China's growth and African Poverty: the case of Southern Africa Exports

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Abstract

African countries have became important suppliers of China in products such as oil, timber and metals. Given the prospects of continuing growth in China, and with it, continuing demand for natural resources, this paper explores the effects of China's demand for African products on Africa's poor populations. The analysis focus on countries in Southern Africa, specifically: Malawi, Mozambique, South Africa and Zambia. Export growth during the period 1995-2004 is analyzed employing a modified version of the GTAP model to simulate poverty effects of economic shocks. Close scrutiny of the data reveals that the bulk of export growth is highly concentrated in terms of products and countries. For non-oil producers, China absorbs a relatively small portion of total exports, concentrated on minerals and metals. For agricultural exporters, China's relevance as an export market is negligible. Even in South Africa, a relatively large economy with a manufacturing exporter profile, China is mainly a market for diamonds and some metals. In the simulations we find little evidence, to date, that China's growth has had a strong impact on the poor in Southern Africa.

1. Introduction

The economic growth of China has revitalized global commodity markets. In 2004, China was the world leading importer of basic metals and the world's third largest importer of oil, accounting for 6% of the world's oil trade (Trinh, Voss and Dyck, 2006). For Africa, a continent rich in natural resources, this has all been good news: African nations have increasingly became important suppliers of China in products such as oil, iron, cotton, diamonds and timber and their exports to China have the dynamism that they lack in other destinations. Given the prospects of continuing growth in China, and with it, continuing demand for natural resources, this paper explores the effects of China's demand for African products on Africa's poor populations.

Assessing the effects of China's growth on Africa's living standards is a complex task for several reasons. First of all, Africa is a diverse continent. With more than 50 countries, Africa spans a wide spectrum of low and middle income regions with different endowments and in different stages of development. Of these countries, only two, Nigeria and South Africa, concentrate more than half of Sub-Saharan Africa's GDP (World The World Bank, 2006). Secondly, China is a large economy growing at a fast pace with potential impacts on several different aspects of the world economy, including exports, imports, foreign aid, and FDI. In the area of trade, China can have important terms-of-trade effects on African nations in several ways: (a) by exporting more (and cheaper) goods directly to Africa, (b) by importing more (and paying more for) African products, (c) by competing with African countries in third markets (e.g., apparel products imported by the EU) and (d) by boosting global commodity prices in general (or perhaps lowering

prices for manufactures worldwide).

In order to make the analysis feasible the scope of this paper is delimited by the following considerations:

- The focus is on exports. From a trade perspective, and relative to other regions in the world, a prominent feature on the relationship between China and Africa is the strong role that this continent plays as a provider of raw materials to China.

- Changes in commodity and factor prices are the key aspects linking the effects of international trade on living standards. This study employs household survey data on income by source of specialization at the poverty level for Malawi, Mozambique and Zambia. These income data is linked to a CGE model through changes in commodity and factor prices. The idea, more fully explained in Section 5, is that given changes in factor and commodity prices, changes in poverty at the national level can be estimated.

- The focus is on selected countries in Africa, particularly in Southern Africa. This choice is driven by two reasons: First, African exports to China are concentrated in few products and countries. This raises the question: what does such growth mean for the other countries on the continent? Is the increase in a given exporter's economic activity being transmitted through regional trade to other neighboring countries? Although these questions is important for all the countries, it is in the southern part of Africa where the combination of low and middle income economies makes gains from regional

integration more likely (Nin-Pratt and Diao, 2006). A second, more practical reason for this focus is that three of the four countries for which we have poverty data are in Southern Africa.

There are few studies looking at the effects of China on Africa. This contrasts sharply with the cases of Asia and Latin America. The main focus on those regions has been on export competition in third markets. For instance, Ahearne, Fernald, Loungani and Schindler (2006a), Ahearne, Fernald, Loungani and Schindler (2006b) and Eichengreen, Rhee and Tong (2004) have looked from different perspectives at the effects of Chinese growth on the export growth of developed and developing Asian countries. Freund and Ozden (2006), Lederman, Olarreaga and Soloaga (2006) and Hanson and Robertson (2006) provide a recent sample of work looking at the effects of China's export growth on Latin American exports.

Most of the work on Africa is either exploratory or concerned with the broad aspects of China-Africa interactions; hence their conclusions are somewhat general. To the best of our knowledge, only one study (Edwards and Jenkins, 2005) looks at the effects of Chinese growth on the poor in Africa. These authors cover twenty-one countries in Sub-Saharan Africa and its main objective is to provide a preliminary assessment of the poverty impacts of China's growth in Africa. These authors propose an analytical framework which combines information on international trade and investment flows. Lack of disaggregated data prevents the authors from having a detailed analysis of the FDI channel, however, they mention that because investment is concentrated on extractive industries it is unlikely to have a positive impact on the poor. For analyzing exports, they use detailed trade data (3-digit SITC) aggregated according labor intensity,

under the assumption that the exports of labor intensive products are most likely to influence poverty. Because exports from Africa to China consist predominantly of extractive products (that tend to be less labor intensive) the impact on poverty might be limited. With respect to competition in third markets, the authors conclude that the only country that can be seriously affected is Lesotho, due to competition in the textile markets. On the import side, countries such as Ghana, Uganda and Tanzania might benefit from cheap imports, while countries like Ethiopia and Nigeria could be worse off due to reductions in domestic output and employment caused by Chinese competition.

Another study with information relevant to our subject is Kaplinsky, McCormick and Morris (2006). Their paper is of an agenda-setting nature and its objective is to identify knowledge gaps surrounding Africa-China interactions. These authors propose a framework for assessing the impact of China's growth on Africa that takes into account the indirect and direct effects of trade, investment and aid flows. They suggest to divide these effects as complementary (positive) or competitive (negative). In this context, increased exports from Africa to China would be a complementary effect, while Chinese competition with local producers of manufactures would be a competitive effect. This work is exploratory, thus the authors do not present an overall evaluation of the impact of China on Africa. Kaplinsky, McCormick and Morris (2006) argue that one of the main impacts of China on Africa is to inhibit potential African exports to third markets.

Goldstein, Pinaud, Reisen and Chen (2005) look at the China-Africa relationship from an economy-wide perspective. These authors collect and analyze evidence on a broad range of issues including global macroeconomic variables, trade linkages, FDI, aid and governance standards in all the African countries with available data. They conclude

that China's growth has benefited Africa as it has pushed Africa's export prices up and has contributed to dampening world inflation, improving Africa's terms of trade. The authors indicate that the benefits of greater commodity prices may not necessarily improve African economies because administrative inefficiency in rent distribution. The authors highlight that high commodity prices might discourage export diversification, worsening in the long-run the situation of several of the African countries.

Broadman (2006) recently published results from a World Bank study in which the prospects of the Africa-China relationship are thoroughly evaluated from an African perspective. The book builds on firm-level data from a large quantitative survey and business case studies carried out by the World Bank in 2006 in Ghana, Senegal, South Africa, and Tanzania. The focus of the survey was to contrast the African operations of Chinese, Indian, African and other internationally owned businesses. The book contains an extensive analysis of the factors impeding trade, and concludes that both border barriers and shallow internal markets should be improved for Africa taking advantage of the opportunities offered by the Asian countries.

Given the broad scope of the existing literature, this paper contributes to the understanding of the effects of China's growth on Africa in several ways. First, by focusing on the exports of few countries, more specific conclusions are reached regarding the impact of increased trade with China on selected countries in Southern Africa. Secondly, a key aspect of the analysis is the employment of the model by Hertel, Keeney, Ivanic and Winters (2007) specially designed for tracking changes in poverty. It combines the macro and microeconomic aspects of economy-wide shocks affecting income and consumption patterns at the poverty levels. An advantage of this approach is

that results can be stated in terms of changes in the poverty headcount of the countries with available data.

The rest of the paper is organized as follows. Section 2 presents a descriptive analysis of Southern African exports to China. Section 3 uses a CGE model to explore the poverty impacts of these exports and Section 4 concludes.

2. Southern African Exports to China

Trade between China and Africa is changing rapidly. Figure 1 shows the evolution of African exports to China an to the world since 1995 (lines with scale on the left-hand side,) and China as a percentage of total exports (shaded area, read from the right hand scale.) The indices show that, over the last decade, African exports to China have grown more than twenty times while those going elsewhere have barely doubled. As a consequence, China has gone from absorbing only 1% of total African exports in 1995 to 12% in 2005 (shaded areas).

Closer scrutiny of the data shows that African exports to China are concentrated on few commodities and countries. Table 1 shows the pattern of export concentration in Chinese imports from Africa in year 2006. The first and second columns of Table 1 identify products at the 4-digits level of the Harmonized System (HS), the third column reports the value of the products imported (in million US$) and the fourth column express their import value as a percentage of total imports. For instance, the first row indicates that crude oil (HS 2709), accounts for US$ 21,010 million or 73% of total Chinese imports from Africa. The products are ranked by import values so that, next in importance, are iron (3% of total imports), cotton (3%), diamonds (2%) and wood (2%).

With regard to country concentration, the last four columns in Table 1 rank African countries according to the value of their exports to China. Starting from the first row, Angola exported US$ 10,928 millions of crude oil, equivalent to 52% of all the Africa's oil exports. Congo and Equatorial Guinea accounted for 12% each, while Sudan provided 9%. The last column, cumulates the percentage contributed by each individual country. In the case of oil, it shows that 84% of the total regional crude oil exports, originated in Angola, Congo, Equatorial Guinea and Sudan. In the cases of iron and diamonds (second and fourth row), South Africa accounts for 98% and 99% of the regional exports to China. Cotton (HS 5201) is the most diversified sector with six countries exporting 63% of total value. In the case of wood, the concentration of sources is similar to the oil sector, with four countries, Gabon, Congo, Cameroon and Equatorial Guinea, providing 88% of total exports.

The link between the oil share of total African exports to China and their rapid growth is explored in Figure 2. It shows export evolution (indices, 1995=100) for Oil Exporters (Angola, Equatorial Guinea, Sudan and Congo), South Africa and Rest of Africa. The fact that exports from oil exporters have increased by a factor of 80 while exports from South Africa and the rest of Africa have increased by a factor of 7 and 13, indicates that China is an important source of export growth, even for non-fuel exporters.

To better assess the importance of China as a market for non-fuel exporters we focus on some countries and regions in Southern Africa, they are: Malawi, Mozambique, Tanzania, Zambia and the South African Custom Unions (SACU). The SACU is formed by Botswana, Lesotho, Namibia, South Africa and Swaziland. Until year 2000, the SACU countries reported trade statistics as single entity, thus for extending the analysis

back on time we keep them together. Table 2 summarizes the importance of the selected countries in terms of their gross domestic products, populations and structure of merchandise exports in year 2004. All the countries belong to the Southern African Development Community (SADC)[1] that accounts for 56% of Sub Saharan Africa's GDP (third column in Table 2) and hosts 33% of its population (fifth column in Table 2). In turn, the selected countries account for 85% of SADC's GDP and 56% of SADC's population. The largest country in economic terms is South Africa which produces 69% of SADC's GDP.

The selected economies differ markedly in their export profiles. The last five columns of Table 2 divide total exports in terms of agricultural raw materials, food products, fuel, ores and metals and manufactures in total exports. According to Table 2, Zambia and Mozambique export mainly ores and metals (62.4% and 52% of their total exports); Malawi exports food (77.8%) and Tanzania exports food (52.7%) and agricultural products (12.9%); South Africa and her partners in the SACU export mainly manufactures.

The diversity in export profiles provides enough variation to contrast the importance of China as an export destination. Table 3 shows the average share of China in the total exports of the selected Southern Africa regions for three different periods (1995-1997, 1998-200 and 2002-2004). For Zambia, China is quickly becoming an important market, recently absorbing as much as 12% of its total exports. For the rest of

[1] Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zimbabwe, Namibia, South Africa, Mauritius, Democratic Republic of the Congo, Madagascar and Seychelles

the countries, China's importance has grown, but still represents a small fraction of total exports. In a extreme is Malawi, for which China's importance is null.

Another aspect we investigate is whether the type of products exported by the selected economies differ from what they export to other countries. Table 4 shows the composition of Southern African exports by destination (to both China and rest of the world) for the same three periods in Table 2 (1995-1997, 1998-2000 and 2002-2004). Focusing on the most recent period, the imports of China from Mozambique concentrates on Timber (79% of average imports) and, to a lesser extent, minerals (17%). Meanwhile Mozambique's exports to other destinations are made up of metals (71%) and food and agricultural products (21%). Malawi exports to China only agricultural products, although these exports are negligible in value, and highly erratic through time. In the case of SACU, exports to China are highly concentrated on Minerals (38%) and Metals (42%) while those exports going elsewhere have an important share of manufactures (35%). In the case of Tanzania, the differences in exports are more striking: more than 70% of Tanzania's exports to China consist of minerals and timber products while exports to the world are concentrated in agricultural products. For this case in particular, it is interesting to note that cotton and textile exports dominated the export mix in earlier years, but this has been displaced in relative importance by the fast growing exports of extractive products. Finally, Zambia's pattern of exports to the world and China are more similar, with minerals being the predominant export in both cases.

To understand whether exports to China are more dynamic than exports to the world, and to what extent, export growth have been accompanied by export diversification, gives a fuller picture of China's relevance as an export destination for the

selected Southern African countries. We use a decomposition that allows to see by how much have exports grown and what has driven that growth (Hummels, 2006). We start by writing the aggregate export value of country *i* at time t as:

$$X_t = N_{kt} \overline{N}_{jt} (\overline{PQ})_{jkt} \tag{1}$$

where N_{kt} refers to the number of products exported at time *t*, $\overline{N}_{jt}$ refers to the average number of export destinations per product so that $N_{jkt} = N_{kt} \overline{N}_{jt}$ is the unique number of shipments of products to each destination, and $(\overline{PQ})_{jkt}$ is the average value per unique shipment. Exports in a given period could increase because country *i* ships more goods, has more destinations per good or a higher average value per shipment (which in turn could include higher prices and/or higher quantities). Products are defined by 6-digit aggregates of the Harmonized System 1996 collected by the United Nations in the COMTRADE Database. We use the imports from the selected Southern Africa countries as reported by their partners. We consider the period 1995-2004 and deflate trade values using the US GDP deflator with base year 2000, so exports are reported in 2000 US$.

Table 5 reports the results from decomposing Southern Africa's export values using Equation (1) for All Destinations, destinations Other than China and only China. For illustrative purposes consider Mozambique. The upper panel of Table 1 shows that in 1995 this country exported 419 products (HS6 tariff lines). The average number of destinations was 2.55, while the average value of each shipment was $593.55 millions. In 2004, Mozambique was exporting 684 products, the number of destinations increased to 2.76, while the average value of each shipment increased to $3,293 millions.

To summarize the results of the decomposition, the lower part of Table 5 shows log percentage changes in each element for the entire period. These log percentage changes sum horizontally, simplifying the interpretation of the results. In the case of Mozambique we can see that total exports to the world grew by 228% of which 171% are due to an increase in export value, 49% due to an increase in the number of products exported, and only 8% due to increased destinations. Turning our attention to destinations Other than China we can see that Mozambique's exports grew by 155% during the period 1995-2004, while those going to China grew by 354%. Notice that for exports with destination other than China, an important part of Mozambique's export growth is based on increases in number of exports while in the case of China, most growth is due to an increase in the average value of each shipment.

The lower panel of Table 5 shows that the agricultural exporters in the sample, Tanzania and Malawi, have had the lowest export growth during the last decade. The results for Malawi in the Chinese market are not shown as its exports to China are sporadic and small. In the case of Tanzania, growth is driven by an increase in the number of products, as opposed to export value. Underlying this is the shipment from Tanzania to China of small values of its main exports to the world such as copper, oilseeds, cotton and wood. Overall, the results in Table 5 show that except for Malawi, Southern African countries have experienced greater growth in their exports to China than to the world.

Given the prevalence of export values as drivers of the export growth of SACU, Mozambique and Zambia in the Chinese market, the next question would be whether this is due to an increase in the value or in the quantities exported. Ideally, unit values (trade

value divided by quantities) would help to differentiated the growth caused by changing quantities and prices, however, the low number of products involved, and the recent nature of trade with China discourage the use of unit values[i]. In any case, the exports of these countries are highly concentrated on metals (Zambia), timber (Mozambique), and minerals (South Africa), and it is often argued that the prices of these commodities have been favored by China's growth. For instance, Bloodgood (2006) finds that the prices of timber, alumina and iron scrap have been high in part because of China's industrial expansion. Broadman (2006) argues that most of the prices of commodities relevant to Africa have risen. It is expected then that the rise in the export value is a consequence of increased commodity prices that have encouraged output expansion.

In summary, the exports of the selected Southern Africa countries follow the same pattern observed when Africa is considered as a single entity, that is, China is a small but increasing share of Southern African total exports and its interest is mainly in primary commodities. Additionally, as an export destination, China is of limited importance for the agricultural producing countries in our sample. The extent to which these export patterns are linked to poverty reduction is the subject of the next section.

3. Effects of Exports to China on Southern Africa Trade and Poverty

To estimate the poverty effects of Southern African exports to China we simulate the changes in commodity and factor prices associated with the observed export growth and their subsequent effects on the poor. We are also interested in the impact of such growth on other countries in the region. We use a substantially modified version of the standard GTAP model (Hertel, 1999), specially suited for the study of poverty responses

to trade shocks. There are four particular features relevant for this analysis: the segmentation of factor markets, the micro modeling of income at the poverty level based on household survey data, the modeling of consumer preferences taking into account income levels (Hertel, et al., 2007) and the incorporation of land use information disaggregated by agro-ecological zones (Lee, Hertel, Sohngen and Ramankutty, 2005). These features are next discussed.

Segmentation of primary factor markets: Labor and capital are modeled using a Constant Elasticity of Transformation (CET) function that "transforms" farm labor into non-farm labor and vice-versa. This implementation tries to overcome the problems of assuming the existence of wage equality across sectors implied by perfect labor mobility between the farm and non-farm sectors. Also, there is support for the idea that rates of return to investment in the agricultural sector are different to those in the non-agricultural sector, thus the CET specification is used to regulate the transformation of agricultural capital into non-agricultural capital.

Income at the poverty level: A second important feature of this paper is the use of a macro-micro modeling approach to poverty assessment whereby results from general equilibrium simulations are passed onto a microeconomic model of income and consumption dynamics at the poverty level. The poverty assessment focuses on number of people that live under certain level of income relative to market prices, or "poverty lines". We employ the $1 and $2 per day poverty lines. The data on poverty relevant for this study is available for Zambia, Malawi and Mozambique. For each country, the data on poverty is stratified according to economic activity. This stratification is intended to represent income specialization. There are seven strata: agricultural self-employment,

non-agricultural self-employment, rural wage labor, urban wage labor, transfer payments, rural diversified households and urban diversified households. Table 6 reports the share of national poverty ($1/day) arising in each stratum, for each of our 3 countries. In general, poverty associated with the rural sector (comprised by the agricultural, rural-wage and rural-diversified strata) contains most of the poor in all the countries.

A first step towards estimating the changes in national poverty following China's economic growth is based on the notion of income elasticity of poverty. The income elasticity of poverty indicates how many people are lifted out of poverty given a 1% increase in income. It is calculated constructing cumulative income distribution functions for each stratum mentioned above using data from national household surveys. The poverty elasticities per stratum are reported in the second panel of Table 6. Poverty elasticities are higher in the wage sectors than in the self-employed and diversified sectors, indicating a relatively high density of these strata in the neighborhood of the poverty line.

The net change in the poverty headcount of a given stratum will ultimately depend on that stratum's household factor ownership. Most poor households own few assets and their main endowment is unskilled labor, therefore a rise in the unskilled wage rate will reduce poverty more than, for example, an increase in the rental rate of capital. This is captured by disaggregating the poverty elasticities by income source, as shown in table 7 in the case of Malawi. These elasticities measure the percentage change in stratum headcount, in response to a one percent increase in returns to different types of household's endowments. So, for example, a one percent increase in unskilled wages in Malawi's agriculture reduces the $1/day poverty headcount in the agriculture stratum by

0.416%. It also contributes to poverty reductions in the diversified urban and rural households, indicating that these households earn a non-negligible share of their income from agriculture self-employment, despite their status. Notice that for the case of Malawi, the poverty effect of better wages is largest for the unskilled labor-specialized strata in both the rural and urban sectors.

Returning to the agriculture stratum poverty elasticities in the first column of Table 7, we see that, in addition to unskilled labor, there are also small elasticities for land and agricultural capital. If returns to all of these income sources were to rise by one percent, then stratum income would raise by one percent for all households, including the households at the poverty line. Therefore, the elasticities in Table 7 sum to the same figure (namely 0.49) displayed in the lower panel of table 6 for this particular stratum.

In most cases, the income sources in Table 7 may be mapped to factor earnings in the general equilibrium model in a straightforward fashion. For example, agricultural labor and capital receive the corresponding factor returns from the general equilibrium model, as do non-agricultural labor and capital. Because it is unknown how much wage labor is used in agriculture and non-agriculture activities, an economy-wide average wage is assigned to these sectors. Finally, transfers are simply indexed by the consumer price index.

Poverty assessment depends not only on earnings, but also on what happens to consumer prices. Poor households are likely to expend relatively large shares of their incomes in food and other basic needs, so the poor's consumption bundle is also important. Therefore, we turn next to our treatment of consumer preferences.

Household Preferences and Welfare: The demand system underlying the general equilibrium model employed in this paper is of the AIDADS ("An Implicit Directly Additive Demand System") type. It is a highly flexible functional demand system able to explain the patterns of consumption in countries with disparate incomes. Furthermore, it has a number of parameters that help to explain consumption behavior at low levels of income. In particular, associated with each commodity, we have an estimate of the subsistence level of consumption, as well as the marginal budget share for household spending, as income rises above the subsistence level.

Incorporation of land use information disaggregated by agro-ecological zones: In the standard GTAP model, land is assumed to transformable between agricultural uses (i.e. crops and livestock) regardless of climatic or soil constraints. In reality, the land used for a given crop might or might not be suitable for another crop or activity. Furthermore, agriculture and forestry ultimately compete for land in many regions. Therefore, Lee et al. (2005) introduce agro-ecological zoning to better inform the issue of land mobility and sharpen the focus on competition among alternative land uses within AEZs. The GTAP-AEZ database has a total of 18 AEZs resulting from combining information on three climatic zones (tropical, temperate and boreal) and 6 global lengths of growing period (moisture regimes).

For this analysis, the AEZ zoning is a key improvement over the standard GTAP model, due to the importance of timber exports for some countries (i.e. Mozambique). In the standard GTAP model, forestry activities are identified with natural resources and land use associated with forests is not identified. With the GTAP-AEZ database, we have information with the land rents associated with timber production at the AEZ level and

therefore it is possible to model competition for land between forestry and other activities. Table 8 shows how the total land-rents generated by forestry activities in Mozambique are much higher than those associated with crop and livestock activities.

The division of land in AEZs has been applied to the version 6 of the GTAP Database (Dimaranan, 2007). The original database depicts the global economy in 2001; we aggregated in 37 economic sectors and 20 regions (see Appendix 1). We focus on Mozambique and Zambia for the poverty analysis. We also explore potential regional spillovers of South Africa's export growth.

Simulations

To explore the effects of China's demand for African products on the poor, we perturb the equilibrium implied by the GTAP data using observed export growth during 2001-2006[ii] (Sandrey, 2007). Based on these data, Table 9 shows the main exports of Mozambique, South Africa and Zambia, classified according to the 4-digit disaggregation of the Harmonized System of trade data matching GTAP categories over the period 2001-2006. The last three columns show the importance of each GTAP category in total exports, their cumulative percentage and, the percentage change in exports between 2001 and 2006.

For Mozambique, HS-4 "wood, in the rough", classified in the GTAP database as "forestry", represented 62% of Mozambique's total exports to China in 2006 (See Table 9, third column from the right). The last column of Table 9 shows that the percentage change in wood exports between 2001 and 2006 is 347%. So, a first shock involves increasing forestry exports by 347%. Table 9 also shows that, since 2004, Mozambique

has started exporting Cotton (HS 5201), Oilseeds (HS 1207) and Chipped Wood (HS 4407). These are small export values, but they are quickly increasing their share in Mozambique's total exports to China (together they went from 0% in 2003 to 21% in 2006). The percentage change in these exports, shown in the last column of table 9, looks large because they started at low levels. These extraordinary rates of increase suggest that it might be interesting to include them in the experiment as well. However, in 2001 there were no exports of these products. And, given the assumptions made about preferences for imports in the GTAP model, if initial exports are non-existent, then they will never be consumed (regardless of how far their price falls. In general, the model does not handle very small flows very well. Therefore, we do not pursue this angle here.

Similarly, the experiment for Zambia uses the increase in exports of Metals (399% see lower part of Table 9, last column) that represented 64% of total Zambian exports to China in 2006. A second shock would consider the increase in Cotton exports (7896% between 2002 and 2006). There is also an important change in the exports of Copper Ores (HS 2603), however, we do not include it because the datum in 2006 diverges in an abnormal way (even for purposes of Table 9), from the previous observations. Furthermore, exports of refined copper are included in the Metal category, so the omission of the copper ore is unlikely to modify the poverty results.

The absence of exports in the year 2001 is an important limitation for it is not possible to get estimates of the still incipient (yet fast growing) exports, such as cotton. Table 10, shows the value of exports from Malawi, Mozambique and Zambia to China, from the GTAP database in 2001. Notice that, in agreement with China's customs data presented in Table 9, there were no exports of cotton in 2001 for Zambia and

Mozambique. Indeed, the only sector that shows significant exports in Mozambique is forestry, a fact we just verified in Table 9. Exports from China to Malawi are non-existent, and Zambia's exports are concentrated on Metals, as noted previously.

The lack of exports in the base year of the GTAP data has two important implications for our simulations: On the one hand, we obtain exactly the same results either by shocking only the main GTAP categories showed in Table 9 (Forestry in Mozambique and Metals in Zambia), or shocking all the categories that has some recent export growth (chipped wood and oilseeds from Mozambique, and cotton for both Mozambique and Zambia). On the other, we have a weak basis for carrying out hypothetical scenarios about export growth to China in the agricultural sector, where most of the poor derive much of their income[iii].

In order to explore possible regional linkages and their effects in poverty, an additional experiment increases South Africa's exports of metal and minerals to China by 836% and 431% respectively (See Table 9).

Finally, we bring together Southern African export growth with China's overall growth. This scenario seeks to complement the analysis by introducing Southern African exports to China, demand for commodities from other countries, and competition with the Southern African countries in third markets. In this experiment, we consider the shocks described before (exports from Zambia and Mozambique and South Africa) and add growth in China. Specifically, we shock China's GDP's quantity index to increase by 55.71%. This magnitude represents China's cumulative output index's growth by year 2006 and was estimated using the dynamic applied general equilibrium model[iv]

benchmarked to the version 5 G-DYN baseline, as reported in Walmsley et al.. The changes in GDP are accompanied by increases in population (3.23%), capital availability (47.86%), skilled and unskilled labor (18.24% and 47.86%) and investment in capital goods (47.10%)[2].

All the experiments use the standard general equilibrium closure of the GTAP model where prices, quantities of non-endowment commodities and regional incomes are endogenous.

Results

Experiment 1: Mozambique exports 347% more timber to China.

Mozambique exports only 17% of the timber it produces, and 64% of all exports are destined to China. This shock has almost no effect on world markets. A first consequence of the increased Chinese demand for Mozambique's timber is to raise its market price by 111%. This translates into higher export prices to all destinations, causing all the countries (except China) to substitute away from Mozambique's timber towards cheaper sources. The combined effect of increased exports to the Chinese market with lower exports elsewhere, is a net export increase is of 33%. On the domestic side, the higher price discourages consumption, which falls by 14%. Changes in domestic and export demand causes Mozambique's timber output to expand by 19%.

Private households consume 88% of Mozambique's timber production and 75% of timber imports. The firms demand the rest. The large share of domestic consumption

[2] In the GTAP model the variables are qgdp, pop, qo (capital and labor) and qcgds respectively.

on timber use is common to several countries. Table 11 shows that in several African (i.e. Zambia, Uganda, Tanzania and Malawi) and Asian economies (i.e. Rest of South Asia and India) near or more than half of the forestry products are used for private consumption. This suggests that the incidence of a price increase in forestry products, perhaps used for housing or energy generation (e.g. cooking, heat), in the poorer households is likely negative.

Table 12 shows how the price of virtually all commodities increases, specially, in the agricultural and food sectors – presumably due to the linkage in the land market. At the same time, domestic output shrank almost across the board and the more pronounced effects are in the food and agricultural sectors. The mechanism operating here is that forestry expansion occurs at the expense of agricultural activities, due to competition for land. Specifically, the increase in timber prices drove up the prices of the land where forestry takes place, displacing other crops such as rice, cotton, etc. In turn, the scarcity of these crops drove their prices up (See market prices in second column of Table 12). Notice that the primary food sectors that do not employ land (i.e. fish and non-ruminants) increased their output as consumers substitute expensive foodstuff for these products. Consequently, the last column of Table 12 shows how imports of the shrinking sectors increased as a consequence of the most favorable import prices.

Back on the issue of land substitutability, Figure 3 maps the percentage change in the demand for land at the AEZ level in the forest and cotton sector. In the forest map (left panel,) darker shades indicate larger positives changes in demand, while in the cotton map (left panel,) lighter shades indicate larger declines in demand. Notice that the strongest competition is in the AEZs 3 to 5 (where most rents are concentrated, as shown

in Table 8), as indicated by the contrasting shades of the map.

Reinforcing the map, Table 13 shows the changes in demand of factor endowments employed by the forestry, agricultural and livestock sectors. Table 13 shows how the demand for these AEZs decreased between 15 and 25% depending on the crop, and increased in the forestry sector. The demand for other endowments (labor and capital) in the forestry sector also increased considerably. The expansion of the forestry sector causes land prices to increase (more than 135% in AEZ 5), as shown in the last column of table 13. The increased demand for labor and capital in the timber sector, and he higher price levels in all the other sectors shown in Table 12, modestly raise the returns to labor (0.82% for the unskilled and 0.18% for the skilled) and capital (0.24%).

Although workers, poor and not poor, are seemingly better off by a rise in their income, changes in their consumption basket should be considered for determining whether the improvement holds in real terms. The framework employed does this by estimating a "true cost of living" focused at the poverty level. This measures the changes in expenditure needed to keep constant the pre-simulation utility level of the poor, once that prices are allowed to change. In the simulation at hand, the true cost of living for the poverty lines of $1 and $2 per day went up by 6.83% and 5.00% respectively. This increase is due to the general raising of the market prices of most commodities, but above all, by the price increases in forestry and lumber products. It turns out, that these two products have an important role in the expenditures of private households representing 60% of their consumption of manufactures, that in turn is close to 8% of their total consumption basket. After weighting the change in the market prices of lumber and forestry products by their share of consumption, it turns out that a person with a real

income equivalent to $1/day must expend 6.83% more, should she remain indifferent to the export increase in forestry products.

In table 14, the true cost of living (last column) is combined with changes in nominal income (next to last column) to obtain real income at the S1/day poverty line level. In general, real income at the poverty level declined, except for those generating income from land. The real income for "landowners" increased by 94.78% (Column 2 in Table 14)/ It is not clear if the result in the price land is plausible, for land availability is not considered a constraint in Mozambique. This is a point that deserves more careful thought, so that land dynamics can be modeled accordingly the functioning of land markets. In any case, the poverty elasticity of income associated with land as a source of income is very low (0.01 in upper panel of table 7), so changes in the poverty headcount are not altered by the potential distortions in modeling the land use. Notice also that because land income increased sharply, any bias in the poverty headcount introduced by misrepresenting land competition, would be downwards.

The changes in factor income by income source weighted by the respective elasticities, translate in an increase in poverty in all the strata, as shown in Table 15. Notice that the relatively low poverty elasticities of the agricultural sector cause this group to increase by 1.33%, a lower increase than in the rest of the strata. Nevertheless, the initial share of poor in the agricultural sector was 41%, therefore this percentage change translates in a considerable increase in the poor headcount. Weighting changes in poverty by the poverty share of each strata (third column of Table 14) yields the total change in poverty: an increase of 3.18 in the national poverty headcount. So the impact

on higher living costs dominates the income effects.

Experiment 2: Zambia exports 399% more metals to China.

Table 9 shows that in 2006 non-ferrous metals (cooper and cobalt) made up 64% of the total Zambian exports to China. According to the GTAP database, Zambia is a small world exporter of these metals (<0.2%), and contrarily to Mozambique's timber, the bulk of its production (99,4%) is exported. Furthermore, China accounts for around 5% of these exports[v]. As in the previous experiment, the small size of Zambian metal's exports make limit the effects of the experiment on world markets. For the domestic economy, minerals are more important representing 12% of total domestic output value.

Table 16 shows percentages changes in output, market prices and imports following the simulation. Given that the predominance of exports and the small share of China in metal exports, output increases only by 6.18%.

The expansion of the metal sector attracts labor and capital from other sectors, driving their prices up. With limited resources, metal expansion occurs at the expense of output in almost all the Zambian industries. Some exceptions are in the agricultural sector, where the products that are still competitive relative to imports, enjoy a modest expansion due to stronger demand derived from higher wages. The mineral sector (omn) expands by 4.67% because it is an important intermediate input of the metal sector. This is also the reason behind the expansion of the financial services, oil and construction sectors. Table 16 shows an increase in imports of all the products which sectors have shrunk. Most of these demand is satisfied by other African regions, however, the effects on those regions' outputs are almost negligible. Finally, the combination of higher

domestic prices and less output results in a reduction of the quantities exported in all the sectors different from Metals.

The higher prices encouraged by the expansion of the metal sector increases the "true cost of living" at the poverty level by 1.47%. This is the result of a price increase, across the board, in all the good included in the poor's basket consumption. However, because income raised faster than the true cost of living, the real income of the poor increased following the shock in exports. Table 17 shows that agricultural labor and capital are the only factors experiencing a reduction in its real income. However, recall from tables 6 and 7 that the income-poverty elasticity of demand in the agricultural sector is nil, therefore, when the income is combined with the elasticities, there is not increase in poverty in the agricultural sector. Table 18 shows this, along with changes in the other strata. The net result this time is a small reduction (0.44%) in the poverty headcount of Zambia. In the agricultural sector, that concentrates 33% of the poor (see third column in Table 18) there are not changes in poverty.

Experiment 3: South Africa exports 836% more metals and 421% more minerals to China.

The main objective of this experiment is to explore whether the type of export growth encouraged by China is transmitted across the selected southern Africa economies trough their trade links. In the two former exercises these kind of effects were limited. By introducing South Africa, a large country relative to Mozambique and Zambia, the possibility to observe whether these effects exist, and if so how important they are, should increase.

The sectors involved in the shock are ferrous metals (i_s), non-ferrous metals (nfm) and minerals (omn). Together they represent 5% of South Africa's output. Roughly half of the ferrous metals and minerals, and almost 80% of non-ferrous metals (nfm), are exported. China buys 4%, 1.4% and 21% of ferrous and non-ferrous metals, and minerals respectively. As before, the shock is on the exports of these products to China using the percentage changes in Table 9.

Table 19 shows the effects on output, prices, imports and exports. These follow the same logic in the descriptions of the two former experiments: prices of the exports subjected to the shock go up, it stimulates the demand for more primary factors, increasing wages and rental rates. Costlier factors lead to shrinkage in many productive sectors, which in turn lead to a reduction in exports. For satisfying domestic consumption, South Africa imports more goods. The size of the export shock is only partially transmitted to the corresponding productive sector because China is only a portion of the market for exports.

The effects of South Africa's booming exports reach other countries in southern Africa. For example, Mozambique's production of ferrous-metal products (i_s) increases by 2%, most of this is demanded by Mozambique's firms as an input of several sectors (i.e. Utilities, Other and heavy Manufactures) that are also increasing due to the increased demand for imports in South Africa. Similar situation occurs in Malawi and Mozambique. These effects are by the most part small in magnitude, and does not yield additional insight to track them in further detail.

From the perspective of the poor in Zambia, Mozambique and Malawi, the effects

of increasing exports in South Africa are not very different from the findings in the previous experiments. In general, the export of primary commodities increase wages, but at a lower pace than the price level of the poor's consumption basket. These result in a slight increase in the poverty levels of the focus regions Malawi (0.12%), Mozambique (0.07%) and Zambia (0.15%).

Experiment 4: Growth in China.

This experiment combines the preceding export growth to China from Mozambique, South Africa and Zambia with overall economic growth in China. In this way, we are asking the model to mimic all of the other aspects of global trade induced by China's growth that are not so directly observable. In particular, we seek to understand the importance of African imports from China, as well as the impact of China's growing exports to third markets in which the African countries might also be competitors. Table 20 compares percentage changes in the poverty headcount of Zambia and Mozambique for all four experiments. In the last column, the results of this final experiment are also included. Notice that the poverty headcount is little altered when we add overall growth in China to the bilateral export growth scenarios. For example, in the case of Mozambique, the increase in the poverty headcount is 3.18% without considering China's growth, and 3.24%. when Chinese growth is added. This suggests that the main factor affecting these economies in general, and poverty in particular, is the bilateral export relationship with China.

In the case of Zambia (second row of table 20), the experiment with only exports reduced poverty by 0.44% while the introduction of China's growth reduces poverty by

0.25%. To see what is driving this small changes we examine changes in the sources of real income: true cost of living and nominal income. The second panel of Table 20 summarizes changes in the true cost of living for all experiments. For Zambia, the true cost of living increases less when growth in China is included than when it is not (0.61% vs. 1.47%). However, Figure 4 shows that increases in nominal incomes are also lower in all the strata when growth in China is included (light shaded bars in Figure 1). The differences are more significant for the skilled and non skilled workers in both the agricultural and urban sector. In Table 7, we can verify that these strata have the highest income poverty elasticity, so changes in their income are important for changes in the poverty headcount. Nominal income is lower because of Chinese competition in third markets, and to a much lesser extent, in the domestic market. China's growth translates into more manufactures exports such as textiles, metal manufactures, automobiles and electronics. In the case of textiles and metal manufactures, China displaces Zambia in third markets (predominantly in the EU), causing a contraction of this sector. This results in a lesser rise in the demand for labor and therefore a smaller rise in wages. When coupled with the rising cost of living, the final result is a reduction of income at the poverty line. However, the changes are very small.

It is hardly surprising that the effect on Southern Africa of increased imports from China are negligible. For the selected countries, imports coming from China are a small share of their total imports. According to IMF statistics China contributed, in 2005, only to 3% of Mozambique and Zambia's total imports. Table 21 summarizes changes in the trade balances for Mozambique and Zambia following China's growth. The first three columns show, by sector, the percentage changes in Chinese exports to the world,

Mozambique and Zambia. The fourth and fifth column display increments in exports from Mozambique and Zambia to China (percentages in bold face indicate the shocks applied to the model). For most sectors, the increments in imports and exports are large, however, because of underlying small trade values, they translate in small changes in aggregate trade. This is shown in, the last two columns of Table 21, which display changes in the trade balances in Mozambique and Zambia. In general, changes in aggregate trade as a consequence of China's growth, are not significant, a fact reflected in the poverty figures.

4. Conclusions

The prospects of poverty alleviation in Africa through exporting commodities to China do not appear to be promising. Close scrutiny of the rapid African export growth in the Chinese market reveals that the bulk of the growth (in absolute terms) is highly concentrated in terms of products and countries. For non-oil producers, China still absorbs a relatively small portion of total exports. A potentially negative feature of this export growth is that China concentrates its interest on minerals and metals. For countries like Malawi, which do not export minerals or metals, China's relevance as an export market is negligible. Even in South Africa, a relatively large economy with a manufacturing exporter profile, China is mainly a market for diamonds and some metals.

The poverty analysis helps to understand how the effects of rapid export growth in extractive industries varies according to the degree that wages and consumption prices are affected. For Mozambique, the rapid expansion of exports of forestry products to China imposes a burden on the poor, as timber is a prominent good in their consumption

basket. Although wages increase, real income deteriorates and poverty goes up. For Zambia, the situation is different. Cooper and Cobalt do not enter to the consumption basket of the poor, and therefore its effects on consumption prices are indirect. This, combined with the fact that rapid export growth pushes wages up, leads to a slight reduction in the poverty levels in Zambia.

The potential effects that export growth in primary products can have on regional integration are not very different from the results discussed above. Because South African exports to China are as concentrated as those of the small countries, the price effects generated by inter-industry linkages in the region are not necessarily beneficial for the poor.

When imports from China, and potential competition in third markets are included, our analysis finds very similar outcomes, suggesting that these factors are small, relative to direct exports, which appear to be the main conduit for transmitting the effects of Chinese growth to the selected Southern African economies. The small impacts on the import side follow directly from the low share of China in the selected countries' total imports. With regard to competition in third markets, the minor effects are consistent with Kaplinsky, et al. (2006), who argues that the effects of China's competition in third markets are more important in the way they inhibit future rather than current export growth.

In concluding, we should highlight some of the limitations of our work. On the trade side, we encountered difficulty dealing with trade flows that did not exist in the base data and are only recently emerging. Also, we did not examine the role of bilateral

investment flows from China to Africa. In this connection, Broadman (2006), using firm level evidence in Ghana, Senegal, South Africa, and Tanzania finds that exports from Africa in the textile and food industry are starting to diversify. Broadman also suggests that there is a direct relationship between Chinese FDI and export diversification of African firms, and that, despite the media attention on investment in extractive industries, "significant Chinese and Indian investments on the African continent have been made in apparel, food processing, retail ventures, fisheries and seafood farming, commercial real estate and transport construction, tourism, power plants, and telecommunications, among other sectors. Moreover, some of these investments are propelling African trade into cutting-edge multinational corporate networks, which are increasingly altering the 'international division of labor.'" To be sure, the dynamism of China's economy may well provide important future opportunities for developing countries, in Africa and beyond. However, we find little evidence to date that China's growth has had a strong impact on the poor in Southern Africa.

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[i] Unit values tend to be inherently noisy (quantities are measured in a more imprecise way than values, therefore errors in observing quantity add to errors in observing values.) The noise worsen as data gets more disaggregated. One way of reducing the noise is averaging over large levels of products, and then correcting for product differences in subsequent analysis; this is not possible in cases such as Mozambique and Zambia because exports are concentrated in few products. As an illustration of the poor information contained in the unit values, consider that unit values of exports of HS-6 440399 (wood, in the rough) from Mozambique to the world, ranges from US$/TM 49.37 in 1997 to US$/TM 0.96 in 2004. This is not really an outlier since for only that product, it is possible to get a time series since 1997. A similar situation occurs with Zambia In the case of larger exporters (i.e. SACU), for which in principle there is the possibility of averaging over products, the problem is that the time series are short. The largest number of products for which a ten year series (1995-2004) can be obtained is 66. These represent disparate products ranging from iron ores to diamonds, so it is not clear that standard econometric correction for quality would yield meaningful results. An additional issue is that the number of products trade with China grows quickly. In the case of SACU, by 2000 there were 205 HS-6 codes exported, and by 2004, 342 codes, so an adjustment for new products would be needed.

[ii] This data is remarkably close to the contained in UN COMTRADE, however this is available to us until 2004. Sandrey's data is available at a lower level of aggregation (HS-4) than COMTRADE (HS-6), and only covers Chinese imports from African countries, therefore it did not provide enough information for the export growth description, but it suits our needs here very well.

[iii] A simulation was performed for Malawi, country that shows the highest export value to China in the agricultural sector (See "Other Crops" in Table 9). The tentative shock was to increase exports of other Crops by 1000%: the share of China in exports is so low that output barely changed. The net result is a reduction at the poverty level of -0.01%.

[iv] This model is able to trace the time path of an economy in a way that is consistent with current capital mobility patterns. The model uses a disequilibrium approach that takes into account temporal and spatial divergences in regional rates of returns and error on investors' forecasting and expectations. In the long run, investment is the result of the gradual equalization of rate of returns across regions. For details see Ianchovichina, Elena and Robert McDougall. "Theoretical Structure of Dynamic GTAP." GTAP Technical Paper No. 17, December 2000.

[v] It is possible to find some contradiction between tables 3 and 4, and these figures. For instance, one might wonder why China is not a destination more important for Zambian exports, if Table 3 indicated that for 1998-2000, it represented 5%. Trade data varies widely, so comparisons should be made for the same year. Hence, for 2001 the GTAP database indicates that China accounts by 3% and 5% of total Zambian total and metal exports, while in COMTRADE these figures are 6% and 8%. These discrepancies can be attributed to the fact that the reports from COMTRADE used in this paper are imports by reporter, while the ones included into GTAP are subdue to a reconciliation process (see Dimaranan).

Table 1. China's Imports from Africa: main products and partners in 2006

HS-4	Description	Imports from Africa in 2006 (million US$)	Percentage of Total Imports from Africa	Origin	Export Value (US$ millions)	%	Cum. %
2709	Crude oil from petroleum and bituminous minerals	21,010.1	73%	Angola	10,928.4	52%	52%
				Congo	2,500.3	12%	64%
				Eq Guinea	2,444.0	12%	76%
				Sudan	1,869.8	9%	84%
				Rest	3,267.59	16%	100%
2601	Iron ores & concentrates, including roast pyrites	839.2	3%	South Africa	818.6	98%	98%
				Rest	20.56	2%	100%
5201	Cotton, not carded or combed	725.1	3%	Burkina Faso	193.0	27%	27%
				Mali	106.7	15%	41%
				Benin	82.1	11%	53%
				Zambia	39.2	5%	58%
				Tanzania	36.9	5%	63%
				Rest	267.21	37%	100%
7102	Diamonds, worked or not, not mounted or set	704.5	2%	South Africa	694.4	99%	99%
				Rest	10.18	1%	100%
4403	Wood in the rough, stripped or not of sapwood etc	665.6	2%	Gabon	291.3	44%	44%
				Congo	103.8	16%	59%
				Cameroon	100.0	15%	74%
				Eq Guinea	93.2	14%	88%
				Rest	77.22	12%	100%
Other	-	4,823.08	17%				
Total		**28,767.62**	100%				

Source; Author's elaboration based on Sandrey, 2007.

Table 2. Gross Domestic Product (2004, constant US$ 2000 millions), Population (millions in 2004) and Export Structure (%) of Selected Countries

Ctry/Region	GDP 2004 US$ 2000 millions	Selected countries as a % of:		Pop.	Selected countries as a % of:		Structure of merchandise Exports (% of total) 2000-04				
		SSAF	SADC*		SSAF	SADCU*	Food	Agricultural raw materials	Fuel	Ores and metals	Manufactures
SSAF	391,961	100	-	726.4	100						
SADC*	220,932	56	100%	236.9	33	100					
Botswana [a]	6,494	2	3	1.8	0	1	3.1	0.5	0.1	5.5	90.6
Lesotho [a c]	976	0	0	1.8	0	1	39.7	12.0	23.0	4.2	21.1
Malawi [d]	1,936	0	1	12.6	2	5	77.8	5.3	0.2	0.3	16.4
Mozambique [d]	5,360	1	2	19.4	3	8	19.1	5.6	16.4	54.8	3.1
Namibia [a c]	4,088	1	2	2.0	0	1	48.3	1.3	1.0	7.3	40.9
South Africa	152,276	39	69	45.5	6	19	8.8	2.3	9.1	22.2	57.6
Swaziland [a c]	1,521	0	1	1.1	0	0	14.6	7.8	0.7	0.2	76.4
Tanzania	11,822	3	5	37.6	5	16	52.7	12.9	2.2	12.0	20.2
Zambia [d]	3,887	1	2	11.5	2	5	15.5	10.3	1.7	62.4	10.0
TOTAL	188,360	48	85	133.3	18	56					

Source: World Bank's African Development Indicators 2006

*SADC – Southern African Development Community comprises: Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zimbabwe, Namibia, South Africa, Mauritius, Democratic Republic of the Congo, Madagascar and Sychelles

a. Treated as South Africa in the trade analysis

b. Aggregated as XSD in GTAP

c. Aggregated as XSC in GTAP

d. Countries with poverty data

Table 3. Weight of China in the Total Exports of Selected Southern African Regions

	1995-1997	1998-2000	2002-2004
Mozambique	0%	1%	3%
Southern African Customs Union	2%	2%	4%
Tanzania	2%	1%	5%
Zambia	1%	5%	12%
Malawi	0%	0%	0%

Source: Author's elaboration based on UN COMTRADE

Table 4. Product Composition of Selected SA country/regions to China

		1995-1997		1998-2000		2002-2004	
Partner	Product Category	CHN	ROW	CHN	ROW	CHN	ROW
Mozambique	Food Products	28	46	4	37	4	12
	Manufactures	35	7	1	14		2
	Minerals		5		4	17	1
	Petroleum and Products		1				1
	Timber and Wood	18	3	95	5	79	1
	Metals	2	3		6		71
	Textiles		3		3		1
	Agricultural Products		22		20		9
	Cotton	16	11		10	1	2
	Total	100	100	100	100	100	100
Malawi	Food Products		6		6		11
	Manufactures		2		1	5	1
	Timber and Wood		1			1	
	Metals				1		
	Textiles		10		10		9
	Agricultural Products	100	81		81	94	76
	Cotton		1		1		1
	Total	100	100		100	100	100
SACU	Food Products	1	8	1	8	1	7
	Manufactures	24	29	19	34	15	35
	Minerals	56	8	42	7	38	5
	Petroleum and Products		1	3	1		1
	Timber and Wood	1	3	1	3	1	3
	Metals	12	38	30	34	42	37
	Textiles	2	4	3	4	2	5
	Agricultural Products	2	8	2	7		6
	Cotton						
	Total	100	100	100	100	100	100
Tanzania	Food Products	1	14	10	23	6	24
	Manufactures		3		4	1	9
	Minerals		1	21	2	40	10
	Petroleum and Products		1		2		1
	Timber and Wood	2	1	9	1	31	1
	Metals	11	7		3	1	3
	Textiles	32	6	8	3	5	3
	Agricultural Products	1	50	7	53	2	41
	Cotton	54	17	45	9	15	7
	Total	100	100	100	100	100	100
Zambia	Food Products		2		3		4
	Manufactures		2		4		3
	Minerals		1	20	6	1	3
	Metals	99	85	80	72	89	67
	Textiles		4		6	1	5
	Agricultural Products		4		7		12
	Cotton	1	1		3	9	7
	Total	100	100	100	100	100	100

Source: Author's elaboration based on UN COMTRADE

Table 5. Decomposing the Export Growth of Selected SA regions, PQ_{jkt} and X_t in thousand US$.

		All Destinations				Other than China				China		
Partner	Year	N_{kt}	N_{jt}	PQ_{jkt}	X_t	N_{kt}	N_{jt}	PQ_{jkt}	X_t	N_{kt}	PQ_{jkt}	X_t
Mozambique	1995	419	2.55	593.55	632,933.63	411	1.55	445.21	282,710.50	8	148.33	1,186.66
	2004	684	2.76	3,293.40	6,209,281.32	665	1.76	1,139.73	1,331,200.21	19	2,153.67	40,919.79
Malawi	1995	557	2.68	470.53	703,289.04	556	1.68	468.14	438,180.71			
	2004	498	2.87	524.40	748,251.14	497	1.87	483.69	448,384.15			
SACU	1995	5044	8.63	1,546.10	67,271,094.75	4555	7.63	613.21	21,301,238.69	489	932.89	456,181.06
	2004	5393	13.37	3,718.80	268,083,998.47	4594	12.34	806.08	45,713,425.50	799	2,912.72	2,379,696.13
Tanzania	1995	845	3.00	1,892.05	4,790,619.41	838	2.00	403.76	675,495.65	7	1,488.29	10,418.00
	2004	1178	3.26	1,955.95	7,517,183.56	1139	2.26	338.52	872,353.89	39	1,617.44	63,079.98
Zambia	1995	719	2.58	1,260.56	2,337,348.40	710	1.58	1,040.92	1,166,868.30	9	219.65	1,976.81
	2004	851	2.84	9,355.15	22,574,347.25	833	1.84	571.84	874,340.24	18	8,783.31	158,099.61
Log Percentage Changes												
		N_{kt}	N_{jt}	PQ_{jkt}	X_t	N_{kt}	N_{jt}	PQ_{jkt}	X_t	N_{kt}	PQ_{jkt}	X_t
Mozambique		0.49	0.08	1.71	2.28	0.48	0.13	0.94	1.55	0.86	2.68	3.54
Malawi		-0.11	0.07	0.11	0.06	-0.11	0.10	0.03	0.02			
SACU		0.07	0.44	0.88	1.38	0.01	0.48	0.27	0.76	0.49	1.14	1.65
Tanzania		0.33	0.09	0.03	0.45	0.31	0.13	-0.18	0.26	1.72	0.08	1.80
Zambia		0.17	0.09	2.00	2.27	0.16	0.15	-0.60	-0.29	0.69	3.69	4.38
Percentages (Sum Horizontally)												
Mozambique		21%	3%	75%	100%	31%	8%	61%	100%	24%	76%	100%
Malawi		-181%	106%	175%	100%	-487%	445%	142%	100%			
SACU		5%	32%	63%	100%	1%	63%	36%	100%	30%	69%	100%
Tanzania		74%	19%	7%	100%	120%	49%	-69%	100%	95%	5%	100%
Zambia		7%	4%	88%	100%	-55%	-52%	208%	100%	16%	84%	100%

Source: Author's calculation based on UN COMTRADE. See text for details.
Notes: For China, the column N_{jt} is ommited because it is simply 1, and its percentage contribution is 0.

Table 6. Share of $1/day Poverty in each Stratum and Elasticity of Poverty Headcount ($1/day) with Respect to Total Income, by Country

	Agr.	N-Agr.	Urb. Lab.	Rur. Lab.	Transf.	Urb. Div	Rur. Div	Total
Malawi	0.55	0.12	0.00	0.02	0.07	0.00	0.24	1.00
Mozambique	0.41	0.13	0.02	0.05	0.13	0.07	0.20	1.00
Zambia	0.33	0.23	0.10	0.07	0.07	0.08	0.12	1.00
Elasticity of Poverty Headcount ($1/day) with Respect to Total Income								
	Agr.	N-Agr.	Urb. Lab.	Rur. Lab.	Transf.	Urb. Div	Rur. Div	
Malawi	0.49	0.30	2.26	1.97	0.43	1.04	0.76	
Mozambique	0.28	0.94	0.97	0.76	0.48	1.58	0.99	
Zambia	0.00	0.64	2.28	0.91	0.45	1.29	0.37	

Source: Hertel et al. (2006)
Notes: Columns are specializations for each household: Agr. = agricultural, N-Agr. = non-agricultural, Urb. Lab. = urban labor, Rur. Lab.= rural labor, Transf.= Transfer, Urb. Div. = urban diversified, Rur. Div. = rural diversified.

Table 7. Poverty Elasticities, by Stratum and Income Source, $1/day, By Country

	Agr.	N-Agr.	Urb. Lab.	Rur. Lab.	Transf.	Urb. Div	Rur. Div
Land	0.03	0.00	0.00	0.00	0.00	0.04	0.02
Ag. Unskilled Labor	0.42	0.00	0.01	0.01	0.00	0.29	0.29
Ag. Skilled Labor	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-Ag. Unskilled Labor	0.00	0.21	0.00	0.00	0.00	0.04	0.05
Non-Ag. Skilled Labor	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Wage Unskilled Labor	0.00	0.00	1.88	1.76	0.00	0.19	0.06
Wage Skilled Labor	0.00	0.00	0.37	0.20	0.00	0.00	0.00
Agricultural Capital	0.05	0.00	0.00	0.00	0.00	0.08	0.05
Non-Agricultural Capital	0.00	0.08	0.00	0.00	0.00	0.15	0.08
Transfers	0.00	0.00	0.00	0.00	0.43	0.25	0.20
Total	0.49	0.30	2.26	1.97	0.43	1.04	0.76
			Mozambique				
	Agr.	N-Agr.	Urb. Lab.	Rur. Lab.	Transf.	Urb. Div	Rur. Div
Land	0.01	0.00	0.00	0.00	0.00	0.01	0.01
Ag. Unskilled Labor	0.26	0.00	0.00	0.00	0.00	0.55	0.43
Ag. Skilled Labor	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-Ag. Unskilled Labor	0.00	0.58	0.00	0.00	0.00	0.08	0.07
Non-Ag. Skilled Labor	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wage Unskilled Labor	0.00	0.00	0.97	0.76	0.00	0.19	0.07
Wage Skilled Labor	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agricultural Capital	0.01	0.00	0.00	0.00	0.00	0.02	0.02
Non-Agricultural Capital	0.00	0.36	0.00	0.00	0.00	0.29	0.20
Transfers	0.00	0.00	0.00	0.00	0.48	0.43	0.20
Total	0.28	0.94	0.98	0.76	0.48	1.58	0.99
			Zambia				
	Agr.	N-Agr.	Urb. Lab.	Rur. Lab.	Transf.	Urb. Div	Rur. Div
Land	0.00	0.00	0.00	0.00	0.00	0.02	0.01
Ag. Unskilled Labor	0.00	0.00	0.00	0.00	0.00	0.06	0.01
Ag. Skilled Labor	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Non-Ag. Unskilled Labor	0.00	0.39	0.00	0.00	0.00	0.25	0.08
Non-Ag. Skilled Labor	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Wage Unskilled Labor	0.00	0.00	1.50	0.72	0.00	0.50	0.16
Wage Skilled Labor	0.00	0.00	0.77	0.19	0.00	0.09	0.02
Agricultural Capital	0.00	0.00	0.00	0.00	0.00	0.04	0.01
Non-Agricultural Capital	0.00	0.24	0.00	0.00	0.00	0.20	0.05
Transfers	0.00	0.00	0.00	0.00	0.45	0.14	0.05
Total	0.00	0.64	2.28	0.91	0.45	1.29	0.37

Source: Hertel et al. (2006)
Notes: Columns are specializations for each household: Agr. = agricultural, N-Agr. = non-agricultural, Urb. Lab. = urban labor, Rur. Lab.= rural labor, Transf.= Transfer, Urb. Div. = urban diversified, Rur. Div. = rural diversified.

Table 8. Value Added Composition of Land Using Sectors, Mozambique

	Rice	Wheat	Grains	Oilseeds	Sugar	Cotton	Other	Milk	Cattle	Forest
AEZ1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
AEZ2	0%	3%	1%	0%	1%	0%	0%	0%	1%	0%
AEZ3	4%	9%	5%	5%	8%	6%	5%	5%	5%	9%
AEZ4	8%	3%	7%	8%	5%	6%	8%	8%	8%	38%
AEZ5	2%	0%	2%	2%	2%	2%	3%	2%	2%	22%
AEZ9	1%	1%	1%	1%	1%	1%	1%	0%	1%	0%
AEZ10	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Source: GTAP-AEZ database
Notes: AEZ1 through AEZ5 are in the tropical climate zone with moisture regimes Arid, Dry Semi-Arid, Moist Semi-Arid, Sub-humid and Humid respectively. AEZ9 and AEZ10 are Moist semi-arid and sub-humid temperate zones.

Table 9. Major exports from Mozambique, South Africa and Zambia to China, 2001-2006, millions US$ and percentages.

Country	HS-4	GTAP	Description	2001	2002	2003	2004	2005	2006	% of	Cumulative	%
	4403	Forest	Forestry	11.05	19.09	26.81	27.59	40.51	49.44	62%	62%	347%
	5201	Cotton	Cotton	0.00	0.00	0.00	0.64	5.91	10.19	13%	75%	1486%
Mozambique	1207	Oilseeds	Oilseeds	0.00	0.00	0.00	0.14	2.61	5.18	7%	81%	3609%
	4407	lum	Timber and	0.01	0.09	0.00	0.15	0.75	1.63	2%	83%	989%
	Total Exports to China				11.19	22.62	26.84	44.31	73.52	79.69		100%
	7202	i_s		6.69	9.95	21.80	72.28	55.76	64.47			
	7219	i_s		31.90	49.78	153.25	128.22	189.62	201.07			
	7402	nfm		29.61	42.57	37.56	11.48	5.68	28.66			
	7606	nfm	Metals	7.80	9.71	23.99	29.97	29.51	40.38	23%	23%	836%
	7601	nfm		6.87	9.20	42.82	74.69	56.98	69.26			
	7502	nfm		2.70	3.48	29.95	18.59	51.51	96.06			
	7110	nfm		16.15	22.67	81.31	264.52	417.82	452.22			
	2607	omn		0.00	0.00	2.61	14.24	19.22	30.96			
	2615	omn		18.32	25.93	28.80	29.21	55.59	52.74			
South Africa	2603	omn		3.66	5.16	11.11	26.77	23.05	100.94			
	2602	omn	Minerals	1.97	4.46	9.17	77.83	63.89	101.13	47%	70%	421%
	2610	omn		2.03	5.98	6.13	24.15	61.43	136.31			
	7102	omn		109.06	199.05	267.41	444.49	501.96	694.36			
	2601	omn		236.25	241.89	287.16	676.73	704.62	818.60			
	3823	HvyMnfcs	Heavy	14.65	18.10	18.09	26.45	46.88	44.44	2%	72%	80%
	3902	HvyMnfcs	Industry	26.79	20.87	22.21	20.26	28.07	30.19			
	8421	OthMnfcs	Heavy	43.04	6.45	20.42	21.42	19.81	39.78	1%	73%	517%
	2710	Petrol	Petroleum	5.16	0.13	0.35	2.22	43.39	30.53	1%	74%	492%
	Total Exports to China				1,172.81	1,269.06	1,842.78	2,955.32	3,443.64	4,095.29	-	100%
	5201	Cotton	Cotton	0.00	0.49	2.14	21.58	30.95	39.22	15%	15%	7896%
	8105	nfm		23.83	24.62	21.09	21.88	15.13	22.65			
Zambia	7402	nfm	Metals	1.01	4.12	7.29	11.50	17.95	66.14	64%	79%	399%
	7403	nfm		9.89	14.64	16.79	113.51	182.61	84.39			
	2603	omn	Minerals	0.16	0.25	0.17	0.27	2.93	38.87	14%	93%	24147%
	Total Exports to China				35.68	46.06	47.88	171.08	251.78	269.13		100%

Source: Author's calculation based on Sandrey (2007). Data are imports reported by China.
notes: HS are 2601 iron ores & concentrates, including roast pyrites (omn-minerals) ; 2602 manganese ores a concntrts inc ferr mangn iron ore (omn-minerals) ; 2603 copper ores and concentrates (omn-minerals); 2607 lead ores and concentrates (omn-minerals); 2610 chromium ores and concentrates (omn-minerals); 2615 niobium, tantalum, vanadium & zirconium ore & conc (omn-minerals); 4403 wood in the rough, stripped or not of sapwood etc (forest-forestry); 5201 cotton, not carded or combed (cotton-cotton); 7102 diamonds, worked or not, not mounted or set (omn-minerals); 7110 platinum, unwrought, semimfr forms or in powder fm (nfm-metals); 7202 ferroalloys (i_s-metals); 7219 fl-rl stainless steel products, not und 600mm wide (i_s-metals); 7402 unrefnd cppr cppr anods f elctroltc refining (nfm-metals); 7403 refined copper & alloys (no mast alloy), unwrought (nfm-metals); 7502 nickle, unwrought (nfm-metals); 7601 aluminum, unwrought (nfm-metals); 7606 aluminum plates, sheets & strip over .2mm thick (nfm-metals); 8105 cobalt mattes etc, cobalt & art, inc waste & scrap (nfm-metals).

Table 10. Value of Exports to China in 2001, GTAP Database, $US millions

	Mozambique	Malawi	Zambia
Rice	0.00	0.00	-
Wheat	-	-	-
Coarse Grains	0.02	0.03	0.02
Oilseeds	-	-	-
Sugar	-	-	-
Cotton	-	-	-
V_F, Other crops	0.06	0.51	0.03
Dairy Farms	-	-	-
Ruminant (Other than dairy)	-	-	-
Non Ruminants	0.01	-	-
Fisheries	0.01	0.01	-
Forestry	12.19	0.01	0.06
Dairy Products	-	0.01	-
Processed Ruminants	0.00	0.00	-
Processed Non Ruminants	0.00	0.01	0.01
Refined Sugar	-	-	0.00
Processed Rice	0.00	0.00	0.00
Vegetable Oils and Fats	0.00	0.00	0.01
Other food, beverages, tobacco	0.11	0.04	0.04
Textiles, Apparel and Footwear	0.02	0.03	0.05
Autos and parts	-	0.00	0.00
Heavy industry	0.01	0.09	0.01
Electronic equipment	-	-	0.00
Other Manufactures	0.08	0.07	0.07
Wholesale/Retail Trade	0.44	0.41	0.11
Transport, Communication	0.82	0.83	0.57
Financial and business serv	0.48	0.94	0.06
Housing, educ, health, public	0.04	0.35	0.15
Uitlities	0.04	0.09	0.12
Petroleum	-	0.05	0.00
Construction	0.07	0.07	0.01
Metal products	0.00	0.01	0.00
Ferrous metals	-	-	0.13
Wood products	0.02	0.01	0.01
Metals nec	-	-	46.18
Mineral products nec	0.00	0.00	0.01
Minerals nec	0.01	-	0.90

Source: Simulation Output

Table 11. Disposition of the Forestry Sector (Output and Imports) in GTAP regions

	Domestic Production				Imports			
	Production	Consumption	Government	Total	Production	Consumption	Government	Total
1 ASEAN	95%	5%	0%	100%	99%	2%	0%	100%
Botswana	75%	25%	0%	100%	94%	6%	0%	100%
China	96%	4%	0%	100%	97%	3%	0%	100%
4 EU	89%	10%	1%	100%	82%	18%	0%	100%
5 FUSSR	89%	11%	0%	100%	75%	25%	1%	100%
6 HYASIA	79%	21%	0%	100%	96%	5%	0%	100%
India	41%	**60%**	0%	100%	3%	**97%**	0%	100%
8 MENA	62%	38%	1%	100%	83%	16%	1%	100%
Mozambique	13%	**88%**	0%	100%	25%	**75%**	0%	100%
Malawi	47%	**53%**	0%	100%	59%	41%	0%	100%
11 NAMER	85%	15%	0%	100%	91%	9%	0%	100%
12 ROW	89%	3%	8%	100%	91%	9%	0%	100%
13 SAMER	77%	23%	0%	100%	74%	26%	0%	100%
Rest of South Asia	46%	**54%**	0%	100%	38%	**62%**	0%	100%
Tanzania	34%	**66%**	0%	100%	57%	43%	0%	100%
Uganda	39%	**61%**	0%	100%	99%	1%	0%	100%
Rest of Southern Africa	52%	**48%**	0%	100%	97%	4%	0%	100%
Rest of Sub-Saharan Africa	54%	**46%**	0%	100%	64%	36%	0%	100%
South Africa	75%	25%	0%	100%	94%	6%	0%	100%
Zambia	14%	**86%**	0%	100%	59%	41%	0%	100%

Source: Simulation Output

Table 12. Percentage Changes in Output, Prices and Imports after an increase in Timber Exports to China, Mozambique

	Output	Market Prices	Imports
Rice	-4.02	5.37	26.58
Wheat	-7.34	3.46	-0.31
Coarse Grains	-0.44	5.94	7.11
Oilseeds	-7.54	2.62	3.13
Sugar	-4.45	3.13	3.61
Cotton	-9.61	2.62	5.58
V_F, Other crops	-2.68	5.24	10.86
Dairy Farms	-0.03	5.76	20.7
Ruminant (Other than dairy)	-0.71	5.68	8.58
Non Ruminants	1.49	1.15	1.95
Fisheries	1.59	3.75	6.12
Forestry	19.48	111.35	396.12
Dairy Products	-3.05	1.29	3.61
Processed Ruminants	-1.13	3.78	14.48
Processed Non Ruminants	0.86	1.3	6.81
Refined Sugar	-5.56	1.48	3.3
Processed Rice	-8.61	5.09	4.27
Vegetable Oils and Fats	-0.76	1.34	5.07
Other food, beverages, tobacco	-0.3	1.81	5.34
Textiles, Apparel and Footwear	-0.02	0.73	4.32
Autos and parts	-1.66	0.28	-2.16
Heavy industry	-4.28	0.63	-2.38
Electronic equipment	-2.94	0.38	-1.6
Other Manufactures	-3.29	0.41	-2.13
Wholesale/Retail Trade	1.49	1	2.71
Transport, Communication	0.44	0.38	1.23
Financial and business serv	-0.15	0.38	1.63
Housing, educ, health, public	1.88	0.78	1.83
Uitlities	-4.05	0.43	-0.98
Petroleum	-0.81	0.5	0.95
Construction	-0.83	0.66	0.54
Metal products	-2.61	0.34	-2.84
Ferrous metals	-1.96	0.4	-0.71
Wood products	-21.89	10.49	13.46
Metals nec	-3.09	0.39	-1.9
Mineral products nec	-1.92	0.47	-0.56
Minerals nec	-3.44	0.43	-3.83

Source: Model Simulation Output

Table 13. Percentage Change in the demand for endowments in Agricultural Livestock an dTimber sector and total change in price of endowments

	Rice	Wheat	Crsgrns	Oilseeds	Sugar	Cotton	OthCrps	Milk	Cattle	Forest	Prices
AEZ1	-0.60	-4.76	0.78	-3.17	-2.12	-4.44	-0.09	1.16	0.83	36.3	33
AEZ2	-0.63	-4.79	0.74	-3.2	-2.15	-4.47	-0.12	1.12	0.8	36.25	33.13
AEZ3	-10.57	-14.32	-9.34	-12.88	-11.94	-14.03	-10.11	-8.99	-9.29	22.55	74.17
AEZ4	-16.74	-20.22	-15.59	-18.89	-18.01	-19.95	-16.31	-15.27	-15.54	14.13	108.96
AEZ5	-19.98	-23.33	-18.87	-22.05	-21.21	-23.07	-19.57	-18.57	-18.83	9.69	131.25
AEZ9	-0.55	-4.71	0.82	-3.12	-2.07	-4.39	-0.04	1.21	0.88	36.36	32.85
AEZ10	-0.63	-4.79	0.75	-3.2	-2.15	-4.47	-0.12	1.13	0.8	36.25	33.11
UnSkLab	-1.85	-6.1	2.09	-6.69	-3.33	-8.78	-0.54	2.42	1.68	40.71	0.82
SkLab	-1.7	-5.95	2.25	-6.54	-3.18	-8.64	-0.38	2.59	1.84	40.9	0.18
Capital	-1.71	-5.97	2.23	-6.56	-3.19	-8.65	-0.39	2.57	1.83	40.89	0.24

Source: Model Simulation Output.
Notes: AEZ1 through AEZ5 are in the tropical climate zone with moisture regimes arid, dry semi-arid, moist semi-arid, sub-humid and humid respectively. AEZ9 and AEZ10 are moist semi-arid and sub-humid temperate zones.

Table 14. Mozambique: Changes in income (nominal and real) and expenditures for the por ($1/day poverty line)

	Real income at the Poverty Level	Nominal Income	True cost of living
Land	94.78	101.56	6.78
Ag. Unskilled Labor	-6.02	0.76	6.78
Ag. Skilled Labor	-6.32	0.44	6.76
Non-Ag. Unskilled Labor	-5.94	0.85	6.79
Non-Ag. Skilled Labor	-6.57	0.18	6.75
Wage Unskilled Labor	-5.97	0.82	6.79
Wage Skilled Labor	-6.57	0.18	6.75
Agricultural Capital	-6.29	0.47	6.76
Non-Agricultural Capital	-6.54	0.21	6.75
Transfers	-1.02	5.74	6.76

Source: Simulation Output

Table 15. Mozambique: Percentage changes in poverty headcount and share of the poor, total and by strata

	Percentage Change	Share of poor	Poverty Change
Agr.	1.33	41%	
N-Agr.	6.17	13%	
Urb. Lab.	6.18	2%	
Rur. Lab.	4.77	5%	3.18
Transf.	0.49	13%	
Urb. Div	7.37	7%	
Rur. Div	4.79	20%	

Source: Simulation Output
Notes: Rows are specializations for each household: Agr. = agricultural, N-Agr. = non-agricultural, Urb. Lab. = urban labor, Rur. Lab.= rural labor, Transf.= Transfer, Urb. Div. = urban diversified, Rur. Div. = rural diversified.

Table 16. Percentage Changes in Output, Prices and Imports after an increase in Metal Exports to China, Zambia

	qo	pm	qim	qxw
Rice	0.05	1.11	5.15	-10.52
Wheat	-0.97	1.03	3.64	-8.63
Coarse Grains	0.58	1.06	1.96	-2.58
Oilseeds	-1.05	1.06	1.77	-4.67
Sugar	-3.1	0.62	-0.58	-3.3
Cotton	**-2.87**	0.7	-1.22	-2.8
V_F, Other crops	-0.3	1.05	2.98	-4.22
Dairy Farms	-0.44	1.33	4.15	-9.18
Ruminant (Other than dairy)	0.17	1.38	2.65	-4.82
Non Ruminants	0.09	1.38	2.05	-3.23
Fisheries	0.41	2.04	2.99	-3.71
Forestry	0.39	2.5	6.35	-11.23
Dairy Products	**-3.75**	1.85	3.31	-11.6
Processed Ruminants	0.03	1.67	6.62	-11.56
Processed Non Ruminants	0.36	1.67	8.16	-11.3
Refined Sugar	**-3.87**	0.99	2.79	-4.48
Processed Rice	-0.32	1.64	3.85	-7.41
Vegetable Oils and Fats	-0.57	1.4	4.08	-8.66
Other food, beverages, tobacco	0.35	1.78	3.46	-5.5
Textiles, Apparel and Footwear	**-2.71**	1.68	5.45	-11.09
Autos and parts	-3.3	1.28	2.09	-6.65
Heavy industry	**-4.76**	1.91	1.92	-10.75
Electronic equipment	**-3.51**	1.64	3.05	-13.13
Other Manufactures	**-6.26**	1.53	2.54	-11.27
Wholesale/Retail Trade	1.1	2.04	4.43	-7.38
Transport, Communication	-0.16	1.82	3.64	-4.2
Financial and business serv	0.25	2.09	4.37	-7.55
Housing, educ, health, public	0.67	1.98	3.5	-7.17
Uitlities	**-2.08**	1.95	7.1	-25.68
Petroleum	1.06	0.18	1.55	-1.3
Construction	1.33	1.44	5.11	-5.27
Metal products	-1.94	1.4	3.22	-9.29
Ferrous metals	**-4.08**	1.45	1.96	-7.09
Wood products	-1.14	2.1	5.71	-11.87
Metals nec	**6.18**	1.7	8.08	6.19
Mineral products nec	-0.87	1.6	3.99	-6.76
Minerals nec	**4.67**	1.96	7.39	-3.04

Source: Simulation Output

Table 17. Zambia: Changes in income (nominal and real) and expenditures for the por ($1/day poverty line)

	Real income at the Poverty Level	Nominal Income	True cost of living
Ag. Unskilled Labor	0.29	1.76	
Ag. Skilled Labor	-0.32	1.15	
Non-Ag. Unskilled Labor	-0.04	1.43	
Non-Ag. Skilled Labor	0.91	2.38	
Wage Unskilled Labor	1.16	2.63	1.47
Wage Skilled Labor	0.58	2.05	
Agricultural Capital	1.15	2.62	
Non-Agricultural Capital	-0.26	1.21	
Transfers	0.8	2.27	
Ag. Unskilled Labor	0.89	2.36	

Source: Simulation Output

Table 18. Zambia: Percentage changes in poverty headcount and share of the poor, total and by strata

	Percentage Change	Share of poor	Poverty Change
Agr.	0	0.33	
N-Agr.	-0.51	0.23	
Urb. Lab.	-1.62	0.1	-0.44
Rur. Lab.	-0.59	0.07	
Transf.	-0.39	0.07	
Urb. Div	-0.81	0.08	
Rur. Div	-0.24	0.12	

Source: Simulation Output

Notes: Rows are specializations for each household: Agr. = agricultural, N-Agr. = non-agricultural, Urb. Lab. = urban labor, Rur. Lab.= rural labor, Transf.= Transfer, Urb. Div. = urban diversified, Rur. Div. = rural diversified.

Table 19. Percentage Changes in Output, Prices and Imports after an increase in Metal an Minerlas Exports to China, South Africa

R006	qo	pm	qim	qxw
Rice	-1.71	0.49	0.49	-1.27
Wheat	-1.38	0.78	1.34	-5.28
Coarse Grains	-0.55	0.82	0.4	-1.62
Oilseeds	-1.69	0.6	-0.19	-2.46
Sugar	-2.18	0.5	-1.07	-2.52
Cotton	-2.16	0.55	-0.64	-2.2
V_F, Other crops	-1.3	0.61	0.58	-2.34
Dairy Farms	-0.17	0.97	3.14	-6.83
Ruminant (Other than dairy)	0.03	0.98	1.63	-2.3
Non Ruminants	-0.32	1.12	0.67	-2.5
Fisheries	-0.38	0.97	1	-1.87
Forestry	-0.89	-1.15	-3.99	4.81
Dairy Products	-0.47	1.38	5.23	-5.93
Processed Ruminants	0.16	1.11	4.34	-6.39
Processed Non Ruminants	-1.18	1.19	5.02	-6.94
Refined Sugar	-2.51	1.15	2.22	-4.79
Processed Rice	-2.04	1.22	1.01	-1.62
Vegetable Oils and Fats	-1.49	1.24	2.97	-5.28
Other food, beverages, tobacco	-0.48	1.43	2.44	-3.94
Textiles, Apparel and Footwear	-3.88	1.44	2.6	-8.99
Autos and parts	-2.95	1.39	2.98	-6.85
Heavy industry	-3.27	1.57	2.5	-7.37
Electronic equipment	-8.93	1.76	2.16	-12.14
Other Manufactures	-6.21	1.63	4.09	-10.5
Wholesale/Retail Trade	-0.12	1.79	3.78	-6.55
Transport, Communication	0.02	1.63	3.04	-7.57
Financial and business serv	0.46	1.74	3.44	-6.35
Housing, educ, health, public	0.8	1.77	3.84	-6.46
Uitlities	-0.49	1.82	9.62	-22.67
Petroleum	2.83	1.24	0.4	-5.39
Construction	-2.54	1.66	6.14	-6.1
Metal products	**13.52**	**1.6**	**4.48**	**-8.82**
Ferrous metals	-2.61	1.86	2.47	26.24
Wood products	**-2.39**	**1.3**	**3.99**	**-6.76**
Metals nec	-2.27	1.84	2.81	-1.7
Mineral products nec	**36.72**	**1.85**	**4.59**	**-6.91**

Source: Simulation Output

Table 20. Comparison of changes in Poverty Headcounts and True cost of Living in different experiments

Poverty Headcount (%Change)

	Mozambique Exports	Zambia Exports	Saouth Africa Exports	China Grows
Mozambique	3.18	-	3.22	3.24
Zambia	-	-0.44	-0.30	-0.25

True Cost of Living

	Mozambique Exports	Zambia Exports	Saouth Africa Exports	China Grows
Mozambique	6.78	-		6.21
Zambia	-	1.47		0.61

Source: Simulation Output

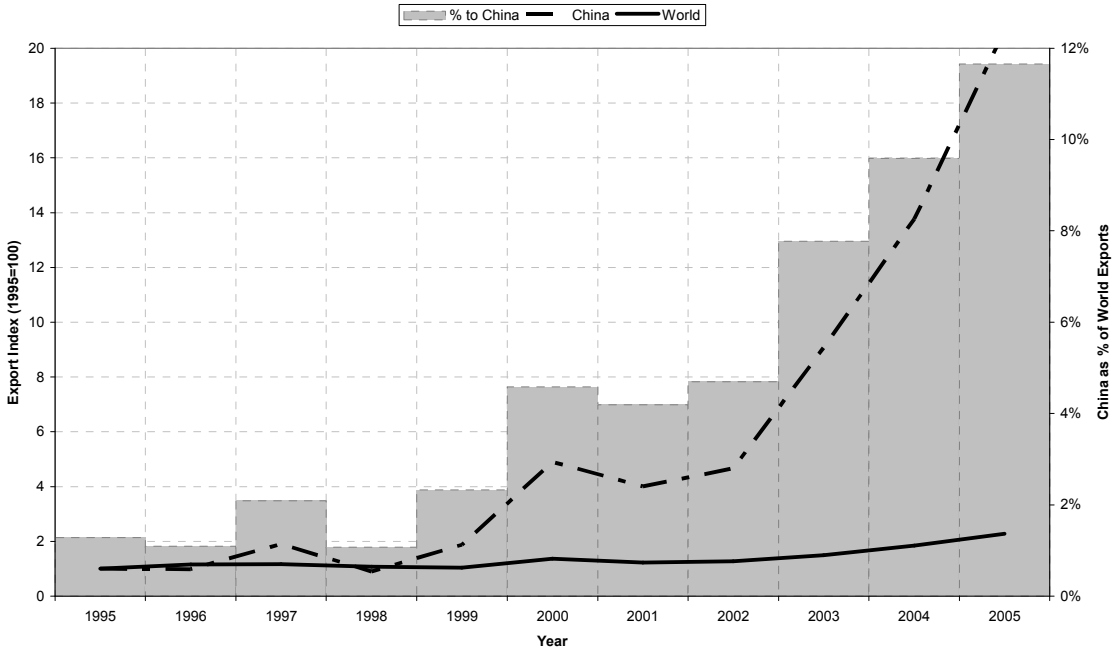
Table 21. Changes in Imports, Exports and Trade Balances in Mozambique and Zambia

	Percentage Changes in Aggregated Chinese Exports to:			Percentage Changes in Exports to China from:		Trade Balance (US$ millions) in:	
	World	Mozambique	China	Mozambique	Zambia	Mozambique	Zambia
Rice	-5.39	20.11	-0.65	-19.16	24.24	-0.48	0.00
Wheat	-0.98	-0.82	3.78	8.97	36.16	0.15	-0.12
Coarse Grains	-3.34	2.51	-3.15	8.33	22.70	-0.48	-0.18
Oilseeds	-4.02	-3.97	-5.26	**3,609.00**	46.91	-0.34	-0.03
Sugar	-10.61	-9.15	-12.19	40.46	59.88	0.00	0.00
Cotton	-2.83	0.21	-4.63	**1,486.00**	**7,896.00**	-1.74	-0.29
V_F, Other crops	-1.95	8.22	0.15	17.59	44.44	-9.60	-1.93
Dairy Farms	-35.90	-22.43	-33.63	22.13	70.02	-0.01	0.00
Ruminant (Other than dairy)	-21.81	-20.08	-25.39	41.45	68.83	-0.14	0.00
Non Ruminants	5.26	9.14	8.31	36.51	36.55	-0.06	-0.13
Fisheries	-43.07	-50.14	-51.74	98.66	108.19	-0.05	0.00
Forestry	-56.92	92.71	-61.77	**350.00**	164.57	**90.30**	0.31
Dairy Products	26.68	40.26	36.30	27.39	25.71	-0.36	-0.11
Processed Ruminants	-2.13	15.28	5.96	11.33	34.77	-0.34	-0.09
Processed Non Ruminants	30.40	52.26	47.98	12.33	12.05	-0.64	-0.19
Refined Sugar	10.73	18.26	14.23	36.55	40.97	-1.82	-1.48
Processed Rice	7.76	11.88	14.37	9.34	32.49	-0.37	-0.10
Vegetable Oils and Fats	-9.83	-6.07	-6.08	41.46	43.16	-1.18	-0.40
Other food, beverages, tobacco	5.97	13.68	11.07	36.27	37.61	-9.61	-1.22
Textiles, Apparel and Footwear	29.07	42.88	47.94	22.58	15.93	-2.92	-9.15
Autos and parts	44.00	46.51	51.03	29.46	24.91	1.24	-1.34
Heavy industry	34.53	39.27	45.00	31.28	23.83	4.47	-3.81
Electronic equipment	48.02	57.06	44.44	36.54	28.29	0.93	-0.98
Other Manufactures	59.41	71.78	80.26	17.96	10.71	4.42	-13.14
Wholesale/Retail Trade	21.95	24.72	26.95	59.27	55.11	-1.81	-0.49
Financial and business serv	36.06	38.62	41.39	45.23	38.18	-4.61	-0.94
Housing, educ, health, public	25.52	27.94	29.36	42.95	38.80	-0.39	-0.69
Uitlities	194.66	327.64	338.47	9.57	-9.92	-3.56	-22.71
Petroleum	7.60	11.41	8.55	54.85	55.07	-1.05	-1.24
Construction	22.11	22.77	27.55	29.66	26.83	-0.05	-1.28
Metal products	48.18	57.74	66.07	19.54	12.53	1.19	-0.91
Ferrous metals	36.35	44.65	48.43	25.52	20.93	0.37	-0.75
Wood products	18.54	41.04	30.69	**989.00**	27.15	-3.97	-0.70
Metals nec	62.47	77.91	97.02	16.71	**399.00**	-25.69	**57.61**
Mineral products nec	36.11	47.86	52.14	26.12	19.65	0.60	-1.59
Minerals nec	7.64	9.24	16.79	37.01	34.39	-0.03	-0.24

Source: Simulation Output

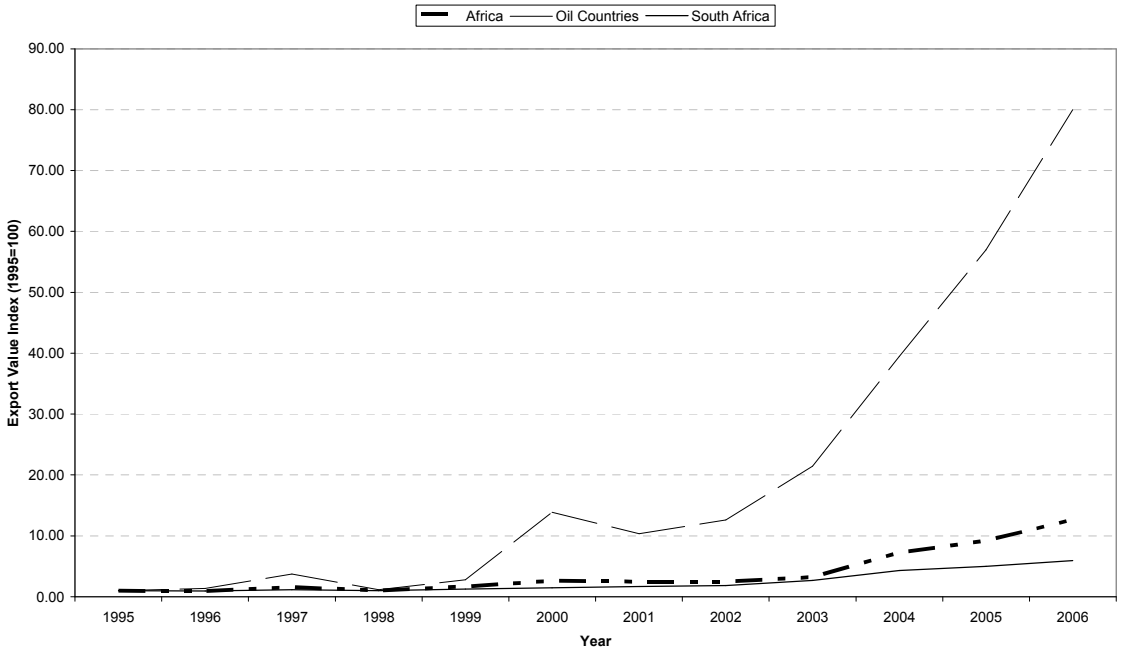
Note: Percentages in bold face are applied shocks.

Figure 1. Evolution of African Exports to China relative to the World, 1995-2005.



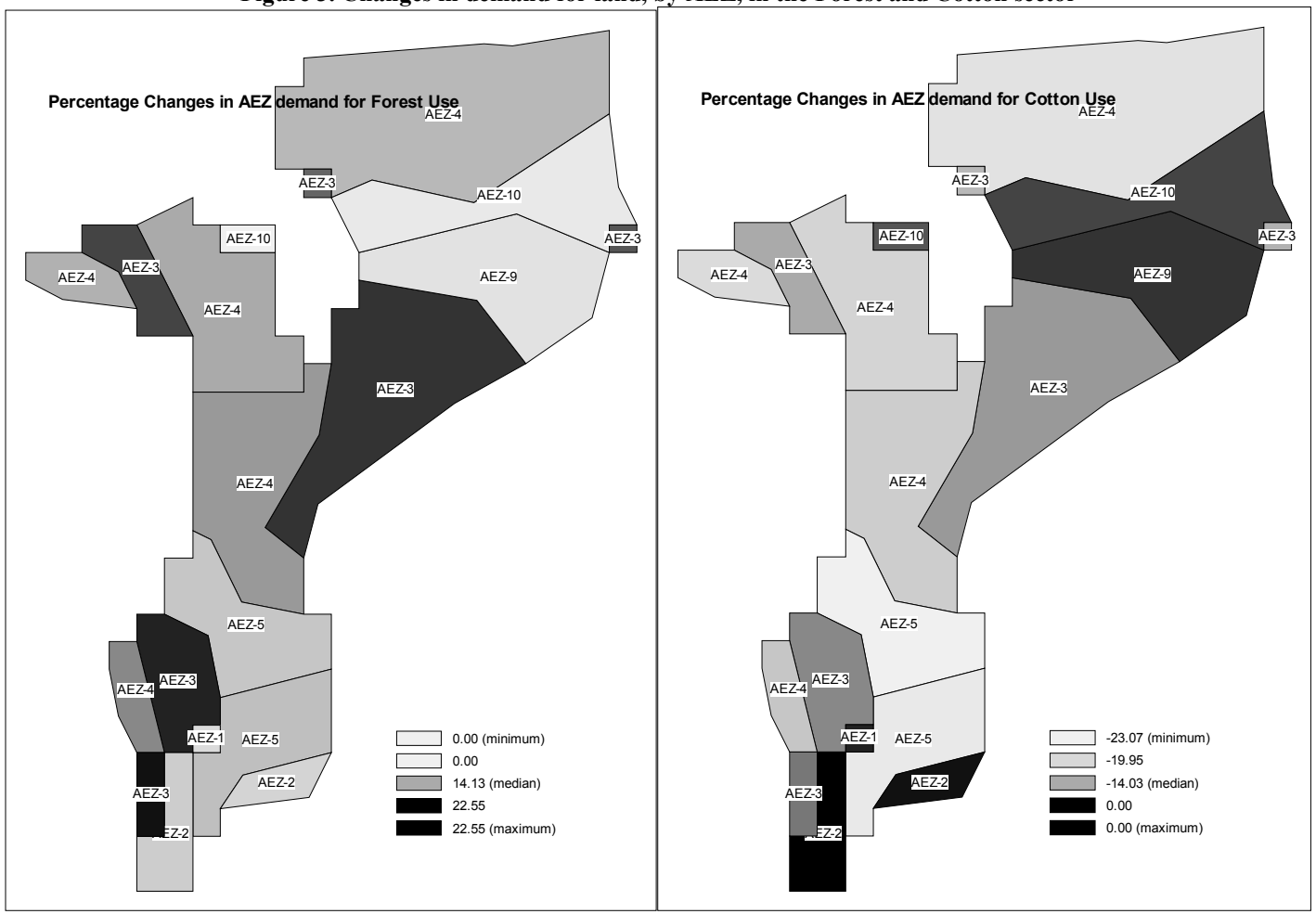
Source: International Monetary Fund, Direction of Trade Statistics

Figure 2. Evolution of African Exports to China , by exporter



Source: Author's elaboration using Sandrey (2007). Oil countries are Angola, Sudan Equatorial Guinea and Congo.

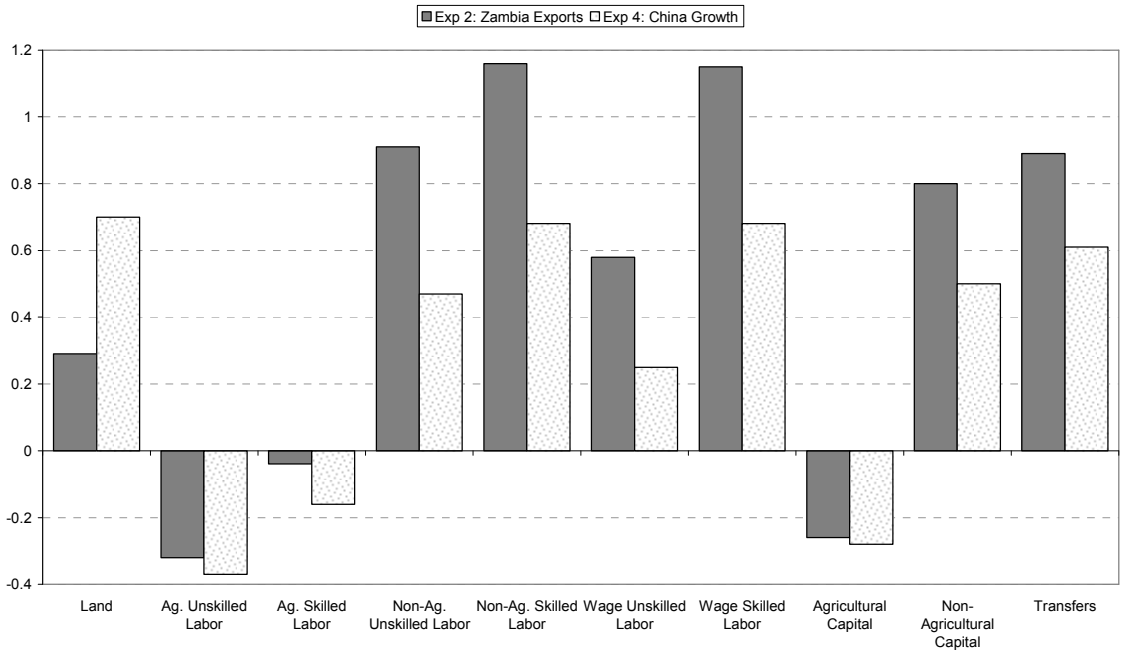
Figure 3. Changes in demand for land, by AEZ, in the Forest and Cotton sector



Source: Model Simulation results mapped using Shademap

Notes: AEZ1 through AEZ5 are in the tropical climate zone with moisture regimes Arid, Dry Semi-Arid, Moist Semi-Arid, Sub-humid and Humid respectively. AEZ9 and AEZ10 are Moist semi-arid and sub-humid temperate zones.

Figure 4. Changes in Zambian real income at the poverty level by source of specialization in Experiments 2 (Zambia Exports) and 4 (China Growth)



APPENDIX: Regions and Sectors Used in the Model

1	ASEAN	Asean Nations	ID	Sectors	Description
2	bwa	Botswana	1	Rice	Rice
3	chn	China	2	Wheat	Wheat
4	EU	Europe + EFTA + Rest of Europe	3	Crsgrns	Coarse Grains
5	FUSSR	Former USSR	4	Oilseeds	Oilseeds
6	HYASIA	High Income Asia	5	Sugar	Sugar
7	ind	India	6	Cotton	Cotton
8	MENA	Former USSR	7	OthCrps	V_F, Other crops
9	moz	Mozambique	8	Milk	Dairy Farms
10	mwi	Malawi	9	Cattle	Ruminant (Other than dairy)
11	NAMER	North America	10	NRumin	Non Ruminants
12	ROW	Rest of the World	11	Fish	Fisheries
13	SAMER	North America	12	Forest	Forestry
14	SASIA	South Asia	13	PrDairy	Dairy Products
15	tza	Tanzania	14	PrBeef	Processed Ruminants
16	uga	Uganda	15	PrNRumn	Processed Non Ruminants
17	xsc	Rest of SACU	16	PrSugar	Refined Sugar
18	xss	Rest of Sub Saharan Africa	17	PrRice	Processed Rice
19	zaf	South Africa	18	PrOilsd	Vegetable Oils and Fats
20	zmb	Zambia	19	OthFdBev	Other food, beverages, tobacco
			20	TextAppl	Textiles, Apparel and Footwear
			21	Autos	Autos and parts
			22	HvyMnfcs	Heavy industry
			23	Electron	Electronic equipment
			24	OthMnfcs	Other Manufactures
			25	WRtrade	Wholesale/Retail Trade
			26	TransCom	Transport, Communication
			27	FinSvce	Financial and business serv
			28	HsEdHe	Housing, educ, health, public
			29	Utility	Uitlities
			30	Petrol	Petroleum
			31	Constrct	Construction
			32	fmp	Metal products
			33	i_s	Ferrous metals
			34	lum	Wood products
			35	nfm	Metals nec
			36	nmm	Mineral products nec
			37	omn	Minerals nec