Efficiency and Equity Gains from Trade Policy Reform: Accounting for Marginal and Average Tariff Rates in A Gendered CGE Analysis for Mozambique[1]

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Abstract: In this paper, we identify potential efficiency and equity gains from trade policy reforms aimed at unifying *de jure* and *de facto* trade policy in Mozambique. Particular attention is paid 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 used to benefit from existing rents. 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. Nevertheless, our results do indicate that growth in factor incomes following the implementation of reforms is favorable to women.

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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 slightly less than 40% of the level implied by *de jure* tariff rates and estimated import volumes. Mozambique is not alone in this respect. For example, Tsikata (1999) found large discrepancies when comparing revenues implied by published tariff and estimated import volumes with actual receipts for Tanzania. 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 (unguarded 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, 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 discusses CGE models in general and presents the modifications to the CGE model necessary to add 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.[2] 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 rents 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 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.[3] Some simply passes straight through in trucks with very minor to no increment in transport costs relative to official imports. Even when dissembled 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.

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

[3] Given the underdeveloped state and characteristics of the existing transport infrastructure, this is not really surprising.

Based on the above information set, we maintain the hypothesis that, in the aggregate, rents dominate the value of tariffs avoided. In addition, in the context of the gender perspective employed in this paper, it is worth noting that, according to Macamo, individuals engaged in unrecorded cross border trade tend overwhelmingly to be men. Hence, the rents derived from unrecorded trade appear to accrue primarily to men, at least in a first order sense.

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.[4] 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.[5] 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.

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 raise the specter of revenue neutral trade policy reform. In principle, the revenue-reducing effects of lower rates could be offset by their application to a broader base through elimination of official exemptions and reductions in incentives to smuggle. Under these circumstances, the allocative efficiencies of trade liberalization are realized "at limited cost" since marginal or published tariff rates define domestic prices while

[4] The SAM can be obtained from the authors on request.

[5] 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 and Martin (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.

government revenue remains the same. The primary losers are individuals with the ability to import duty free (or 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 economy with an extremely thin human capital base. Consistent with available data, the human capital base among women is particularly thin.[6]

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 activities undertaken by women with about 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 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. In order 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

[6] More detail on gender issues can be found in UNDP (2002).

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.

3.1 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.

3.1.1 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.

3.1.2 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.

3.1.3 Exports and Imports

As in most models with foreign trade, exports and imports receive special treatment.[7] 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.

3.1.4 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

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[7] 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.

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 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.

3.2 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-Douglass preferences by consumers. The government implicitly maximizes a Cobb-Douglass 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 involves detailed accounting for marketing margins in the same manner as described in Arndt, Jensen, Robinson, and Tarp (2000) and Jensen and Tarp (2002). Also nonstandard, but performed previously (see for example Arndt and Tarp, 2000), 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. 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 (as is the case elsewhere in Africa at least). 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.

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 (see McDougall and Dimaran, 2002). On the other hand, a series of studies of southern African economies conducted by the International Food Policy Research Institute under the MERRISA project 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. Conceptually, the issue can 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 a rent or 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 value of imports augmented by the full amount of tariff revenue implied by published rates. As mentioned above, available evidence indicates that rents comprise the large majority of the value of tariffs avoided while increased real resource costs, such as transport costs, are relatively minor. To simplify the modeling, the value of tariffs avoided is assumed to be comprised purely of rent (zero incremental real resource costs) in the model.[8] Urban households are presumed to receive 100% of this

[8] If real resource outlays to avoid tariffs are indeed a relatively small share of the value of tariffs avoided, then this simplification is harmless. The other case, involving significant real resource outlays to

rent. The value of commodity consumption by urban households is then increased commensurately in order to maintain a balanced system of accounts.

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 is different, however. Taking 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 enter 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 transferred directly to urban households. In sum, exemptions are modeled by generating the full value of revenue from posted (marginal) tariff rates; then, governed by the information on the share not paying duty from Table 1, this amount is split with, in the base, actual tariff revenue sent to government as revenue and the remainder, tariff revenue avoided, appearing as income (rents) to urban households.

4 Simulations and Results

4.1 Simulations

Table 5 illustrates the simulations undertaken with the model. In the first, labeled "All Product 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). 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 single level that maintains revenue neutrality with respect to all indirect taxes.[9] The share of products imported duty free remains constant. 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.

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 indirect tax revenue was targeted since those taxes (less output subsidies) represented 75% of government revenue in 1997. In addition, these are the taxes that interfere with the price system. 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 this revenue closure, wages remain an acceptable welfare

chase rents, has been examined in the seminal paper by Krueger (1974) among others.

[9] 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.

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 considers 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 in what follows. Then the implications of adding a gender dimension to the model are assessed.

4.2 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 approximately 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 16% (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 19 percentage points. The net effect is a 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 seven percent tariff rate. This involves a substantial tariff rate cut for each of the commodity aggregates, and trade expands the most in this scenario.[10] 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. Real GDP changes little in all scenarios; however, aggregate absorption – the best available measure of economy-wide welfare – increases in all 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 fairly considerably when protection is removed. Increases in production are observed in Finance and Insurance. Import penetration in this sector 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 provided below.

Table 8 provides information on factor prices. In all scenarios, all wages and rental rates increase relative to the base. The increases are fairly substantial in the third scenario at about 3.2% to 3.5% for all factors. 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. For example, the producer price index rises by 2.4% in scenario three ("Both"). So, from the producer perspective, factor prices increase by only about 1% relative to producer sales prices.

[10] 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.

Second, the rents that accrue from importing duty-free, when published tariff rates are positive, function in a manner exactly analogous to a tariff. Indeed, having the government collect all tariff revenue and then immediately and without cost reimburse a share of the total tariff payments back to those relatively few individuals with the right to import duty-free represents a conceptually equivalent situation to the one considered here. In a macroeconomic sense, the rents from duty-free importation function like a tariff (an indirect tax) that is later reimbursed (a direct transfer) to selected individuals. 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:

$$C + I + G + (X - M) = GDP = GDPfc + IT$$

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

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

where E_i represents the quantity of each factor employed, w_i represents the wage for each factor, TR^o represents official tariff revenue, TR^r represents rents from avoidance of posted tariffs, and IT^o 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^o + IT^o is held constant. The remaining term represents the rents from tariffs avoided, TR^r. In scenarios one and three, this value is reduced from about 3.6% of GDP at factor cost to zero. If nominal GDP remained constant and TR^r were the only source of indirect tax revenue, average wages would have to increase by 3.6%. In the event, nominal (CPI deflated) GDP declines slightly 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 3.4%, which is the value one obtains from Table 8.

This effect often leads to the erroneous conclusion that trade liberalization increases wages (Robinson and Thierfelder, 1999) and hence increases household and economy-wide welfare. 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, wages 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 usually on the order of one percent). The decline in urban household welfare is attributable entirely to the disappearance of rents, which formerly accounted for nearly eight percent 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 in excess of three percent.[11]

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 3.2 to 3.5 percent. When factors 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.

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, once again,

[11] 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 meet 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 sectoral production effects.

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 3.4%, a significant increment.

5 Conclusions

The aim of this paper was to conduct a trade policy analysis where specific attention is 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 demonstrated how the basic analytical CGE-machinery for modelling tariff rate quotas (TRQ) can in fact be applied to address this issue.

Our results are unsurprising in the sense that in the non-gendered aggregate framework, there are possibilities for increasing both efficiency and equity. Losers from trade reforms include urban households, who used to benefit 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 to those urban households, who did not manage to absorb rents in the past. Similarly, 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 three where a flat tariff rate is applied and all duty-free importation ceases, rural household welfare as measured by equivalent variation increases by about 2,5% 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 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 they cannot be identified within the present analytical framework.

Finally, it does appear to us that the tariff rate reforms experimented with in this paper deserve attention by policymakers. The value added taxes in South Africa are around 15%, which can be reimbursed at the border. If Mozambique were to introduce a flat tariff rate of 10%, and coordination with South Africa were possible so Mozambican tariff collection were linked to the South African VAT pay-back, importers would end up having an incentive in the order of 5% to declare imports rather than an incentive to smuggle. In sum, efficiency and equity enhancing trade policy initiatives exist, which can at the same time ensure public revenue remains unaffected. They should certainly be considered actively from a practical policy point of view.

Table 1: Import values, tariff rates, and tariff revenues for 1997 (in billions of meticais).

Sector	Import Value	Tariff Rate	Implied Tariff Revenue	Actual Tariff Revenue	Implied Share Exempt
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.
Note: In 1997, there were approximately 11,406 Mt/USD.

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

	Female	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

Sources: Arndt (2003); 1997 census data; 1997 national accounts data; and authors' calculations.

Table 3: Employment row shares (in %).

	Female	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 %).

	Female	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%

Table 5: Simulations.

Label	Description
Base	Base data in billions of meticais.
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.

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

	Base Share	All products pay	Flat tariff rates	Both
Exchange Rate	1.00	6.5%	2.0%	6.5%
Real GDP	41,037	0.1%	0.1%	0.1%
Total Absorption	48,833	0.7%	0.8%	1.0%
Imports	11,831	1.7%	0.1%	1.5%
Exports	4,083	5.0%	0.2%	4.4%
Investment	8,173	4.3%	-0.5%	3.4%
Tariff Rate Expansion Factor[1]	1.00	0.34	0.16	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 interpretation of the tariff rate expansion 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: Real value added by sector.

	Base Share	Base Level	All products pay	Flat tariff rates	Both
Primary Ag. Crops	27.4%	9963	-0.42%	0.79%	0.02%
Primary Ag. Livestock	2.2%	795	-2.06%	0.33%	-1.57%
Forestry and Firewood	3.2%	1156	0.35%	0.22%	0.40%
Extraction	4.3%	1570	2.25%	0.47%	2.14%
Food Processing	3.3%	1198	-1.39%	-1.10%	-1.70%
Beverages and Tobacco	0.9%	313	-5.48%	-3.08%	-6.10%
Primary Product Processing	2.2%	802	-2.38%	-2.83%	-3.35%
Chemicals	0.6%	231	-1.76%	0.19%	-1.41%
Other Manufactures	1.1%	410	0.65%	0.39%	0.74%
Other Services	8.3%	3018	-1.25%	-0.50%	-1.30%
Construction	6.5%	2375	3.45%	-0.32%	2.79%
Commerce	20.1%	7337	-0.18%	-0.21%	-0.25%
Transport and Communication	8.9%	3236	-0.13%	-0.30%	-0.25%
Insurance and Finance	4.6%	1682	3.11%	0.07%	2.67%
Public Administration and Def.	2.8%	1007	-0.04%	-0.02%	-0.04%
Education	1.6%	601	-0.86%	-0.25%	-0.85%
Health	0.5%	179	-0.64%	-0.18%	-0.63%
Labor Intensive Services	1.5%	550	-0.01%	-0.01%	-0.01%

Table 8: Real (CPI deflated) wages.

	Base	All products pay	Flat tariff rates	Both
Unskilled Ag Labor	1.63	2.43%	2.90%	3.44%
Skilled Ag Labor	2.66	2.36%	3.01%	3.43%
Unskilled Non-Ag Labor	6.99	3.09%	1.19%	3.19%
Skilled Non-Ag Labor	23.96	3.58%	0.92%	3.47%
Highly Skilled Non-Ag Labor	57.03	3.58%	0.92%	3.47%
Capital	0.15	3.29%	1.58%	3.54%

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

	Base	All products pay	Flat tariff rates	Both
Urban	16,319	-4.77%	-1.28%	-4.67%
Rural	20,231	2.22%	1.29%	2.49%

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

	Base	All products pay	Flat tariff rates	Both
Urban	16,334	-4.81%	-1.25%	-4.69%
Rural	20,241	2.25%	1.28%	2.51%

Table 11: Returns to male and female labor.

	Base	All products pay	Flat tariff rates	Both
Female	9,599	2.84%	2.08%	3.40%
Male	15,588	3.11%	1.55%	3.37%

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