

RESEARCH REPORT

A Household Level Analysis of African Trade Liberalization on Mozambique

Vunrability of Low Income Households

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Introduction

A number of studies have identified differing impacts on developing countries, both positive and negative, resulting from trade liberalization (Hertel, Preckel, and Reimer, 2001; Vanzetti D. 1998; Winters A, McCulloch and McKay 2004). Identifying and anticipating these trade liberalization impacts, especially on poor households is important for policy formulation and planning pro-poor, sustainable growth. The objective of this paper is to identify the impacts on poor households of developing countries own trade liberalization on income, consumption. Specifically, we evaluate the potential impacts of trade liberalization on Mozambique resulting from a proposed tripartite free trade area (TFTA) and eventually a continental wide customs union (CCU). This research compliments analysis of these trade agreements by Melvel and Karingi (2012), and Jensen and Sandray (2011), which focused on "regional" or "national" income impacts resulting from regional integration in Africa. In contrast, this paper focuses on the potential impacts these trade agreements might have on poor, urban and rural, households in an effort to enlighten pro-poor growth policies and strategies. The focus here is on vulnerability of poor households, not on trade policy itself: trade policy is taken as given with some basic assumptions outlined in the following sections¹. Our analysis is limited to a selected country in Southern Africa, as an illustration of the importance of including pro-poor growth strategies into trade negotiations and complimentary national policies. The methodology can be expanded to include detailed household breakdowns for any number of countries in the GTAP database, provided data is available².

In the following sections, we outline our methodology, present a summary of the tariff cuts applied, the impacts on trade, output and in a separate section we detail the impacts of these tariff cuts on households in Mozambique. Although the focus of our analysis is on household income, consumption and employment, we also presents impacts on government revenue and prices of government expenditure since government budgets play an important role in how poor households might ultimately be impacted.

¹ We employ many of the trade liberalization assumptions set out in earlier papers in an effort to make results comparable.

² Readers are cautioned to not make generalized conclusions based on the selected country, since household impacts will be critically dependant on specific consumption and income flows as determined by household surveys.

Methodology

Trade agreements such as a Continental Free Trade Area (CFTA) or a Continental Customs Union require a methodology which can account for changes in tariffs across a broad spectrum of products, for both imports and exports. Changes in product prices or output in any one product can have impacts on employment, wages and output in other industries, government revenue and expenditures, underscoring the importance of capturing significant linkages between products and markets. For this reason, computable general equilibrium models (CGE) are well suited to the analysis of trade agreements. CGE models emphasize the linkages between product and factor markets on prices and output through detailed input-output linkages and equations which model macro-economic linkages such as investment and savings. A change in prices in one market can be linked to changes in other markets. Several types of CGE models are employed for this purpose: some are dynamic, emphasizing the impacts of investment and year-on-year growth rates in industry and trade (based on projections); others are static modeling investment purchases, but not the impacts of investment on productive capacity growth over time.

The objective of this paper is to highlight the impacts of trade agreements on poor households. Since investment and year-over-year growth rates are not a significant part of our analysis, we employ a static CGE model, augmented to include extra details on household's consumption and income. Household consumption is impacted by trade agreements through product prices; lower import taxes will likely result in lower market prices for the goods most impacted by lower tariffs and consumers will benefit as their real incomes increase *ceterus parabus*. Households incomes are impacted when output and prices for domestically produced goods increase or decrease. Increased production would suggest that prices are higher and rates of return and employment in those industries are increasing (barring an increase in productivity). Capturing these consumption and income effects are crucial to gaining insights of how trade agreements might impact poor households.

Many of the commonly employed global CGE models in use today include a "regional household" structure which not only reduces the private household down to a single entity, but they often obscure the linkages between household incomes and expenditures by aggregating the private household with government and investment activities under a "regional household". The standard GTAP model is the most popular example of this structure (Hertel 1997). Other models often follow suit. The combined regional household has many advantages for global model over a more detailed household structure in relation to the data required to calibrate the model-often data on domestic households, income and taxes are not often readily available on a global basis and they lack uniformity.

We therefore employ the newly released MyGTAP (2012a) data program and GTAPMy(2012b) model which allow for the deconstruction of the GTAP regional household into individual households and separates government expenditure and income from

households activities. These modules and the data used to employ them are reviewed in the following sections.

GTAPMy Model

The GTAPMy model is described in Walmsley and Minor (2012b) and is briefly described here. The basis of the GTAPMy model is the standard, static, GTAP model widely used in international analysis of tariffs and trade agreements (Hertel 1997). As mentioned earlier, the standard GTAP model features a regional household, which combines all incomes from taxes and factors of production (land, labor, capital) and then distributes this income, based on shares, to the private household, government and investment. The benefit of this structure is that a precise specification of taxes and factor incomes is not required-incomes from all sources are combined, then split. So, while a user may have good information on the structure of consumption, they will not require detailed data to establish income and these data can be obtained from broad national accounts.

Our analysis not only requires that the private household be split into multiple households (poor and non-poor), but it also requires specification of factor incomes that are directly linked to specific households. As mentioned earlier, how a particular household is impacted by trade reforms will be determined by the gains (losses) in factor incomes in contrast to changes in consumption prices.

The GTAPMy model includes this specification. By removing the regional household and including direct linkages between taxes and government expenditure as wells as factor incomes and expenditure, greater focus can be put on the distributional impacts of trade agreements.

The standard GTAP model includes a non-standard constant difference of elasticity (CDE) expenditure function. The advantages of a CDE function is that it models well a variety of consumption patterns found at differing income levels. That is to say it generates classical "Engels" curves which are characterized by shifting consumption between necessities and luxury goods. While the CDE provides a good basis for modeling private consumption across a broad range of households and countries, it is not ideal for molding extreme situations, where poverty and subsistence expenditures are dominant. Subsistence expenditures are defined as a share of expenditure being tied to a specific consumption bundle, which must be consumed no matter what changes in prices and incomes may arise in the simulation. This structure has been employed by modelers , most frequently in the form of a Linear Expenditure System (LES) or Stone-Geary demand structure (see Crusoe, Stone, etc.).

The GTAPMy model allows a user to specify which private household demand structure to employ. In this paper, we employ the LES function for Mozambique and other poor countries

and regions and the CDE for middle income and rich countries. Thereby gaining the benefits of both structures where they are best employed.

The GTAPMy framework also has the benefit of allowing the user to specify multiple households in any number of regions while leaving un-split (regional) households in other regions not of detailed interest, thereby reducing the data requirements for employing a globally based model, with varied household structures across regions.

Finally, the GTAPMy structure allows the user to specify unique factors of production. The standard GTAP model and database include 5 standard factors of production, land, skilled and unskilled labor, capital and natural resources. In the analysis that follows, we split the standard GTAP factors of production into eight factors of production, land, four types of labor, two types of capital and natural resources. The splitting of factors of production allows for greater specificity in the sources of household incomes and can improve analysis of sector - income linkages which are of interest in trade policy analysis.

Since the standard GTAP database includes only a single, regional household, and the standard factors of production, we augment the standard GTAP database employing the MyGTAP data program and the standard GTAP database version 8a, calibrated to 2007 global trade and production.

MODEL CLOSURE

The standard GTAP model assumes full employment of endowment commodities (land, labor, capital), perfect competition (zero economic profits), mobile factors (except land which moves sluggishly between uses), a flexible trade balance and mobile capital between regions (which responds to variations in rates of return on capital). We make several changes to the standard GTAP closure:

- Unemployment of labor in the rest of Africa;
- Unemployment of uneducated labor, partial primary and secondary school labor, and full employment of labor with at least some tertiary education;
- Fixed trade balance relative to regional income;
- Fixed proportion of capital investment as a ratio to total global investment.

The assumption of unemployment in the rest of Africa recognizes the high unemployment levels in Africa. Our aggregation of the GTAP data combines all labor into one category (skilled and unskilled are combined into "labor), so we are unable to provide a refined specification which recognizes the likely full employment of skilled labor in Africa.

Fixing the trade balance to regional income assures that Mozambique will not run any trade deficits (surpluses) beyond what they already maintain in the base database.

Finally, we assume the investment is a fixed proportion of global investment³. This assumption stands in contrast to the standard GTAP model, which includes investment equations which are largely driven by rates of return and a parameter called "RORFLEX". Although the GTAP investment equations are sophisticated and can provide insights, the equations are dependent on the value of RORFLEX, for which there is no known empirical estimate. In truth, investment is a variable which is not well represented in the static GTAP model, except in a theoretical sense. We therefore leave investment as a fixed proportion of global savings and investment. In Appendix D, we explore the sensitivity of the results to two different investment assumptions: activating the GTAP investment equations to ascertain any insights they may suggest; we explore a long run closure to capital markets, sometimes referred to as the Baldwin approach as outlined in (Walmsley and Francois XXX).

A final alternative closure explored is a tax replacement scenario, which assumes that any lost government tax revenue is "replaced" by a consumption tax on all households. This last alternative closure is stylized, since there are numerous methods for raising tax revenue and it is beyond the scope of this paper to explore more than an illustration in this regard.

GTAP Database

The data employed in this study are as provided in the GTAP database version 8a. The GTAP database includes data from input-output tables, macro, tariff and trade database for 129 countries and regions. The data are calibrated to 2007. While it is possible to "project" the GTAP database to more recent years, applying data on factor growth rates and productivity, we do not employ this method in this paper. The standard GTAP database includes data sufficient to derive gross domestic product (GDP). The MyGTAP data program also includes data on foreign aid, remittances and foreign income flows, which can be used to derive gross national product (GNP) a better measure of national income for national consumption. However, after considering the inclusion of the MyGTAP data, we opted to not apply it in this paper. Mozambique has substantial net outflows of foreign income (most related to the MOZAL aluminum smelter). In the standard GTAP database, it would appear that these data were included in factor incomes for capital, but high direct tax rates on capital factor income remove this outflow from household consumption and allocate it to government income in the form of taxes. This results in a high savings rate for the government of Mozambique. This simply allocates that foreign income to national savings which are then allocated to the global bank in GTAP. Inserting further accounting to separate out these flows would require even more data on taxes and would provide few benefits in terms of insights in our case, so we omit these data from our analysis.

For the purposes of this study, we aggregate the 129 countries\regions to twenty-one regions and countries. Table 1 summarizes the countries and regions we employ and appendix A

³ In GTAP, this is the same as setting RORDELTA = 0.

details the countries and regions as specified in the GTAP database. Our aggregation includes most African countries in the GTAP database with several large players in world trade.

Table 1
Countries and Regions GTAP V8a Database

Country\Region	Country\Region
N. America	Kenya
EU-25	Madagascar
Rest of World	Malawi
China	Mauritius
Brazil	Mozambique
North Africa n.e.c.	Tanzania
West Africa	Uganda
Central Africa n.e.c.	Zambia
Central Africa	Zimbabwe
Ethiopia	East Africa n.e.c.

Source: See appendix A for more details.

The GTAP database includes 57 sectors and 5 factor endowments. Our focus is on poor households in Mozambique, and most poor households are in rural areas or have farming as a major income source. Also, the largest share of subsistence income is food (approximately 75 percent) in Mozambique. For these reasons, we aggregate many manufactured commodities, while providing less aggregation for agricultural and food commodities. Table 2 provides a summary of our commodity aggregation.

Table 2
Sector Aggregations of the GTAP Database

Sector	Sector
Rice (paddy and processed)	Fishing
Wheat	Coal, oil, gas
Maize and cereals	Bovine, sheep, goat meat
Plant fibers and crops n.e.c.	Vegetable oils and fats
Vegetables, fruit and nuts	Dairy products
Oil seeds	Sugar (processed)
Cane and beet sugar	Textile, apparel, leather
Cattle, sheep and goats	Manufactures
Animal products n.e.c.	Minerals and metals
Forestry	Services
Transport and trade margins	

Source: Author's aggregation..

The GTAP database includes five main factors of production, land, unskilled and skilled labor, capital and natural resources. The split between skilled and unskilled labor in the GTAP database is determined by using a regression estimate for a given country. As will be seen in the following section, we employ a household survey for Mozambique which includes detailed information on the education of labor. We, therefore, aggregate labor up to one labor category and then split labor into four labor categories employing the MyGTAP data application, with the splits derived from the Mozambique household survey-not the standard regression estimates.

The factor employed in our analysis are listed in Table 3.

Table 3
Factor Splits Employed

Split\GTAP Factors	GTAP Database Factors
Land	Land
Natural resources	Natural Resources
Agricultural capital (split)	Capital
Non-Agricultural capital (split)	Capital
Labor - no education (split)	Labor (skilled and unskilled)
Labor - some primary education (split)	Labor (skilled and unskilled)
Labor -some secondary education (split)	Labor (skilled and unskilled)
Labor-some tertiary education (split)	Labor (skilled and unskilled)

Source: Author's analysis.

Tariff Data

Trade agreements such as a tripartite free trade area or a continental customs union are negotiated in relation to detailed tariff lines - usually the harmonized six digit level or more detailed. The GTAP database specifies tariffs at the GTAP 57 commodity\sector level. In order to specify tariff cutting formulas and sensitive products for exclusion, a detailed database is required. The CEPII research institute and the United Nations Trade and Development (UNCTAD) have developed the MacMap database for this purpose⁴. The MacMap database specifies tariffs at the harmonized tariff system six digit level, the most detailed tariff description common across countries. The MacMap data set is largely consistent with the GTAP database, although some differences exist⁵.

⁴ <http://www.cepii.fr/anglaisgraph/bdd/macmap.htm>.

⁵ Differences arise from the fact that the GTAP database algorithms leverage the higher level of aggregation required for the GTAP database to improve on aggregated tariff estimates. Bilateral trade flows at the HS-6 level can be inaccurate leading to faulty trade weights being employed in aggregation. The GTAP database uses unique trade flow values derived from their own programs to trade weight average tariffs.

MacMap tariff data include both *ad valorem* tariffs and *ad valorem* equivalents of specific duties. It is assumed that when we discuss tariffs, we mean both types of duties when combined.

We create three distinct sets of tariff cuts:

1. Cuts to complete existing regional free trade agreements such as the SADC, COMESA and EAC free trade protocols;
2. Cuts to implement the tripartite free trade area in Africa;
3. Changes (raising or lowering tariffs) to implement an Africa wide customs union (requires a common external tariff or CET).

In each case we assume that the agreements include provision for sensitive products, resulting in less complete tariff elimination or reductions. Sensitive product lists exist for some of the agreements discussed here, but in some cases they are incomplete or are not yet in the public domain. We therefore employ a standard formula for defining sensitive products in accordance with the formula specified by Jean, Labourde and Martin (2008). The formula is based on the concept of defining products which result in the highest tariff revenues for a country. The combination of the tariff rate and the volume of trade are usually reasonable predictors of sensitive products.

In each case we define 5 percent of products to be sensitive. In the case of SADC, although the stated goal is to achieve zero duties, many tariffs still exist, as is the case with Mozambique, Zambia and Zimbabwe⁶. We therefore consider these free trade areas to be incomplete and apply the 5 percent rule.

In many cases, implementation of the trade protocols are largely complete, with few exceptions, such as the case of SACU in SADC (that is for SACU imports from SADC) and in selected cases for the EAC and COMESA. Our sensitive product methodology does not raise tariffs beyond their base line 2007 level, it only exempts them from further cuts⁷. So, if a country had implemented a trade agreement completely by 2007, with zero duties on all products eliminated, the sensitive product formula will have no impact.

Household Data

Our methodology requires that the single regional household in the standard GTAP database be split into multiple households for analysis of distributional impacts. Mozambique has conducted several household surveys for the purposes of monitoring changes in poverty rates

⁶ Sensitive product lists are available from the authors.

⁷ At the time analysis was being conducted, the WITS database included a variety of updated tariffs for African countries; however, the years covered varied greatly from country to country. Mozambique's tariff data was updated to 2009, but was employing the revised HS commodity system released in 2008. Due the significant effort involved in incorporating this data, to gain only two years of tariff revisions, we elected to employ the sensitive product method used for all other African countries.

in the country. The most recent survey, Household Budget Survey 2008/2009 (IOF 2008/2009), includes detailed expenditure and income data for over 10,000 households, including poor, non-poor, urban and rural areas. The survey data can be projected to a representation of national data employing household weights estimated by the Instituto Nacional de Estatística, providing a comprehensive national view.

The survey data from the IOF 2008/2009 has been cleaned and incorporated into the World Bank Africa Region Poverty Program for Harmonized Household Surveys (SHIP). The details of the SHIP database and structure can be found in the Reference Manual (World Bank 2011) and Stata programs establishing the database. The SHIP database provides many advantages over accessing the raw data. Data fields have been harmonized and categories of expenditures and incomes are translated (from the national language) from the original database by researchers familiar with the survey. The SHIP database includes categorizations of households as rural and urban, as well as classification of households by expenditure quintiles within rural and urban areas. National weights are provided to scale households representation in national data.

While the SHIP data provided an excellent starting point for our classification and household descriptions, household survey data is well known to include errors and omissions due to the vast undertaking of carrying out a national survey; the database, therefore, was subject to further analysis, cleaning and eventual augmentation. Initial summaries of expenditures across all product and services categories revealed several aberrant values which required correction⁸. We therefore trimmed the household data, removing the upper and lower 2% of observations in each quintile.

Comparisons of household income and expenditure were analyzed and compared to measures of wealth included in the survey - this analysis revealed inconsistencies between measures of wealth and expenditures\incomes, especially in regards to rural households, where expenditure data revealed a low correlation to measures of wealth. Data for urban households had much higher correlations between measures of wealth, expenditure and income. Generally it is found in household surveys that measures of expenditure are more complete and accurate than measures of income - this result holds for urban households in the Mozambique data, but, once again, does not hold for rural households. The results we found in the Mozambique SHIP data have been confirmed by World Bank staff (Alfani *et. al.* 2012) and have been attributed to poor survey implementation. Alfani *et. al.* find there is reason to believe expenditure data is systematically under reported in Urban households, due to survey limitations. They also find that some of the food price indexes employed to adjust rural and regional consumption may have led to an overstatement of food consumption in certain households at the regional level. Alfani *et. al.* report that the Mozambique data are more reliable at the national level, but still undertake adjustments to the data based on earlier

⁸ For example, education spending in some households were 90% of household consumption with no food expenditures.

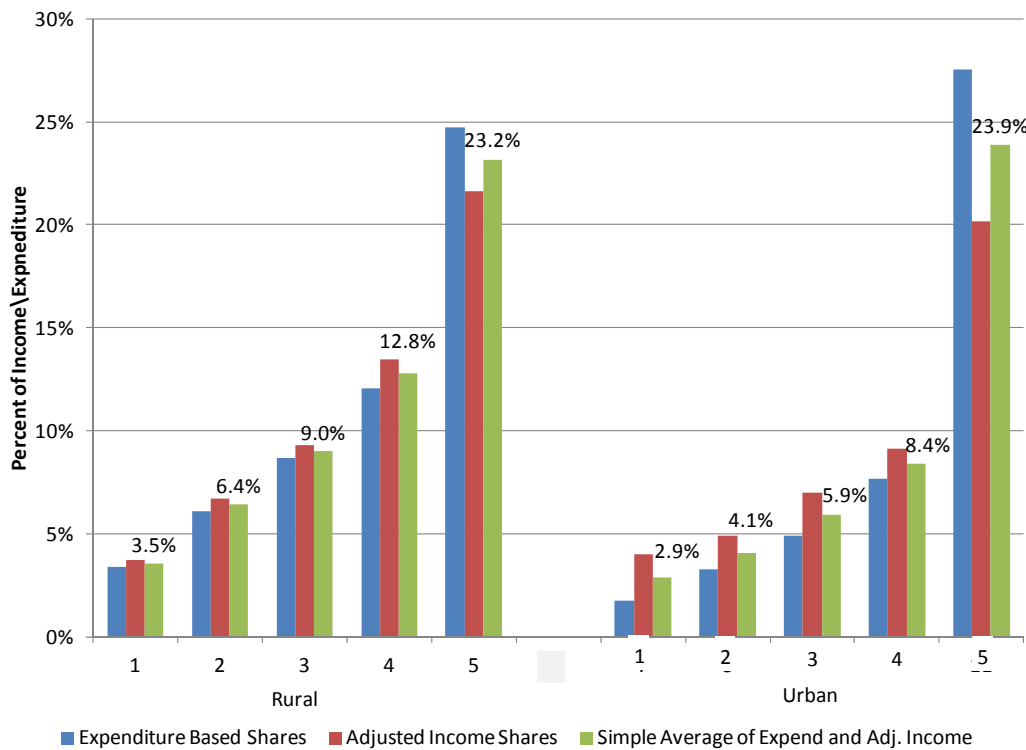
surveys (in effect including data from earlier surveys into estimates derived from the current survey).

HOUSEHOLD INCOME SHARES

For this studies purposes, a first step in our analysis was to derive the proportion of each quintile in total national income. These proportions (by quintile) would then be used to divide the factor incomes in the GTAP database. Recognizing the limitations and inconsistencies in the data mentioned above, we derive the proportions of each household's income in total national income by combining the expenditure and income data to create an average distribution which lies between the two estimates - based on income and expenditure data.

First we adjusted the income data to include auto-consumption, that is the income equivalent of self produced and consumed goods, primarily food, to create an income equivalent of the expenditure data. Figure 1 illustrates our findings. As concluded in earlier World Bank research, our analysis estimates urban household income from adjusted income data were significantly higher than the expenditure data would suggest. While for rural households the two estimates were reasonably close, except for the fifth quintile. For the purposes of our analysis, we estimate the share of each household in national income as the average of the expenditure and adjusted income shares-to moderate some of the biases suggested in the data the survey's limitations (calculations provided in Appendix C).

Figure 1
Distribution of Income by Quintile, Rural and Urban, Mozambique



Source: Authors calculations from the SHIP database, Mozambique.

FACTOR INCOME SHARES

The SHIP survey reports each workers main and secondary sectors of employment. It also reports the education level for each worker. The sectors reported in the survey are based on the United Nations Central Product Classification (CPC). First the CPC codes were corresponded to the GTAP sectors to provide a breakdown of labor income by GTAP sector and education level. The standard GTAP labor category estimates were aggregated to just "labor" and then split according to the shares estimated from the reported incomes in the household survey. This provide the factor splits for labor by GTAP commodity. Capital was split between agricultural and non-agricultural capital based on the sector in which the capital resided. Land and natural resources were not split.

In 2008/2009, it is estimated that 49.6 percent of urban households and 56.9 percent of rural households lived at or below the poverty line in Mozambique (Third National Poverty Assessment, Ministry of Planning and Development p. 26).

For the first through third quintiles, comprising households at or below the poverty line, it was assumed that all household incomes derived from land and labor (table 4). Returns to capital and natural resources were assumed to accrue to households above the poverty line, or the fourth and fifth quintiles.

Table 4
Estimated Factor Incomes by Household

	Rural Expenditure Quintiles)					Urban (Expenditure Quintiles)				
Factor	1 st	2 nd	3 rd	4 th	5 th	1 st	2 nd	3 rd	4 th	5 th
<u>Land</u>	27.3	56.6	102.6	27.0	32.6	--	--	--	-	--
<u>Natural Res.</u>	--	--	--	43.9	76.9	--	--	--	18.5	48.8
<u>Labor</u> -no education	30.2	44.2	37.2	11.5	18.9	21.2	12.4	14.2	7.1	3.3
<u>Labor</u> -some primary	63.7	183.1	253.9	73.6	89.1	78.2	90.9	120.7	68.4	49.2
<u>Labor</u> -some secondary	45.0	66.4	96.9	42.9	84.9	58.5	103.7	154.9	105.3	145.7
<u>Labor</u> -some tertiary	38.0	18.0	27.0	10.3	109.5	6.7	27.8	51.9	61.4	540.5
<u>Capital</u> -Ag	--	--	--	88.0	154.2	--	--	--	37.2	98.0
<u>Capital</u> -Other	--	--	--	438.1	767.7	--	--	--	185.2	487.8
Total	204.3	368.3	517.6	735.2	1,333.9	164.6	234.8	341.7	483.1	1,373.3

Source: GTAP database V8a and Mozambique Household Survey.

CONSUMPTION SHARES

The final element required to complete the description of the households in our model are data on consumption. The SHIP database included several broad categories of consumption expenditure goods, include food, alcohol, tobacco, education, textiles and clothing, autos, transportation, fuel, firewood, energy, health etc. While the SHIP data were adequate for defining broad categories, such as food, it lacked details on food composition e.g. grains, meat, milk, sugar etc. We therefore augmented the SHIP data with data from the original OAF2008/2009 survey as reported in the Ministry of Planning report on poverty and wellbeing (2010, pp 119-132). Consumption shares were first split employing the SHIP data, to derive shares of food and non-food in the household consumption bundles. Detailed food shares within the food bundle for the first three quintiles were derived from the Ministry of Planning report. Since these tables were specifically developed using data from the first three quintiles (i.e., poor households). The fourth and fifth quintiles detailed shares of food within the food bundle were derived, in part, as the residuals of food consumption left over after allocating the food within the first three quintiles.

Non-Food consumption was based on the shares reported in the GTAP model. For most poor households, these data were of second order consequences, since food consumption shares exceeded 75% of all goods and services consumed⁹. Table 5 illustrates the consumption shares for each of the ten households in our analysis.

⁹ The GTAP database structure allocates "trade margins" to a unique sector. Trade margins are the mark-ups by wholesale and retailers to pay for delivering and selling products. Ideally, the trade margins would be allocated by sector and household, but the data do not support this type of breakdown. We, therefore, allocate trade margins by first taking the share of non-food consumption in total consumption. In the cases of the fourth and fifth rural quintiles, the shares of margins had to be reduced to allow for a reasonable allocation of consumption to non-food commodities (e.g., employing this method resulted in very high shares of trade margins within those two rural quintiles).

Table 5
Consumption Shares by Household, Mozambique, 2007

	Percent									
	Rural (Quintile)					Urban (Quintile)				
	1 st	2 nd	3 rd	4 th	5 th	1 st	2 nd	3 rd	4 th	5 th
Rice (paddy and processed)	4.5%	4.6%	4.3%	4.3%	2.9%	8.6%	8.1%	7.6%	2.9%	1.3%
Wheat	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Maize and cereals	19.5%	20.0%	18.8%	0.8%	0.5%	10.9%	10.2%	9.7%	0.5%	0.2%
Plant fibers and crops n.e.c.	10.6%	10.9%	10.2%	13.5%	9.2%	7.8%	7.3%	6.9%	9.2%	4.2%
Vegetables, fruit and nuts	21.4%	22.0%	20.7%	3.4%	2.3%	19.6%	18.4%	17.4%	2.3%	1.1%
Oil seeds	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cane and beet sugar	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cattle, sheep and goats	0.2%	0.2%	0.2%	0.4%	0.3%	0.1%	0.1%	0.1%	0.3%	0.1%
Animal products n.e.c.	0.1%	0.1%	0.1%	3.4%	2.3%	0.1%	0.1%	0.1%	2.3%	1.1%
Forestry	8.5%	7.1%	6.1%	5.1%	3.7%	4.6%	4.8%	4.2%	3.2%	1.2%
Fishing	2.6%	2.7%	2.5%	1.2%	0.8%	2.6%	2.4%	2.3%	0.8%	0.4%
Coal, oil, gas	6.1%	5.4%	3.9%	3.5%	3.1%	6.0%	5.0%	3.6%	2.4%	0.6%
Bovine, sheep, goat meet	2.1%	2.1%	2.0%	3.3%	2.3%	1.2%	1.1%	1.0%	2.3%	1.0%
Vegetable oils and fats	11.8%	12.3%	11.9%	26.5%	19.3%	16.3%	15.3%	15.3%	20.1%	13.0%
Dairy products	1.4%	1.4%	1.4%	0.7%	0.5%	1.4%	1.3%	1.2%	0.5%	0.2%
Sugar	1.0%	1.0%	0.9%	2.9%	1.9%	2.4%	2.3%	2.2%	2.0%	0.9%
Textile, apparel, leather	1.6%	2.0%	2.6%	2.0%	4.2%	0.7%	1.3%	1.7%	2.3%	3.9%
Manufactures	6.0%	5.3%	4.7%	4.1%	3.8%	4.0%	4.9%	4.7%	4.3%	7.4%
Minerals and metals	0.2%	0.2%	0.2%	0.3%	0.5%	0.2%	0.3%	0.3%	0.5%	1.0%
Services	2.0%	2.2%	2.5%	3.4%	5.9%	4.9%	7.0%	8.2%	11.2%	20.1%
Transport and trade margins	0.3%	0.5%	6.8%	21.4%	36.6%	8.5%	10.3%	13.6%	32.9%	42.3%
Household Consumption (Millions of US\$)	207.6	374.3	525.9	747.1	1355.5	167.3	238.6	347.2	490.9	1395.5

Source: Author's calculations based on SHIP data, Ministry of Planning 2008/2009. Total values for household consumption are from the GTAP database calculations presented earlier.

Trade Agreements - Production, Trade and Prices

Our analysis of African trade agreements is based on the GTAP V8a database. The version 8a database includes trade, production and tariffs for 2007. In order to simulate tariff removal due to the Tripartite Free Trade Area and the African Customs Union, we first simulate the completion of the regional economic cooperation\free trade agreements (RECs). The focus of our analysis is Mozambique, but it is still useful to accurately reflect the completion of RECs outside Mozambique. We estimate the completion of three RECs in our analysis:

- Southern African Development Community (SADC);
- Common Market for Eastern and Southern Africa (COMESA);
- East African Community (EAC).

Appendix E in this report describes these RECs in more details. An important aspect of these trade agreements is the sometimes uneven coverage and progress in implementing tariff cuts. A number of allowances have been made for countries to declare goods sensitive and exempt from tariff reduction or elimination. Or, in some instances, REC members are very slow in meeting their obligations. We, therefore, project a "dirty" completion of the RECs, based on the assumption that countries which have not as of 2007 reduced or eliminated their tariffs, will likely keep many of them in place by the time the TFTA is negotiated. Furthermore, we assume these sensitive products will not have their tariffs effectively reduced or eliminated in the tripartite trade negotiations. We allow up to 5 percent of a RECs tariffs to be considered sensitive.

When considering the tripartite FTA, we allow for up to 5 percent of a countries tariffs to be considered sensitive. In choosing the 5 percent sensitive products, we also apply the rule that all tripartite members apply a most favored nation rule and that they offer their currently lowest tariff rate to all tripartite members, that is no tariff may rise as a result of the tripartite negotiations.

Finally, we consider the African Customs Union which assumes that all tariffs between African countries are eliminated and that a common external tariff (CET) is adopted. There

are two significant impacts related to the ACU: the elimination of all remaining tariffs and duties from the tripartite agreement, that is the elimination of all duties, including sensitive products); and the recalibration of external duties to the CET levels. In regards to the CET, we assume that 5 percent of the products imported from outside Africa are defined as sensitive¹⁰. The CET levels are assumed to be the same as the CET levels negotiated by COMESA in its customs union negotiations. The choice of applying the COMESA CET is based in part on the fact that there are 19 COMESA countries and 8 SADC countries in addition to the facts that COMESA members have already initiated negotiations for a CET and that a number of countries in COMESA are already SADC members¹¹.

Table 6
COMESA ACU Common External Tariffs

Category	Rates
Raw materials	0.0
Capital goods	0.0
Semi-processed \ intermediate goods	10.0
Consumption goods	25.0

Source: COMESA Secretariat.

Tariff Reductions

We model three tariff reduction scenarios, one is the completion of the RECs and two are new trade agreements to be negotiated. In all cases, tariffs will change for Mozambique's exports and imports. Table 7 illustrates the trade weighted changes to Mozambique's import tariffs. Mozambique's trade weighted import tariffs in 2007 ranged from a low of zero on cane and beet sugars, to a high of 18.8 percent on bovine, goat and sheep meat. The 17.3 percent tariff on textiles and wearing apparel is also notable, since the trade volume is significant. Table 8 illustrates tariffs Mozambique faces in its export markets (trade weighted). While Mozambique faces relatively low tariffs on the majority of its goods exports, several notable exceptions include agricultural products sugar (45.5), oil seeds(47.0), plant based fibers (74.1), and grains(32.6).

¹⁰ The 5 percent sensitive products are defined by aggregating across all of Africa in contrast to a country-by-country definition.

¹¹ Of course, SACU, the oldest and most advanced customs union in Africa has a different CET structure and this is likely to influence any final CET structure adopted.

Table 7

Mozambique Trade Weighted Import Tariffs, Baseline 2007, Completion of RECs, Tripartite FTA, and African Customs Union

GTAP Commodity	Baseline Imports 2007 (Millions of US\$)	Base Tariff 2007 (a)	Model Scenarios (Percentage Point Change)		
			Completion of RECs	Tripartite Free Trade Agreement	African Continental Customs Union
Rice	141.1	7.1	0.0	0.0	17.7
Wheat	93.6	2.5	0.0	0.0	-2.5
Maize and cereals	8.7	6.1	-3.6	-1.6	-0.8
Plant fibers and crops n.e.c.	14.8	3.9	-1.2	-0.1	-0.9
Vegetables, fruit and nuts	33.3	17.9	-2.4	-0.1	-14.8
Oil seeds	1.7	2.8	-0.4	0.0	-2.3
Cane and beet sugar	0.0	0.0	0.0	0.0	0.0
Cattle, sheep and goats	0.5	3.6	-2.8	0.0	-0.6
Animal products n.e.c.	5.7	7.5	-0.9	0.0	-6.5
Forestry	16.2	1.2	-0.2	0.0	-0.9
Fishing	1.1	17.9	-8.1	0.0	-7.2
Coal, oil, gas (b)	437.6	6.9	0.0	0.0	12.2
Bovine, sheep, goat meat	22.3	18.8	-2.6	0.0	-13.0
Vegetable oils and fats	253.6	13.0	-1.3	-0.1	-2.9
Dairy products	32.7	12.6	-2.7	0.0	-8.4
Sugar	90.8	7.5	0.0	0.0	-7.4
Textile, apparel, leather	119.0	17.3	-3.1	-0.1	-2.2
Manufactures	1,341.8	7.2	-1.3	0.0	-1.2
Minerals and metals	948.7	3.4	-0.9	0.0	-0.6
Services	537.8	0.0	0.0	0.0	0.0
Transport and trade margins	183.8	0.0	0.0	0.0	0.0
Total	4,284.8	--	--	--	--

Source: GTAP V8 database and author's calculations from MacMap database.

(a) Trade weighted.

(b) A number of petroleum products such as processed fuels and liquefied gas are defined as consumption goods in the harmonized system. Therefore, tariffs on these products will rise to 25 percent (see Table 6).

COMPLETION OF RECs

Completion of the RECs, in Mozambique's case, SADC, results in a number of import tariff cuts ranging from -8.1 percent on fish imports to a trade weighted reduction of -3.6 percent on maize and cereal grains (Table 7). The cuts result largely from high tariffs Mozambique is reported to apply to imports from South Africa. These cuts result despite the 5 percent sensitive products allowed in our tariff cutting formula, underlining the substantial degree of protection Mozambique applied against imports from South Africa in 2007.

The completion of the RECs (SADC) has only modest impacts on the tariffs Mozambique's exports faced in 2007, underlining the fact that most tariffs Mozambique faces in the SADC region are already low. Still, our tariff cutting formula results in cuts to the tariffs Mozambique faces on milk and dairy products by slightly more than seven percentage points (resulting largely from concessions from Zimbabwe) and a drop of more than one percent on animal products.

Table 8

Mozambique Trade Weighted Export Tariffs, Baseline 2007, Completion of REC, Tripartite FTA, and African Customs Union

GTAP Commodity	Baseline Exports 2007 (Millions of US\$)	Model Scenarios (Percentage Point Change)			
		Base Tariff 2007 (a)	Completion of RECs (a)	Tripartite Free Trade Agreement (a)	African Continental Customs Union (a)
Rice	2.0	2.1	-0.7	-1.5	0.0
Wheat	10.6	0.0	0.0	0.0	0.0
Maize and cereals	13.4	21.4	0.0	-0.3	-0.4
Plant fibers and crops n.e.c.	207.3	5.3	0.0	-0.7	0.0
Vegetables, fruit and nuts	52.2	16.0	-0.1	-0.4	0.0
Oil seeds	30.4	2.6	0.0	0.0	-0.1
Cane and beet sugar	0.0	0.0	0.0	0.0	0.0
Cattle, sheep and goats	0.1	0.0	0.0	0.0	0.0
Animal products n.e.c.	4.2	1.4	-1.3	0.0	0.0
Forestry	112.6	0.0	0.0	0.0	0.0
Fishing	5.1	1.2	0.0	0.0	-1.0
Coal, oil, gas	573.7	0.0	0.0	0.0	0.0
Bovine, sheep, goat meat	0.6	2.1	0.0	0.0	-2.1
Vegetable oils and fats	130.7	1.0	-0.2	-0.6	-0.3
Dairy products	0.2	14.3	-7.6	-0.3	0.0
Sugar	85.7	48.1	0.0	-18.0	-0.1
Textile, apparel, leather	14.0	3.3	-1.2	-0.3	-0.7
Manufactures	121.4	81.9	-0.2	-0.4	-1.3
Minerals and metals	1,880.8	0.1	0.0	0.0	0.0
Services	1,084.6	0.0	0.0	0.0	0.0
Transport and trade margins	215.7	0.0	0.0	0.0	0.0
Total	4,545.5	--	--	--	--

Source: GTAP V8 database and author's calculations from MacMap database.

(a) Trade weighted.

TRIPARTITE FTA (TFTA)

The Tripartite FTA requires only modest tariff reductions to Mozambique's trade weighted import tariffs. This is, in part, due to the fact that most tariff reductions that matter to Mozambique have been undertaken under the SADC trade protocol. Again, Mozambique is allowed to designate 5 percent of its tariff lines as sensitive products, further reducing Mozambique's need to lower its import tariffs. The only tariff reduction over one percent is for maize, cereals, grains and crops.

The tripartite FTA offers some market access in the form of lower tariffs in Africa. Most notably, a large reduction in tariffs Mozambique faces on its sugar exports to other African countries - most notably Kenya, which maintains a very high tariff on its imports of sugar from Mozambique. Other products with improved market access include plant fiber and other crops, vegetables and nuts (Malawi and Zimbabwe).

AFRICAN CUSTOMS UNION (ACCU)

The Abuja treaty came into force in 1994 after gaining the required signatories. The Abuja treaty established an agenda for achieving an African wide Continental Customs Union based in large part on the processes currently under way, including the RECs and Tripartite agreement - it is the next logical step in a 30 year process. Though the Abuja treaty suggests a completion date for an African wide continental customs union by the end of this decade, there are still considerable steps to be undertaken, including the completion of the RECs and a continental FTA.

A customs union introduces two important elements into the African trade liberalization processes: the elimination of all intra-African tariffs; and the establishment of a common external tariff (CET). A customs union is intended to facilitate trade in several ways, but most notably, by eliminating the requirement for customs inspections and paper work between its members. The achievement of a customs union and the free flow of good across borders is not trivial, in fact reduced time to trade due to simplified customs procedures has been shown to exceed the benefits that can often be gained through tariff liberalization (Minor and Tsigas 2008). To gain this free flow of goods, incentives to circumvent tariffs and duties by transshipping goods must be reduced or eliminated. This means that in order for goods to flow freely across Africa, African countries must present a common tariff to non-African trade, or their will be an incentive to transship goods between African countries to avoid duties. This gives rise the requirement for a CET.

The COMESA CET, as illustrated in Table 6, was applied in our study. This CET has four tariff bands: raw materials, capital good, semi-processed, consumer goods. Applying this CET to Mozambique results in a wide array of changes to Mozambique's import tariff structure. Two categories of goods, coal, oil, and gas, and rice actually experience tariff increases, while all other products result in tariff cuts.

The tariffs Mozambique faces also decrease as a result of the customs union: these decreases result from the total elimination of tariffs between African countries. As we noted earlier in the cases of the RECs and the TFTA, African countries were allowed to maintain 5 percent sensitive products. The adoption of the customs union would require the RECs to eliminate their sensitive products between one another or customs agencies would have the burden of monitoring imports from African countries to assure smuggling was not taking place and proper duties were being applied. Table 8 illustrates that Mozambique will face lower tariffs on bovine, sheep and goat meat (-4.0 percent) and fish (-1.0 percent).

GDP and Production

Table 9 illustrates the impacts of our three scenarios on real GDP—that is changes in output measured at base prices. The impacts on GDP of tariff reforms in all three scenarios is modest, ranging from zero percent to -4.0 percent for Mauritius in the case of the African Customs Union (Table 9). The vast majority of GDP impacts are less than two percent with many less than one percent. Mauritius, therefore, is an exceptional case. Mozambique's GDP impacts range from positive 0.2 percent resulting from the completion of the RECs (mainly SADC in the case of Mozambique) to -0.8 percent in the case of the African Customs Union with the impacts from the Tripartite Free Trade area in-between at 0.1 percent of GDP.

Changes to Mozambique's real output are reported in Table 10. The completion of the RECs has a negligible impact on overall output, as suggested by the GDP changes. However, there are some sectors that win and others that lose from the completion of the RECs. On a dollar value basis, minerals and metals is impacted the most, with a US\$ 16.2 million increase in output, measured in 2007 prices (1.2 percent of baseline). Manufactures output is most negatively impacted with a loss of output of US\$ -2.1 million. Most agricultural products are only modestly impacted with impacts of less than US\$ 1.0 million, with the exception of bovine meats and forestry products. A notable change in output is in the services sector, for trade and transport services which increase by US\$ 16.2 million.

Changes in output across sectors is more varied in the case of the TFTA. Overall changes to output are still modest, but there are some notable shifts between sectors in output. Sugar output increases by US\$ 102.5 million or 121 percent. As was demonstrated earlier, tariffs on sugar are reduced in the Africa region, in particular, by Kenya. The following section on trade provides more details on the causes of these impacts on sugar. Other agricultural sectors gain as well, including cane and beet sugar (inputs into refined sugar), other animal products and cattle sheep and goats. Losing agricultural sectors include plant based fibers, US\$ -10.0 million, forestry products, oil seeds, and rice. Manufacture output is negatively impacted, with output down in all manufacturing sectors, led by minerals and metals US\$ -39.8 million (2.0 percent). Services are mixed, with trade and transport once again gaining and other services losing, both of these impacts are less than one percent of output of services.

The impacts of the ACCU are more varied than the prior two cases. The impacts of the ACCU on agricultural products is mixed. Gains in sugar output under the TFTA are rolled back, with production of refined sugar decreasing by US\$ -68.8 million (-36.7 percent). Production of cane and beet sugar, inputs into refined sugar, also decline. Output of animal products declines by -7.1 percent or US\$ -12.8 million and vegetable fruits and nuts experience a decline in output of US\$ -15.5 million or -2.8 percent. Manufacturing output generally does well under the ACCU scenario modeled here, with manufacturing output increasing by US\$ 16.4 million or 5.9 percent. Textiles and apparel, once again is not a leader in output growth, with a decline of output of US\$ -4.1 million or 5 percent. Services output are negatively impacted by the ACCU, with general services and trade and transport margins declining modestly.

Table 9
Changes in Real GDP, Constant 2007 Dollars (Millions of US\$ and Percent Change)

Country\Region	(A) Baseline Value (US\$ Millions) 2007	Completion of RECs		Tripartite Free Trade Agreement			African Continental Customs Union		
		(B) Change Value	(C) Change Percent	(A+B) = (D) Baseline	(E) Change Value	(F) Change Percent	(D+E) = (G) Baseline	(H) Change Value	(I) Change Percent
N. America	16,519,626.0	0.0	0.0	16,519,626.0	1.7	0.0	16,519,627.7	-39.6	0.0
EU-25	16,792,316.0	0.0	0.0	16,792,316.0	3.4	0.0	16,792,319.4	-691.8	0.0
Rest of World	16,330,752.0	0.0	0.0	16,330,752.0	-1.6	0.0	16,330,750.4	-222.1	0.0
China	3,494,058.0	0.0	0.0	3,494,058.0	-4.9	0.0	3,494,053.1	12.6	0.0
Brazil	1,365,983.4	0.0	0.0	1,365,983.4	0.5	0.0	1,365,983.9	36.5	0.0
North Africa nec	449,477.8	0.0	0.0	449,477.8	-3.0	0.0	449,474.8	-13.7	0.0
West Africa	280,519.2	128.5	0.0	280,647.7	-135.4	0.0	280,512.4	634.5	0.2
Central Afr. nec	41,363.4	0.4	0.0	41,363.8	2.1	0.0	41,365.9	443.0	1.1
Central Africa	69,240.6	-0.2	0.0	69,240.4	-1.1	0.0	69,239.3	-98.3	-0.1
Ethiopia	19,182.3	0.7	0.0	19,183.0	3.0	0.0	19,185.9	15.9	0.1
Kenya	27,166.4	0.3	0.0	27,166.7	52.6	0.2	27,219.3	-10.1	0.0
Madagascar	7,342.9	-0.1	0.0	7,342.8	0.7	0.0	7,343.5	-66.4	-0.9
Malawi	3,585.9	9.8	0.3	3,595.6	22.7	0.6	3,618.3	-8.2	-0.2
Mauritius	7,521.2	-0.2	0.0	7,521.0	1.5	0.0	7,522.5	-299.7	-4.0
Mozambique	8,030.0	17.1	0.2	8,047.1	9.3	0.1	8,056.3	-63.5	-0.8
Tanzania	16,825.4	5.6	0.0	16,831.0	10.2	0.1	16,841.1	-85.9	-0.5
Uganda	11,892.3	0.1	0.0	11,892.4	28.2	0.2	11,920.6	-26.9	-0.2
Zambia	11,541.4	26.0	0.2	11,567.4	41.1	0.4	11,608.5	78.9	0.7
Zimbabwe	4,423.8	26.0	0.6	4,449.8	12.4	0.3	4,462.2	117.0	2.6
East Afr. nec	58,477.0	-0.5	0.0	58,476.5	-0.1	0.0	58,476.4	1,299.7	2.2
SACU	312,019.1	150.5	0.0	312,169.7	340.5	0.1	312,510.2	-1,107.1	-0.4

Source: GTAPMy Model.

Table 10
Changes in Mozambique's Output \ Production Constant 2007 Prices (Percent and Millions US\$)

Commodity	(A) Baseline Value 2007	Completion of RECs (5% Sensitive)		Tripartite FTA (5% Sensitive)			African Continental Customs Union (5% Sensitive)		
		(B) Chang Value	(C) Change Percent	(A+B) = (D) Baseline	(E) Change Value	(F) Change Percent	(D+E) = (G) Baseline	(H) Change Value	(I) Change Percent
Rice	83.6	0.1	0.1	83.7	-3.0	-3.6	80.7	26.0	32.2
Wheat	9.9	0.0	-0.1	9.9	-0.5	-5.5	9.4	0.3	3.6
Maize and cereals	375.8	0.8	0.2	376.5	-0.9	-0.2	375.6	-2.2	-0.6
Plant fibers	777.4	0.2	0.0	777.6	-10.0	-1.3	767.6	9.6	1.2
Vegetables, fruit, nuts	539.9	0.5	0.1	540.4	5.3	1.0	545.7	-15.5	-2.8
Oil seeds	34.6	0.1	0.4	34.7	0.1	0.2	34.8	-1.1	-3.3
Cane and beet sugar	2.9	0.0	0.4	2.9	3.2	111.0	6.2	-2.2	-35.3
Cattle, sheep, goats	37.5	-0.2	-0.5	37.4	2.1	5.5	39.4	-3.7	-9.5
Animal products	172.9	0.0	0.0	172.9	8.7	5.0	181.6	-12.8	-7.1
Forestry	338.8	2.4	0.7	341.2	-3.5	-1.0	337.7	-5.6	-1.7
Fishing	118.4	0.5	0.4	118.9	1.4	1.2	120.3	-2.6	-2.2
Coal, oil, gas	542.9	-1.4	-0.3	541.5	-1.8	-0.3	539.7	24.4	4.5
bovine, sheep, goat meet	83.0	-1.4	-1.6	81.6	-2.0	-2.4	79.6	-9.5	-11.9
Veg. oils and fats	806.8	0.7	0.1	807.6	-3.7	-0.5	803.8	-7.6	-0.9
Dairy products	4.3	0.0	0.1	4.3	0.0	-0.7	4.2	-0.8	-18.5
Sugar	84.6	0.4	0.5	85.0	102.5	121.1	187.5	-68.8	-36.7
Textile-apparel	87.5	-4.3	-4.9	83.2	-1.7	-2.0	81.4	-4.1	-5.0
Manufactures	286.7	-2.1	-0.7	284.6	-8.4	-2.9	276.2	16.4	5.9
Minerals- metals	2,007.7	23.2	1.2	2,031.0	-39.8	-2.0	1,991.2	6.5	0.3
Services	5,072.8	-1.7	0.0	5,071.1	-30.9	-0.6	5,040.2	-10.7	-0.2
Transport and trade margins	3,257.1	16.2	0.5	3,273.3	31.3	1.0	3,304.6	-50.8	-1.5
Total	14,725.2	34.1	0.0	14,759.3	48.2	0.3	14,807.5	-114.8	-0.8

Source: GTAPMy model.

Imports and Exports

Tables 11 and 12 illustrate the simulated changes in Mozambique's imports and exports resulting from the three simulations. In the case of the completion of the RECs Mozambique's imports and exports change almost equally resulting in no change in the trade balance. On the imports side, the most notable changes is for Mozambique's imports of fish products, this is due, in large part to tariff changes and imports from South Africa rising. With the exception of textiles and apparel, imports of manufactures and services increase slightly. Most agricultural products experience increases in imports from zero to five percent. Mozambique's exports increase consistent with the tariff concessions reported in Table 8 with the largest increase in exports in the milk and dairy sector of US\$ 0.3 million (this results largely from the removal of tariffs on these products by Zimbabwe). Animal products and rice also see modest rises in exports, again, consistent with the tariff changes Mozambique faces in its export markets consistent with Table 8.

The most notable impact of the TFTA on Mozambique is the reduction in Kenyan sugar tariffs, which results in the -18.0 percentage point drop in the tariffs Mozambique faces (see Table 8). The large reduction in this tariff rate increases Mozambique's exports of sugar by over 100 percent or US\$ 83 million. This rise in exports drives much of the results in imports found in Table 11, notably the 205 percent rise in cane and beet sugar (albeit, from a very low level).

In contrast to the Tripartite FTA, the ACCU influence on Mozambique's trade results from Mozambique's own tariff changes after the CET is imposed, with one notable exception, sugar. Under the ACCU, Mozambique's margin of preference in export markets (notably Kenya) is reduced by the CET being imposed on imports from outside Africa. This results in a near reversal of Mozambique's gains in sugar it experienced under the TFTA. Other sectors impacted by the ACCU include rice which see imports fall by US\$21 million or -14.7 percent and livestock (tariffs on imports rise 17.7 percentage points) and meats imports rise by 33 percent. Manufactures and services imports see only modest changes. However, on the export side, manufactures and services see increases of US\$23.6 million and US\$ 24.0 million respectively.

Table 11
Mozambique Imports Constant 2007 Dollars (Percent and Millions of US\$)

Commodity	(A) Baseline Value (US\$ Millions) 2007	Completion of RECs (Max 5% Sensitive)		Tripartite FTA (5% Sensitive)			African Continental Customs Union (5% Sensitive)		
		(B) Chang Value	(C) Change Percent	(A+B) = (D) Baseline	(E) Change Value	(F) Change Percent	(D+E) = (G) Baseline	(H) Chang e Value	(I) Change Percent
Rice	141.1	0.8	0.5	141.9	4.8	3.4	146.7	-21.5	-14.7
Wheat	93.7	0.1	0.1	93.7	-0.4	-0.5	93.3	-0.7	-0.7
Maize and cereals	8.8	0.4	4.7	9.2	0.4	4.4	9.6	-0.2	-2.5
Plant fibers	14.8	0.7	4.8	15.5	1.2	7.7	16.7	-0.3	-1.9
Vegetables, fruit, nuts	33.3	1.3	3.9	34.6	1.5	4.2	36.1	7.2	20.0
Oil seeds	1.7	0.0	0.7	1.7	0.1	7.5	1.8	0.0	-2.7
Cane and beet sugar	0.0	0.0	-0.1	0.0	0.0	205.5	0.0	0.0	-50.2
Cattle, sheep, goats	0.5	0.0	4.5	0.5	0.1	12.8	0.6	-0.1	-16.4
Animal products	5.7	0.1	1.3	5.8	0.5	8.0	6.2	-0.2	-3.0
Forestry	16.2	0.1	0.5	16.3	0.4	2.2	16.7	0.0	0.2
Fishing	1.1	0.1	11.8	1.2	0.0	1.6	1.2	0.1	9.3
Coal, oil, gas	437.6	2.2	0.5	439.8	3.6	0.8	443.5	2.5	0.6
bovine, sheep, goat meet	22.3	2.2	9.7	24.5	2.0	8.1	26.5	9.0	33.8
Veg. oils and fats	253.6	4.4	1.7	258.0	5.0	2.0	263.1	11.0	4.2
Dairy products	32.7	0.6	1.8	33.3	0.3	0.8	33.6	0.6	1.9
Sugar	90.8	0.4	0.5	91.2	6.2	6.8	97.4	-3.1	-3.2
Textile-apparel	119.0	8.2	6.9	127.2	1.3	1.0	128.4	3.6	2.8
Manufactures	1,341.8	7.0	0.5	1,348.8	0.6	0.0	1,349.4	7.4	0.5
Minerals, metals	948.7	6.8	0.7	955.5	-2.0	-0.2	953.6	4.7	0.5
Services	537.8	-4.0	-0.7	533.8	4.0	0.7	537.7	-8.1	-1.5
Transport and trade margins	183.8	1.0	0.5	184.7	2.6	1.4	187.3	0.3	0.2
Total	4,284.8	32.3	0.8	4,317.1	32.1	0.7	4,349.2	12.1	0.3

Source: GTAPMy model.

Table 12
Mozambique Exports Constant 2007 Dollars (Percent and Millions of US\$)

Commodity	(A) Baseline Value (US\$ Millions) 2007	Completion of RECs (Max 5% Sensitive)		Tripartite FTA (5% Sensitive)			African Continental Customs Union (5% Sensitive)		
		(B) Change Value	(C) Change Percent	(A+B) = (D) Baseline	(E) Change Value	(F) Change Percent	(D+E) = (G) Baseline	(H) Change Value	(I) Change Percent
Rice	2.0	0.0	2.1	2.1	0.0	1.4	2.1	0.1	3.5
Wheat	10.6	0.0	-0.1	10.6	-0.6	-5.5	10.0	0.4	3.7
Maize and cereals	13.4	-0.1	-0.7	13.3	-0.6	-4.2	12.7	0.7	5.9
Plant fibers	207.4	-0.7	-0.3	206.7	-10.8	-5.2	195.8	14.3	7.3
Vegetables, fruit, nuts	52.2	0.1	0.1	52.3	-3.0	-5.6	49.3	2.9	5.8
Oil seeds	30.4	0.2	0.6	30.6	-1.6	-5.1	29.1	-0.1	-0.2
Cane and beet sugar	0.0	0.0	0.9	0.0	0.0	-56.4	0.0	0.0	74.1
Cattle, sheep, goats	0.1	0.0	0.2	0.1	0.0	-11.4	0.1	0.0	12.6
Animal products	4.2	0.1	2.9	4.3	-0.3	-6.5	4.0	0.2	6.2
Forestry	112.6	0.9	0.8	113.5	-4.6	-4.0	108.9	-3.3	-3.0
Fishing	5.1	0.0	0.2	5.1	-0.1	-2.2	5.0	0.1	1.1
Coal, oil, gas	573.7	-1.5	-0.3	572.2	-1.9	-0.3	570.3	25.1	4.4
bovine, sheep, goat meat	0.6	0.0	0.8	0.6	-0.1	-19.0	0.5	0.2	40.0
Veg. oils and fats	130.7	1.0	0.8	131.7	-3.1	-2.3	128.6	7.1	5.6
Dairy products	0.2	0.3	119.1	0.5	-0.1	-29.4	0.3	0.0	13.0
Sugar	85.7	0.4	0.5	86.1	111.8	129.8	198.0	-74.0	-37.4
Textile-apparel	14.0	1.6	11.5	15.6	-0.7	-4.2	15.0	-0.2	-1.1
Manufactures	121.4	1.6	1.3	123.0	-7.8	-6.3	115.3	23.6	20.5
Minerals, metals	1,880.8	27.8	1.5	1,908.6	-36.2	-1.9	1,872.4	7.0	0.4
Services	1,084.6	6.9	0.6	1,091.5	-24.2	-2.2	1,067.3	24.1	2.3
Transport and trade margins	215.8	-0.1	0.0	215.7	-3.0	-1.4	212.7	-4.9	-2.3
Total	4,545.5	38.6	0.8	4,584.1	13.4	0.3	4,597.4	23.6	0.0

Source: Authors calculations from GTAPMy model.

Household Income, Employment and Vulnerability of the Poor

The analysis so far has focused on the impacts commonly discussed in the environment of trade policy analysis: GDP, output and trade flows. A unique feature of the GTAPMy model is the capability to disaggregate the regional household into both private and government entities. We further disaggregates the private households into rural and urban quintiles. Since half of the population of Mozambique lives below the poverty line (references from poverty report), the first two quintiles in each category includes families below the poverty line. The third quintile includes households above, below and at the poverty line, and the fourth and fifth quintiles are above the poverty lines. Table 4 illustrated the sources of factor incomes for each household (labor, land, and capital). Table 5 illustrated the expenditure patterns for each household. Combining this information allows us to examine the impacts of changing prices and quantities on household incomes and consumption by household. This disaggregate analysis stands in contrast to a typical "national welfare analysis" often cited in CGE analysis in that we do not assume that all parties will be impacted equally - the assumption is that trade policy will have distributional impacts and that the impacts on poor households should be given special consideration when making trade policy.

In addition to a focus on households, we bring into focus the importance of trade policy on government revenue and expenditure. Trade policy, tariff reforms in this case, result in changes to government revenues - taxes collected at the border, and possibly elsewhere in the economy, will be impacted by changes to imports, exports and output. Import tax revenues are often a major source of government revenue for developing countries. In the case of Mozambique, import tax revenues make up US\$247 million of total government income of US\$ 1,550 million or 16 percent of government revenues in 2007. Losses to these revenues due to tariff reforms will likely have to be replaced by taxes elsewhere in the economy. Not properly accounting for these revenue changes would potential distort the analysis, since an overall positive impact on households might be countered by much lower government revenue, which will have to be made up, usually through taxes on the households. The ultimate impacts on households would depend on the tax instrument employed to recover revenues - would they be pro-poor tax and revenue replacements? Would the government replace the revenue or cut services, and if so, which services would be cut? In the processes of answering these questions, pro-poor policies can be brought to light and play a part in informed policy debate from at an earlier time.

Nominal Income (Levels)

Table 13 illustrates the impacts on real income for each of the private households and the government for each of the three scenarios. In the first two scenarios, completion of the RECs

and the TFTA agreement all households experience an increase in income. In the case of the ACCU, all households experience a decrease in household income (although this is only half the story, since we have not considered the impacts on consumption prices). Government revenues will also be of concern. In the case of completion of RECs, government revenue falls by US\$-34.2 million, more than the US\$ 25.3 million increase in household incomes. The net balance on income within Mozambique will be US\$ -8.9 million. How this government balance is recovered or from where it will be cut should be made a part of policy discussions.

In the case of the tripartite free trade agreement, both household incomes and government revenues are positive, relieving the government's need to raise revenue or cut services. Importantly, income in the first three quintiles increase more than the average 1.1 percent. This suggests the Tripartite agreement is possibly a pro-poor agreement. Notably, urban households in the second the third quintiles experience positive growth, but below the average for all households.

In contrast to the tripartite agreement, which has a generally positive impact on income and revenues for all parties, the proposed ACCU with a CET, modeled on the COMESA CET, has the opposite effects--household incomes and government revenues all decline. Moreover, the impacts on poor households in the first three quintiles, for both urban and rural households is not only negative, but are greater losses than the average impacts on all households.

Table 13
Impacts on Household and Government Nominal Income (Income in Millions US\$ 2007)

	Population	Completion of RECs (Max 5% Sensitive)			Tripartite Free Trade Agreement			African Continental Customs Union		
		Baseline	\$	%	Baseline	\$	%	Baseline	\$	%
Rural-1	2,997,295	204.3	0.6	0.3	204.8	2.8	1.4	207.6	-2.7	-1.3
Rural-2	2,997,295	368.3	1.0	0.3	369.4	6.0	1.6	375.4	-6.4	-1.7
Rural-3	2,997,295	517.6	1.5	0.3	519.1	8.9	1.7	528.0	-9.5	-1.8
Rural-4	2,997,295	735.1	4.3	0.6	739.4	11.1	1.5	750.5	-4.8	-0.6
Rural-5	2,997,295	1,333.6	7.6	0.6	1341.2	18.9	1.4	1,360.2	-7.3	-0.5
Urban-1	1,309,041	164.7	0.4	0.3	165.1	1.8	1.1	166.9	-2.1	-1.3
Urban-2	1,309,041	234.8	0.6	0.3	235.5	2.2	0.9	237.6	-2.5	-1.1
Urban-3	1,309,041	341.7	0.9	0.3	342.6	3.0	0.9	345.5	-3.4	-1.0
Urban-4	1,309,041	483.0	2.2	0.5	485.3	5.6	1.2	490.8	-3.0	-0.6
Urban-5	1,309,041	1,373.1	6.2	0.5	1379.3	15.0	1.1	1,394.3	-5.6	-0.4
Total - Private Household	21,531,684	5,756.2	25.3	0.4	5,781.5	75.2	1.3	5,856.7	-47.4	-0.8
Government	--	1,550.2	-34.2	-2.2	1516.1	14.9	1.0	1,531.0	-2.2	-0.1
Total	21,531,684	7,306.4	-8.9	-0.1	7,297.6	90.1	1.2	7,387.7	-49.6	-0.7

Source: authors calculations from the GTAPMy model.

The gains and losses to household incomes in the tripartite free trade agreement and the ACCU arise from a similar source - refined sugar exports (Table 12). Sugar manufacture requires a relatively large proportion of uneducated labor and sugar exports increase dramatically in the case of the tripartite FTA (due to Kenya lowering its tariffs). Uneducated labor is disproportionately represented in the first three quintiles of each household. In the case of the ACCU, Mozambique loses substantial exports of refined sugar to African countries, as the duties on these products from countries outside Africa decline, leading to a reduction in Mozambique's exports of sugar. Policy makers will have to carefully consider pro-poor growth policies when entering into negotiations for the ACCU.

Impacts on Real Income

Of course, income is only a part of the story. What matters to households is real income, which takes into account both changes in income and changes in the prices of consumption goods. Table 5 illustrated the distribution of consumption by households across 10 commodities, including food, non-food and services. Table 14 includes the changes in income from Table 13 and adds a price index for household consumption. This consumption price index is household specific and accounts for differences in the composition in consumption across households.

In the case of the completion of the RECs, price movements complement the rise in income to result in an even higher level of real income and consumption. So, while increases in income for most households was approximately 0.3 percent, the fall in the price of household consumption goods by -0.3 percent are roughly doubles real income growth. In the case of the government, the fall in prices is moderate, at about -0.2 percent, and reduces the need for the government to raise additional revenues somewhat.

In the case of the TFTA, prices and incomes are both positive, with rising income outpacing the rise in prices for most households, except the second and third urban quintiles, which see prices rise faster than incomes, and hence resulting in reduced real income for those households. Finally, the government sees prices rise slightly, reducing the advantages of additional revenue.

The ACCU real income results confirm the results in nominal terms, all households are worse off as a result of the ACCU. However, the impacts of prices on real income are mixed across households. In the cases of the first four rural quintiles, price changes reduce the impacts of lower incomes somewhat, as the prices of consumption goods fall. However, in all other households, including all the urban households, rising prices compound the fall income, resulting in real income levels lower than when looking at nominal income alone. Government prices are not strongly impacted by the ACCU, and the negative income effect stands as it did earlier.

Table 14
Household and Government Real Income in Mozambique

Household	Completion of RECs (Max 5% Sensitive)			Tripartite Free Trade Agreement			African Continental Customs Union		
	Real Income			Real Income			Real Income		
	Prices	Income	(Income-Prices)	Prices	Income	(Income-Prices)	Prices	Income	(Income-Prices)
Rural1	-0.3	0.3	0.6	1.3	1.4	0.1	-0.3	-1.3	-1.1
Rural2	-0.3	0.3	0.6	1.3	1.6	0.3	-0.4	-1.7	-1.4
Rural3	-0.3	0.3	0.6	1.3	1.7	0.5	-0.4	-1.8	-1.4
Rural4	-0.3	0.6	0.9	0.9	1.5	0.6	-0.2	-0.6	-0.5
Rural5	-0.3	0.6	0.9	0.7	1.4	0.7	0.1	-0.5	-0.6
Urban1	-0.2	0.3	0.5	1.1	1.1	0.0	0.4	-1.3	-1.7
Urban2	-0.3	0.3	0.5	1.0	0.9	-0.1	0.3	-1.1	-1.4
Urban3	-0.3	0.3	0.5	1.0	0.9	-0.1	0.2	-1.0	-1.2
Urban4	-0.3	0.5	0.7	0.7	1.2	0.4	0.0	-0.6	-0.6
Urban5	-0.3	0.5	0.8	0.5	1.1	0.6	0.0	-0.4	-0.4
Govt.	-0.2	-2.2	-2.0	0.4	1.0	0.6	0.0	-2.2	-2.2

Source: Author's calculations from GTAPMy model.

Employment and Wage Impacts

Income is a function of wage rates and employment. In our model, we assume unemployment of all labor categories, except labor with some tertiary education. As a result, wage rates for all but the most educated labor is held fixed¹². All other endowments are assumed to be fully employed and changes in their wage or rental rates are observed.

Table 15 illustrates changes in employment and wage rates for each endowment factor in our model. Under the first scenario, completion of the RECs, increased demand results in modest increases in wages and employment across endowments-labor categories except the highly educated experience increases in employment. All the changes are less than one percent.

The Tripartite Free Trade Agreement has mixed results on the prices of endowments: land and agricultural capital have increased rental rates but natural resources and other capital have decreasing rental rates. The strong influence of sugar exports can be seen in the higher rental rates for land and agricultural capital. Employment of uneducated and labor with some

¹² Assuming unemployment is the same as fixing the wage rate, since we assume that labor can be readily hired without driving up the wage rate. We do not specify a pool of labor, so the assumption is that labor is pulled from an unspecified - infinite-pool of labor. Since the changes in employment in our simulations are modest, this assumption seems reasonable.

primary education, the lowest educated labor categories increases, while employment of labor with some secondary education falls. Again, this results from the high proportion of low educated labor in the sugar sector, which see large increase in output under this trade scenario.

Under the ACCU scenario, all wages and employment, except natural resources, fall. Rental rates on natural resources rise a substantial 11 percentage points due to the large rise in metal product exports. Of concern, employment in all labor categories declines by between -0.2 and -2.3 percent. The fall in agricultural rental rates is due to the large drop in sugar exports.

Table 15
Employment and Wage Rates (Percent Change)

Endowments	Completion of RECs (Max 5% Sensitive)		Tripartite Free Trade Agreement		African Continental Customs Union	
	Employment	Real Wage	Employment	Real Wage	Employment	Real Wage
Land	--	0.6	--	2.5	--	-2.8
Natural resources	--	0.7	--	-1.3	--	11.7
Labor-no education	0.4	--	0.3	--	-0.5	--
Labor-some primary	0.6	--	1.0	--	-2.3	--
Labor-some secondary	0.5	--	-0.8	--	-0.2	--
Labor-tertiary	--	0.6	--	0.0	--	-0.3
Capital-agriculture	--	0.7	--	4.4	--	-3.9
Capital-other	--	0.7	--	-0.3	--	-0.4

Source: Authors calculations from GTAPMy model.

Conclusions

Completion of the RECs will modestly

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Appendix-A GTAP

Country \ Regional Aggregations

GTAP Countries and Regions

GTAP Code	GTAP Label
NAFTA	North America Free Trade Area (USA, Canada, Mexico)
EU25	European Union
ROW	Rest of the World
CHN	China
BRA	Brazil
XNF	Rest of North Africa (Algeria, Morocco, Libya, Tunisia)
XWF	Rest of Western Africa (Benin, Burkina Faso, Cape Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Mauritania, Niger, Saint Helena, Sierra Leone, Togo)
XCF	Rest of Central Africa (Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea, Gabon, Sao Tome and Principe)
XAC	Rest of Southern Africa (Angola, Democratic Republic of Congo)
ETH	Ethiopia
KEN	Kenya
MDG	Madagascar
MWI	Malawi
MUS	Mauritius
MOZ	Mozambique
TZA	Tanzania
UGA	Uganda
ZMB	Zambia
ZWE	Zimbabwe
XEC	Rest of Eastern Africa (Burundi, Comoros, Djibouti, Eritrea, Mayotte, Reunion, Rwanda, Seychelles, Somalia, Sudan)
XSC	South African Customs Union (South Africa, Botswana, Lesotho, Namibia, Swaziland)

Appendix-B Correlations of Household Survey Income , Expenditure, Wealth and Education

Spearman Correlation Coefficients (Urban Households)

	Gross Income	Per Capita Expenditure
Education Level of Household (higher indicator corresponds to higher education)	0.42	0.39
Main cooking fuel (lower values represent wood and kerosene, higher values are gas and electric)	0.45	0.51
Own house	0.36	0.43
Own electronics, car, bike, TV, radio etc. (index higher index represents more goods owned)	0.42	0.44

Source: Mozambique SHIP Data 2008/2009.

Spearman Correlation Coefficients (Rural Households)

	Gross Income	Per Capita Expenditure
Education Level of Household (higher indicator corresponds to higher education)	0.21	0.06
Main cooking fuel (lower values represent wood and kerosene, higher values are gas and electric)	0.11	0.09
Own house	0.08	0.07
Own electronics, car, bike, TV, radio etc. (index higher index represents more goods owned)	0.30	0.16

Source: Mozambique SHIP data 2008/2009.

Appendix - C Distribution of Income and Consumption by Quintiles

Calculation of Household Income by Quintiles

	Rural					Urban				
	1	2	3	4	5	1	2	3	4	5
Population										
Population (000's)	2,998	2,998	2,998	2,998	2,998	1,310	1,310	1,310	1,310	1,310
Estimates of Income Distribution (Expenditure Based)										
Survey Distribution	3.4%	6.1%	8.7%	12.1%	24.7%	1.7%	3.2%	4.9%	7.7%	27.5%
by Quintile (millions of US\$)	289.3	524.2	747.2	1,039.5	2,129.0	149.5	279.4	420.8	659.9	2,371.2
per Capita	96.5	174.8	249.3	346.9	710.5	114.2	213.3	321.6	503.8	1,812.9
Estimates of Income Distribution (Income Based - Unadjusted for Autosonsumption)										
Survey Distribution	2.7%	3.8%	4.1%	6.2%	11.6%	6.0%	6.8%	9.9%	14.1%	34.8%
by Quintile (millions of US\$)	73.9	104.6	113.9	173.4	323.4	167.3	187.6	275.0	390.8	966.0
per Capita	24.7	34.9	38.0	57.9	107.9	127.8	143.2	210.1	298.3	738.6
Autoconsumption										
Auto-consumption (LCU - Millions)	2,725	5,570	8,476	12,070	18,278	770	1,402	1,793	1,577	1,034
by Quintile (millions of US\$)	112.9	230.9	351.3	500.3	757.6	31.9	58.1	74.3	65.4	42.9
Auto-consumption per capita (US\$)	37.7	77.0	117.2	167.0	252.8	24.4	44.4	56.8	49.9	32.8
Estimates of Income Distribution (Income Based - Adjusted for Autosonsumption)										
by Quintile (millions of US\$)	186.9	335.5	465.2	673.7	1,081.0	199.2	245.7	349.3	456.1	1,008.9
Adjusted Income w\ Auto per capita	62.3	111.9	155.2	224.8	360.8	152.2	187.6	266.9	348.2	771.3
	3.7%	6.7%	9.3%	13.5%	21.6%	4.0%	4.9%	7.0%	9.1%	20.2%
Imputed Income Shares by Quartile (Simple Average Expenditure and Adj. Income)										
Simple Average of Adjusted Income and Expenditure Shares	3.5%	6.4%	9.0%	12.8%	23.2%	2.9%	4.1%	5.9%	8.4%	23.9%

Source: 2008/2009 SHIP Survey for Mozambique. Author's calculations.

Appendix-D Model Closures

Exogenous

poph
qoh_s
pfactwld
psaveslack profitslack incomeslack endwslack
cgdslack tradslack
gincomeslack hincomeslack
ams atm atf ats atd
aosec aoreg avasec avareg
afcom afsec afreg afecom afesec afereg
aoall afall afeall
dppriv dpgov dpgsave dphsave dphsave_all
to tp tm tms tx txs tpdh tpmh toh
emplh empl
sremoh sremih remavo
sfyoh sfyih fyavo
saidout saidin aidavo
realTRNH realTRNG
s_sub ;

Rest Endogenous ;

!Fix the trade Balance in Africa, relative to government savings

swap DTBALR(AFR) = dpgsave(AFR);

!Allow for unemployment of uneducated labor and some primary school labor;

swap empl("flno", "MOZ") = pfactreal("flno", "MOZ");

swap empl("flpr", "MOZ") = pfactreal("flpr", "MOZ");

swap empl("flse", "MOZ") = pfactreal("flse", "MOZ");

!General unemployment in Africa!

swap empl("labor", AFRNOMOZ) = pfactreal("labor", AFRNOMOZ);