertaken with the model. In the first, labeled “All Products Pay”, the share of products imported duty free is set to zero while all tariff rates are adjusted proportionately to maintain revenue neutrality with respect to all indirect taxes (not just tariff revenue). Consumption subsidies reflecting direct consumption of products imported duty free are also set to zero. This corresponds to a fictional scenario where all legal exemptions are eliminated and all smuggling is halted. In the second, labeled “Flat Tariff Rates”, all positive tariff rates are reset to a

¹¹ To simplify the modeling, the real resource costs associated with importing duty free are assumed to be zero. If real resource outlays to avoid tariffs are indeed a relatively small share of the value of tariffs avoided, as the available evidence suggests, then this simplification is harmless. The other case, involving significant real resource outlays, has been examined in the seminal paper by Krueger (1974) among others.

single level that maintains revenue neutrality with respect to all indirect taxes.¹² The share of products imported duty free remains constant. Consumption subsidies adjust to offset the level of virtual tariff revenue associated with direct consumption of duty free imports. In the third, labeled “Both”, the share of products imported duty free drops to zero and all positive tariff rates are reset to a single rate. This rate is adjusted to maintain revenue neutrality with respect to all indirect taxes.

Table 5. Simulations	
Label	Description
Base	Base data in billions of meticaís.
All products pay	The share of products imported duty free drops to zero while tariff rates are adjusted proportionately to maintain revenue neutrality.
Flat tariff rates	All positive tariff rates are reset to a single level that maintains revenue neutrality. The share of products imported duty free remains constant.
Both	The share of products imported duty free drops to zero and all positive tariff rates are reset to a single rate. This rate is adjusted to maintain revenue neutrality.

The simulations are designed to investigate the implications of a lower tax rate applied to a wider base, a very common public finance application. In this case, we are also careful to track the implications for male and female labor. As in most public finance applications, careful attention is given to the maintenance of revenue neutrality. Maintenance of total indirect tax revenue was also targeted since these are the taxes that interfere with the price system. The value of indirect taxes (less output subsidies) represented 75% of government revenue in 1997. Changes in revenue from indirect taxes have implications for welfare analysis. As shown by Robinson and Thierfelder (1999), changes in indirect tax rates that change indirect tax revenue invalidate wages as an acceptable welfare indicator. With the revenue closure adopted, wages remain an acceptable welfare indicator (at least for the large majority of the population that lacks rights to import duty free).

The motivating notion behind the simulations is that lower tariff rates substantially reduce the incentives to evade tariffs. Therefore, revenue neutrality is maintained in all simulations. In order to separate out effects, the first simulations consider what happens if all duty free importation could be eliminated. The second scenario consid-

¹² As Table 1 indicates, the tariff rate applied to some imports, particularly services, is zero in the base. These rates remain at zero in all simulations.

ers the implications of applying a single flat tariff rate to all commodities while the share of commodities entering the country duty free remains the same. These two scenarios are both unrealistic. The first would be impossible to achieve. In the second, one would expect the share of duty free imports to decline endogenously in sectors with high tariff levels. However, the two scenarios define two extreme points in the policy set of interest.

The third scenario combines the first two scenarios to create a scenario of potential policy interest. This scenario asks the question: “what flat tariff rate applied to all imported commodities (excluding commodities with a tariff rate of zero in the base) would be required to maintain revenue assuming all imported goods paid tariffs at the published rate, and what are the welfare implications, including implications by gender, of this policy?”

All scenarios were run using a gendered model and a more standard model without a gender dimension. Results from the standard (no gender dimension) are presented and analyzed first. Next, the implications of adding a gender dimension to the model are assessed.

5.2. Results

Macroeconomic results for the non-gendered model are illustrated in Table 6. Trade expands in all scenarios. Growth in trade is led by increased imports of processed food, beverages and tobacco, and processed primary products, which are associated with the highest initial rates of protection. Reductions in tariff rates applied to these products are large in all scenarios. In scenario one, the existing rate structure is reduced by nearly two thirds (see the Tariff Rate Expansion Factor at the bottom of the Table). Consequently, rates on these three commodities decline from 35% to about 12%. In scenario two, duty free shares remain constant but tariffs are reset to a single flat rate of about 17% (the flat tariff rate is equal to the Tariff Rate Expansion Factor). For most commodities, this involves a tariff rate increase, which tends to reduce trade volumes; however, for the three highly taxed commodities mentioned above, tariffs decline by 18 percentage points. The net effect is a very small increase in trade volumes in this scenario.

Scenario three involves the elimination of exemptions and the application of a flat tariff rate. Under these conditions, revenue neutrality can be maintained with a 7% tariff rate. This involves a substantial tariff rate cut for each of the commodity aggregates.

However, trade expands less than in scenario one (All products pay) since importing duty free and consuming directly is no longer an option. All products are assessed duties.¹³ The expansion of imports induces a devaluation of the currency in order to stimulate import competing and exporting sectors. Due to the very large level of external financing received by Mozambique, the value of imports massively exceeds the value of exports. As a result, exports must grow by proportionately much more for a given proportional change in imports in order to maintain external balance. Real GDP changes little in all scenarios; however, total absorption – a measure of economy-wide welfare – increases mildly in the “Flat” and “Both” scenarios.

Table 6. Macroeconomic results for the non-gendered model.

	Base	All products pay (%)	Flat Tariff rates (%)	Both (%)
Exchange Rate	1.00	5.0	1.4	5.0
Real GDP	40,609	0.1	0.1	0.1
Total Absorption	48,357	0.0	0.4	0.3
Imports	11,831	1.7	0.0	1.4
Exports	4,083	4.9	0.1	4.2
Investment	8,173	3.9	-0.3	3.0
Tariff Rate Expansion Factor ¹⁾	1.00	0.35	0.17	0.07

Note: All metical figures are in billions. Also, the levels of some macroeconomic aggregates differ slightly from published values due to more explicit accounting for the rents associated with duty-free importation.

¹⁾The tariff rate expansion factor is not in percentage terms and the interpretation of this factor differs by scenario. In scenarios “Base” and “All products pay”, the factor multiplies existing marginal tariff rates. In scenarios “Flat tariff rates” and “Both”, the factor still multiplies all tariff rates; however, these are all set to one. So, the expansion factor is the unique tariff rate applied to all goods with strictly positive tariff rates in these two scenarios.

Table 7 provides information on the contribution of each sector to real GDP at factor cost in the base, the level of value added generated by each sector, and the percentage change in real value added generated by each producing sector for each scenario. Focusing on the third scenario (“Both”), one observes some changes in the composition of value added, but they are not dramatic. Small sectors that enjoyed substantial protection, such as Beverages and Tobacco, shrink when protection is removed. Increases in production are observed in Insurance and Finance. Import penetration in this sector

¹³ As indicated earlier, deriving an appropriate aggregate tariff rate for an aggregate commodity is complex. It is worth noting that some components of some aggregates are taxed at a rate lower than 7%. So, the 7% flat rate does represent a tariff rate increase for some commodities when a more detailed level of disaggregation is considered.

is fairly large at about 30% of the value of domestic consumption. The devaluation enables this sector to compete more effectively against imports and hence increase value added. The devaluation also increases the local currency value of foreign capital inflows. Since most of these inflows fund investment expenditure, investment spending increases spurring activity in, for example, the construction sector. An intuitive explanation of the decline in value added produced by the livestock sector will be deferred for later.

Table 7. Real value added by sector.

	Base Share (%)	Base Level	All products pay (%)	Flat tariff rates (%)	Both (%)
Primary Ag. Crops	27.4	9,963	-0.4	0.8	0.0
Primary Ag. Livestock	2.2	795	-2.1	0.3	-1.6
Forestry and Firewood	3.2	1,156	0.2	0.2	0.3
Extraction	4.3	1,570	2.4	0.5	2.3
Food Processing	3.3	1,198	-1.6	-1.2	-1.9
Beverages and Tobacco	0.9	313	-5.3	-3.1	-5.9
Primary Product Processing	2.2	802	-3.0	-3.2	-4.0
Chemicals	0.6	231	-1.7	0.4	-1.3
Other Manufactures	1.1	410	0.3	0.6	0.4
Other Services	8.3	3,018	-0.9	-0.4	-1.0
Construction	6.5	2,375	3.3	-0.2	2.6
Commerce	20.1	7,337	-0.2	-0.3	-0.3
Transport and Communication	8.9	3,236	0.0	-0.2	-0.1
Insurance and Finance	4.6	1,682	3.1	0.1	2.6
Public Administration and Def.	2.8	1,007	0.0	0.0	0.0
Education	1.6	601	-0.7	-0.2	-0.7
Health	0.5	179	-0.5	-0.1	-0.5
Labor Intensive Services	1.5	550	0.4	0.1	0.4

Table 8 provides information on factor prices. In all scenarios, all wages and rental rates increase relative to the base. The increases range from about 1.5% to 1.8% for all factors. This implies that all households lacking access to duty free imports benefit from the policy change. These are compelling results that are relatively simple to explain. Two broad effects dominate these increases in real wages.

First, the figures reported in Table 8 are real factor prices with deflation being performed by the consumer price index (the numeraire). As indicated above, the three commodities with the highest rates of protection (Processed Food, Beverages and Tobacco, and Processed Primary Products) represent a significant share of the consumer consumption bundle. When protection is removed, prices for these commodities decline. Since the level of the consumer price index is fixed as numeraire, the level of

the consumer price index (CPI) cannot decline by definition. Only relative prices matter in a CGE model. As a result, other prices, including factor prices, tend to rise relative to the CPI in order to achieve a relative decline in the prices of the basket of goods comprising the CPI.

Table 8. Real (CPI deflated) wages

	Base	All products pay (%)	Flat Tariff rates (%)	Both (%)
Unskilled Ag Labor	1.63	0.6	2.1	1.6
Skilled Ag Labor	2.66	0.5	2.2	1.6
Unskilled Non-Ag Labor	6.99	1.4	0.5	1.5
Skilled Non-Ag Labor	23.96	1.9	0.2	1.8
Highly Skilled Non-Ag Labor	57.03	1.9	0.2	1.8
Capital	0.15	1.5	0.9	1.8

Second, as indicated earlier, the rents that accrue from importing duty-free and reselling on the domestic market at tariff laden prices function in a manner analogous to imposing a tariff and having the government reimburse these “tariff payments” back to those relatively few individuals with the right to import duty-free. In a macroeconomic sense, the rents from duty-free importation and subsequent resale function like a tariff (an indirect tax) that is later reimbursed (a direct transfer) to selected individuals.¹⁴ Reductions in these “transfers”, through tariff rate reductions (which lower the implicit value of the rents) or reductions in the share of goods imported duty free, function like reductions in standard tariffs with concomitant reductions in transfers.

The macroeconomic impact on wages can best be perceived by considering a fundamental national accounting identity:

$$C + I + G + (X - M) = GDP = GDP_{fc} + IT$$

where C is consumption, I is investment, G is government, X is exports, M is imports, GDP is gross domestic product, GDP_{fc} is GDP at factor cost, and IT is total indirect taxes. The right hand side of the above expression can be rewritten as:

$$\sum E_i w_i + TR^o + TR^r + IT^o$$

¹⁴ Direct consumption of duty free imports, on the other hand, functions as if the government had imposed a tariff a tariff at the border and then given back the revenue in the form of a commodity specific consumption subsidy. These two indirect taxes exactly offset one another.

where E_i represents the quantity of each factor employed, w_i represents the wage for each factor, TR^0 represents official tariff revenue, TR^f represents rents from resale of goods imported duty free, and IT^0 represents other sources of indirect tax revenue. The sum of employment of endowments (land/natural resources, labor, capital, human capital) multiplied by their respective wages yields GDP at factor cost. The sum of the three tax components gives total indirect taxes.

In the simulations considered here, endowment supplies are fixed and fully employed. Hence, the only way to increase nominal GDP at factor cost is to increase wages. By assumption in each scenario, the sum $TR^0 + IT^0$ is held constant. The remaining term represents the rents from resale of goods imported duty free, TR^f . In scenarios one and three, this value is reduced from about 2.4% of GDP at factor cost to zero. If nominal GDP remained constant and TR^f were the only source of indirect tax revenue, average wages would have to increase by about 2.4%. In the event, nominal (CPI deflated) GDP declines by about 0.6% and other indirect tax revenue sources remain in place (at a constant value). Simple calculations indicate that average factor prices must rise by slightly more than 1.7%, which is approximately the weighted average factor price change value one obtains from Table 8.

This effect on nominal wages often leads to the erroneous conclusion that trade liberalization increases household and economy-wide welfare due to the wage effect. As pointed out by Robinson and Thierfelder (1999), this is not necessarily the case. For example, if the tariff revenue is replaced by direct taxes such as income taxes, households might find that the increase in income taxes more than offsets the “wage increase” that follows from reductions in indirect tax revenue. In this instance, the household is not better off. More generally, using factor prices as a welfare indicator in trade liberalization scenarios will tend to overstate the benefits of trade liberalization if the implications of reductions in government tariff revenue are not accounted for.

In this case, in order to conduct an acceptable welfare analysis using wages, we must account, not for the reduction in tariff revenue actually collected (which remains essentially constant), but for the reduction in rents accrued to those with the ability to import duty free. Even though we know relatively little about these people, it seems safe to assume that they are not particularly numerous and that they are not poor. For these relatively few individuals (such as corrupt border guards), the reductions in the rents received will almost surely exceed the average increment to wages predicted by the model. Hence, their welfare declines. However, for the large majority of working

people who lack access to duty free imports, wages are an acceptable welfare indicator. The results indicate that wages for these people will rise (with no offsetting reduction in rents).

A composite view of welfare effects on households can be obtained by examining household equivalent variation. This is done in Table 9. As shown in the Table, urban household welfare declines very substantially while rural household welfare increases substantially (these are large numbers for trade policy simulations where welfare changes are often on the order of one percent). The decline in urban household welfare is attributable entirely to the disappearance of rents from resale of products imported duty free, which formerly accounted for about 5.6% of total income. If the information existed to divide urban households into those receiving rents and those not receiving rents, simple calculations indicate that urban households not receiving rents would experience welfare gains of about two percent.¹⁵

Table 9. Household welfare measured by equivalent variation in the non-gendered model

	Base	All products pay (%)	Flat Tariff rates (%)	Both (%)
Urban	15,891	-3.6	-1.1	-3.8
Rural	20,102	1.6	1.1	1.9

We turn now to the gender dimensioned model. Not surprisingly, the macroeconomic effects between the gender dimensioned and non-gender dimensioned models are very similar. This is illustrated in Table 10, which shows household equivalent variation. While not exactly the same, the results are qualitatively very similar. The more interesting stories potentially involve implications for wages. However, for the scenario of policy interest (scenario three: “Both”), the implications of a flat tariff rate and the elimination of duty free imports are remarkably consistent across factor types. As illustrated in Table 8, returns to all factors increase by 1.5 to 1.8 percent. When factors

¹⁵ This aggregation of urban households into a single average helps to explain the somewhat counterintuitive decline in livestock production shown in Table 7. Urban households are, on average, considerably wealthier than rural households; and they direct a much larger fraction of their income to meat consumption. When average urban household income declines, direct demand for livestock products declines as well. In addition, marketed meat products (butchered animals) are considered processed foods. With declines in domestic processed food production following reductions in tariffs, intermediate demand for livestock products as well. A more detailed analysis with more disaggregate data would provide a more precise insight into production effects for the livestock sector.

are split between male and female types, this relatively uniform impact upon wages persists. As a result, the story for female wages is qualitatively very similar to the story for wages in general.

Table 10. Household welfare measured by equivalent variation in the gendered model

	Base	All products pay (%)	Flat Tariff rates (%)	Both (%)
Urban	15,906	-3.9	-1.1	-3.8
Rural	20,111	1.6	1.0	1.9

The relative uniformity in implications for factor returns stem from the relatively mild effects on the structure of production. As shown in Table 1, Food Processing, Beverages and Tobacco, and Primary Product Processing are the sectors with the highest tariff rates (plus a high level of import penetration). As a result, these sectors can be expected to be the ones most strongly affected by trade liberalization. However, as shown in Table 1, these sectors represent only about 6.4% of value added and do not employ a particularly large concentration of any one factor. In addition, the estimated Armington elasticities of substitution between imported and domestic produced goods for these sectors are relatively small at 0.8 (Arndt, Robinson and Tarp 2002) implying relatively small domestic production adjustment despite the price changes. Changes in household income between rural and urban groups does generate changes in the overall composition of commodity demand due to differing marginal budget shares between the two groups; however, these compositional effects are relatively mild.¹⁶ If the structure of production is to remain relatively constant, relative factor prices must remain relatively constant as well, which is what we observe. As a result, the overall macroeconomic effect on factor prices from elimination of rents from duty free importing discussed above tends to dominate the results.

The splitting of labor into male and female components does permit analysis of total wage payments to women and men. This is shown in Table 11. Here, due to the relatively uniform impacts on wages, relative uniformity prevails despite the quite different structures of the male and female labor forces in terms of skills profile. Total payments to female and male labor both increase by about 1.6%, a significant increment.¹⁷

¹⁶ Since preferences are assumed homothetic, changes in household income do not change the composition of commodity demand by the household (*ceteris paribus*).

¹⁷ It should be pointed out that relatively uniform impacts on male and female classes of labor are not necessarily a foregone conclusion in this class of model. Fontana and Wood (2000), Arndt and Tarp (2000), and Fontana (2003) generate differential gender impacts.

Table 11. Returns to male and female labor

	Base	All products pay (%)	Flat Tariff rates (%)	Both (%)
Urban	9,599	1.1	1.4	1.6
Rural	15,588	1.4	0.8	1.6

6. Conclusions

The aim of this paper was to conduct a trade policy analysis with specific attention paid to disaggregating male and female labor, so as to track any efficiency and distributional consequences this may have for the conclusions emerging from an aggregate non-gendered approach. We have at the same time made a novel attempt at capturing the importance of divergences between average and marginal tariff rates. The differences between *de jure* and *de facto* trade policy are, as discussed in this paper, significant in Mozambique, and the modelling dilemmas involved in addressing this have traditionally been far from straight forward. On this background, we develop a simple theoretical model of marginal and average tariff rates. Motivated by this theoretical model (as well as some conceptual similarities with the modelling of tariff rate quotas (TRQs)), the CGE model was then adjusted to address this issue.

Our results indicate that there are possibilities for increasing both efficiency and equity. Losers from trade reforms include those households (urban households by assumption) who benefited from their ability to import duty free one way or the other. It is highly unlikely that these rent-creaming households are particularly poor. In contrast, the welfare of poor rural families tends to increase in both the non-gendered and the gendered version of the CGE model applied here. In scenario “Both” where a flat tariff rate is applied and all duty-free importation ceases, rural household welfare as measured by equivalent variation increases by about 1.9% in both the gendered and non-gendered approaches. The implications for wages are strongly positive and remarkably uniform indicating that the large majority of the urban population that does not enjoy access to duty free goods becomes better off following reforms. The uniformity in results across factors suggests that, at the level of aggregation used in this paper, it is difficult to uncover any major differential gender impacts of trade reforms. This obviously does not rule out that some smaller, more specific groups of poorer women may loose out following reforms, but our results are encouraging in the sense that trade policy reform does appear to benefit women as much as men at the aggregation level applied here. Future research would be required to establish in more detail the implications for intra-household resource allocations.

7. References

- Armington, Paul S. (1969) "The Geographic Pattern of Trade and the Effects of Price Changes." *International Monetary Fund Staff Papers*, 16(2): 179-201
- Arndt, Channing (2003). "HIV/AIDS, Human Capital, and Economic Prospects for Mozambique." World Bank, Africa Region Working Paper Series No. 48.
- Arndt, Channing, Henning Tarp Jensen, Sherman Robinson and Finn Tarp (2000). "Agricultural Technology and Marketing Margins in Mozambique." *Journal of Development Studies*, 37(1):121-137.
- Arndt, C., S. Robinson, and F. Tarp. "Parameter Estimation for a Computable General Equilibrium Model: A Maximum Entropy Approach." *Economic Modelling*. 19(2002): 375-398.
- Arndt, Channing and Finn Tarp (2000). "Agricultural Technology, Risk, and Gender: A CGE Analysis for Mozambique." *World Development*, 28(7):1307-1326.
- Bach, Christian, Will Martin and Jennifer A. Stevens (1996). "China and the WTO: Tariff Offers, Exemptions, and Welfare Implications." *Weltwirtschaftliches Archiv*, 132(3): 409-31.
- Bell, Emma (2003). "Gender and PRSPs: With Experiences from Tanzania, Bolivia, Viet Nam and Mozambique." Institute of Development Studies, UK.
- Devarajan, Shantayanan, Jeffrey D. Lewis and Sherman Robinson (1990). "Policy Lessons from Trade-Focused, Two-Sector Models." *Journal of Policy Modeling*. Vol. 12, pp. 625-657.
- Elbehri, Aziz and Ken Pearson (2000). "Implementing Bilateral Tariff Rate Quotas in GTAP using GEMPACK." Global Trade Analysis Project Technical Paper No. 18.
- Fontana, Marzia (2003). "Modeling the Effects of Trade on Women, at Work and at Home: A Comparative Perspective." International Food Policy Research Institute, Trade and Macroeconomics Division Discussion Paper 110.

- Fontana, Marzia and Adrian Wood. "Modeling the Effects of Trade on Women, at Work and at Home." *World Development*. 28(7): 1173-90.
- Jensen, Henning T. and Finn Tarp (2002). "CGE Modelling and Trade Policy: Reassessing the Agricultural Bias." *Journal of Agricultural Economics*, 53(2): 383-405.
- Krueger, Anne O. (1974). "The Political Economy of the Rent-Seeking Society." *American Economic Review*, 64(3): 291-303.
- Löfgren, Hans, Rebecca L. Harris, and Sherman Robinson (2001). "A Standard Computable General Equilibrium (CGE) Model in GAMS." Trade and Macroeconomics Discussion Paper no. 75, International Food Policy Research Institute, Washington, DC, USA.
- Macamo, Jose Luis (1998). "Estimates of Unrecorded Cross-Border Trade Between Mozambique and Her Neighbors: Implications for Food Security." Final Report for Technoserve, Inc. Nairobi, Kenya.
- McDougall, Robert and Betina Dimaranan (2002). *V5 Documentation*. Center for Global Trade Analysis, Purdue.
- McKibbin, Warwick J (1992). "Short-Run Implications of Long-Run Shocks: Lessons from the 1980s and 1990s." in *Macroeconomic modelling of the long-run.*" Hargreaves, Colin P., ed. Aldershot, U.K.
- Ministry of Education (MINED) (2001). Data on enrollments in electronic form. Maputo.
- National Institute of Statistics (2000). *Contas Nacionais: 1999*. Maputo.
- National Institute of Statistics (2001). *Questionário de Indicadores Básicos de Bem-Estar*. Maputo.
- Pritchett, Lant and Geeta Sethi (1994). "Tariff Rates, Tariff Revenue, and Tariff Reform: Some New Facts." *World Bank Economic Review*, 8(1): 1-16.

- Robinson, Sherman and Karen Thierfelder (1999). "Note on Taxes, Prices, Wages, and Welfare in General Equilibrium Models." Trade and Macroeconomics Discussion Paper no. 39, International Food Policy Research Institute, Washington, DC, USA.
- Sen, A. K. (1963) "Neo-classical and neo-Keynesian theories of distribution." *Economic Record*, 39: 53-66.
- Tarp, Finn, Channing Arndt, Henning T. Jensen, Sherman Robinson and Rasmus Heltberg (2002). *Facing the Development Challenge in Mozambique: An Economy-wide Perspective*. IFPRI Research Report No. 126, Washington, D.C.
- Tsikata, Y. M. (1999). "Southern Africa: Trade, Liberalization, and Implications for a Free Trade Area." Trade and Industrial Policy Secretariat (TIPS) Annual Forum.
- UNDP (2002). "Mozambique: Gender, Women and Human Development: An Agenda for the Future." National Human Development Report 2001. Maputo.

Working Papers

Fødevareøkonomisk Institut

07/03	September 2003	Channing Arndt and Finn Tarp	Trade Policy Reform and the Missing Revenue: A Gendered Analysis for Mozambique
06/03	September 2003	Henning Porskrog, Mona Kristoffersen, Karsten Larsen and Ole Olsen	SGM-calculation of cost in Denmark
05/03	Juli 2003	Max Nielsen	Beregningsgrundlag for prisudviklingen for uforarbejdet fisk i Danmark: Arbejdsrapport til Fiske-riets Økonomi 2003
04/03	June 2003	Wusheng Yu and Trine Vig Jensen	Tariff Preferences, WTO Negotiations and the LDCs The case of the "Everything But Arms" Initiative
03/03	Maj 2003	Henning Tarp Jensen and Finn Tarp	Trade Liberalisation and Spatial Inequality: Methodological Innovations in Vietnamese Perspective
02/03	Maj 2003	Peter Vig Jensen	Sammenligning af udvalgte svenske og danske landbrugsbedrifter
01/03	Maj 2003	Hans G. Jensen and Søren E. Frandsen	Implications of EU Accession of Ten New Members The Copenhagen Agreement
19/02	December 2002	Janus Søndergaard og Mogens Lund	HACCP i den danske ægsektor
18/02	December 2002	Jesper L. Andersen	Reasons for Technical Inefficiency of Danish Baltic Sea Trawlers
17/02	December 2002	Jørgen Dejgaard Jensen og Lene Toftkær	En økonometrisk model for føde- vareefterspørgslen i Danmark

16/02	November 2002	Lars-Bo Jacobsen	Konstruktion af en økologispecifik input-output database for dansk økonomi
15/02	November 2002	Wusheng Yu and Søren E. Frandsen	China's WTO Commitments in Agriculture: Does the Impact Depend on OECD Agricultural Policies?
14/02	September 2002	Ayoe Hoff	The Translog Approximation of the Constant Elasticity of Substitution Production Function with more than two Input Variables
13/02	September 2002	Erik Lindebo	The Groundfish Fishery of Georges Bank An Examination of Management and Overcapacity Issues
12/02	September 2002	Martin Wegge og Jørgen Dejgaard Jensen	Oversigt over eksisterende empiriske studier af fødevareefterspørgslen
11/02	August 2002	Kenneth Baltzer	Efterspørgslen efter fødevarer kvalitet og -sikkerhed: Et pilot-studie af danske forbrugeres efterspørgsel efter æg
10/02	August 2002	Jesper Levring Andersen	Using different inputs and outputs to estimate technical efficiency in fisheries. An application to Danish Seiners in the North Sea and Skagerrak
9/02	Juni 2002	Steffen Møllenberg	Jordbrugsbedrifternes økonomi i EU – Analyser på regnskabsdata
8/02	Maj 2002	Chantal Pohl Nielsen	Vietnam's Rice Policy: Recent Reforms and Future Opportunities
7/02	Maj 2002	Jesper Graversen og Morten Gylling	Energiafgrøder til fastbrændselsformål – produktionsøkonomi, håndteringsomkostninger og leveringsplaner

6/02	April 2002	Red. Søren Marcus Pedersen, Jørgen Lindgaard Pedersen og Morten Gylling	Perspektiverne for præcisions-jordbrug
5/02	Februar 2002	Wusheng Yu	Projecting World Food Demand using Alternative Demand Systems
4/02	Februar 2002	Jørgen D. Jensen	Fødevarer-kvalitet og –sikkerhed Centrale begreber og deres operationalisering
3/02	Januar 2002	Jesper Andersen, Hans Frost og Jørgen Løkkegaard	Prognose for fiskeriets indtjening 2002
2/02	Januar 2002	Christian Bjørnskov and Kim Martin Lind	Where Do Developing Countries Go After Doha? An analysis of WTO positions and potential alliances
1/02	Januar 2002	Michael Friis Jensen	Reviewing the SPS Agreement: A Developing Country Perspective