

Services Liberalization in Preferential Trade Arrangements

The Case of Kenya

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January 2011



Abstract

Given the growing importance of commitments to foreign investors in services in regional trade agreements, it is important to develop applied general equilibrium models to assess the impacts of liberalization of barriers to multinational service providers. This paper develops a 55 sector applied general equilibrium model of Kenya with foreign direct investment and Dixit-Stiglitz productivity effects from additional varieties of imperfectly competitive goods or services, and uses the model to assess its regional and multilateral trade options, focusing on commitments to foreign investors in services. To assess the sensitivity of the results to parameter values, the model is executed 30,000 times, and results are reported as confidence intervals of the sample distributions.

The analysis reveals that a 50 percent preferential reduction in the ad valorem equivalents of barriers in

all business services by Kenya with its African partners would be somewhat beneficial for Kenya. If a preferential agreement with African partners is combined with an agreement with the European Union, the gains would more than triple the gains of an Africa only agreement. Multilateral reduction of services barriers, however, would yield gains about 12 times the gains of an agreement with the Africa region alone. These results suggest that preferential liberalization in the region is a valuable first step, but wider liberalization, with larger partners and liberal rules of origin or multilaterally, will yield much larger gains due to providing access to a much wider set of services providers. The largest gains would come from domestic regulatory reform in services, as this would almost triple the gains of multilateral liberalization.

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I. Introduction

Both economic theory and empirical literature have shown that wide availability of business services results in productivity gains to the manufacturing sector and contributes to its international competitiveness.¹ International commitments to national treatment and market access for foreign investors in key business services sectors may help developing countries obtain better access to these services that contribute to the productivity gains. Some developing countries, however, are hesitant to make substantial multilateral commitments, but may be more inclined to proceed in regional arrangements with other neighboring developing countries, rather than with a major Northern partner. Commitments in services, however, are often limited in South-South arrangements.

¹ Arnold et al. (2007), Fernandes (2007) and Fernandes and Paunov (2008) have provided econometric estimates of the gains from services liberalization. Marshall (1988) shows that in three regions in the United Kingdom (Birmingham, Leeds and Manchester) almost 80 percent of the services purchased by manufacturers were bought from suppliers within the same region. He cites studies which show that firm performance is enhanced by the local availability of producer services. In developing countries, McKee (1988) argues that the local availability of producer services is very important for the development of leading industrial sectors.

Both the urban economics literature (Vernon, 1960; Chinitz, 1961) and the modern economic geography literature (e.g., Krugman, 1991; Fujita, Krugman and Venables, 1999) have focused on the fact that related economic activity is economically concentrated due to agglomeration externalities (e.g., computer businesses in Silicon Valley, ceramic tiles in Sassuolo, Italy). Evidence comes from a variety of sources. Ciccone and Hall (1996) show that firms operating in economically dense areas are more productive than firms operating in relative isolation. Caballero and Lyons (1992) show that productivity increases in industries when output of its input supplying industries increases. Hummels (1995) shows that most of the richest countries in the world are clustered in relatively small regions of Europe, North America and East Asia, while the poor countries are spread around the rest of the world. He argues this is partly explained by transportation costs for inputs since it is more expensive to buy specialized inputs in countries that are far away for the countries where a large variety of such inputs are located.

Since the early 1990s, regional trade agreements have surged; 283 have been notified to the WTO and were in force as of February 2010.² Given the inclusion of services in modern FTA agreements negotiated with the EU, the US and in some other agreements, economists need to be able to assess the impact of services commitments as part of their advice to governments regarding preferential trade agreements. Services commitments in regional agreements could lead to substantial productivity improvements. But is there an analogy to trade diversion in goods whereby preferential commitments in services could be immiserizing? Are developing countries likely to obtain substantially larger gains from an agreement with a developed country, rather than a developing country? How do the gains of preferential versus global liberalization compare?

Given that preferential trade liberalization discriminates against excluded countries, it is well known from the vast theoretical literature that preferential liberalization of goods may lead to either gains or losses of welfare. Perhaps motivated by this uncertainty of outcomes of their agreements, policy-makers have expressed considerable demand for analysis of these agreements. Applied modelers have responded with applied general equilibrium models that focus on goods. So the literature now contains a substantial number of studies that examine regional agreements in goods.³ But this paper and the Jensen and Tarr (2010) paper are the first

²See http://www.wto.org/english/tratop_e/region_e/region_e.htm. This does not include a significant number of regional agreements that are in force (among developing countries) that have not been notified to the WTO.

³The more prominent studies include Harris (1984), Cox and Harris (1986), Harrison, Rutherford and Tarr (1996), Smith and Venables (1988), Baldwin, Forslid and Haarland (2000), several in the Francois and Shiells (1994) volume, Levy and van Wijnbergen (1995), Harrison, Rutherford and Tarr (1997a), Rutherford, Rutstrom and Tarr (1993), Rutherford, Rutstrom and Tarr (1995), Harrison, Rutherford and Tarr (2002), Rutherford and Tarr (2003) and Harrison, Rutherford, Tarr and Gurgel (2004). See Jensen and Tarr (2010) for a review of this literature.

numerical studies of regional arrangements that assess the impact of commitments to multinational firms who will undertake foreign direct investment in services.⁴

Given substantial demand by governments for advice on their prospective trade policies in the regional and multilateral arenas, it is unfortunate that the profession does not have a framework for assessing the ex ante welfare impact of preferential reduction of barriers against foreign direct investment in business services. We attempt to fill that gap in this paper. Crucial to the analysis, we incorporate the Dixit-Stiglitz-Ethier mechanism of endogenous productivity gains from additional varieties of imperfectly produced goods and services.

Jensen and Tarr (2010) have shown that if domestic firms capture rents from the barriers against multinational providers of services, then these rents are analogous to tariff losses in goods, and losses may occur from preferential liberalization of services. Moreover, with imperfect competition, preferential liberalization will lead to a gain of varieties from the partner countries, but a loss of varieties from excluded countries; the lost varieties can lead to a net loss of welfare. We simulate examples of cases where there is a loss of welfare due to the loss of varieties and show how key elasticities in the model influence the result.

⁴ Earlier papers that examined the impact of barriers to foreign direct investment in services include the following. Markusen, Rutherford and Tarr (2005) developed a stylized model where foreign direct investment is required for entry of new multinational competitors in services, but they did not apply this model to the data of an actual economy. Brown and Stern (2001) and Dee et al. (2003) employ multi-country numerical models with many of the same features of Markusen, Rutherford and Tarr. Their models contain three sectors, agriculture, manufacturing and services, and are thus also rather stylized. The Dixit-Stiglitz endogenous productivity effect from the impact of service sector liberalization on product variety is not mentioned in the results of Brown and Stern and are interpreted as of little relevance in Dee et al.⁴ Konan and Maskus (2006) develop a small open economy constant returns to scale model with an initial monopoly in services sectors that results in monopoly rents and increased costs. They examine the impact of exogenously allowing additional firms to enter. The papers by Jensen, Rutherford and Tarr (2007) and Rutherford and Tarr (2008) on Russian WTO accession are the closest to this model; but there was only one aggregate rest of the world in those models, so there was no possible consideration of regional impacts in those papers.

Kenya is an example of a country facing most of the policy choices mentioned above. In many of its business services sectors, including maritime and road transportation, banking, insurance and professional services, the regulatory regime imposes significant burdens on the cost of providing services, both by Kenyan service providers and by multinationals. In 2010 it was involved in negotiations of commitments in services in various regional arrangements, including the Economic Partnership Agreements with the European Union, COMESA and the East African Customs Union.⁵ And in the context of its international negotiations under the Doha Development Agenda, Kenya may be called upon to make further commitments in the business services area. Kenya is proceeding cautiously regarding services commitments in all these areas, but is taking steps to adopt a mutual recognition agreement in professional services within the East African Customs Union.

In this paper we develop a 55-sector small open economy comparative static computable general equilibrium model of Kenya that we believe is appropriate to evaluate the impact of Kenyan liberalization of services barriers. We build on the model of Balistreri, Rutherford and Tarr (2009), but we decompose the rest of the world into three regions: the European Union; our Africa region; and the Rest of the World. All foreign regions are sources of foreign direct investment in some of the business services sectors.

We find that a 50 percent preferential reduction in the ad valorem equivalents of barriers in all business services with respect to its African regional partners would be slightly beneficial for Kenya in our central elasticity case. But an agreement with the EU is worth more than twice as much as an agreement with the Africa region, and if preferential liberalization with the Africa region is combined with an agreement with the EU, the gains would more triple. If the

⁵ See table 1 for a list of COMESA (Common Market of East and Southern Africa) and East African Customs Union countries.

liberalization of business services commitments is extended to all foreign partners (called “Unilateral” in the tables), the gains would increase by twelve times compared with an African agreement alone. Thus, these results suggest that preferential liberalization in the region is a valuable first step, but wider liberalization, with larger partners or multilaterally will yield much larger gains due to providing access to a much wider set of services providers.

Finally, we estimate that a serious effort to reduce non-discriminatory regulatory barriers (that is, barriers that raise the costs of Kenyans as well as foreign services providers in Kenya) would almost triple the benefits of multilateral liberalization in Kenya.

Multilateral liberalization yields larger gains than preferential liberalization since with preferential liberalization Kenya will not obtain additional service sector suppliers from excluded countries, and, in fact, Kenya will suffer losses of service sector suppliers in excluded countries. Moreover, we summarize research below that shows that small countries gain more technological spillovers from trade with technologically advanced countries (at least in research and development intensive products). Our model allows for differentiated rates of technological spillover by region and product, and this is the main explanation for why the estimated gains from a preferential agreement with the EU will yield larger gains for Kenya than a preferential agreement with the African region.

Combining African regional liberalization with regional liberalization with the EU would capture the gains from agreements with both regions. Kenya could combine an agreement with the EU and the Africa region with liberal rules of origin, and the results would then come closer to the gains from unilateral liberalization with the whole world.

We devote considerable attention to the sensitivity of our results to uncertainty in the parameters. First, to understand the model better, we conduct piecemeal sensitivity of the results, where we isolate the impact of each of the parameters to ascertain which parameters most strongly impact the results. Second, to assess the robustness of the results to parameter uncertainty, we conduct systematic sensitivity analysis, where we execute the model 30,000 times. Each simulation is based on a random draw of all the parameter values; we then present sample distributions and sample confidence intervals of the key variables.⁶ Regarding Kenya's preferential arrangement with the Africa region, we find, from the systematic sensitivity analysis, that there is a 9.5 chance that Kenya would lose. If Kenyans are assumed to capture the rents from barriers in services, then the mean estimate is that Kenya would lose.

We conduct sensitivity on a range of values of key parameters that determine the productivity impacts in imperfect competition. In the Kenya-Africa scenario, we show that there is a set of plausible parameter values that result in sufficient loss of varieties from the rest of the world and the EU region that there would be negative welfare effects for Kenya. This shows that under imperfect competition there is an extension of the trade diversion results of perfect competition.

The paper is organized as follows. In section II, we provide an overview of the Kenyan services sectors. We discuss how we estimated the tariff equivalents of the barriers in services in section III. We provide an overview of the model in section IV and a discussion of the data in section V. The central results are presented in section VI and sensitivity results are presented in section VII. Given the initiative of the East African Customs Union to begin to include services

⁶ The systematic sensitivity analysis has been conducted with the range of parameters values shown in table 22, with the exception of the elasticity of firm supply with respect to price. For this latter elasticities, , the systematic sensitivity analysis was done with these elasticities equal to 2 for the Africa and Kenyan regions, ten for the EU and 15 for the Rest of the World (for all sectors).

in their agreements by negotiating mutual recognition agreements in professional services, we focus on a range of possible policy options in professional services. These are presented in section VIII. Conclusions are presented in section IX. In appendix A, we discuss the trade and tariff data in some detail. We document the calculation of ownership shares by sector and region in appendix B. How we obtained estimates of the Dixit-Stiglitz elasticities in goods is described in appendix C. The explanation of the estimation of the ad valorem equivalents of barriers in professional services, done by Nora Dihel and Josaphat Kweka, is explained in appendix D.

II. Overview of the Kenyan Service Sectors

In this section, we summarize the key institutional and policy issues in telecommunications, banking, insurance and transportation. This discussion is based on several policy notes written on the Kenyan business services sectors.

Transportation

One bright spot in the Kenyan transportation network is its air transportation services. In recent years, Kenya allowed private sector development (both Kenyan and foreign) to develop the air transportation links. The efficient air transportation services facilitate the important tourism sector and have been instrumental in the development of the Kenyan cut flower industry, which in turn has contributed to growth and poverty reduction.

However, Kenya's port, rail and road transportation facilities are significant problems for transportation of its goods and for the competitiveness of its exports (for details see Helu, 2007; Ochieng, 2007; and World Bank, 2007). Its principal port, Mombassa, is plagued by poor infrastructure and complicated bureaucratic procedures. As a result, it takes an average of two weeks to clear a container at the port and more than four weeks for over 5 percent of the containers. The cost of importing a container into Kenya exceeds USD 1300, while it is under USD 1,000 per container in Tanzania and South Africa

and under USD 500 per container in Malaysia and Singapore.⁷ Uncertainty over delivery times is a significant cost burden on manufactured exports. The port at Dar es Salaam, Tanzania, is regarded as more efficient and container throughput has been growing much faster there.

Due to a lack of investment, Kenya's railways have significantly declined and are considered rather poor providers of freight transportation services since the 1980s.⁸ Road transportation is the primary means of overland transport. But some sections of the key "Northern Corridor" are in very poor condition.

Kenya's problems with its ports, rail and road transportation facilities were highlighted by Kenya's ranking on the international Logistics Perception Index of 2004.⁹ Of the 70 countries in the 2004 survey, Kenya was ranked as the least logistically friendly (World Bank, 2007). In Africa, the survey included South Africa, Zambia, Ghana and Nigeria. For 2006, the survey expanded to include 150 countries, and Kenya ranks at number 75--below several African countries, but above average for the region.

Telecommunications

As of 2007, Kenya's telecommunications services were expensive compared with other Sub-Saharan African countries and even more when compared with those of East and South Asia. Relative to countries with comparable income, Kenya had fewer fixed lines per capita, less than half the level of international calls per subscriber and higher Internet charges. Perhaps more important is the low efficiency of service provision (see World Bank, 2007, pp.45-47). Kenya currently requires that telephone companies must be at least 30 percent owned by Kenyan nationals. Problems related to the licensing of the third mobile telephone provider¹⁰ and the "Second National Operator" were primarily due to this

⁷ World Bank staff estimates.

⁸ In the hope of improved performance, Kenya's railways were turned over to Rift Valley Railways, a South African company, in November 2006.

⁹ The Logistics Perception Index measures the perceptions of managerial level personnel of international freight forwarding companies. It is published by the Global Facilitation Partnership for Transportation and Trade and available at: www.gfptt.org.

¹⁰ Regarding the third mobile telephone operator, a consortium of a local investor (Kenya National Federation of Cooperatives, KNFC) and foreign investors (Econet Wireless) won the tender in February 2004. But the consortium was put together to meet the 30 percent local ownership requirement, not because of business reasons. Citing deals

restraint. In fact, the Government has acknowledged that the 30 percent ownership requirement is delaying licensing of additional telecom operators.¹¹

By the end of 2009, however, the duopoly of Zain and Safaricom was broken by the addition of two additional operators to the market: Orange Kenya and Essar Telecom Kenya. Subscribers increased to 19.4 million, or 49.7 percent of the population, almost all of whom were prepaid subscribers. About 85 percent of the population lived in a region where service was provided. According to the Communications Commission of Kenya, prices of mobile services were declining due to competition among the four operators. Safaricom was the leader in mobile banking software for its telephones and thus succeeded in capturing back significant market share.

Data transmissions are especially expensive by international standards. The primary explanation for the high cost of these services is that until recently East Africa was the only major coastline in the world without access to a fiber-optic cable network. In early 2008, these services were provided by satellite services, which are more expensive than fiber optic seabed cable. However, the completion of the SEACOM and TEAMS fiber optic cable systems in 2009 and the expected operation of the EASSy system in mid-2010 should lower the costs of internet and data transmission services. A reduction in the costs of internet transmission services will likely result in more internet service users. More internet users will likely allow achievement of economies of scale in production that would further reduce costs. However, according to one expert, as of early 2010, the main consequence of the TEAMS and SEACOM project completion has been increasing speed, but not lowering of costs.¹²

While there are obviously serious economic problems in the telecom sector, the government has implemented significant reforms in the sector in the last ten years. The government's strategy for the

made by a previous CEO of KNFC, KNFC at one point wrote to the Communications Commission of Kenya (CCK) withdrawing from the consortium. KNFC later withdrew its letter of objection, but lost its controlling share of the consortium. CCK, nonetheless, awarded the license to Econet Wireless and court battles ensued. The Government eventually suspended the entire CCK board and its Director General, and suspended the license of Econet. In April 2007, Econet has agreed to withdraw its court case and settle the matter out of court. Ultimately, it began operating under the brand name "Yu" and changed its name to Essar Telecom Kenya in April 2009.

¹¹ "SNO to get a year to meet local ownership rule," *The Saturday Standard*, Business section, April 14, 2007.

¹² See www.moseskemibaro.com/2010/01/02/a-review-of-kenyas-ict-position-in-2009/

sector is outlined in the Postal and Telecommunications Policy Statement of 1997.¹³ The strategy outlines a more liberal and private sector led strategy designed to optimize the sector's contribution to economic growth of Kenya (Matano and Njeru, 2007). The Kenya Communications Act of 1998 created the Communication Commission of Kenya as an independent regulator of the sector. The monopoly rights of Telekom Kenya Ltd expired on June 30, 2004. Since then significant competition has been introduced into the sector and the Communication Commission of Kenya introduced the modern and efficient "Unified Licensing Framework" for licensing of telecommunications companies. The estimates of this paper can be taken as an assessment of the effective implementation of this reform program.

Banking and Insurance

Banking. Relative to other countries in Africa, Kenya has a well developed financial sector. The cost of credit does not appear to be a major constraint for large enterprises. Nonetheless, medium, small and micro enterprises have severe problems accessing credit.¹⁴ Only about 1.5 percent of the credit these enterprises receive is from banks, and about 90 percent of them have no access to credit. Their problems accessing credit is because of: the high costs to banks of evaluating and monitoring credit to small enterprises; the absence of credit rating agencies, deficiencies in the legal system that make enforcement of debt contracts difficult and push collateral requirements too high for small firms; many small firms lack the capacity to process bank paperwork; and many small firms do not have access to insurance that would significantly reduce the risk to banks and the collateral required.

Foreign banks can operate in Kenya, either by acquiring a Kenyan bank or by obtaining a license to operate as a Kenyan affiliate bank of a multinational bank. In practice, affiliates of multinational banks are provided full market access and national treatment, but Kenya has not "bound" this practice at the WTO. The European Union has requested that Kenya commit to national treatment of foreign investment

¹³ This statement is consistent with the government's Economic Recovery Strategy for Wealth Creation (ERS)

¹⁴ Despite the credit problems, it is the medium and small enterprises that are the fastest growing part of the Kenyan economy. They increased their share of GDP from 13.8 in 1993 to 18.4 in 1999.

in the sector by binding this commitment at the WTO (Kiptui, 2007). Branch banking by foreign banks, however, is not permitted.

Insurance. The insurance market in Kenya is small, but is considered one of the more developed in Africa. Similar to banking issues, however, medium, small and micro enterprises have little access to insurance (World Bank, 2007). Regarding the regulatory environment, cross border provision of insurance is limited to cargo insurance and reinsurance services. In addition, the ownership of an insurance company must be at least one-third Kenyan and one-third of the members of the Boards of Directors must be Kenyan.

Distribution Services

Distribution services are the wholesale and retail trade sector of the economy. In Kenya in 2004 this sector accounted for about 10 percent of GDP, there were 217,000 retail outlets and about 66 percent of these retail outlets were either small retail stores or kiosks. Only one-half a percent of the outlets are super markets or very large stores. It is necessary to distinguish agricultural marketing from the marketing of manufactured goods.

Prior to 1993, many agricultural products, including maize, coffee and tea had to be sold to State Marketing Boards. The State Marketing Boards had an exclusive right to purchase, distribute and import these products. Since the reforms of 1993, farmers are now free to sell to private traders or to mills or the final consumer directly, but they still have the option to sell to the State Marketing Board if they choose. On the other hand, distribution of manufacturing goods has traditionally been handled by the private sector.

Presently numerous business licenses are required and many are considering damaging forms of government regulation (Onyango, 2007). The Government established a committee to review 1335 licenses. Draft laws and regulations have been prepared to implement the recommendations of the committee but have not yet been implemented as of mid-2007. In addition, restrictions on large scale outlets, shop opening hours and zoning restraints on business have been criticized as unnecessary burdens on business.

With respect to discriminatory restraints on foreign investors, Kenya requires that foreigners conduct business only in areas designated as general business areas. Local partners are encouraged, but not required. Expatriates employees are limited and the company must demonstrate that the skills are not available locally.

Professional Services

There are rather severe restrictions on the rights of foreigners to operate with a license in many of the professional services sectors, including legal, accounting, auditing and engineering services. The East African Customs Union is making its first foray into commitments in the services areas by encouraging mutual recognition agreements among the members. In appendix D, we provide details on the situation in engineering services sectors.

III. Estimation of the Tariff Equivalence of the Regulatory Barriers

Estimates of the ad valorem equivalents of the regulatory barriers in services are key to the results. In order to make these estimates, we first need to assess the regulatory environment in the services sectors in our model. We commissioned a 54 page survey of the regulatory regimes in key Kenyan business services sectors, namely, insurance, banking, fixed line and mobile telecommunications services and maritime transportation services.¹⁵ We supplemented this information based on a good set of studies on the services sectors that were presented at the conference on “Trade in Services” in Nairobi, Kenya on March 26, 27, 2007. In particular, we examined the papers by: Kiptui (2007) on financial services; Ndaro (2007) on communication services; Helu (2007) on maritime services; Ochieng (2007) on transport services; and Oresi (2007) on railway services. The study by the World Bank (2007) provided additional detail on the key issues in the sectors and the Telecommunications Management Group (2007) provided extensive details on telecoms. Tarr (2007a, 2007b) summarized this information in telecommunications

¹⁵ We thank Ms. Sonal Sejjal of the law firm of Anjarwalla & Khanna Advocates for leading this research effort.

and transportation. These questionnaires and papers provided us with data and descriptions and assessments of the regulatory environment in these sectors.

Mircheva (2007) then estimated the ad valorem equivalents of barriers to foreign direct investment in fixed line and mobile telecommunications, banking, insurance and maritime transportation services. The process involved converting the answers and data of the questionnaires into an index of restrictiveness in each industry. Mircheva followed the methodology of Kimura, Ando and Fujii (2004a, 2004b, 2004c) to generate these estimates. In the case of professional services, we used engineering services as a proxy for all professional services.¹⁶ The details of the regulatory regime and the scoring are listed as appendix D.

This methodology further involves building on the estimates and methodology explained in the volume by C. Findlay and T. Warren (2000), notably papers by Warren (2000), McGuire and Schulele (2000) and Kang (2000). For each of these service sectors, the authors evaluated the regulatory environment across many countries. The price of services is then regressed against the regulatory barriers to determine the impact of any of the regulatory barriers on the price of services. Mircheva (and Kweka in the case of engineering services) then assumed that the international regression applies to Kenya in the case that the above mentioned restrictiveness indexes are used. Applying that regression and their assessments of the regulatory environment in Kenya from the questionnaires and other information sources, she estimated the ad valorem impact of a reduction in barriers¹⁷ both for discriminatory and non-discriminatory barriers. Mircheva then weighted her fixed line and mobile telecommunications estimates by their market shares to obtain her estimate for communications. The results of the estimates of the ad valorem equivalents of the barriers are listed in table 4.

In the case of professional services, we used engineering services as a proxy for all professional services. In engineering services, we have the regression results from the paper by Ngyuen-Hong (2000). Based on an international data set, he estimates the ad valorem equivalents of barriers on trade in engineering services. No such estimates are available for other

¹⁶ The estimates were done by Josaphat Kweka, senior economist in the World Bank office in Tanzania in collaboration with Nora Dihel, Trade Coordinator for East Africa in the World Bank.

¹⁷ Warren estimated quantity impacts and then using elasticity estimates was able to obtain price impacts. The estimates by Mircheva that we employ are for “discriminatory” barriers against foreign direct investment.

professional services. Since the methodology we employ requires the existence of a cross-country regression estimate of the impact of barriers to foreign direct investment, we must use engineering services as our proxy. The scoring was done by Josaphat Kweka, senior economist in the World Bank office in Tanzania. The details of the regulatory regime and the scoring are listed as appendix D.

IV. Overview of the Model

This paper builds on the algebraic structure of the model of Balistreri, Rutherford and Tarr (2009). Here we provide a general description of the structure described there and provide more details where we depart from that structure. There are 55 sectors in the model shown in table 1. Primary factors include skilled, semi-skilled and unskilled labor; mobile capital; sector-specific capital in imperfectly competitive sectors; and primary inputs imported by multinational service providers, reflecting specialized management expertise or technology of the firm. The existence of sector specific capital in several sectors implies that there are decreasing returns to scale in the use of the mobile factors and supply curves in these sectors slope up. We explain this further in the appendix.

As in Balistreri, Rutherford and Tarr (2009), there are three categories of firms in the model: (1) perfectly competitive goods and services sectors; (2) imperfectly competitive goods sectors; and (3) imperfectly competitive services sectors with foreign direct investment. The cost, production and pricing structures in the three categories differ widely. The principal extension is that we disaggregate the rest of the world region of Balistreri, Rutherford and Tarr (2009) into three regions: (1) the European Union; (2) the union of the East African Customs Union and COMESA, which we call our African region; and (3) the Rest of the World. In the imperfectly competitive sectors, this requires introducing different firm types with distinct cost structures for each region. We retain the small open economy model framework, so only Kenya is modeled fully.

Perfectly Competitive Goods and Services Sectors

Regardless of sector, all firms minimize the cost of production. In the *competitive goods and services sectors*, goods or services are produced under constant returns to scale and where price equals marginal costs with zero profits. This includes all 20 of the agriculture sectors and 19 manufacturing or services sectors, including some food processing sectors such as meat and dairy products and grain milling, and services such as construction, hotels and restaurants, postal communication, real estate, public administration, health and education. In these sectors, products are differentiated by country of origin, i.e., we employ the Armington assumption. All goods producing firms (including imperfectly competitive firms) can sell on the domestic market or export. Firms optimize their output decision between exports and domestic sales based on relative prices and their constant elasticity of transformation production function. Having chosen how much to allocate between exports and domestic sales, firms also optimize their output decision between exports to the three possible export regions, based on relative prices the three regions and their constant elasticity of transformation production function for shifting output between the regions.

Goods Produced Subject to Increasing Returns to Scale

Goods in these seven sectors are differentiated at the firm level. We assume that manufactured goods may be produced domestically or imported for firms in any region in the model. Firms in these industries set prices such that marginal cost (which is constant) equals marginal revenue; and there is free entry, which drives profits to zero. For domestic firms, costs are defined by observed primary factor and intermediate inputs to that sector in the base year data. Foreigners produce the goods abroad at constant marginal cost but incur a fixed cost of

operating in Kenya. The cif import price of foreign goods is simply defined by the import price, and, by the zero profits assumption, in equilibrium the import price must cover fixed and marginal costs of foreign firms. Domestic firms set prices using the Chamberlinian large group monopolistic competition assumption within a Dixit-Stiglitz framework, which results in constant markups over marginal cost for both foreign firms and domestic firms.

We have made one significant modeling extension in the imperfectly competitive sectors compared to the Balistreri, Rutherford and Tarr (2009) model. In the Balistreri, Rutherford and Tarr model, domestic firms faced a perfectly elastic demand curve on export markets and they exported at marginal costs. In this model, all imperfectly competitive domestic firms (both goods and services producers) face a downward sloping demand curve in each of their three export markets. Consistent with firm level product differentiation, we assume that the elasticity of demand in each of the export markets is the Dixit-Stiglitz elasticity of demand. Firms then set marginal revenue equal to marginal costs in each of the three export markets; then the export market contribute to the quasi-rents of the firm and affect the entry and exit decisions of firms.

Introducing downward sloping demand curves into the model means that there are possible terms of trade affects to consider in this model that were not present in the Jensen, Rutherford and Tarr model. Balistreri and Markusen (2009) have shown, however, that there should be virtually no role for optimal tariffs to exploit terms of trade effects. The reason is that, unlike perfectly competitive firms, imperfectly competitive firms are pricing such that marginal revenue equals marginal costs on export markets, which is the objective of optimal tariffs.

For simplicity we assume that the composition of fixed and marginal cost is identical in all firms producing under increasing returns to scale (in both goods and services). This assumption in our Dixit-Stiglitz based Chamberlinian large-group model assures that output per

firm for all firm types remains constant, i.e., the model does not produce rationalization gains or losses.

The number of varieties affects the productivity of the use of imperfectly competitive goods based on the standard Dixit-Stiglitz formulation. The effective cost function for users of goods produced subject to increasing returns to scale declines in the total number of firms in the industry.

Service Sectors That Are Produced under Increasing Returns to Scale and Imperfect Competition

These nine sectors are telecommunications, banking and insurance services, various transportation services and professional business services. In these services sectors, we observe that some services are provided by foreign service providers on a cross border basis analogous to goods providers from abroad. But a large share of business services are provided by service providers with a domestic presence, both multinational and Kenyan.¹⁸ Our model allows for both types of foreign service provision in these sectors. There are cross border services allowed in this sector and they are provided from abroad at constant costs—this is analogous to competitive provision of goods from abroad. Cross border services, however, are not good substitutes for service providers who have a domestic presence.¹⁹

Crucial to the results, we allow multinational service firm providers that choose to establish a presence in Kenya in order to compete with Kenyan firms directly. As in the goods

¹⁸ One estimate puts the world-wide cross-border share of trade in services at 41% and the share of trade in services provided by multinational affiliates at 38%. Travel expenditures 20% and compensation to employees working abroad 1% make up the difference. See Brown and Stern (2001, table 1).

¹⁹ Daniels (1985) found that service providers charge higher prices when the service is provided at a distance.

sectors, services that are produced subject to increasing returns to scale are differentiated at the firm level. Firms in these industries set prices such that marginal cost (which is constant) equals marginal revenue; and there is free entry, which drives profits to zero. We assume firm level product differentiation and employ the Chamberlinian large group monopolistic competition assumption within a Dixit-Stiglitz framework. Given our assumption on the composition of fixed and variable costs, we have constant markups over marginal cost for both foreign firms and domestic firms, i.e., no rationalization impacts.

For domestic firms, costs are defined by observed primary factors and intermediate inputs to that sector in the base year data. When multinationals service providers decide to establish a domestic presence in Kenya, they will import some of their technology or management expertise. That is, foreign direct investment generally entails importing specialized foreign inputs. Thus, the cost structure of multinationals differs from national only service providers. Multinationals incur costs related to both imported primary inputs and Kenyan primary factors, in addition to intermediate factor inputs. Foreign provision of services differs from foreign provision of goods, since the service providers use Kenyan primary inputs. Domestic service providers do not import the specialized primary factors available to the multinationals. Hence, domestic service firms incur primary factor costs related to Kenyan labor and capital only. These services are characterized by firm-level product differentiation. For multinational firms, the barriers to foreign direct investment affect their profitability and entry. Reduction in the constraints on foreign direct investment will induce foreign entry that will typically lead to productivity gains because when more varieties of service providers are available, buyers can obtain varieties that more closely fit their demands and needs (the Dixit-Stiglitz variety effect).

Evidence on the Role of Trade and FDI in Increasing Total Factor Productivity through Technology Transfer

Grossman and Helpman (1991) have developed models of economic growth that have highlighted the role of trade in a greater variety of intermediate goods as a vehicle for technological spillovers that allow less developed countries to close the technological gap with industrialized countries. Similarly, Romer (1994) has argued that product variety is a crucial and often overlooked source of gains to the economy from trade liberalization. In our model, it is the greater availability of varieties that is the engine of productivity growth, but we believe there are other mechanisms as well through which trade may increase productivity.²⁰ Consequently, we take variety as a metaphor for the various ways increased trade can increase productivity. Winters et al. (2004) summarize the empirical literature by concluding that “the recent empirical evidence seems to suggest that openness and trade liberalization have a strong influence on productivity and its rate of change.” Some of the key articles regarding product variety are the following. Broda and Weinstein (2004) find that increased product variety contributes to a fall of 1.2 percent per year in the “true” import price index. Hummels and Klenow (2005) and Schott (2004) have shown that product variety and quality are important in explaining trade between nations. Feenstra et al. (1999) show that increased variety of exports in a sector increases total factor productivity in most manufacturing sectors in Taiwan (China) and Korea, and they have some evidence that increased input variety also increases total factor productivity. In business services, because of the high cost of using distant suppliers, the close availability of a diverse set of business services may be even more important for growth than in goods. The evidence for this was cited in the introduction section.

Beginning with the path-breaking work of Coe and Helpman (1995), a rich literature now exists that shows that important mechanisms for the transmission of knowledge and the increase in total factor productivity are the purchase of imported intermediate goods and inward foreign direct investment. The literature shows that for small developing countries, trading with large technologically advanced countries is crucial for TFP growth.²¹ A summary of this literature is

²⁰ Trade or services liberalization may increase growth indirectly through its positive impact on the development of institutions (see Rodrik, Subramanian and Trebbi, 2004). It may also induce firms to move down their average cost curves, or import higher quality products or shift production to more efficient firms within an industry. Tybout and Westbrook (1995) find evidence of this latter type of rationalization for Mexican manufacturing firms.

²¹ Schiff et al., (2002, table 1) have shown that for R&D intensive sectors, trade with industrialized countries contributes significantly to total factor productivity in developing countries, but trade with developing countries

provided in Jensen and Tarr (2010, Appendix E). Given the importance of foreign direct investment in services in our model, we mention here that Arnold, Mattoo and Javorcik (2007) show that in the Czech Republic, services sector liberalization led to increased productivity of downstream industries, and the key channel through which reform led to increased productivity was allowing foreign entry. Fernandes and Paunov (2008) found a positive and significant effect of foreign direct investment in services on productivity growth in Chile. Fernandes (2007) finds a positive and significant effect of services liberalization in both finance and infrastructure on the productivity of downstream manufacturing in the fifteen Eastern European countries.

In our model, the parameter that reflects the ability of a region to increase total factor productivity through the transmission of new technologies is the elasticity of varieties with respect to the price. Based on the literature summary in Jensen and Tarr (2010, Appendix E), we assign central values to this elasticity based on the region and the research and development intensity of the sector. The assigned central values for these parameters by sector and region are in table 6B. We conduct extensive sensitivity analysis on this parameter, both piecemeal and systematic.

V. Data of the Model

Social Accounting Matrix

The key data source for our study is the social accounting matrix taken from Kiringai, Thurlow and Wanjala (2006). This is a social accounting matrix (SAM) for the year 2003. The table is very rich in agricultural detail, with 20 agricultural sectors. Given our focus on services, we found it necessary to disaggregate the single transportation sector into five sectors (based on value of output data of the various transportation sectors published in the *Economic Survey, 2006* for Kenya by the Central Bureau of Statistics (2007a, p. 198)) and the single financial services sector into insurance, and banking and other financial services, from data in Central Bureau of Statistics (2007a, pp. 95-98. We assumed that the input output structure for all sectors using these services was identical for the disaggregated sectors. A full listing of the sectors and factors of production is provided in table 1. Kiringai et al. (2007) also provide a

does not. On the other hand, for sectors that are low in R&D intensity, their results suggest that for technology diffusion trade with developing countries can be as important as trade with industrialized countries.

set of 20 household accounts integrated into the social accounting matrix. Of these 20 households, ten are rural and ten are urban, ranked according to income. Due to some problems with the consistency of the household data, however, we employ one representative household in this model.

Trade Data by Regional Partner and Sector

To obtain the shares of imports and exports from the different regions of our model, we used trade data for 2007 obtained from WITS access to the COMTRADE database. The regions of our model are Kenya, the European Union, the East African Customs Union plus COMESA and the Rest of the World. For the European Union, we took the 27 member countries as of 2007. In appendix A, we calculate and report data for the East African Customs Union and COMESA separately. For the East African Customs Union, we took Tanzania, Uganda, Rwanda and Burundi. Excluding those East African Customs Union countries that are also COMESA members, COMESA includes Comoros, Democratic Republic of Congo, Djibouti, Egypt, Eritrea, Ethiopia, Libya, Madagascar, Malawi, Mauritius, Seychelles, Sudan, Swaziland, Zambia and Zimbabwe.²² Trade shares for the “Africa” region in our model are the sum of East Africa Customs Union plus COMESA. Rest of the World is the residual.

We mapped two digit sectors from the COMTRADE database into the sectors of our model. The exact mapping is defined in appendix A. We used Kenya as the reporter country for both exports and imports. Results for both exports and imports are reported in tables A2 and A3 of appendix A.

Tariff Data

Tariff and Sales Tax Data. We started with MFN tariff rates at the eight digit level taken from the website of the Kenyan government: www.kra.go.ke/customs/customsdownloads.php. These tariff rates were then aggregated to the sectors of our model, using simple averages.

We obtained data on the total taxes on imports and the total value of imports and took the ratio to obtain the average value of import taxes in the Kenyan economy. In 2005, this was 8.4 percent.²³ That is,

²² To avoid double counting we exclude from COMESA the members of the East African Customs Union.

²³ Economic Survey (2006, pp. 103, 115).

on average, Kenyan importers paid 8.4 percent of the value of imports on import taxes that did not apply to domestic production.

As we reported in Balestreri, Rutherford and Tarr (2009), the MFN tariff rates, multiplied times the trade flows, exceed the collected tariff rates. That is, using MFN tariff rates for all trade, the weighted average tariff rate exceeds the collected tariff rate of 8.4 percent for the economy as a whole. Thus, they exaggerate the protection received by Kenyan industry and agriculture. This is due to tariff preferences to regional partners and due to other preference items or tariff exemptions. We assume that zero tariffs apply on all imports from the East African Customs Union and from COMESA.²⁴ Thus, we apply the MFN tariff rates only on the trade flows from outside of these African regions (EU and Rest of World in our model) and take a weighted average tariff rate of the MFN rates on the non-East African regions. The resulting weighted average tariff rate on non-East African imports still exceeds 8.4 percent. We then equi-proportionally reduced all the MFN tariffs in our model so that the estimated collected tariffs on imports from the EU and Rest of World divided by the total value of import is 8.4 percent.

Share of Market Captured by Multinational Service Providers

It was necessary to calculate the market share of multinational firms in the services sectors by region of the model. Take the banking sector as an example. We need to know the share of the market captured by Kenyan, EU, African and Rest of the World firms, where the countries in the regions are defined in table 1. This entailed acquiring a list of all banks operating in Kenya along with their market share, and, when the bank is owned by multiple parties, allocating the ownership across the regions of our model. The database Bankscope was sufficient for this task in most cases, but websites of the banks had to be consulted to allocate ownership shares in several cases. The results, by region and sector, are presented in table 6. Documentation

²⁴ Kenya agreed to implement zero tariffs on East African Customs Union imports as of January 1, 2005. See Michael-Stahl (2005).

of the results, with listing by firm, sector and region, and the data sources are presented in appendix B.

Share of Expatriate Labor Employed by Multinational Service Providers

The impact of liberalization of barriers to foreign direct investment in business services sectors on the demand for labor in these sectors will depend importantly on the share of expatriate labor used by multinational firms. We explain in the results section that despite the fact that multinationals use Kenyan labor less intensively than their Kenyan competitors, if multinationals use mostly Kenyan labor, their expansion is likely to increase the demand for Kenyan labor in these sectors.²⁵ We obtained estimates of the share of expatriate labor or specialized technology not available to Kenyan firms that is used by multinational service providers in Kenya from the survey mentioned above. We found that multinational service providers use mostly local primary factor inputs and only small amounts of expatriate labor or specialized technology. Our estimated share of foreign inputs used by multinationals in Kenya is presented in the table on sensitivity analysis.

Estimates of the Dixit-Stiglitz Elasticities of Substitution for Goods

It was necessary for us to obtain estimates of the Dixit-Stiglitz product variety elasticities of substitution for the imperfectly competitive sectors in our model. Christian Broda, Joshua Greenfield and David Weinstein (2006) estimated Dixit-Stiglitz product variety elasticities of substitution at the 3 digit level in 73 countries. Among the 73 countries, there were four in Sub-Saharan Africa: the Central African Republic, Madagascar, Malawi and Mauritius. We judged

²⁵ See Markusen, Rutherford and Tarr (2005) for a detailed explanation on why FDI may be a partial equilibrium substitute for domestic labor but a general equilibrium complement.

that Madagascar was the country closest in characteristics to Kenya, so we took the values of the elasticities estimated for Madagascar as a proxy for the elasticities for Kenya. We explain in appendix C, how we mapped the 3 digit elasticities for 130 goods sectors estimated by Broda et al. into the sectors of our model. The mapping and resulting elasticities by relevant sector in our model are shown in table C1.

VI. Results for Preferential Reduction of All Services Barriers—Central Elasticity Case

We execute several scenarios to assess the impacts of Kenya entering into a bilateral free trade agreement that includes services with the European Union, and similarly with the Africa region. In these scenarios we assume that Kenyan ad valorem equivalents of the barriers against foreign investors in services are reduced by 50 percent with respect to the region with which Kenya has an agreement. We assume that Kenya already offers tariff free access to goods originating from its African trade partners, so in the scenario where we evaluate the agreement with the Africa region we include only liberalization of discriminatory barriers against foreign investors in services. Insofar as combining preferential trade agreements could potentially reduce trade diversion inherent in separate agreements (see, e.g., Harrison, Rutherford and Tarr, 2002, 2004), we examine the impacts of the combination of free trade agreements with both the Africa region and the European Union. We compare these impacts with unilateral non-discriminatory liberalization. Finally, given our earlier result on the importance of reducing non-discriminatory barriers against investors in services, we examine the impact of a 50 percent reduction of non-discriminatory barriers against service providers combined with unilateral liberalization of discriminatory barriers.

As discussed in Jensen and Tarr (2010), who captures the rents from the barriers is very important for the welfare results. Consequently, for each policy scenario, we execute two versions of the model with our central elasticities. In one case, we assume that Kenyans do not capture any rents from the barriers. In the second scenario, we assume that the discriminatory barriers generate rents that are captured by Kenyans. In our systematic sensitivity analysis, in each of the 30,000 scenarios, we allow the share of rents captured by Kenyans to vary

stochastically between zero and one. In a section below, we focus on the impacts in professional services by considering the same set of policy experiments where we allow reduction in services barriers only in professional services.

Aggregate Effects

We first discuss (and present results in tables 7 and 8) our estimates of the full reform scenario in our central elasticities case. In these tables we present results on the impacts on aggregate variables including welfare, the real exchange rate, aggregate exports and imports, the return to capital, skilled labor and unskilled labor and the percentage change in tariff revenue. In order to obtain an estimate of the adjustment costs, we estimate the percentage of each of our factors of production that have to change industries.

Significant gains with the EU—deriving primarily from services liberalization. We estimate that the preferential arrangement with the EU that includes both goods and services would generate gains for Kenya of 0.7 percent of consumption with no initial rent capture and 0.5 percent of consumption if there is initial rent capture by Kenyans. The gains come primarily from the preferential liberalization of services, although the relative contribution is much larger with no initial rent capture. That is, the gains to Kenya from preferential liberalization of tariffs with the EU are invariant to the rent capture assumption at 0.2 percent of consumption. But, if there is initial rent capture, the gains to Kenya of preferential liberalization of services fall from 0.5 percent of consumption to 0.3 percent of consumption.

Small gains from preferential liberalization with the Africa region. In the case of preferential liberalization with the Africa region, the gains are smaller—0.3 percent of consumption in the case of no initial rent capture and 0.1 percent of consumption in the case of rent capture initially by Kenya. The agreement with the EU includes tariff reduction, while tariff free access in the Africa region is considered part of the status quo; so the appropriate scenario for comparison of the relative gains for Kenya is the scenario in the second column of the results tables, labeled “EU discriminatory services.” With no initial rent capture, the gains for Kenya of an agreement with the EU are 60 percent greater than the gains from an agreement with the Africa region. With initial rent capture, gains of an agreement with the EU are three times greater than the gains from an agreement with the Africa region. We show in the sensitivity section that

there is a possibility of losses from an agreement with the Africa region in the initial rent capture case.

Why are the gains larger for the agreement with the “northern” region. As we discussed above, trade with and FDI from large technologically advanced regions can be expected to lead to technology diffusion that increases total factor productivity. Although trade and FDI from small developing countries can contribute to technology diffusion, it has been estimated to do so to a significantly lesser extent, at least for research and development intensive sectors. The elasticity of the number of varieties (firms) with respect to price is the parameter in our model that captures that effect, and the values we have chosen are in table 6B.²⁶ Table 21 shows that we estimate that the number of varieties from the EU substantially increases as a result of preferential liberalization with the EU, while table 18 shows that the estimated expansion of varieties from the Africa region is much more modest in response to preferential liberalization with respect to the African region. We show in the sensitivity analysis below that this elasticity of supply parameter is very important for the results: preferential agreements in services are more likely to be beneficial the higher the supply elasticities of the partner country’s services suppliers and the lower the supply elasticities of the excluded countries services suppliers.

More substantial gains from combining the Africa FTA with a FTA with Europe. In tables 7 and 8, in the column labeled “EU-Africa FTA,” we show our estimates for the impacts of agreeing to a FTA with both the EU and the Africa region. The estimated gains are approximately the sum of the separate agreements. This shows that Kenya can significantly augment the gains it may realize from an agreement with the Africa region, by adding a FTA with the EU.

Harrison, Rutherford and Tarr (2002) found that, for Chile, the gains from combining free trade agreements would be more than additive. Harrison, Rutherford, Tarr and Gurgel (2004) found similar results for Brazil. That is, the gains of the two agreements combined exceeded the gains of the two separate agreements. The reason is that if Chile, for example, agreed to a free

²⁶ The elasticity of supply corresponds to the share of the sector’s costs that are due to a specific factor of production. In all of the imperfectly competitive sectors, we assume there are four specific factors: one for each region in the model. Then, as industry output expands, the price of the specific factor necessary for production of that variety increases, thereby increasing the cost of production of firms. Since the cost of production of firms increases as the industry supply increases, the supply curve of each region will slope up in each of these sectors. And higher cost shares of the specific factor will lead to less elastic supply curves in that sector.

trade agreement with the U.S., then competition from the U.S. would greatly reduce the trade diversion associated with an agreement with neighboring developing countries. But there are the possibilities of trade diversion with the rest of the world region, so the gains from combined agreements are not necessarily greater than the gains from the separate agreements.

Non-discriminatory liberalization would result in a five-fold increase in the gains compared with preferential liberalization with the EU. With non-discriminatory liberalization, Kenyans would be able to access goods and services from the least cost supplier in the world. This would eliminate all trade diversion losses, reduce any adverse terms of trade losses and result in the maximum number of new foreign varieties for productivity improvement from trade and FDI liberalization. Consequently, the gains are much larger in this case. Because the rest of the world has a much larger share of the goods market in Kenya than it enjoys in the services sectors, the gains from non-discriminatory liberalization come more from liberalization of goods than from services.

The largest gains come from reduction in the barriers that domestic as well as foreign firms face. Consistent with the work of Jensen, Rutherford and Tarr (2009) in a model with an aggregate rest of the world, we find that the largest gains for Kenya would come from liberalization of the non-discriminatory barriers in services. That is, when we estimate the impact of a 50 percent reduction in the non-discriminatory services barriers on top of unilateral liberalization of all discriminatory services barriers, the estimated gains are 10.3 percent of consumption with no rent capture or 7.0 percent of consumption with initial rent capture.

Sector Impacts

In table 9, we present results for the percentage change in output by sector for four scenarios: an FTA with the EU; and FTA with the Africa region; and FTA with the EU and the Africa region combined; and unilateral liberalization. Details of what is included in these scenarios are explained in table 7.

In general we see an expansion of the output of the business services sectors in all scenarios. Multinational firms in the business services sectors are located in the home country and their output is defined as part of industry output. Reduction of barriers against one partner generally reduces the number of firms from the other three regions in the model, but on balance the output of the sector expands. To see what happens to EU firms, versus Kenyan and other

firms, it is necessary to view the tables that report the change in the number of firms by scenario.

Outside of business services, we estimate that mining, coffee and other manufactured food sectors are the sectors that will expand the greatest. These sectors are intensive users of business services, such as transportation and banking services. Regulatory reforms will decrease the price and allow for quality improvements in these business services, which permits these sectors to operate more cheaply and offer better quality services.

Given that we assume that total employment and the capital stock are fixed in the medium term, if labor expands in some sectors, it must contract in other sectors. Given the large expansion in several sectors, especially services, we must have declines in others in the medium term. Although we estimate small declines in output in several sectors, especially those that use business services less intensively, the striking result is that there is very little output decline in response to any regional initiative. On the other hand, since we assume zero tariffs in our unilateral reform scenario, output declines are much more pronounced in some cases. Sugarcane, which is the one of the more highly protected sectors, is estimated to decline substantially along with wheat and rice in the unilateral scenario. The stark result from table 9 is that for sectors that experience output declines, the contractions are generally much more moderate in the regional preferential scenarios than in the unilateral scenario. This follows from the less substantial drop in overall protection to any sector in a preferential trade arrangement.

VII. Sensitivity Analysis

In this section we assess the impact of parameter values and key modeling assumptions on the results. Through our “piecemeal sensitivity analysis” we will determine the most important parameters for the results, and we will assess how important for the results are rent capture or additional varieties from reform in services sectors under increasing returns to scale. In the piecemeal sensitivity analysis, we change the value of a single parameter while holding the values of all other parameters unchanged at our central elasticity values. We present piecemeal sensitivity analysis of the two most relevant policy scenarios. In table 22, we examine the

prospective free trade agreement with the EU, and in table 23, we examine the agreement with the Africa region.

Given uncertainty of parameter values and the rent capture assumption, point estimates of the results may be viewed with skepticism. In our “systematic sensitivity analysis,” we execute 30,000 simulations. In each simulation, we allow the computer to randomly select the values of all parameters, subject to the specified probability distributions of the parameters. Through the systematic sensitivity analysis we will be able to assess how robust the results are and obtain confidence intervals of the results.

Rent Capture Assumption

In the row labeled “share of rents captured” we retain the increasing returns to scale assumption in the services sectors and selected goods sectors, but allow the initial rent capture share in the services sectors to be either zero (central value) or 1 (upper value). We see that there is approximately a 40 percent reduction in the welfare gain from a free trade agreement with the EU if rents are captured initially (from a welfare gain of 0.67 percent of consumption to 0.49 percent of consumption). In the case of an agreement with the African region, the gains fall even more dramatically, from a welfare gain of 0.25 percent of consumption to a gain of 0.05 percent of consumption in our central elasticity case.

Impact of Constant Returns to Scale—Possible Negative Welfare Effects

In the row labeled CRTS—share of rents captured—we assume constant returns to scale in all sectors, which eliminates the Dixit-Stiglitz externality from additional varieties. We allow the initial rent capture share in the services sectors to be either zero (central value) or 1 (upper value). We see that without the Dixit-Stiglitz variety externality, the gains from an agreement with the EU fall dramatically. With no initial rent capture, the gains for the EU agreement would be .09 percent of consumption, and would fall to negative values (-0.06 percent of consumption) with initial rent capture. In the case of an agreement with the Africa region, the gains are 0.14 percent of consumption with no initial rent capture and are negative (-0.06 percent of consumption) with initial rent capture.

Piecemeal Sensitivity Analysis

Four parameters stand out as having a strong impact on the results. The elasticity of substitution between firm varieties in imperfectly competitive services sectors, $\sigma(q_i, q_j)$ has a very strong impact. At the low end of the elasticity range, the estimated gains are almost 10 percent of consumption from a preferential agreement with the EU and 5 percent of consumption from an agreement with the Africa region. Following from the Le Chatelier principle, larger elasticities typically lead to larger welfare gains in response to welfare improving reforms, as the economy can adapt more readily. Unlike other elasticities, however, a lower value of $\sigma(q_i, q_j)$ increases the welfare gains. This is because lower values of this elasticity imply that varieties are less close to each other, so additional varieties are worth more. Since the policy shocks in goods are much less, the same elasticity variation in goods has a much smaller impact, but its impact is nonetheless significant. The elasticity of substitution between value-added and business services, $\sigma(va, bs)$, also has a strong impact. The better firms are able to substitute business services for labor and capital, the more the economy will gain from the reforms that reduce the quality adjusted price of business services. Finally, for the agreement with the EU, there is a strong impact from changes in the value of ϵ_{EU} , the elasticity of multinational service firm supply with respect to the price of output. For the agreement with Africa, there is a strong impact of the parameter ϵ_{AFR} . Larger values of this parameter mean that tariff preferences that open opportunities for EU service firms to provide new varieties, will not be so quickly choked by the increased cost of the specific factor required for EU firm expansion. We investigate the sensitivity of the results to changes in the value of this parameter in more detail below.

Impact of Partner and Excluded Country Elasticities of Multinational Service Firm Supply—Why It Is More Likely to Obtain Gains from Large Technologically Advanced Partners

In figures 1 and 2, we depict the impact and interrelationship of the elasticities of firm supply from partner and excluded countries. In figure 1, we examine the estimates for the welfare effects in Kenya of a 50 percent preferential reduction of barriers in services against African partners. On the vertical axis is the set of elasticities of firm supply of African partners with respect to price. We scale this set of elasticities from between one-half to twice their central values. On the horizontal axis we scale the central values of the elasticities of firm supply of all

excluded countries from one-half of their central values to twice their central values. Excluded regions are the EU and Rest of the World. In figure 2, we do analogous simulations, except that since the preferential liberalization is with the EU, the EU elasticities are on the vertical axis and we scale the elasticities of the African region and the Rest of the World on the horizontal axis. In the left hand side panel, we present results with no initial rent capture, but initial rent capture is shown on the right hand side panel.

Regarding preferential reduction of barriers with African partners, we see in figure 1 that, with initial rent capture, there is a significant range of elasticities that result in losses for Kenya. Without initial rent capture, however, there are gains for all these values.

We see from figures 1 and 2 that the gains to the home country increase the higher the elasticity of supply of firms in partner countries and the lower the elasticity of supply of firms in excluded countries, with the partner country elasticity being by far the more important. Preferential reduction of barriers, leads to an increase in firms (varieties) and productivity from partner countries, but a loss of service providers (varieties) from all excluded regions and the home country, results in a loss of productivity for sectors using these services. The lost productivity from lost varieties from the regions excluded and the home country from the preferential liberalization in services is analogous to the trade diversion losses in perfect competition. When firm elasticities in partner countries are high, the after tax price increase for firms in partner countries from preferential reduction of barriers induces a large increase in partner country varieties, boosting productivity. For excluded countries, the price decrease of partner countries shifts in demand for their products and lowers their price; but the lower price induces fewer lost varieties when firms in excluded countries have low elasticities. In addition to the variety impacts in imperfect competition, as explained above, in perfect competition the rent and terms of trade impacts reinforce the argument that high elasticities of partners and low elasticities of excluded countries increase the likelihood of welfare gains from a preferential agreement in services.

Systematic Sensitivity Analysis

In the systematic sensitivity analysis, we execute the model 30,000 times and harvest the results for desired variables. In each individual simulation, we allow the computer to select values of all the parameters in the model (the parameters in table 22), based on the specified

probability density functions (pdfs) of the parameters. We assume uniform probability density functions, with upper and lower values of the pdfs given by the upper and lower values in the piecemeal sensitivity analysis table. We include initial rent capture in the systematic sensitivity analysis, with the rent capture parameter allowed to take values between zero and one with a uniform pdf.

The results for preferential reduction of barriers with African partners on welfare, output and labor are shown in figures 3-5 and similar figures for the preferential trade agreement with the EU in figures 6-8.. The sample distribution of the welfare results for preferential reduction of barriers in services with the Africa region is depicted in figure 3. We find that in 1.9 percent of the 30,000 simulations yield a negative welfare result, which we interpret as a 1.9 percent probability that preferential liberalization with the Africa region will yield a negative result. A 95 percent confidence interval for equivalent variation as a percent of consumption is: 0.008 to 0.417 around a sample mean of .203.²⁷

The sample distribution of the welfare results for a free trade agreement with the EU that includes services are depicted in figure 6. In the 30,000 simulations, there are no negative values. A 95 percent confidence interval for equivalent variation as a percent of consumption is: 0.37 to 0.94 around a sample mean of 0.63.²⁸

In figures 4 and 7, we show “box and whisker” diagrams for the sample distribution of the percentage change in output by sector. Sectors are on the horizontal axis and the percentage change in output is shown on the vertical axis. The bars in the box are the means of the distributions. Fifty percent confidence intervals are depicted by the boxes, while the vertical lines show 95 percent confidence intervals.

The means of the systematic sensitivity results show a similar pattern to the point estimates regarding the expansion of the services sectors. While the confidence intervals are rather tight for most sectors, they reveal a large range of uncertainty for several sectors. With respect to the EU agreement, while the sign of the direction of change does not change within the 95 percent confidence interval, the confidence intervals of expected output change are large for other manufactured food, maritime transportation, coffee and mining (among the expanding sectors) and sugarcane, non-metallic products and other manufactures (on the negative side). For

²⁷ 90 percent and 99 percent confidence intervals are 0.033 to 0.384 and -0.029 to 0.479, respectively.

²⁸ 90 and 99 percent confidence intervals are 0.41 to .89 and 0.30 to 1.07, respectively.

several sectors, where the mean change in output is close to zero, notably wood and paper, and chemicals, 95 percent confidence intervals reveal that the estimated sign of the change is not robust. For the Africa agreement, it is remarkable how tight the 95 percent confidence intervals are for those sectors where the mean predicted change is small (with the exception again of wood and paper). Confidence intervals are much less tight for sectors with significant predicted changes, but the sign of the change does not change throughout the confidence intervals.

VIII. Results for Preferential Reduction of Barriers in Professional Services Liberalization

In these scenarios we consider the impact of a preferential reduction in barriers in professional services, but assume that there is no reduction of barriers in other services sectors. We execute the same policy scenarios that we executed in the earlier section, where all services barriers are reduced on a preferential basis. The results are shown in tables 24-26. In table 24, we assume no initial rent capture, but in table 25, we assume initial rent capture.

We find that preferential liberalization of professional services with respect to its African regional partners would result in small positive welfare gains (0.02 percent of consumption) in the case of no initial rent capture, but virtually no welfare impact with initial rent capture.²⁹ But, it may be seen as positive if it is an important first step toward wider liberalization. Preferential liberalization of professional services with the EU will yield positive gains of 0.06 percent of consumption (in the no initial rent capture case). If liberalization in professional services is extended to all foreign partners (called “unilateral” in the tables), the gains would increase to 0.16 percent of consumption.. Thus, these results suggest that preferential liberalization in the region may be a useful, but wider liberalization, with larger partners or multilaterally will yield much larger gains.

Finally, we estimate that the largest gains in professional services reform would come from a serious effort to reduce non-discriminatory regulatory barriers (that is, barriers that raise

²⁹ Taken to a third decimal place, the impact is negative with initial rent capture.

the costs of Kenyans as well as foreign professional services providers in Kenya). This would more than quadruple the benefits of multilateral liberalization in Kenya. These results are consistent with the work of Dihel *et al.*, (2010). They have documented extensive regulatory barriers in professional services in Kenya and other East African countries that prevent entry of potential suppliers and limit competition among existing professional service suppliers.

As we mentioned in section III, we used engineering services as a proxy for all services when we estimated the barriers and calculated the market shares of different regions. Experts in this field in East Africa have suggested that engineering services are likely less constrained than some other services, notably legal services. This would imply that the ad valorem equivalents of the barriers would be higher if averaged with the other more protected sectors, and the gains from non-discriminatory liberalization would be higher. In some other sectors, like accounting, there is a much greater foreign presence. With higher barriers, discriminatory liberalization with the Africa region in accounting could displace a larger number of varieties in a sector like accounting and increase trade diversion.

IX. Conclusions

In this paper we have developed an innovative small open economy computable general equilibrium model of the Kenyan economy that is capable of assessing the impact of the preferential liberalization of barriers against multinational service providers. We have provided a discussion of the welfare economics of services liberalization, in which we argue that it is likely that the gains from preferential reduction of barriers against multinational services will be larger if the partner region is large. We find that gains to Kenya from preferential reduction of barriers in services with the Africa region are negligible, and could be negative under some plausible parameter assumptions. We show that under imperfect competition with the Dixit-Stiglitz

variety externality, welfare losses from preferential reduction of services barriers are possible due to a loss of varieties from excluded countries. Gains from a free trade agreement with the EU that includes a preferential 50 percent reduction in the ad valorem equivalents of the barriers in the services sectors will produce significant gains for Kenya, deriving primarily from services commitments. Kenyan gains from liberalization with the EU region are considerably larger than the gains from an agreement with the African region because a small increase in the price to EU producers can be expected to induce a relatively large increase in the number of varieties. In addition, when rents are captured initially, the terms of trade loss on partner services and the lost rents on services from the Rest of the World are larger when partners have low supply elasticities. We have conducted extensive sensitivity analysis to determine confidence intervals for the results and found plausible ranges of key parameters that lead to estimated losses for preferential liberalization of services with the Africa region.

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Table 1 -- List of Sectors in the Kenya Model

| Business Services | Agriculture (CRTS) |
|--------------------------------------|-----------------------------------|
| Communication | Maize |
| Insurance | Wheat |
| Banking and other financial services | Rice |
| Professional business services | Barley |
| Road services | Cotton |
| Railway transport | Other cereals |
| Maritime transport | Sugarcane |
| Pipeline transport | Coffee |
| Airline transport | Tea |
| | Roots & tubers |
| | Pulses & oil seeds |
| | Fruits |
| | Vegetables |
| | Cut flowers |
| | Others crops |
| | Beef |
| | Dairy |
| | Poultry |
| | Sheep goat and lamb for slaughter |
| | Other livestock |
| | |
| | Other CRTS |
| | Fishing |
| | Forestry |
| | Mining |
| | Meat & dairy |
| | Other manufactured food |
| | Textile & clothing |
| | Leather & footwear |
| | Wood & paper |
| | Printing and publishing |
| | Other manufactures |
| | Water |
| | Electricity |
| | Construction |
| | Trade |
| | Hotels |
| | Real estate |
| | Adminsitration |
| | Health |
| | Education |

Note: East African Custom Union includes (besides Kenya) Burundi, Rwanda, Tanzania and Uganda. COMESA includes Burundi, Comoros, Democratic Republic of Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, Sudan, Swaziland, Zambia and Zimbabwe.

Table 2 -- Sectoral value-added (% , unless otherwise indicated)

| | Labor | | | Capital | Land | GDP | |
|--------------------------------------|---------------|--------------------|-----------------|---------|------|------------------------------------|------------|
| | Skilled labor | Semi-skilled labor | Unskilled labor | | | BKS (Billions of Kenyan Shillings) | % of total |
| Business Services | | | | | | | |
| Communication | 3.7 | 19.7 | 13.7 | 62.9 | | 30.6 | 3.1 |
| Insurance | 1.2 | 5.4 | 19.3 | 74.0 | | 21.1 | 2.2 |
| Banking and other financial services | 1.2 | 5.4 | 19.3 | 74.0 | | 45.7 | 4.7 |
| Professional business services | 23.1 | 4.4 | 14.3 | 58.3 | | 94.5 | 9.7 |
| Road services | 9.9 | 34.6 | 5.5 | 50.0 | | 42.0 | 4.3 |
| Railway transport | 9.9 | 34.6 | 5.5 | 50.0 | | 1.2 | 0.1 |
| Maritime transport | 9.9 | 34.6 | 5.5 | 50.0 | | 4.6 | 0.5 |
| Pipeline transport | 9.9 | 34.6 | 5.5 | 50.0 | | 2.1 | 0.2 |
| Airline transport | 9.9 | 34.6 | 5.5 | 50.0 | | 16.9 | 1.7 |
| Dixit-Stiglitz Goods | | | | | | | |
| Beverages & tobacco | | 0.7 | 34.0 | 65.2 | | 13.7 | 1.4 |
| Grain milling | 2.1 | 9.5 | 2.9 | 85.5 | | 9.6 | 1.0 |
| Sugar & bakery & confectionary | 7.9 | 36.8 | 11.7 | 43.6 | | 4.4 | 0.5 |
| Petroleum | | 0.4 | 1.3 | 98.4 | | 3.9 | 0.4 |
| Chemicals | 16.4 | 5.4 | 29.7 | 48.5 | | 7.1 | 0.7 |
| Metals and machines | 2.8 | 55.0 | 2.9 | 39.2 | | 8.2 | 0.8 |
| Non metallic products | 0.5 | 9.8 | | 89.7 | | 23.1 | 2.4 |
| Agriculture | | | | | | | |
| Maize | 10.7 | 48.0 | 0.2 | 10.7 | 30.4 | 28.9 | 3.0 |
| Wheat | 0.7 | 25.0 | | 20.6 | 53.7 | 0.4 | 0.0 |
| Rice | 24.8 | 21.2 | | 22.6 | 31.3 | 1.1 | 0.1 |
| Barley | 1.1 | 24.9 | | 20.6 | 53.4 | 0.7 | 0.1 |
| Cotton | 17.4 | 26.3 | 0.1 | 12.7 | 43.5 | 0.3 | 0.0 |
| Other cereals | 8.6 | 24.6 | 0.2 | 23.5 | 43.2 | 0.1 | 0.0 |
| Sugarcane | 7.6 | 37.6 | 0.3 | 11.5 | 43.1 | 1.8 | 0.2 |
| Coffee | 14.6 | 30.1 | 0.2 | 12.2 | 42.8 | 5.6 | 0.6 |
| Tea | 13.9 | 45.3 | 0.2 | 10.6 | 30.0 | 35.0 | 3.6 |
| Roots & tubers | 11.6 | 38.3 | 0.3 | 31.9 | 18.0 | 10.0 | 1.0 |
| Pulses & oil seeds | 12.0 | 38.0 | 0.5 | 11.9 | 37.7 | 19.0 | 1.9 |
| Fruits | 15.3 | 34.0 | 0.2 | 10.6 | 39.9 | 13.5 | 1.4 |
| Vegetables | 14.7 | 38.7 | 0.3 | 29.8 | 16.5 | 22.0 | 2.2 |
| Cut flowers | 35.2 | 19.7 | 0.1 | 10.3 | 34.7 | 11.7 | 1.2 |
| Others crops | 15.3 | 36.5 | 0.6 | 27.3 | 20.3 | 7.3 | 0.7 |
| Beef | 24.8 | 36.2 | 0.5 | 38.5 | | 13.9 | 1.4 |
| Dairy | 26.1 | 35.7 | 0.2 | 38.1 | | 23.6 | 2.4 |
| Poultry | 15.3 | 43.4 | 0.8 | 40.5 | | 15.2 | 1.6 |
| Sheep goat and lamb for slaughter | 28.2 | 36.9 | 0.2 | 34.6 | | 5.1 | 0.5 |
| Other livestock | 6.5 | 35.4 | 0.2 | 58.0 | | 3.8 | 0.4 |
| Other CRTS | | | | | | | |
| Fishing | 3.7 | 7.4 | | 88.8 | | 3.9 | 0.4 |

Table 2 -- Sectoral value-added (% , unless otherwise indicated) continue

| | | | | | | |
|-------------------------|------|------|------|------|------|-----|
| Forestry | 3.1 | 23.2 | | 73.7 | 7.0 | 0.7 |
| Mining | 16.4 | 30.9 | | 52.7 | 3.2 | 0.3 |
| Meat & dairy | 3.2 | 27.6 | 0.0 | 69.2 | 11.9 | 1.2 |
| Other manufactured food | 8.3 | 36.1 | 0.5 | 55.1 | 0.9 | 0.1 |
| Printing and publishing | | 44.8 | | 55.2 | 5.7 | 0.6 |
| Textile & clothing | 57.0 | 9.3 | 0.6 | 33.1 | 5.4 | 0.6 |
| Leather & footwear | 13.9 | 2.3 | | 83.9 | 5.2 | 0.5 |
| Wood & paper | 4.4 | 7.1 | 27.1 | 61.4 | 2.9 | 0.3 |
| Other manufactures | 3.3 | 63.9 | 0.6 | 32.3 | 29.8 | 3.0 |
| Water | | 28.8 | 10.9 | 60.3 | 13.1 | 1.3 |
| Electricity | 0.7 | 25.4 | 1.5 | 72.3 | 12.9 | 1.3 |
| Construction | 1.5 | 14.9 | 2.5 | 81.1 | 51.8 | 5.3 |
| Trade | 16.6 | 5.6 | 7.0 | 70.8 | 63.6 | 6.5 |
| Hotels | 51.1 | 5.0 | 0.9 | 43.1 | 9.8 | 1.0 |
| Real estate | 0.3 | 29.8 | 13.0 | 57.0 | 56.2 | 5.8 |
| Adminsitration | 1.1 | 12.1 | 8.0 | 78.8 | 49.3 | 5.1 |
| Health | 1.6 | 2.6 | 92.5 | 3.2 | 21.2 | 2.2 |
| Education | 0.8 | 2.9 | 66.4 | 30.0 | 74.9 | 7.7 |

Table 3 -- Trade Flows

| | Imports | | | Exports | | |
|--------------------------------------|---------|------------|-------------|---------|------------|-------------|
| | BKS | % of total | % of supply | BKS | % of total | % of output |
| Business Services | | | | | | |
| Communication | | | | 1.9 | 0.8 | 4.1 |
| Insurance | 2.4 | 0.7 | 7.5 | 0.4 | 0.2 | 1.5 |
| Banking and other financial services | 5.1 | 1.5 | 7.6 | 0.9 | 0.4 | 1.5 |
| Professional business services | | | | | | |
| Road services | 29.9 | 9.0 | 30.7 | 20.3 | 8.3 | 23.1 |
| Railway transport | 1.0 | 0.3 | 29.7 | | | |
| Maritime transport | 3.7 | 1.1 | 29.8 | 2.6 | 1.1 | 23.1 |
| Pipeline transport | 1.7 | 0.5 | 29.7 | 1.2 | 0.5 | 23.1 |
| Airline transport | 12.9 | 3.9 | 30.1 | 9.0 | 3.7 | 23.1 |
| Dixit-Stiglitz Goods | | | | | | |
| Beverages & tobacco | 1.4 | 0.4 | 5.1 | 12.1 | 4.9 | 30.4 |
| Grain milling | 0.7 | 0.2 | 2.1 | | | |
| Sugar & bakery & confectionary | 2.9 | 0.9 | 14.6 | 2.0 | 0.8 | 10.8 |
| Petroleum | 60.0 | 18.0 | 56.8 | 14.7 | 6.0 | 49.0 |
| Chemicals | 50.4 | 15.1 | 67.2 | 12.9 | 5.2 | 71.2 |
| Metals and machines | 48.0 | 14.4 | 69.4 | 5.0 | 2.0 | 55.8 |
| Non metallic products | 2.9 | 0.9 | 8.7 | 3.8 | 1.5 | 11.1 |
| Agriculture | | | | | | |
| Maize | 0.7 | 0.2 | 2.0 | 0.3 | 0.1 | 0.6 |
| Wheat | 10.9 | 3.3 | 96.1 | 0.1 | 0.0 | 14.6 |
| Rice | 3.9 | 1.2 | 53.7 | | | |
| Barley | | | | 0.1 | 0.0 | 11.0 |
| Cotton | | | | 0.0 | 0.0 | 7.4 |
| Other cereals | | | | 0.0 | 0.0 | 41.2 |
| Sugarcane | 1.5 | 0.4 | 42.5 | 1.5 | 0.6 | 33.7 |
| Coffee | | | | 11.7 | 4.8 | 86.6 |
| Tea | 0.4 | 0.1 | 9.0 | 47.1 | 19.1 | 91.5 |
| Roots & tubers | | | | | | |
| Pulses & oil seeds | 0.5 | 0.1 | 3.4 | 8.1 | 3.3 | 38.3 |
| Fruits | | | | 2.0 | 0.8 | 18.2 |
| Vegetables | 0.5 | 0.1 | 2.7 | 7.9 | 3.2 | 31.0 |
| Cut flowers | | | | 21.3 | 8.7 | 98.4 |
| Others crops | 0.7 | 0.2 | 6.0 | 4.5 | 1.8 | 29.9 |
| Beef | | | | | | |
| Dairy | | | | | | |
| Poultry | | | | | | |
| Sheep goat and lamb for slaughter | | | | | | |
| Other livestock | | | | | | |
| Other CRTS | | | | | | |
| Fishing | | | | | | |
| Forestry | | | | | | |
| Mining | 0.4 | 0.1 | 31.5 | 6.1 | 2.5 | 95.2 |
| Meat & dairy | 1.0 | 0.3 | 2.9 | 12.8 | 5.2 | 25.7 |
| Other manufactured food | 22.9 | 6.8 | 76.4 | 2.8 | 1.2 | 69.6 |
| Printing and publishing | 11.1 | 3.3 | 34.9 | | | |
| Textile & clothing | 9.4 | 2.8 | 43.6 | 4.4 | 1.8 | 31.2 |
| Leather & footwear | 1.6 | 0.5 | 9.9 | 3.5 | 1.4 | 20.4 |
| Wood & paper | 2.9 | 0.9 | 43.4 | 8.4 | 3.4 | 88.9 |
| Other manufactures | 35.4 | 10.6 | 43.9 | 14.7 | 6.0 | 22.2 |
| Water | | | | | | |
| Electricity | | | | | | |
| Construction | | | | | | |
| Trade | | | | | | |
| Hotels | | | | | | |
| Real estate | 7.4 | 2.2 | 10.1 | 1.5 | 0.6 | 2.3 |
| Administration | | | | | | |
| Health | | | | | | |
| Education | | | | | | |

Table 4 -- Benchmark Distortions (%)

| | Tariff | Sales Tax | Regulatory barriers | |
|--------------------------------------|--------|-----------|---------------------|---------------|
| | | | All firms | Foreign firms |
| Business Services | | | | |
| Communication | | | 6.0 | 4.0 |
| Insurance | | 0.6 | 13.0 | 26.0 |
| Banking and other financial services | | 0.6 | 17.0 | |
| Professional business services | | | 3.7 | 11.9 |
| Road services | | | 15.0 | 30.0 |
| Railway transport | | | 25.0 | |
| Maritime transport | | | 57.0 | 40.0 |
| Pipeline transport | | | | |
| Airline transport | | | 2.0 | 2.0 |
| Dixit-Stiglitz Goods | | | | |
| Beverages & tobacco | 30.4 | 44.0 | | |
| Grain milling | 25.8 | 9.4 | | |
| Sugar & bakery & confectionary | 23.5 | 19.5 | | |
| Petroleum | 10.4 | 22.4 | | |
| Chemicals | 8.8 | 4.8 | | |
| Metals and machines | 9.5 | 5.2 | | |
| Non metallic products | 19.3 | 0.7 | | |
| Agriculture | | | | |
| Maize | 29.6 | | | |
| Wheat | 11.0 | | | |
| Rice | 27.6 | | | |
| Barley | 9.9 | | | |
| Cotton | 12.5 | 12.5 | | |
| Other cereals | 9.9 | | | |
| Sugarcane | 64.2 | 19.4 | | |
| Coffee | 19.7 | | | |
| Tea | 19.7 | 5.1 | | |
| Roots & tubers | | | | |
| Pulses & oil seeds | 6.7 | 0.0 | | |
| Fruits | 19.5 | | | |
| Vegetables | 19.7 | 0.1 | | |
| Cut flowers | 19.7 | | | |
| Others crops | 2.7 | 3.4 | | |
| Beef | 19.7 | | | |
| Dairy | 28.9 | | | |
| Poultry | 19.7 | | | |
| Sheep goat and lamb for slaughter | | | | |
| Other livestock | 19.7 | | | |
| Other CRTS | | | | |
| Fishing | 19.7 | | | |
| Forestry | | | | |
| Mining | 1.2 | 4.1 | | |
| Meat & dairy | 27.6 | 15.5 | | |
| Other manufactured food | 15.8 | 5.5 | | |
| Printing and publishing | | 12.1 | | |
| Textile & clothing | 14.4 | 8.5 | | |
| Leather & footwear | 13.8 | 14.5 | | |
| Wood & paper | 9.2 | 5.9 | | |
| Other manufactures | 17.2 | 3.0 | | |
| Water | | | | |
| Electricity | | | | |
| Construction | | | | |
| Trade | | 1.9 | | |
| Hotels | | 13.9 | | |
| Real estate | | | | |
| Administration | | | | |
| Health | | | | |
| Education | | | | |

Source: Authors' estimates. See Balistreri, Rutherford, and Tarr (2009) for details.

Table 5 -- Trade Flows by Trading Partner (%)

| | Imports | | | Exports | | |
|--------------------------------------|----------------|--------|-------------------|----------------|--------|-------------------|
| | European Union | Africa | Rest of the World | European Union | Africa | Rest of the World |
| Business Services | | | | | | |
| Communication | | | | 66 | 0 | 34 |
| Insurance | 23 | 0 | 77 | 23 | 0 | 77 |
| Banking and other financial services | 75 | 1 | 24 | 75 | 1 | 24 |
| Professional business services | | | | | | |
| Road services | 10 | 70 | 20 | 10 | 70 | 20 |
| Railway transport | 0 | 0 | 100 | | | |
| Maritime transport | 45 | 27 | 27 | 45 | 27 | 27 |
| Pipeline transport | 0 | 41 | 59 | 0 | 41 | 59 |
| Airline transport | 43 | 14 | 43 | 43 | 14 | 43 |
| Dixit-Stiglitz Goods | | | | | | |
| Beverages & tobacco | 23 | 58 | 20 | 7 | 57 | 37 |
| Grain milling | 13 | 32 | 55 | | | |
| Sugar & bakery & confectionary | 20 | 15 | 65 | 3 | 73 | 24 |
| Petroleum | 3 | 2 | 94 | 0 | 58 | 41 |
| Chemicals | 28 | 6 | 66 | 0 | 69 | 30 |
| Metals and machines | 27 | 2 | 70 | 3 | 78 | 19 |
| Non metallic products | 24 | 4 | 72 | 5 | 86 | 9 |
| Agriculture | | | | | | |
| Maize | 0 | 91 | 9 | 0 | 27 | 73 |
| Wheat | 3 | 0 | 97 | 0 | 28 | 72 |
| Rice | 0 | 16 | 84 | | | |
| Barley | | | | 0 | 100 | 0 |
| Cotton | | | | 12 | 2 | 86 |
| Other cereals | | | | 1 | 64 | 35 |
| Sugarcane | 4 | 65 | 31 | 0 | 98 | 2 |
| Coffee | | | | 59 | 1 | 40 |
| Tea | 0 | 1 | 99 | 19 | 24 | 57 |
| Roots & tubers | | | | | | |
| Pulses & oil seeds | 1 | 76 | 24 | 60 | 2 | 38 |
| Fruits | | | | 76 | 6 | 18 |
| Vegetables | 11 | 43 | 46 | 89 | 2 | 9 |
| Cut flowers | | | | 81 | 6 | 13 |
| Others crops | 14 | 58 | 28 | 15 | 53 | 32 |
| Beef | | | | | | |
| Dairy | | | | | | |
| Poultry | | | | | | |
| Sheep goat and lamb for slaughter | | | | | | |
| Other livestock | | | | | | |
| Other CRTS | | | | | | |
| Fishing | | | | | | |
| Forestry | | | | | | |
| Mining | 5 | 5 | 90 | 28 | 43 | 29 |
| Meat & dairy | 12 | 17 | 71 | 1 | 74 | 26 |
| Other manufactured food | 7 | 16 | 77 | 34 | 56 | 10 |
| Printing and publishing | 35 | 19 | 45 | | | |
| Textile & clothing | 3 | 7 | 89 | 1 | 18 | 80 |
| Leather & footwear | 3 | 1 | 96 | 18 | 48 | 35 |
| Wood & paper | 34 | 16 | 50 | 4 | 87 | 10 |
| Other manufactures | 36 | 2 | 61 | 14 | 70 | 17 |
| Water | | | | | | |
| Electricity | | | | | | |
| Construction | | | | | | |
| Trade | | | | | | |
| Hotels | | | | | | |
| Real estate | 33 | 33 | 33 | 33 | 33 | 33 |
| Adminsitration | | | | | | |
| Health | | | | | | |
| Education | | | | | | |

Source: Authors' estimates.

Table 6A -- Market Shares in Sectors with FDI (%)

| | Kenya | European Union | Africa | Rest of the World |
|--------------------------------------|-------|----------------|--------|-------------------|
| Business Services | | | | |
| Communication | 26 | 49 | 0 | 25 |
| Insurance | 85 | 4 | 0 | 11 |
| Banking and other financial services | 62 | 29 | 0 | 9 |
| Professional business services | 94 | 2 | 2 | 2 |
| Road services | 80 | 2 | 14 | 4 |
| Railway transport | 0 | 0 | 0 | 100 |
| Maritime transport | 45 | 25 | 15 | 15 |
| Pipeline transport | 70 | 0 | 13 | 18 |
| Airline transport | 30 | 30 | 10 | 30 |

Source: Authors' estimates. See appendix for details.

Table 6B: Estimates of elasticity of firms with respect to price for Kenya by sector and by Kenyan trading partner region

| | R&D intensity | | Elasticity Estimates | | |
|--|--|--------|----------------------|-----|--|
| | R&D expenditures divided by sales (times 1000) for the US* | | | | |
| | | Africa | EU | ROW | |
| SERVICES | | | | | |
| telecommunications | 52-high | 2.5 | 13.4 | 20 | |
| banking | 4-low | 3.3 | 3.3 | 10 | |
| insurance | 4-low | 3.3 | 3.3 | 10 | |
| professional services | 116-high | 2.5 | 13.4 | 20 | |
| air transport** | medium | 1.9 | 10 | 15 | |
| road transport | low | 3.3 | 3.3 | 10 | |
| rail transport** | medium | 1.9 | 10 | 15 | |
| water transport** | medium | 1.9 | 10 | 15 | |
| MANUFACTURING | | | | | |
| beverages and tobacco | 14-low | 3.3 | 3.3 | 10 | |
| grain milling*** | 7-low | 3.3 | 3.3 | 10 | |
| sugar&bakery&confectioners*** | 7-low | 3.3 | 3.3 | 10 | |
| petroleum | 2-low | 3.3 | 3.3 | 10 | |
| chemicals | 34-medium | 1.9 | 10 | 15 | |
| metals and machines*** | 33-medium | 1.9 | 10 | 15 | |
| non-metallic products*** | 0-17-low | 3.3 | 3.3 | 10 | |
| *Based on average R&D expenditures for the years 2004 and 2005. The average for all US industries was 36. | | | | | |
| **We evaluate transportation as a medium R&D sector since three sectors dominate R&D expenditures of US multinationals operating abroad. These are transportation, chemicals and computers and electronics. Moreover, about two-thirds of all R&D expenditures of foreign multinationals operating in the US was performed in the same three sectors. See "U.S. and International Research and Development: Funds and Technology Linkages," at http://www.nsf.gov/statistics/seind04/c4/c4s5.htm . | | | | | |
| ***Food is the proxy for grain milling and sugar, bakery and confectioners; machinery is used for metals and machines; for non-metallic products, we used plastics, rubber, mineral and wood products. | | | | | |
| Development: 2005, Data Tables. Available at: http://www.nsf.gov/statistics/nsf10319/content.cfm?pub_id=3750&id=3 . See appendix E for details of the calculations. | | | | | |

Table 7: Summary of Results (results are percentage change from initial equilibrium, unless otherwise indicated)
No initial rent capture case

| Scenario definition | Benchmark | EU FTA | EU | | Africa FTA | EU-Africa FTA | Unilateral | Unilateral Discriminatory Services | Unilateral Tariffs | Unilateral & Domestic |
|---|-----------|--------------|-------------------------|------------|-------------|---------------|---------------|------------------------------------|--------------------|-----------------------|
| | | | Discriminatory Services | EU Tariffs | | | | | | |
| 50% reduction of discriminatory barriers on EU services firms | No | Yes | Yes | No | No | Yes | Yes | No | Yes | |
| 50% reduction of discriminatory barriers on African services firm | No | No | No | No | Yes | Yes | Yes | No | Yes | |
| 50% reduction of discriminatory barriers on ROW services firms | No | No | No | No | No | No | Yes | No | Yes | |
| 50% reduction of regulatory barriers for all services firms | No | No | No | No | No | No | No | No | Yes | |
| Removal of tariffs on EU sourced goods | No | Yes | No | Yes | No | Yes | Yes | No | Yes | |
| Removal of tariffs on ROW sourced goods | No | No | No | No | No | No | Yes | Yes | Yes | |
| Aggregate welfare | | | | | | | | | | |
| Welfare (EV as % of consumption) | | 0.7 | 0.5 | 0.2 | 0.3 | 1.0 | 3.6 | 1.5 | 2.0 | 10.3 |
| Welfare (EV as % of GDP) | | 0.6 | 0.4 | 0.1 | 0.2 | 0.8 | 3.0 | 1.3 | 1.7 | 8.6 |
| Government budget | | | | | | | | | | |
| Tariff revenue (% of GDP) | 3.6 | 2.1 | 2.9 | 2.1 | 2.9 | 2.1 | | 2.9 | | |
| Tariff revenue | | -29.0 | -0.1 | -28.9 | -0.1 | -29.1 | -100.0 | -0.3 | -100.0 | -100.0 |
| Aggregate trade | | | | | | | | | | |
| Real exchange rate | | 0.9 | 0.3 | 0.6 | 0.2 | 1.2 | 4.0 | 0.9 | 3.1 | 5.8 |
| Aggregate exports | | 3.2 | 0.1 | 3.1 | 0.3 | 3.5 | 12.6 | 0.5 | 11.9 | 15.4 |
| Factor Earnings | | | | | | | | | | |
| Skilled labor | | 2.2 | 0.7 | 1.5 | 0.5 | 2.7 | 9.0 | 2.2 | 6.5 | 15.3 |
| Semi-skilled labor | | 1.1 | 0.5 | 0.6 | 0.3 | 1.4 | 5.6 | 1.5 | 4.1 | 10.3 |
| Unskilled labor | | 1.5 | 0.6 | 0.9 | 0.3 | 1.9 | 7.4 | 1.9 | 5.3 | 14.3 |
| Capital | | 1.5 | 0.5 | 0.9 | 0.3 | 1.8 | 7.0 | 1.7 | 5.1 | 12.4 |
| Land | | 2.6 | 0.4 | 2.2 | 0.5 | 3.0 | 7.7 | 1.4 | 6.1 | 10.0 |
| Factor adjustments | | | | | | | | | | |
| Skilled labor | | 0.5 | 0.3 | 0.3 | 0.2 | 0.7 | 2.1 | 0.9 | 1.3 | 4.2 |
| Semi-skilled labor | | 0.7 | 0.2 | 0.7 | 0.1 | 0.8 | 2.5 | 0.6 | 1.9 | 4.5 |
| Unskilled labor | | 0.2 | 0.1 | 0.1 | 0.0 | 0.2 | 0.7 | 0.2 | 0.5 | 1.3 |
| Capital | | 0.3 | 0.1 | 0.3 | 0.0 | 0.3 | 1.3 | 0.3 | 1.2 | 2.2 |
| Land | | 1.0 | 0.5 | 0.7 | 0.4 | 1.4 | 3.7 | 1.4 | 2.2 | 7.2 |

Source: Authors' estimates.

Table 8: Summary of Results (results are percentage change from initial equilibrium, unless otherwise indicated)
Initial Rent Capture Case

| Scenario definition | Benchmark | EU FTA | EU Discriminatory Services | EU Tariffs | Africa FTA | EU-Africa FTA | Unilateral | Unilateral Discriminatory Services | Unilateral Tariffs | Unilateral & Domestic |
|---|-----------|--------------|----------------------------|------------|-------------|---------------|---------------|------------------------------------|--------------------|-----------------------|
| 50% reduction of discriminatory barriers on EU services firms | No | Yes | Yes | No | No | Yes | Yes | Yes | No | Yes |
| 50% reduction of discriminatory barriers on African services firm | No | No | No | No | Yes | Yes | Yes | Yes | No | Yes |
| 50% reduction of discriminatory barriers on ROW services firms | No | No | No | No | No | No | Yes | Yes | No | Yes |
| 50% reduction of regulatory barriers for all services firms | No | No | No | No | No | No | No | No | No | Yes |
| Removal of tariffs on EU sourced goods | No | Yes | No | Yes | No | Yes | Yes | No | Yes | Yes |
| Removal of tariffs on ROW sourced goods | No | No | No | No | No | No | Yes | No | Yes | Yes |
| Aggregate welfare | | | | | | | | | | |
| Welfare (EV as % of consumption) | | 0.5 | 0.3 | 0.2 | 0.1 | 0.5 | 2.9 | 0.9 | 2.0 | 7.0 |
| Welfare (EV as % of GDP) | | 0.4 | 0.3 | 0.1 | 0.0 | 0.5 | 2.5 | 0.7 | 1.7 | 5.9 |
| Government budget | | | | | | | | | | |
| Tariff revenue (% of GDP) | 3.6 | 2.1 | 2.9 | 2.1 | 2.9 | 2.1 | | 2.9 | | |
| Tariff revenue | | -29.0 | -0.1 | -28.9 | -0.1 | -29.1 | -100.0 | -0.4 | -100.0 | -100.0 |
| Aggregate trade | | | | | | | | | | |
| Real exchange rate | | 0.9 | 0.3 | 0.6 | 0.2 | 1.1 | 4.0 | 0.9 | 3.1 | 5.5 |
| Aggregate exports | | 3.2 | 0.1 | 3.1 | 0.2 | 3.4 | 12.4 | 0.4 | 11.9 | 14.3 |
| Factor Earnings | | | | | | | | | | |
| Skilled labor | | 2.2 | 0.7 | 1.5 | 0.5 | 2.7 | 8.9 | 2.2 | 6.5 | 14.7 |
| Semi-skilled labor | | 1.1 | 0.5 | 0.6 | 0.3 | 1.4 | 5.6 | 1.5 | 4.1 | 10.0 |
| Unskilled labor | | 1.5 | 0.6 | 0.9 | 0.3 | 1.8 | 7.4 | 1.9 | 5.3 | 14.6 |
| Capital | | 1.4 | 0.5 | 0.9 | 0.3 | 1.7 | 6.9 | 1.6 | 5.1 | 12.2 |
| Land | | 2.5 | 0.3 | 2.2 | 0.4 | 2.9 | 7.5 | 1.1 | 6.1 | 8.5 |
| Factor adjustments | | | | | | | | | | |
| Skilled labor | | 0.6 | 0.4 | 0.3 | 0.3 | 0.9 | 2.3 | 1.1 | 1.3 | 5.0 |
| Semi-skilled labor | | 0.8 | 0.3 | 0.7 | 0.2 | 0.9 | 2.5 | 0.8 | 1.9 | 4.9 |
| Unskilled labor | | 0.2 | 0.1 | 0.1 | 0.1 | 0.3 | 0.8 | 0.4 | 0.5 | 2.0 |
| Capital | | 0.3 | 0.1 | 0.3 | 0.1 | 0.4 | 1.4 | 0.4 | 1.2 | 2.7 |
| Land | | 1.0 | 0.4 | 0.7 | 0.4 | 1.4 | 3.7 | 1.5 | 2.2 | 7.2 |

Source: Authors' estimates.

Table 9: Output and Employment Impacts from Liberalisation (% change from benchmark)

No initial rent capture case

| | Unilateral FTA | | EU-Africa FTA | | Africa FTA | | EU FTA | |
|--------------------------------------|----------------|--------------|---------------|--------------|------------|--------------|--------|--------------|
| | Output | Labor income | Output | Labor income | Output | Labor income | Output | Labor income |
| Business Services | | | | | | | | |
| Communication | 3.0 | 8.3 | 1.1 | 2.3 | 0.2 | 0.3 | 0.9 | 2.0 |
| Insurance | 4.1 | 9.8 | 0.9 | 2.0 | 0.2 | 0.4 | 0.7 | 1.6 |
| Banking and other financial services | 2.4 | 7.7 | 0.9 | 2.1 | 0.2 | 0.4 | 0.7 | 1.7 |
| Professional business services | 4.1 | 10.5 | 1.5 | 3.1 | 0.2 | 0.4 | 1.3 | 2.6 |
| Road services | 6.5 | 9.4 | 2.8 | 3.0 | 0.4 | 0.5 | 2.3 | 2.4 |
| Railway transport | 12.6 | 14.3 | 6.1 | 5.7 | 1.8 | 1.4 | 4.2 | 4.2 |
| Maritime transport | 14.3 | 16.8 | 8.2 | 8.2 | -0.2 | -0.6 | 8.2 | 8.7 |
| Pipeline transport | 5.5 | 7.0 | 2.7 | 2.3 | 0.8 | 0.4 | 1.9 | 1.9 |
| Airline transport | 6.6 | 8.4 | 3.2 | 2.8 | 0.9 | 0.4 | 2.3 | 2.4 |
| Dixit-Stiglitz Goods | | | | | | | | |
| Beverages & tobacco | 6.2 | 12.1 | 0.6 | 1.9 | 0.1 | 0.3 | 0.5 | 1.6 |
| Grain milling | 2.7 | 10.0 | 0.5 | 2.4 | 0.1 | 0.4 | 0.4 | 1.9 |
| Sugar & bakery & confectionary | -2.4 | 4.0 | 0.4 | 2.1 | 0.1 | 0.4 | 0.3 | 1.7 |
| Petroleum | 0.7 | 3.5 | 3.4 | 4.0 | 0.2 | 0.2 | 3.2 | 3.7 |
| Chemicals | 1.5 | 7.3 | -0.4 | 1.0 | 0.0 | 0.3 | -0.4 | 0.7 |
| Metals and machines | -8.4 | -3.3 | -3.7 | -2.5 | 0.0 | 0.3 | -3.7 | -2.7 |
| Non metallic products | -14.2 | -9.7 | -1.0 | 0.6 | 0.0 | 0.3 | -1.0 | 0.3 |
| Agriculture | | | | | | | | |
| Maize | 1.7 | 7.1 | 0.6 | 2.1 | 0.1 | 0.3 | 0.6 | 1.8 |
| Wheat | -27.7 | -24.9 | -2.7 | -0.9 | -0.2 | 0.1 | -2.4 | -1.0 |
| Rice | -29.8 | -27.0 | 0.6 | 2.0 | 0.1 | 0.3 | 0.5 | 1.7 |
| Barley | 3.3 | 10.0 | 0.1 | 2.2 | 0.0 | 0.4 | 0.1 | 1.8 |
| Cotton | 2.5 | 7.6 | 0.5 | 1.9 | 0.1 | 0.3 | 0.4 | 1.6 |
| Other cereals | -2.1 | 3.9 | -0.9 | 1.1 | -0.2 | 0.1 | -0.6 | 0.9 |
| Sugarcane | -31.0 | -30.2 | -3.2 | -3.4 | 2.3 | 1.9 | -5.5 | -5.4 |
| Coffee | 52.4 | 60.9 | 15.5 | 17.4 | 0.4 | 0.7 | 15.1 | 16.8 |
| Tea | -7.3 | -2.1 | -1.6 | 0.0 | -1.2 | -1.0 | -0.3 | 1.1 |
| Roots & tubers | 0.6 | 4.9 | 0.3 | 1.4 | 0.1 | 0.3 | 0.2 | 1.1 |
| Pulses & oil seeds | 0.3 | 5.7 | 0.1 | 1.7 | 0.0 | 0.3 | 0.1 | 1.4 |
| Fruits | -0.4 | 5.0 | -0.1 | 1.4 | 0.1 | 0.3 | -0.2 | 1.1 |
| Vegetables | -0.7 | 4.8 | 0.3 | 1.8 | 0.1 | 0.3 | 0.2 | 1.5 |
| Cut flowers | 21.1 | 27.1 | 11.2 | 12.7 | 4.8 | 4.9 | 6.1 | 7.4 |
| Others crops | 1.0 | 5.6 | 1.2 | 2.5 | 0.1 | 0.3 | 1.2 | 2.2 |
| Beef | 2.2 | 9.3 | 0.6 | 2.5 | 0.0 | 0.4 | 0.6 | 2.1 |
| Dairy | 0.4 | 7.1 | 0.1 | 1.9 | 0.0 | 0.3 | 0.1 | 1.5 |
| Poultry | 0.6 | 7.1 | 0.1 | 1.8 | 0.0 | 0.3 | 0.1 | 1.5 |
| Sheep goat and lamb for slaughter | 0.9 | 7.9 | 0.1 | 2.0 | 0.0 | 0.4 | 0.1 | 1.7 |
| Other livestock | -0.5 | 6.1 | 0.0 | 1.7 | 0.0 | 0.3 | -0.1 | 1.3 |
| Other CRTS | | | | | | | | |
| Fishing | 0.3 | 7.3 | -0.1 | 1.7 | 0.0 | 0.4 | -0.1 | 1.3 |
| Forestry | 0.1 | 6.8 | 0.0 | 1.8 | 0.0 | 0.4 | 0.0 | 1.4 |
| Mining | 81.3 | 96.4 | 9.0 | 10.8 | 0.8 | 1.0 | 8.1 | 9.7 |
| Meat & dairy | 7.1 | 13.6 | 0.9 | 2.4 | 0.1 | 0.3 | 0.8 | 2.0 |
| Other manufactured food | 49.6 | 63.3 | 8.1 | 10.5 | 0.7 | 1.1 | 7.4 | 9.3 |
| Printing and publishing | 6.2 | 12.6 | 0.8 | 2.1 | 0.1 | 0.3 | 0.7 | 1.8 |
| Textile & clothing | -4.4 | 3.1 | -0.1 | 2.2 | -0.1 | 0.4 | -0.1 | 1.8 |
| Leather & footwear | 4.7 | 12.8 | 0.4 | 2.3 | 0.0 | 0.4 | 0.4 | 2.0 |
| Wood & paper | 4.3 | 11.6 | -0.8 | 0.8 | 0.1 | 0.5 | -0.9 | 0.4 |
| Other manufactures | -12.1 | -7.3 | -6.2 | -5.1 | 0.0 | 0.3 | -6.3 | -5.4 |
| Water | -0.5 | 5.9 | 0.1 | 1.8 | 0.0 | 0.3 | 0.1 | 1.4 |
| Electricity | 0.5 | 6.7 | 0.4 | 1.9 | 0.1 | 0.4 | 0.2 | 1.5 |
| Construction | 0.0 | 6.0 | 0.0 | 1.5 | 0.0 | 0.3 | 0.0 | 1.2 |
| Trade | 3.4 | 7.6 | 1.1 | 2.0 | 0.1 | 0.2 | 1.0 | 1.7 |
| Hotels | 0.4 | 5.6 | 0.0 | 1.3 | 0.0 | 0.3 | 0.0 | 1.1 |
| Real estate | -2.3 | 3.5 | -0.5 | 1.0 | 0.0 | 0.3 | -0.5 | 0.7 |
| Administration | 0.0 | 6.4 | 0.0 | 1.6 | 0.0 | 0.3 | 0.0 | 1.3 |
| Health | -0.3 | 7.0 | -0.2 | 1.6 | 0.0 | 0.3 | -0.2 | 1.3 |
| Education | -0.3 | 6.7 | -0.1 | 1.7 | 0.0 | 0.3 | -0.1 | 1.4 |

Source: Authors' estimates.

**Table 10: Impacts on Imports from Unilateral Liberalisation (% change from benchmark)
No initial rent capture case**

| | European Union | Africa | Rest of the World |
|--------------------------------------|----------------|--------|-------------------|
| Business Services | | | |
| Communication | | | |
| Insurance | -1.0 | | 5.5 |
| Banking and other financial services | 3.4 | 3.4 | 3.9 |
| Professional business services | | | |
| Road services | -6.3 | -6.3 | -4.2 |
| Railway transport | | | -3.0 |
| Maritime transport | -20.9 | -25.2 | -19.1 |
| Pipeline transport | | -0.9 | -0.5 |
| Airline transport | -2.6 | -3.2 | -2.4 |
| Dixit-Stiglitz Goods | | | |
| Beverages & tobacco | 67.0 | -6.6 | 148.7 |
| Grain milling | 59.6 | -13.9 | 218.3 |
| Sugar & bakery & confectionary | 43.7 | -20.8 | 118.6 |
| Petroleum | 2.8 | -25.4 | 6.5 |
| Chemicals | 5.1 | -14.2 | 6.0 |
| Metals and machines | 6.0 | -19.8 | 9.1 |
| Non metallic products | 37.4 | -24.2 | 187.9 |
| Agriculture | | | |
| Maize | 173.2 | -3.1 | 173.2 |
| Wheat | 4.2 | -31.4 | 4.2 |
| Rice | 65.3 | -37.6 | 65.3 |
| Barley | | | |
| Cotton | | | |
| Other cereals | | | |
| Sugarcane | 216.2 | -56.5 | 216.2 |
| Coffee | | | |
| Tea | 58.3 | -22.9 | 58.3 |
| Roots & tubers | | | |
| Pulses & oil seeds | 31.3 | 1.4 | 31.3 |
| Fruits | | | |
| Vegetables | 98.7 | -3.2 | 98.7 |
| Cut flowers | | | |
| Others crops | 11.6 | 0.4 | 11.6 |
| Beef | | | |
| Dairy | | | |
| Poultry | | | |
| Sheep goat and lamb for slaughter | | | |
| Other livestock | | | |
| Other CRTS | | | |
| Fishing | | | |
| Forestry | | | |
| Mining | -26.0 | -29.4 | -26.0 |
| Meat & dairy | 107.8 | -21.6 | 107.8 |
| Other manufactured food | 16.5 | -35.3 | 16.5 |
| Printing and publishing | -3.4 | -3.4 | -3.4 |
| Textile & clothing | 29.2 | -24.5 | 29.2 |
| Leather & footwear | 44.1 | -14.1 | 44.1 |
| Wood & paper | 17.9 | -17.2 | 17.9 |
| Other manufactures | 26.6 | -32.8 | 26.6 |
| Water | | | |
| Electricity | | | |
| Construction | | | |
| Trade | | | |
| Hotels | | | |
| Real estate | 4.3 | 4.3 | 4.3 |
| Administration | | | |
| Health | | | |
| Education | | | |

Source: Authors' estimates.

**Table 11: Impacts on Exports from Unilateral Liberalisation (% change from benchmark)
No initial rent capture case**

| | European Union | Africa | Rest of the World |
|--------------------------------------|----------------|--------|-------------------|
| Business Services | | | |
| Communication | 0.2 | | 0.2 |
| Insurance | -6.6 | | -6.6 |
| Banking and other financial services | -1.6 | -1.6 | -1.6 |
| Professional business services | | | |
| Road services | 5.1 | 5.1 | 5.1 |
| Railway transport | | | 23.8 |
| Maritime transport | 3.4 | 3.4 | 3.4 |
| Pipeline transport | | 6.8 | 6.8 |
| Airline transport | 6.4 | 6.4 | 6.4 |
| Dixit-Stiglitz Goods | | | |
| Beverages & tobacco | 13.8 | 13.8 | 13.8 |
| Grain milling | | | |
| Sugar & bakery & confectionary | 15.0 | 15.0 | 15.0 |
| Petroleum | 16.2 | 16.2 | 16.2 |
| Chemicals | 7.5 | 7.5 | 7.5 |
| Metals and machines | 52.8 | 52.8 | 52.8 |
| Non metallic products | 20.1 | 20.1 | 20.1 |
| Agriculture | | | |
| Maize | 6.0 | 6.0 | 6.0 |
| Wheat | | -25.3 | -25.3 |
| Rice | | | |
| Barley | | -3.5 | |
| Cotton | 1.9 | 1.9 | 1.9 |
| Other cereals | -5.1 | -5.1 | -5.1 |
| Sugarcane | -15.5 | -15.5 | -15.5 |
| Coffee | 55.7 | 55.7 | 55.7 |
| Tea | -7.0 | -7.0 | -7.0 |
| Roots & tubers | | | |
| Pulses & oil seeds | -0.7 | -0.7 | -0.7 |
| Fruits | -3.3 | -3.3 | -3.3 |
| Vegetables | -0.8 | -0.8 | -0.8 |
| Cut flowers | 21.4 | 21.4 | 21.4 |
| Others crops | 1.3 | 1.3 | 1.3 |
| Beef | | | |
| Dairy | | | |
| Poultry | | | |
| Sheep goat and lamb for slaughter | | | |
| Other livestock | | | |
| Other CRTS | | | |
| Fishing | | | |
| Forestry | | | |
| Mining | 85.2 | 85.2 | 85.2 |
| Meat & dairy | 23.5 | 23.5 | 23.5 |
| Other manufactured food | 77.4 | 77.4 | 77.4 |
| Printing and publishing | | | |
| Textile & clothing | 6.6 | 6.6 | 6.6 |
| Leather & footwear | 18.1 | 18.1 | 18.1 |
| Wood & paper | 5.5 | 5.5 | 5.5 |
| Other manufactures | 3.6 | 3.6 | 3.6 |
| Water | | | |
| Electricity | | | |
| Construction | | | |
| Trade | | | |
| Hotels | | | |
| Real estate | -8.2 | -8.2 | -8.2 |
| Administration | | | |
| Health | | | |
| Education | | | |

Source: Authors' estimates.

Table 12: Impacts on Number of Firms from Unilateral Liberalisation (% change from benchmark)
No initial rent capture case

| | Kenya | European Union | Africa | Rest of the World |
|--------------------------------------|-------|----------------|--------|-------------------|
| Business Services | | | | |
| Communication | -1.8 | 5.3 | | 6.2 |
| Insurance | -6.3 | 33.4 | | 91.4 |
| Banking and other financial services | 1.4 | 1.7 | 1.7 | 3.5 |
| Professional business services | 1.1 | 50.7 | 13.7 | 61.1 |
| Road services | -0.3 | 39.8 | 39.7 | 128.3 |
| Railway transport | | | | 7.5 |
| Maritime transport | -9.0 | 86.4 | 16.7 | 115.9 |
| Pipeline transport | 3.9 | | 3.0 | 12.2 |
| Airline transport | 3.3 | 9.1 | 2.7 | 11.1 |
| Dixit-Stiglitz Goods | | | | |
| Beverages & tobacco | 5.5 | 50.6 | -5.4 | 116.4 |
| Grain milling | 2.2 | 45.5 | -11.5 | 169.9 |
| Sugar & bakery & confectionary | -2.3 | 33.4 | -17.1 | 92.2 |
| Petroleum | 0.6 | 2.2 | -20.6 | 5.1 |
| Chemicals | 1.4 | 3.9 | -11.3 | 4.7 |
| Metals and machines | -7.3 | 4.6 | -15.9 | 7.0 |
| Non metallic products | -10.5 | 28.9 | -20.1 | 144.9 |

Source: Authors' estimates.

Table 13: Impacts on Imports from combined EU and Africa FTAs
No initial rent capture case (% change from benchmark)

| | European Union | Africa | Rest of the World |
|--------------------------------------|----------------|--------|-------------------|
| Business Services | | | |
| Communication | | | |
| Insurance | 3.4 | | -0.4 |
| Banking and other financial services | 0.6 | 0.6 | 0.8 |
| Professional business services | | | |
| Road services | -3.5 | -3.5 | -4.3 |
| Railway transport | | | -1.9 |
| Maritime transport | -11.8 | -18.1 | -20.7 |
| Pipeline transport | | -0.8 | -0.7 |
| Airline transport | -1.4 | -1.9 | -1.8 |
| Dixit-Stiglitz Goods | | | |
| Beverages & tobacco | 75.3 | -1.5 | -2.5 |
| Grain milling | 79.3 | -1.7 | -3.4 |
| Sugar & bakery & confectionary | 72.5 | -3.6 | -7.0 |
| Petroleum | 36.0 | -0.8 | -1.7 |
| Chemicals | 43.7 | -4.4 | -14.3 |
| Metals and machines | 129.4 | -8.5 | -43.3 |
| Non metallic products | 72.1 | -2.6 | -6.8 |
| Agriculture | | | |
| Maize | 178.7 | -1.1 | -1.1 |
| Wheat | 51.1 | -0.6 | -0.6 |
| Rice | 164.2 | -0.3 | -0.3 |
| Barley | | | |
| Cotton | | | |
| Other cereals | | | |
| Sugarcane | 521.0 | -14.6 | -14.6 |
| Coffee | | | |
| Tea | 104.5 | -0.4 | -0.4 |
| Roots & tubers | | | |
| Pulses & oil seeds | 29.9 | 0.3 | 0.3 |
| Fruits | | | |
| Vegetables | 102.5 | -1.4 | -1.4 |
| Cut flowers | | | |
| Others crops | 11.5 | 0.4 | 0.4 |
| Beef | | | |
| Dairy | | | |
| Poultry | | | |
| Sheep goat and lamb for slaughter | | | |
| Other livestock | | | |
| Other CRTS | | | |
| Fishing | | | |
| Forestry | | | |
| Mining | 1.5 | -3.1 | -3.1 |
| Meat & dairy | 153.6 | -4.3 | -4.3 |
| Other manufactured food | 72.7 | -4.1 | -4.1 |
| Printing and publishing | -0.6 | -0.6 | -0.6 |
| Textile & clothing | 69.5 | -0.9 | -0.9 |
| Leather & footwear | 67.6 | 0.0 | 0.0 |
| Wood & paper | 32.1 | -7.2 | -7.2 |
| Other manufactures | 59.8 | -15.1 | -15.1 |
| Water | | | |
| Electricity | | | |
| Construction | | | |
| Trade | | | |
| Hotels | | | |
| Real estate | 0.5 | 0.5 | 0.5 |
| Administration | | | |
| Health | | | |
| Education | | | |

Source: Authors' estimates.

Table 14: Impacts on Exports from Combined EU-Africa FTA
No initial rent capture case (% change from benchmark)

| | European Union | Africa | Rest of the World |
|--------------------------------------|----------------|--------|-------------------|
| Business Services | | | |
| Communication | 0.2 | | 0.2 |
| Insurance | -0.2 | | -0.2 |
| Banking and other financial services | 0.4 | 0.4 | 0.4 |
| Professional business services | | | |
| Road services | 2.6 | 2.6 | 2.6 |
| Railway transport | | | 11.8 |
| Maritime transport | 1.7 | 1.7 | 1.7 |
| Pipeline transport | | 3.8 | 3.8 |
| Airline transport | 3.6 | 3.6 | 3.6 |
| Dixit-Stiglitz Goods | | | |
| Beverages & tobacco | 1.9 | 1.9 | 1.9 |
| Grain milling | | | |
| Sugar & bakery & confectionary | 3.6 | 3.6 | 3.6 |
| Petroleum | 4.6 | 4.6 | 4.6 |
| Chemicals | 1.2 | 1.2 | 1.2 |
| Metals and machines | 26.0 | 26.0 | 26.0 |
| Non metallic products | 2.6 | 2.6 | 2.6 |
| Agriculture | | | |
| Maize | 2.4 | 2.4 | 2.4 |
| Wheat | | -4.5 | -4.5 |
| Rice | | | |
| Barley | | -2.4 | |
| Cotton | 0.5 | 0.5 | 0.5 |
| Other cereals | -2.1 | -2.1 | -2.1 |
| Sugarcane | 2.8 | 2.8 | 2.8 |
| Coffee | 16.6 | 16.6 | 16.6 |
| Tea | -1.7 | -1.7 | -1.7 |
| Roots & tubers | | | |
| Pulses & oil seeds | -0.1 | -0.1 | -0.1 |
| Fruits | -1.0 | -1.0 | -1.0 |
| Vegetables | 1.0 | 1.0 | 1.0 |
| Cut flowers | 11.4 | 11.4 | 11.4 |
| Others crops | 1.7 | 1.7 | 1.7 |
| Beef | | | |
| Dairy | | | |
| Poultry | | | |
| Sheep goat and lamb for slaughter | | | |
| Other livestock | | | |
| Other CRTS | | | |
| Fishing | | | |
| Forestry | | | |
| Mining | 9.4 | 9.4 | 9.4 |
| Meat & dairy | 3.5 | 3.5 | 3.5 |
| Other manufactured food | 11.9 | 11.9 | 11.9 |
| Printing and publishing | | | |
| Textile & clothing | 0.2 | 0.2 | 0.2 |
| Leather & footwear | 0.6 | 0.6 | 0.6 |
| Wood & paper | -0.5 | -0.5 | -0.5 |
| Other manufactures | -0.2 | -0.2 | -0.2 |
| Water | | | |
| Electricity | | | |
| Construction | | | |
| Trade | | | |
| Hotels | | | |
| Real estate | -1.3 | -1.3 | -1.3 |
| Administration | | | |
| Health | | | |
| Education | | | |

Source: Authors' estimates.

Table 15: Impacts on Number of Firms from Combined EU-Africa FTA
No initial rent capture case (% change from benchmark)

| | Kenya | European Union | Africa | Rest of the World |
|--------------------------------------|-------|----------------|--------|-------------------|
| Business Services | | | | |
| Communication | -1.4 | 7.0 | | -5.4 |
| Insurance | -0.3 | 42.2 | | -0.6 |
| Banking and other financial services | 0.6 | 0.6 | 0.6 | 1.2 |
| Professional business services | 0.2 | 46.4 | 12.8 | 0.6 |
| Road services | -0.5 | 41.1 | 41.0 | -4.2 |
| Railway transport | | | | 3.6 |
| Maritime transport | -7.0 | 120.3 | 20.3 | -35.0 |
| Pipeline transport | 2.0 | | 1.4 | 5.6 |
| Airline transport | 1.8 | 7.1 | 2.1 | 2.2 |
| Dixit-Stiglitz Goods | | | | |
| Beverages & tobacco | 0.6 | 56.5 | -1.2 | -2.0 |
| Grain milling | 0.4 | 59.5 | -1.3 | -2.8 |
| Sugar & bakery & confectionary | 0.4 | 53.9 | -2.9 | -5.6 |
| Petroleum | 3.2 | 27.2 | -0.6 | -1.4 |
| Chemicals | -0.4 | 33.3 | -3.4 | -11.1 |
| Metals and machines | -3.2 | 96.9 | -6.7 | -33.9 |
| Non metallic products | -0.7 | 53.8 | -2.1 | -5.5 |

Source: Authors' estimates.

Table 16: Impacts on Imports from African FTA
No initial rent capture case (% change from benchmark)

| | European Union | Africa | Rest of the World |
|--------------------------------------|----------------|--------|-------------------|
| Business Services | | | |
| Communication | | | |
| Insurance | 0.1 | | 0.1 |
| Banking and other financial services | 0.1 | 0.1 | 0.2 |
| Professional business services | | | |
| Road services | -3.0 | -2.3 | -3.1 |
| Railway transport | | | -0.6 |
| Maritime transport | -2.5 | -1.7 | -2.5 |
| Pipeline transport | | -0.3 | -0.3 |
| Airline transport | -0.4 | -0.4 | -0.4 |
| Dixit-Stiglitz Goods | | | |
| Beverages & tobacco | 0.0 | 0.0 | 0.1 |
| Grain milling | 0.0 | 0.0 | 0.0 |
| Sugar & bakery & confectionary | 0.0 | 0.0 | 0.1 |
| Petroleum | 0.0 | 0.0 | 0.0 |
| Chemicals | 0.1 | 0.0 | 0.1 |
| Metals and machines | 0.0 | 0.0 | 0.1 |
| Non metallic products | 0.1 | 0.1 | 0.2 |
| Agriculture | | | |
| Maize | 0.2 | 0.2 | 0.2 |
| Wheat | 0.1 | 0.1 | 0.1 |
| Rice | 0.1 | 0.1 | 0.1 |
| Barley | | | |
| Cotton | | | |
| Other cereals | | | |
| Sugarcane | -1.1 | -1.1 | -1.1 |
| Coffee | | | |
| Tea | -0.4 | -0.4 | -0.4 |
| Roots & tubers | | | |
| Pulses & oil seeds | 0.2 | 0.2 | 0.2 |
| Fruits | | | |
| Vegetables | 0.0 | 0.0 | 0.0 |
| Cut flowers | | | |
| Others crops | 0.2 | 0.2 | 0.2 |
| Beef | | | |
| Dairy | | | |
| Poultry | | | |
| Sheep goat and lamb for slaughter | | | |
| Other livestock | | | |
| Other CRTS | | | |
| Fishing | | | |
| Forestry | | | |
| Mining | -0.2 | -0.2 | -0.2 |
| Meat & dairy | 0.0 | 0.0 | 0.0 |
| Other manufactured food | 0.0 | 0.0 | 0.0 |
| Printing and publishing | 0.1 | 0.1 | 0.1 |
| Textile & clothing | 0.3 | 0.3 | 0.3 |
| Leather & footwear | 0.2 | 0.2 | 0.2 |
| Wood & paper | 0.9 | 0.9 | 0.9 |
| Other manufactures | 0.2 | 0.2 | 0.2 |
| Water | | | |
| Electricity | | | |
| Construction | | | |
| Trade | | | |
| Hotels | | | |
| Real estate | 0.2 | 0.2 | 0.2 |
| Administration | | | |
| Health | | | |
| Education | | | |

Source: Authors' estimates.

Table 17: Impacts on Exports from African FTA
No initial rent capture case (% change from benchmark)

| | European Union | Africa | Rest of the World |
|--------------------------------------|----------------|--------|-------------------|
| Business Services | | | |
| Communication | 0.1 | | 0.1 |
| Insurance | 0.1 | | 0.1 |
| Banking and other financial services | 0.1 | 0.1 | 0.1 |
| Professional business services | | | |
| Road services | -1.1 | -1.1 | -1.1 |
| Railway transport | | | 3.6 |
| Maritime transport | 1.3 | 1.3 | 1.3 |
| Pipeline transport | | 1.2 | 1.2 |
| Airline transport | 1.2 | 1.2 | 1.2 |
| Dixit-Stiglitz Goods | | | |
| Beverages & tobacco | 0.2 | 0.2 | 0.2 |
| Grain milling | | | |
| Sugar & bakery & confectionary | 0.1 | 0.1 | 0.1 |
| Petroleum | 0.3 | 0.3 | 0.3 |
| Chemicals | 0.0 | 0.0 | 0.0 |
| Metals and machines | 0.0 | 0.0 | 0.0 |
| Non metallic products | 0.0 | 0.0 | 0.0 |
| Agriculture | | | |
| Maize | 0.0 | 0.0 | 0.0 |
| Wheat | | -0.5 | -0.5 |
| Rice | | | |
| Barley | | -0.3 | |
| Cotton | 0.1 | 0.1 | 0.1 |
| Other cereals | -0.5 | -0.5 | -0.5 |
| Sugarcane | 4.1 | 4.1 | 4.1 |
| Coffee | 0.5 | 0.5 | 0.5 |
| Tea | -1.2 | -1.2 | -1.2 |
| Roots & tubers | | | |
| Pulses & oil seeds | -0.1 | -0.1 | -0.1 |
| Fruits | 0.0 | 0.0 | 0.0 |
| Vegetables | 0.2 | 0.2 | 0.2 |
| Cut flowers | 4.9 | 4.9 | 4.9 |
| Others crops | 0.0 | 0.0 | 0.0 |
| Beef | | | |
| Dairy | | | |
| Poultry | | | |
| Sheep goat and lamb for slaughter | | | |
| Other livestock | | | |
| Other CRTS | | | |
| Fishing | | | |
| Forestry | | | |
| Mining | 0.8 | 0.8 | 0.8 |
| Meat & dairy | 0.2 | 0.2 | 0.2 |
| Other manufactured food | 0.8 | 0.8 | 0.8 |
| Printing and publishing | | | |
| Textile & clothing | -0.3 | -0.3 | -0.3 |
| Leather & footwear | -0.1 | -0.1 | -0.1 |
| Wood & paper | 0.1 | 0.1 | 0.1 |
| Other manufactures | -0.1 | -0.1 | -0.1 |
| Water | | | |
| Electricity | | | |
| Construction | | | |
| Trade | | | |
| Hotels | | | |
| Real estate | -0.1 | -0.1 | -0.1 |
| Administration | | | |
| Health | | | |
| Education | | | |

Source: Authors' estimates.

Table 18: Impacts on Number of Firms from African FTA
No initial rent capture case **(% change from benchmark)**

| | Kenya | European Union | Africa | Rest of the World |
|--------------------------------------|-------|----------------|--------|-------------------|
| Business Services | | | | |
| Communication | 0.0 | 0.1 | | 0.2 |
| Insurance | 0.1 | 0.1 | | 0.2 |
| Banking and other financial services | 0.1 | 0.1 | 0.1 | 0.2 |
| Professional business services | 0.0 | -0.1 | 12.6 | -0.1 |
| Road services | -2.2 | -2.8 | 40.2 | -5.5 |
| Railway transport | | | | 1.1 |
| Maritime transport | -0.1 | -2.8 | 28.3 | -3.4 |
| Pipeline transport | 0.6 | | 0.4 | 1.6 |
| Airline transport | 0.7 | 0.9 | 1.9 | 1.0 |
| Dixit-Stiglitz Goods | | | | |
| Beverages & tobacco | 0.1 | 0.0 | 0.0 | 0.0 |
| Grain milling | 0.1 | 0.0 | 0.0 | 0.0 |
| Sugar & bakery & confectionary | 0.1 | 0.0 | 0.0 | 0.1 |
| Petroleum | 0.2 | 0.0 | 0.0 | 0.0 |
| Chemicals | 0.0 | 0.1 | 0.0 | 0.1 |
| Metals and machines | 0.0 | 0.0 | 0.0 | 0.0 |
| Non metallic products | 0.0 | 0.1 | 0.1 | 0.2 |

Source: Authors' estimates.

Table 19: Impacts on Imports from EU FTA

No initial rent capture case (% change from benchmark)

| | European Union | Africa | Rest of the World |
|--------------------------------------|----------------|--------|-------------------|
| Business Services | | | |
| Communication | | | |
| Insurance | 3.3 | | -0.5 |
| Banking and other financial services | 0.5 | 0.5 | 0.6 |
| Professional business services | | | |
| Road services | -0.6 | -1.3 | -1.3 |
| Railway transport | | | -1.2 |
| Maritime transport | -9.6 | -17.2 | -18.8 |
| Pipeline transport | | -0.6 | -0.4 |
| Airline transport | -1.0 | -1.4 | -1.4 |
| Dixit-Stiglitz Goods | | | |
| Beverages & tobacco | 75.2 | -1.6 | -2.6 |
| Grain milling | 79.3 | -1.7 | -3.5 |
| Sugar & bakery & confectionary | 72.4 | -3.7 | -7.1 |
| Petroleum | 36.0 | -0.8 | -1.8 |
| Chemicals | 43.5 | -4.4 | -14.4 |
| Metals and machines | 129.3 | -8.5 | -43.3 |
| Non metallic products | 71.9 | -2.7 | -7.0 |
| Agriculture | | | |
| Maize | 178.2 | -1.3 | -1.3 |
| Wheat | 51.0 | -0.7 | -0.7 |
| Rice | 163.9 | -0.4 | -0.4 |
| Barley | | | |
| Cotton | | | |
| Other cereals | | | |
| Sugarcane | 527.5 | -13.7 | -13.7 |
| Coffee | | | |
| Tea | 105.4 | 0.0 | 0.0 |
| Roots & tubers | | | |
| Pulses & oil seeds | 29.6 | 0.1 | 0.1 |
| Fruits | | | |
| Vegetables | 102.5 | -1.4 | -1.4 |
| Cut flowers | | | |
| Others crops | 11.4 | 0.2 | 0.2 |
| Beef | | | |
| Dairy | | | |
| Poultry | | | |
| Sheep goat and lamb for slaughter | | | |
| Other livestock | | | |
| Other CRTS | | | |
| Fishing | | | |
| Forestry | | | |
| Mining | 1.7 | -2.9 | -2.9 |
| Meat & dairy | 153.5 | -4.4 | -4.4 |
| Other manufactured food | 72.6 | -4.1 | -4.1 |
| Printing and publishing | -0.7 | -0.7 | -0.7 |
| Textile & clothing | 68.9 | -1.3 | -1.3 |
| Leather & footwear | 67.3 | -0.2 | -0.2 |
| Wood & paper | 30.9 | -8.1 | -8.1 |
| Other manufactures | 59.5 | -15.3 | -15.3 |
| Water | | | |
| Electricity | | | |
| Construction | | | |
| Trade | | | |
| Hotels | | | |
| Real estate | 0.3 | 0.3 | 0.3 |
| Administration | | | |
| Health | | | |
| Education | | | |

Source: Authors' estimates.

Table 20: Impacts on Exports from EU FTA**No initial rent capture case** (% change from benchmark)

| | European Union | Africa | Rest of the World |
|--------------------------------------|----------------|--------|-------------------|
| Business Services | | | |
| Communication | 0.2 | | 0.2 |
| Insurance | -0.2 | | -0.2 |
| Banking and other financial services | 0.3 | 0.3 | 0.3 |
| Professional business services | | | |
| Road services | 3.6 | 3.6 | 3.6 |
| Railway transport | | | 7.9 |
| Maritime transport | 0.4 | 0.4 | 0.4 |
| Pipeline transport | | 2.6 | 2.6 |
| Airline transport | 2.5 | 2.5 | 2.5 |
| Dixit-Stiglitz Goods | | | |
| Beverages & tobacco | 1.7 | 1.7 | 1.7 |
| Grain milling | | | |
| Sugar & bakery & confectionary | 3.5 | 3.5 | 3.5 |
| Petroleum | 4.4 | 4.4 | 4.4 |
| Chemicals | 1.2 | 1.2 | 1.2 |
| Metals and machines | 25.9 | 25.9 | 25.9 |
| Non metallic products | 2.6 | 2.6 | 2.6 |
| Agriculture | | | |
| Maize | 2.4 | 2.4 | 2.4 |
| Wheat | | -3.9 | -3.9 |
| Rice | | | |
| Barley | | -2.1 | |
| Cotton | 0.4 | 0.4 | 0.4 |
| Other cereals | -1.6 | -1.6 | -1.6 |
| Sugarcane | -1.3 | -1.3 | -1.3 |
| Coffee | 16.2 | 16.2 | 16.2 |
| Tea | -0.4 | -0.4 | -0.4 |
| Roots & tubers | | | |
| Pulses & oil seeds | 0.0 | 0.0 | 0.0 |
| Fruits | -1.0 | -1.0 | -1.0 |
| Vegetables | 0.8 | 0.8 | 0.8 |
| Cut flowers | 6.2 | 6.2 | 6.2 |
| Others crops | 1.7 | 1.7 | 1.7 |
| Beef | | | |
| Dairy | | | |
| Poultry | | | |
| Sheep goat and lamb for slaughter | | | |
| Other livestock | | | |
| Other CRTS | | | |
| Fishing | | | |
| Forestry | | | |
| Mining | 8.5 | 8.5 | 8.5 |
| Meat & dairy | 3.4 | 3.4 | 3.4 |
| Other manufactured food | 10.9 | 10.9 | 10.9 |
| Printing and publishing | | | |
| Textile & clothing | 0.5 | 0.5 | 0.5 |
| Leather & footwear | 0.7 | 0.7 | 0.7 |
| Wood & paper | -0.6 | -0.6 | -0.6 |
| Other manufactures | -0.1 | -0.1 | -0.1 |
| Water | | | |
| Electricity | | | |
| Construction | | | |
| Trade | | | |
| Hotels | | | |
| Real estate | -1.2 | -1.2 | -1.2 |
| Administration | | | |
| Health | | | |
| Education | | | |

Source: Authors' estimates.

Table 21: Impacts on Number of Firms from EU FTA
No initial rent capture case **(% change from benchmark)**

| | Kenya | European Union | Africa | Rest of the World |
|--------------------------------------|-------|----------------|--------|-------------------|
| Business Services | | | | |
| Communication | -1.4 | 6.9 | | -5.6 |
| Insurance | -0.4 | 42.0 | | -0.8 |
| Banking and other financial services | 0.5 | 0.5 | 0.5 | 0.9 |
| Professional business services | 0.2 | 46.5 | 0.2 | 0.7 |
| Road services | 1.7 | 44.3 | 0.7 | 1.4 |
| Railway transport | | | | 2.5 |
| Maritime transport | -7.0 | 127.4 | -12.2 | -33.1 |
| Pipeline transport | 1.4 | | 1.0 | 3.8 |
| Airline transport | 1.2 | 6.2 | 0.3 | 1.1 |
| Dixit-Stiglitz Goods | | | | |
| Beverages & tobacco | 0.4 | 56.5 | -1.3 | -2.1 |
| Grain milling | 0.4 | 59.5 | -1.4 | -2.8 |
| Sugar & bakery & confectionary | 0.3 | 53.9 | -3.0 | -5.7 |
| Petroleum | 3.0 | 27.1 | -0.6 | -1.4 |
| Chemicals | -0.4 | 33.2 | -3.5 | -11.2 |
| Metals and machines | -3.2 | 96.8 | -6.7 | -33.9 |
| Non metallic products | -0.7 | 53.7 | -2.2 | -5.6 |

Source: Authors' estimates.

| Table 22: Sensitivity Analysis of Kenya-EU FTA | | | | | | |
|---|---|---------|--------|-----------------------|---------|-------|
| Parameter | Parameter Value | | | % Welfare Change (EV) | | |
| | Lower | Central | Upper | Lower | Central | Upper |
| $\sigma(q_i, q_j)$ – services sectors | 1.5 | 3 | 4.5 | 9.99 | 0.67 | 0.50 |
| $\sigma(q_i, q_j)$ – goods sectors | see below | | | 1.06 | 0.67 | 0.59 |
| $\sigma(va, bs)$ | 0.625 | 1.25 | 1.875 | 0.55 | 0.67 | 0.82 |
| $\sigma(D, M)$ | 2 | 4 | 6 | 0.65 | 0.67 | 0.69 |
| $\sigma(L, K)$ | 0.5 | 1 | 1.5 | 0.64 | 0.67 | 0.70 |
| $\sigma(A_1, \dots, A_n)$ | 0 | 0 | 0.25 | 0.67 | 0.67 | 0.67 |
| $\sigma(D, E)$ | 2 | 4 | 6 | 0.65 | 0.67 | 0.69 |
| ϵ_{KEN} | Central values of all 4 sets of eta | | | 0.61 | 0.67 | 0.72 |
| ϵ_{EU} | parameters are listed in table 6B | | | 0.25 | 0.67 | 0.96 |
| ϵ_{AFR} | Lower values are 0.5 central values and | | | 0.68 | 0.67 | 0.67 |
| ϵ_{ROW} | upper values are 1.5 times central values | | | 0.90 | 0.67 | 0.55 |
| share of rents captured | 0 | 0 | 1 | 0.67 | 0.67 | 0.49 |
| CRTS--share of rents captured | NA | 0 | 1 | NA | 0.09 | -0.06 |
| θ_m | 0.025 | 0.05 | 0.075 | 0.67 | 0.67 | 0.67 |
| $\sigma(q_i, q_j)$ – goods sectors | | | | | | |
| sugar and bakery | 2.12 | 2.93 | 3.74 | | | |
| beverages and tobacco | 1.52 | 2.33 | 3.14 | | | |
| chemicals | 2.01 | 2.82 | 3.63 | | | |
| metals and machines | 8.345 | 16.69 | 25.035 | | | |
| grain milling | 2.43 | 3.24 | 4.05 | | | |
| nonmetallic products | 2.805 | 5.61 | 8.415 | | | |
| petroleum | 2.75 | 3.56 | 4.37 | | | |

Source: Authors' estimates

| Table 23: Sensitivity Analysis of Kenya-Africa FTA | | | | | | |
|---|---|---------|--------|-----------------------|---------|-------|
| Parameter | Parameter Value | | | % Welfare Change (EV) | | |
| | Lower | Central | Upper | Lower | Central | Upper |
| $\sigma(q_i, q_j)$ – services sectors | 1.5 | 3 | 4.5 | 5.02 | 0.29 | 0.16 |
| $\sigma(q_i, q_j)$ – goods sectors | see below | | | 0.32 | 0.29 | 0.28 |
| $\sigma(va, bs)$ | 0.625 | 1.25 | 1.875 | 0.25 | 0.29 | 0.33 |
| $\sigma(D, M)$ | 2 | 4 | 6 | 0.28 | 0.29 | 0.29 |
| $\sigma(L, K)$ | 0.5 | 1 | 1.5 | 0.28 | 0.29 | 0.29 |
| $\sigma(A_1, \dots, A_n)$ | 0 | 0 | 0.25 | 0.29 | 0.29 | 0.29 |
| $\sigma(D, E)$ | 2 | 4 | 6 | 0.28 | 0.29 | 0.29 |
| ϵ_{KEN} | Central values of all 4 sets of eta | | | 0.31 | 0.29 | 0.27 |
| ϵ_{EU} | parameters are listed in table 6B | | | 0.29 | 0.29 | 0.29 |
| ϵ_{AFR} | Lower values are 0.5 central values and | | | 0.14 | 0.29 | 0.43 |
| ϵ_{ROW} | upper values are 1.5 times central values | | | 0.29 | 0.29 | 0.29 |
| share of rents captured | 0 | 0 | 1 | 0.29 | 0.29 | 0.05 |
| CRTS--share of rents captured | NA | 0 | 1 | NA | 0.14 | -0.06 |
| θ_m | 0.025 | 0.05 | 0.075 | 0.29 | 0.29 | 0.29 |
| $\sigma(q_i, q_j)$ – goods sectors | | | | | | |
| sugar and bakery | 2.12 | 2.93 | 3.74 | | | |
| beverages and tobacco | 1.52 | 2.33 | 3.14 | | | |
| chemicals | 2.01 | 2.82 | 3.63 | | | |
| metals and machines | 8.345 | 16.69 | 25.035 | | | |
| gain milling | 2.43 | 3.24 | 4.05 | | | |
| nonmetallic products | 2.805 | 5.61 | 8.415 | | | |
| petroleum | 2.75 | 3.56 | 4.37 | | | |

Source: Authors' estimates

Table 24: Summary of Results for Professional Services --No Initial Rent Capture Case
(results are percentage change from initial equilibrium, unless otherwise indicated)

| Scenario definition | Domestic & Discriminatory Services | Domestic Services | Unilateral Discriminatory Services | EU Discriminatory Services | Africa Discriminatory Services | Africa-EU Discriminatory Services | Rest of World Discriminatory Services |
|---|--|----------------------|--|----------------------------------|--------------------------------------|---|---|
| 50% reduction of discriminatory barriers on EU services firms | Yes | No | Yes | Yes | No | Yes | No |
| 50% reduction of discriminatory barriers on African services firm | Yes | No | Yes | No | Yes | Yes | No |
| 50% reduction of discriminatory barriers on ROW services firms | Yes | No | Yes | No | No | No | Yes |
| 50% reduction of regulatory barriers for all services firms | Yes | Yes | No | No | No | No | No |
| Aggregate welfare | | | | | | | |
| Welfare (EV as % of consumption) | 0.71 | 0.54 | 0.16 | 0.06 | 0.02 | 0.08 | 0.07 |
| Welfare (EV as % of GDP) | 0.60 | 0.45 | 0.13 | 0.05 | 0.02 | 0.07 | 0.06 |
| Government budget | | | | | | | |
| Tariff revenue (% of GDP) | 2.9 | 2.9 | 2.9 | 2.9 | 2.9 | 2.9 | 2.9 |
| Tariff revenue | -0.1 | -0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Aggregate trade | | | | | | | |
| Real exchange rate | 0.2 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Aggregate exports | 0.6 | 0.4 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 |
| Factor Earnings | | | | | | | |
| Skilled labor | 1.0 | 0.6 | 0.4 | 0.2 | 0.0 | 0.2 | 0.2 |
| Semi-skilled labor | 0.5 | 0.4 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 |
| Unskilled labor | 0.8 | 0.5 | 0.3 | 0.1 | 0.0 | 0.1 | 0.1 |
| Capital | 0.7 | 0.4 | 0.2 | 0.1 | 0.0 | 0.1 | 0.1 |
| Land | 1.2 | 0.8 | 0.4 | 0.1 | 0.1 | 0.2 | 0.2 |
| Factor adjustments | | | | | | | |
| Skilled labor | 0.5 | 0.3 | 0.2 | 0.1 | 0.0 | 0.1 | 0.1 |
| Semi-skilled labor | 0.4 | 0.2 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 |
| Unskilled labor | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Capital | 0.2 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Land | 1.1 | 0.7 | 0.3 | 0.1 | 0.0 | 0.2 | 0.2 |

Source: Authors' estimates.

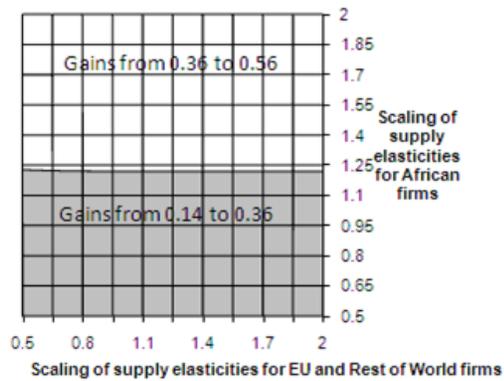
Table 25: Summary of Results for Professional Services, initial rent capture case
(results are percentage change from initial equilibrium, unless otherwise indicated)

| Scenario definition | Domestic & Discriminatory Services | Domestic Services | Unilateral Discriminatory Services | EU Discriminatory Services | Africa Discriminatory Services | Africa-EU Discriminatory Services | Rest of World Discriminatory Services |
|---|--|----------------------|--|----------------------------------|--------------------------------------|---|---|
| 50% reduction of discriminatory barriers on EU services firms | Yes | No | Yes | Yes | No | Yes | No |
| 50% reduction of discriminatory barriers on African services firm | Yes | No | Yes | No | Yes | Yes | No |
| 50% reduction of discriminatory barriers on ROW services firms | Yes | No | Yes | No | No | No | Yes |
| 50% reduction of regulatory barriers for all services firms | Yes | Yes | No | No | No | No | No |
| Aggregate welfare | | | | | | | |
| Welfare (EV as % of consumption) | 0.63 | 0.52 | 0.09 | 0.04 | 0.00 | 0.08 | 0.05 |
| Welfare (EV as % of GDP) | 0.53 | 0.44 | 0.08 | 0.04 | 0.00 | 0.07 | 0.04 |
| Government budget | | | | | | | |
| Tariff revenue (% of GDP) | 2.9 | 2.9 | 2.9 | 2.9 | 2.9 | 2.9 | 2.9 |
| Tariff revenue | -0.1 | -0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Aggregate trade | | | | | | | |
| Real exchange rate | 0.2 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Aggregate exports | 0.6 | 0.4 | 0.2 | 0.1 | 0.0 | 0.1 | 0.1 |
| Factor Earnings | | | | | | | |
| Skilled labor | 1.0 | 0.6 | 0.4 | 0.2 | 0.0 | 0.2 | 0.2 |
| Semi-skilled labor | 0.5 | 0.3 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 |
| Unskilled labor | 0.8 | 0.5 | 0.3 | 0.1 | 0.0 | 0.1 | 0.1 |
| Capital | 0.6 | 0.4 | 0.2 | 0.1 | 0.0 | 0.1 | 0.1 |
| Land | 1.1 | 0.8 | 0.3 | 0.1 | 0.0 | 0.2 | 0.2 |
| Factor adjustments | | | | | | | |
| Skilled labor | 0.5 | 0.3 | 0.3 | 0.1 | 0.0 | 0.1 | 0.1 |
| Semi-skilled labor | 0.4 | 0.2 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 |
| Unskilled labor | 0.2 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Capital | 0.2 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Land | 1.1 | 0.7 | 0.3 | 0.1 | 0.0 | 0.2 | 0.1 |

Source: Authors' estimates.

Figure 1 Sensitivity Analysis of Kenyan Preferential Liberalization of Services with African Partners: Impact of Partner and Excluded Country Supply Elasticity, with and without Rent Capture

Case I: No initial rent capture by Kenya



Case II: Initial rent capture by Kenya

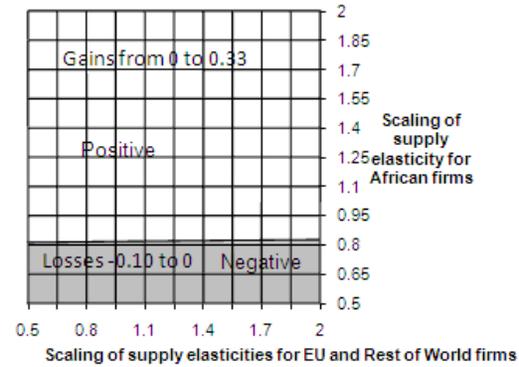
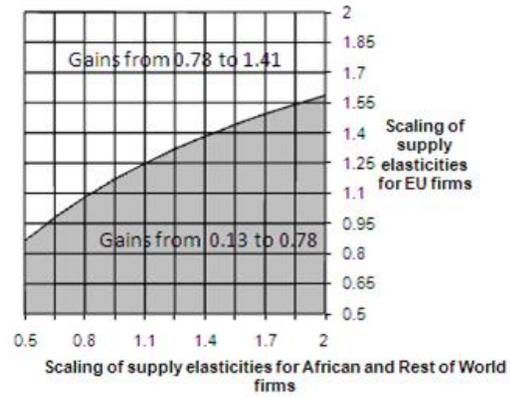


Figure 2: Sensitivity Analysis of Kenyan Preferential Liberalization of Services with the EU: Impact of Partner and Excluded Country Supply Elasticity, with and without Rent Capture

Case I: No initial rent capture by Kenya



Case II: Initial rent capture by Kenya

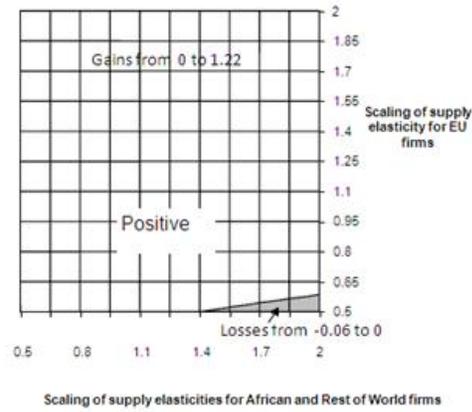


Figure 3: Sample Frequency Distribution of the Welfare Results of Kenyan Preferential Reduction of Services Barriers Against African Partners—30,000 simulations.

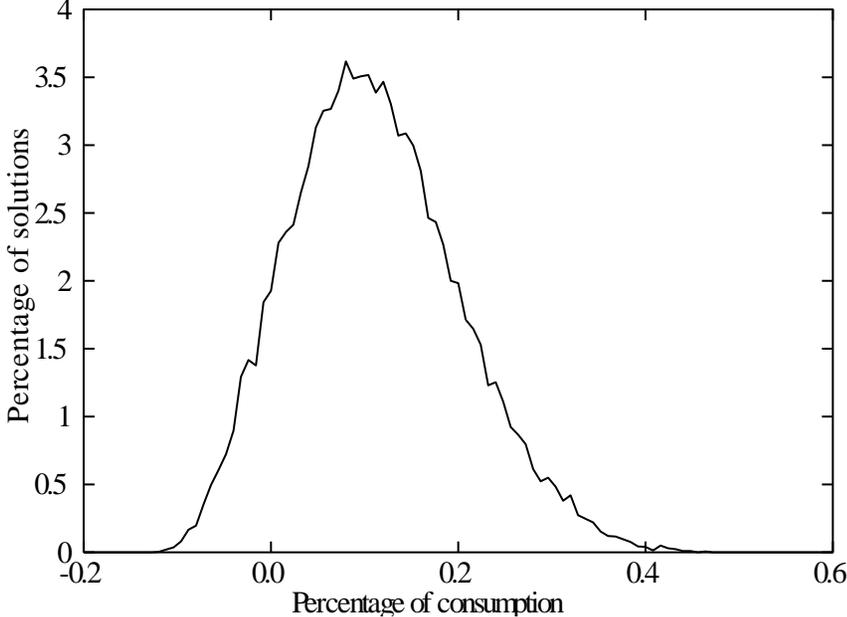
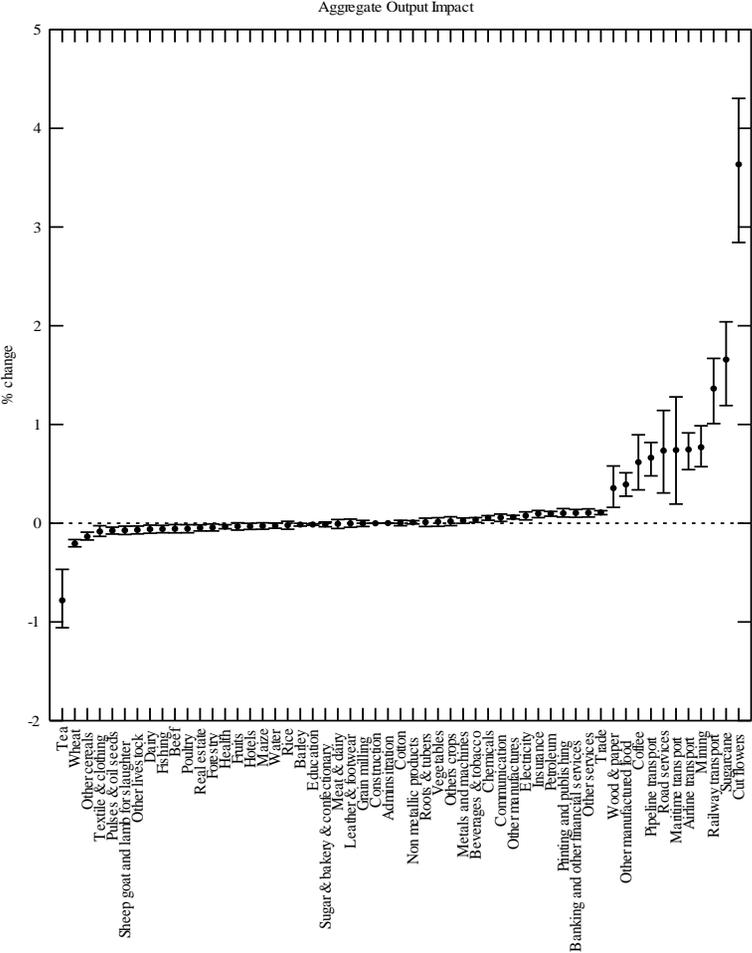
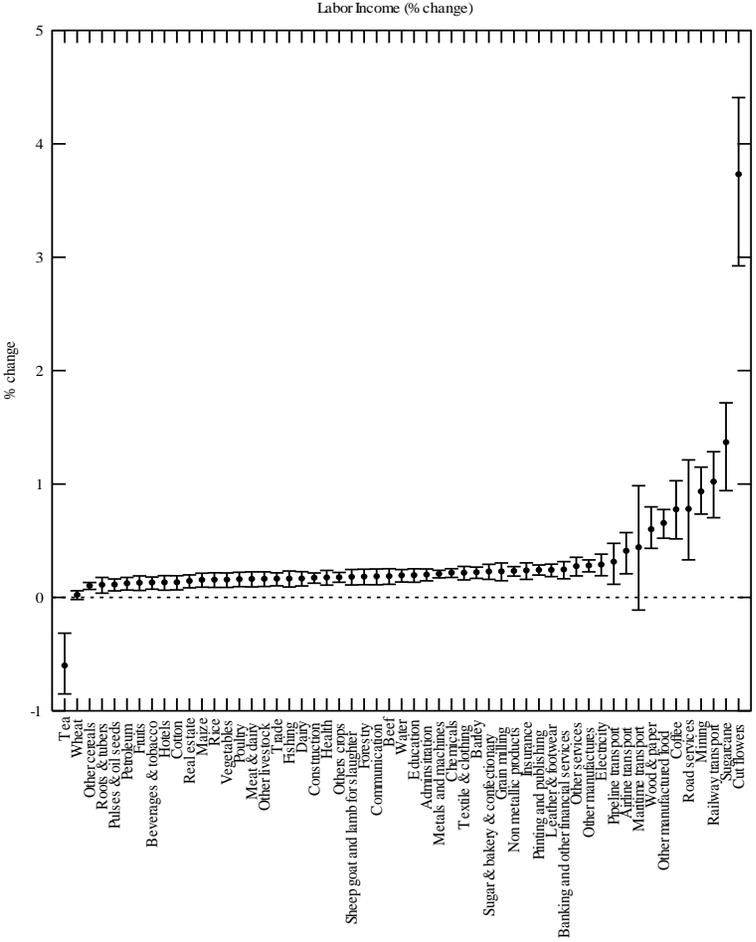


Figure 4: Means, 50 and 95 Percent Confidence Intervals of the Sample Frequency Distributions of the Output Changes by Sector from Kenyan Preferential Reduction of Services Barriers Against African Partners—30, 000 simulations.



Note: The boxes are limited vertically by the 25% and 75% quartiles. The bars in the box are the means. The vertical lines extend to the 2.5% and 97.5% percentiles.

Figure 5: Means, 50 and 95 Percent Confidence Intervals of the Sample Distributions of the Labor Payment Changes by Sector from Kenyan Preferential Reduction of Services Barriers Against African Partners—30,000 simulations.



Note: The boxes are limited vertically by the 25% and 75% quartiles. The bars in the box are the means. The vertical lines extend to the 2.5% and 97.5% percentiles.

Figure 6: Sample Frequency Distribution of the Welfare Results of Kenyan Preferential Reduction of Services Barriers Against EU Partners—30,000 simulations.

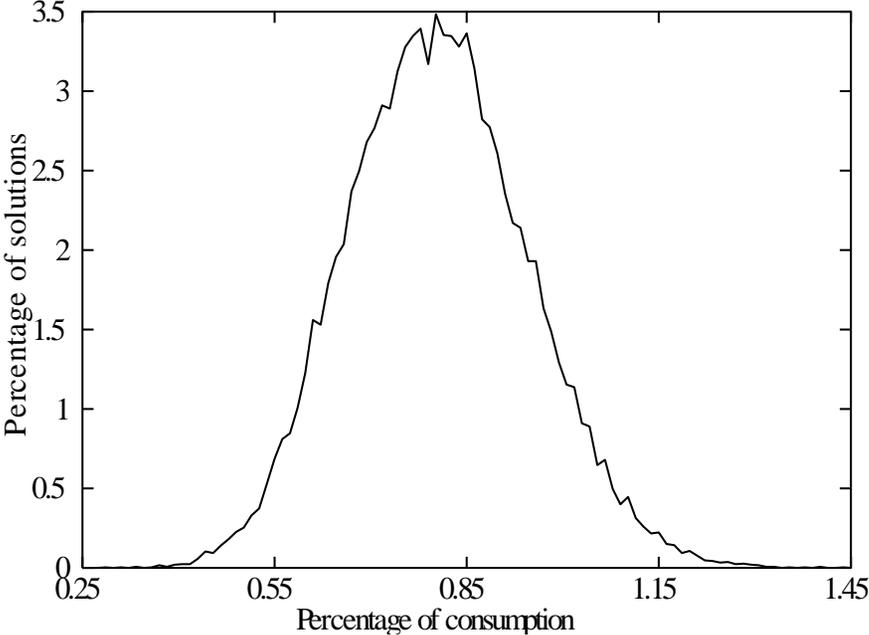
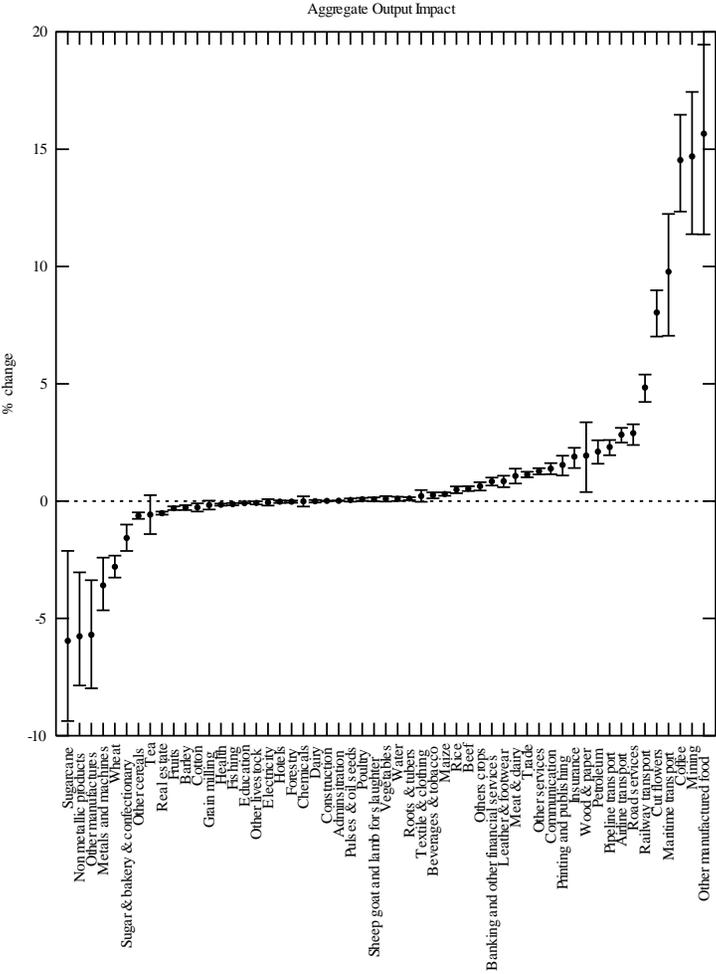
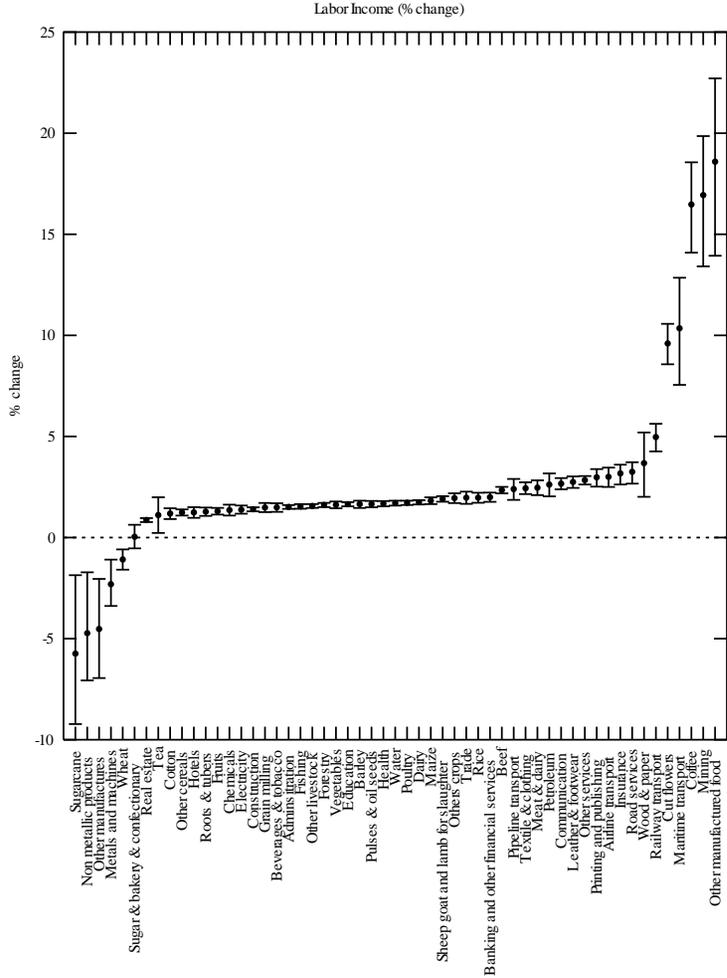


Figure 7: Means, 50 and 95 Percent Confidence Intervals of the Sample Distributions of the Output Changes by Sector from Kenyan Preferential Reduction of Services Barriers Against EU Partners—30,000 simulations.



Note: The boxes are limited vertically by the 25% and 75% quartiles. The bars in the box are the means. The vertical lines extend to the 2.5% and 97.5% percentiles.

Figure 8: Means, 50 and 95 Percent Confidence Intervals of the Sample Distributions of the Labor Payment Changes by Sector from Kenyan Preferential Reduction of Services Barriers Against EU Partners—30,000 simulations.



Note: The boxes are limited vertically by the 25% and 75% quartiles. The bars in the box are the means. The vertical lines extend to the 2.5% and 97.5% percentiles.

Appendices

Appendix A: Trade Share Data and Tariff Rates for Kenya's Trade Partners

Appendix B: Documentation of the Calculation of Ownership Shares for Kenya

Appendix C : Estimates of the Dixit-Stiglitz Elasticities of Substitution for Kenyan Imperfectly Competitive Goods

Appendix D: Engineering Services in Kenya - Restrictiveness Index

Appendix E: Data on Research and Development Expenditures and Sales for the United States in 2004 and 2005.

Appendix F: Kenya Model with Multiple FDI and Trade Partners (Algebraic Structure)

Appendix G: A Note of the Relationship Between Sector Specific Capital and the Elasticity of Supply in Applied General Equilibrium Models of Imperfect Competition

Appendix A: Trade Share Data and Tariff Rates for Kenya's Trade Partners

Trade Share Data

To obtain the shares of imports and exports from the different regions of our model, we used trade data for 2007 obtained from WITS access to the COMTRADE database.

The regions of our model are Kenya, the European Union, the East African Customs Union plus COMESA and the Rest of the World. For the European Union, we took the 27 member countries as of 2007. In this appendix, we calculate and report data for the East African Customs Union and COMESA separately. For the East African Customs Union, we took Tanzania, Uganda, Rwanda and Burundi. For COMESA, in order to avoid double counting, we took the COMESA countries less those in the East African Customs Union, i.e., Comoros, Congo, Djibuti, Egypt, Eritrea, Ethiopia, Libya, Madagascar, Malawi, Mauritius Seychelles, Sudan, Swaziland, Zambia and Zimbabwe. Trade shares for the "Africa" region in our model is the sum of East Africa Customs Union plus COMESA as defined above. Rest of the World is the residual.

We mapped two digit sectors from the COMTRADE database into the sectors of our model. The exact mapping is defined in the first table below.

We used Kenya as the reporter country for both exports and imports. Results for both exports and imports are reported in the subsequent three tables, by CRTS and IRTS goods in our model separately.

Tariff Rate Calculations

Tariff and Sales Tax Data. We started with MFN tariff rates at the eight digit level taken from the website of the Kenyan government: www.kra.go.ke/customs/customsdownloads.php. These tariff rates were then aggregated to the sectors of our model, using simple averages.

We obtained data on the total taxes on imports and the total value of imports and took the ratio to obtain the average value of import taxes in the Kenyan economy. In 2005, this was 8.4 percent.³⁰ That is, on average, Kenyan importers paid 8.4 percent of the value of imports on import taxes that did not apply to domestic production.

As we reported in Balestreri, Rutherford and Tarr (2009), the MFN tariff rates, multiplied times the trade flows, exceed the collected tariff rates. That is, using MFN tariff rates for all trade, the weighted average tariff rate exceeds the collected tariff rate of 8.4 percent for the economy as a whole. Thus, they exaggerate the protection received by Kenyan industry and agriculture. This is due to tariff preferences to regional partners and due to other preference items or tariff exemptions. We assume that zero tariffs apply

³⁰ Economic Survey (2006, pp. 103, 115).

on all imports from the East African Customs Union and from COMESA.³¹ Thus, we apply the MFN tariff rates only on the trade flows from outside of these African regions (EU and Rest of World in our model) and take a weighted average tariff rate of the MFN rates on the non-East African regions. The resulting weighted average tariff rate on non-East African imports still exceeds 8.4 percent. We then proportionally reduced all the MFN tariffs in our model so that the estimated collected tariffs on imports from the EU and Rest of World divided by the total value of import is 8.4 percent.

³¹ Kenya agreed to implement zero tariffs on East African Customs Union imports as of January 1, 2005. See Michael-Stahl (2005).

Notes on Product/Sector Classifications in SITC Revision 2

| Product | SITC Classification (Rev. 2) |
|---|---|
| All goods | 0 to 9 |
| Dixit-Stiglitz Goods | |
| Beverages and tobacco | 1 |
| Food manufactures (excl. bev & tob) ** | 012+014++0224+023+024++0252+037+046 to 048+056+058+0612+ 0615+0619+062+0712+0722+0723+073+0812 to 0918+09+41+42+43 |
| Printing and publishing | 64 |
| Mineral fuels | 3 |
| Chemicals | 5 |
| Metals and machines | 67+68+69+7 |
| Non-metallic products | 66 |
| Other manufactures (excl. CRTS sectors) | 62+81+82+83+87+88+89 |
| Agriculture (excl. food manuf & bev, tob) | 0+1+2+4-27-28-1-above food manufacturing products |
| Other goods | All goods-Dixit/Stiglitz goods-above agriculture |
| Agricultural Products | |
| Maize | 044 |
| Wheat | 041 |
| Rice | 042 |
| Barley | 043 |
| Other cereals | 045 |
| Cotton | 263 |
| Sugar | 061 |
| Coffee | 071 |
| Tea | 074 |
| Roots and tubers | 0548 |
| Oil seeds and pulses | 22 |
| Fruits | 057+058 |
| Vegetables | 054+056 |
| Cut flowers | 2927 |
| Other crops | 072+075+081 |
| Beef | 0111 |
| Dairy products | 02 |
| Poultry | 0114 |
| Meats of sheep and goats | 0112 |
| Other livestock | 00+0113+0115+0116+0118 |
| Other CRTS Goods | |
| Fishing | 03 |
| Forestry | 24+25 |
| Mining | 27+28 |
| Meats and dairy | 01+02 |
| Grain milling | 046+047 |
| Sugar & bakery confectionary | 062+073+048 |
| Textiles and clothing | 65+84 |
| Leather and footwear | 61+85 |
| Wood and papers | 63+64 |

Note: ** based on all processed and manufacturing food products

Kenyan Exports Values and Shares of Agricultural and Other CRTS Products in 2007

| Product | Export value (\$ '000) | | | | | export shares | | | | |
|-------------------------|------------------------|--------|---------|---------|---------|---------------|-------|-------|-------|-------|
| | COMESA15 | EAC5 | EU27 | ROW | WLD | COMESA15 | EAC5 | EU27 | ROW | WLD |
| AGRICULTURE | | | | | | | | | | |
| Maize | 671 | 2,694 | 7 | 9,096 | 12,468 | 0.054 | 0.216 | 0.001 | 0.730 | 1.000 |
| Wheat | 2 | 43 | 0 | 119 | 164 | 0.013 | 0.264 | 0.000 | 0.723 | 1.000 |
| Rice | 203 | 318 | 5 | 86 | 613 | 0.332 | 0.519 | 0.009 | 0.140 | 1.000 |
| Barley | 0 | 654 | 0 | 0 | 654 | 0.000 | 1.000 | 0.000 | 0.000 | 1.000 |
| Other cerea: | 453 | 107 | 8 | 309 | 877 | 0.517 | 0.122 | 0.009 | 0.352 | 1.000 |
| Cotton | 4 | 0 | 18 | 126 | 148 | 0.025 | 0.000 | 0.120 | 0.855 | 1.000 |
| Sugar | 10,573 | 8,616 | 19 | 336 | 19,545 | 0.541 | 0.441 | 0.001 | 0.017 | 1.000 |
| Coffee | 1,093 | 780 | 98,647 | 65,708 | 166,228 | 0.007 | 0.005 | 0.593 | 0.395 | 1.000 |
| Tea | 170,298 | 238 | 131,530 | 396,147 | 698,213 | 0.244 | 0.000 | 0.188 | 0.567 | 1.000 |
| Roots and | 1 | 24 | 7 | 0 | 32 | 0.022 | 0.739 | 0.229 | 0.010 | 1.000 |
| Oil seeds a | 14 | 157 | 4,831 | 3,007 | 8,009 | 0.002 | 0.020 | 0.603 | 0.375 | 1.000 |
| Fruits | 2,335 | 4,878 | 85,188 | 20,397 | 112,797 | 0.021 | 0.043 | 0.755 | 0.181 | 1.000 |
| Vegetables | 987 | 4,610 | 256,893 | 26,590 | 289,080 | 0.003 | 0.016 | 0.889 | 0.092 | 1.000 |
| Cut flowers | 22,982 | 8 | 316,343 | 50,929 | 390,262 | 0.059 | 0.000 | 0.811 | 0.130 | 1.000 |
| Other crop: | 737 | 3,739 | 1,233 | 2,733 | 8,442 | 0.087 | 0.443 | 0.146 | 0.324 | 1.000 |
| Beef | 287 | 528 | 0 | 484 | 1,299 | 0.221 | 0.406 | 0.000 | 0.372 | 1.000 |
| Dairy prod: | 3,002 | 10,337 | 25 | 3,340 | 16,704 | 0.180 | 0.619 | 0.001 | 0.200 | 1.000 |
| Poultry | 101 | 8 | 0 | 9 | 118 | 0.856 | 0.067 | 0.000 | 0.077 | 1.000 |
| Meats of sl | 101 | 283 | 0 | 86 | 469 | 0.214 | 0.603 | 0.000 | 0.183 | 1.000 |
| Other lives: | 150 | 1,876 | 69 | 1,013 | 3,108 | 0.048 | 0.604 | 0.022 | 0.326 | 1.000 |
| OTHER CRTS GOODS | | | | | | | | | | |
| Fishing | 411 | 162 | 34,837 | 25,757 | 61,167 | 0.007 | 0.003 | 0.570 | 0.421 | 1.000 |
| Forestry | 412 | 483 | 4 | 169 | 1,068 | 0.386 | 0.452 | 0.004 | 0.159 | 1.000 |
| Mining | 2,305 | 29,358 | 21,162 | 21,545 | 74,369 | 0.031 | 0.395 | 0.285 | 0.290 | 1.000 |
| Meats and | 3,821 | 14,847 | 131 | 6,576 | 25,375 | 0.151 | 0.585 | 0.005 | 0.259 | 1.000 |
| Grain millin | 415 | 538 | 49 | 59 | 1,062 | 0.391 | 0.507 | 0.046 | 0.056 | 1.000 |
| Sugar & ba | 14,420 | 33,297 | 1,912 | 16,008 | 65,637 | 0.220 | 0.507 | 0.029 | 0.244 | 1.000 |
| Textiles an | 22,415 | 32,212 | 3,996 | 238,463 | 297,087 | 0.075 | 0.108 | 0.013 | 0.803 | 1.000 |
| Leather an: | 14,512 | 28,989 | 15,930 | 31,441 | 90,872 | 0.160 | 0.319 | 0.175 | 0.346 | 1.000 |
| Wood and | 16,394 | 47,045 | 2,587 | 7,287 | 73,314 | 0.224 | 0.642 | 0.035 | 0.099 | 1.000 |

Source: Based on UN COMTRADE Statistics.

Kenyan Imports of Agricultural and Other CRTS Products in 2007

| Product | Import value (\$ '000) | | | | | Import shares | | | | |
|------------------------------|------------------------|--------|--------|---------|---------|---------------|-------|-------|-------|-------|
| | COMESA15 | EAC5 | EU27 | ROW | WLD | COMESA15 | EAC5 | EU27 | ROW | WLD |
| AGRICULTURE | | | | | | | | | | |
| Maize | 625 | 14,194 | 0 | 1,445 | 16,265 | 0.038 | 0.873 | 0.000 | 0.089 | 1.000 |
| Wheat | 62 | 2 | 3,618 | 140,505 | 144,187 | 0.000 | 0.000 | 0.025 | 0.974 | 1.000 |
| Rice | 8,919 | 2,563 | 12 | 58,559 | 70,054 | 0.127 | 0.037 | 0.000 | 0.836 | 1.000 |
| Barley | 0 | 0 | 1 | 0 | 1 | 0.000 | 0.000 | 1.000 | 0.000 | 1.000 |
| Other cereals | 0 | 9,083 | 3 | 53 | 9,139 | 0.000 | 0.994 | 0.000 | 0.006 | 1.000 |
| Cotton | 214 | 4,322 | 0 | 119 | 4,655 | 0.046 | 0.929 | 0.000 | 0.026 | 1.000 |
| Sugar | 72,342 | 1,914 | 4,939 | 35,055 | 114,249 | 0.633 | 0.017 | 0.043 | 0.307 | 1.000 |
| Coffee | 41 | 635 | 78 | 1,347 | 2,101 | 0.020 | 0.302 | 0.037 | 0.641 | 1.000 |
| Tea | 0 | 86 | 22 | 8,088 | 8,196 | 0.000 | 0.011 | 0.003 | 0.987 | 1.000 |
| Roots and tubers | 0 | 29 | 662 | 205 | 896 | 0.000 | 0.032 | 0.739 | 0.228 | 1.000 |
| Oil seeds and pulses | 803 | 16,126 | 164 | 5,296 | 22,388 | 0.036 | 0.720 | 0.007 | 0.237 | 1.000 |
| Fruits | 1,492 | 2,848 | 2,444 | 7,358 | 14,141 | 0.105 | 0.201 | 0.173 | 0.520 | 1.000 |
| Vegetables | 1,589 | 19,450 | 5,546 | 22,592 | 49,177 | 0.032 | 0.396 | 0.113 | 0.459 | 1.000 |
| Cut flowers | 0 | 1,844 | 7 | 161 | 2,012 | 0.000 | 0.917 | 0.003 | 0.080 | 1.000 |
| Other crops | 55 | 9,461 | 2,337 | 4,599 | 16,452 | 0.003 | 0.575 | 0.142 | 0.280 | 1.000 |
| Beef | 0 | 0 | 0 | 0 | 0 | 0.000 | 0.000 | 1.000 | 0.000 | 1.000 |
| Dairy products | 693 | 458 | 779 | 3,437 | 5,367 | 0.129 | 0.085 | 0.145 | 0.640 | 1.000 |
| Poultry | 0 | 0 | 0 | 0 | 0 | 0.000 | 0.000 | 1.000 | 0.000 | 1.000 |
| Meats of sheep and goats | 0 | 0 | 0 | 8 | 8 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| Other livestock | 67 | 36 | 246 | 1,787 | 2,136 | 0.031 | 0.017 | 0.115 | 0.836 | 1.000 |
| OTHER CRTS GOODS | | | | | | | | | | |
| Fishing | 3,155 | 640 | 194 | 4,326 | 8,315 | 0.379 | 0.077 | 0.023 | 0.520 | 1.000 |
| Forestry | 1,084 | 16,979 | 4,388 | 9,851 | 32,301 | 0.034 | 0.526 | 0.136 | 0.305 | 1.000 |
| Mining | 518 | 1,272 | 1,774 | 33,094 | 36,658 | 0.014 | 0.035 | 0.048 | 0.903 | 1.000 |
| Meats and dairy | 781 | 458 | 868 | 5,143 | 7,249 | 0.108 | 0.063 | 0.120 | 0.709 | 1.000 |
| Grain milling | 10,092 | 1,341 | 4,728 | 19,656 | 35,817 | 0.282 | 0.037 | 0.132 | 0.549 | 1.000 |
| Sugar & bakery confectionary | 3,151 | 1,400 | 6,280 | 20,475 | 31,307 | 0.101 | 0.045 | 0.201 | 0.654 | 1.000 |
| Textiles and clothing | 4,815 | 18,592 | 10,903 | 279,109 | 313,418 | 0.015 | 0.059 | 0.035 | 0.891 | 1.000 |
| Leather and footwear | 170 | 117 | 551 | 20,191 | 21,029 | 0.008 | 0.006 | 0.026 | 0.960 | 1.000 |
| Wood and papers | 30,504 | 7,720 | 79,746 | 115,781 | 233,751 | 0.130 | 0.033 | 0.341 | 0.495 | 1.000 |

Source: Based on UN COMTRADE Statistics.

Kenyan Exports and Imports of Dixit-Stiglitz Goods and Other Products in 2007

| Product | Trade value (\$ '000) | | | | | Trade Share | | | | |
|----------------|-----------------------|---------|-----------|-----------|-----------|----------------|-------|-------|-------|-------|
| | COMESA15 | EAC5 | EU27 | ROW | WLD | COMESA15 | EAC5 | EU27 | ROW | WLD |
| EXPORTS | | | | | | EXPORTS | | | | |
| All goods | 664,849 | 952,788 | 1,084,812 | 1,378,351 | 4,080,800 | 0.163 | 0.233 | 0.266 | 0.338 | 1.000 |
| Beverages | 46,796 | 47,692 | 11,535 | 61,085 | 167,109 | 0.280 | 0.285 | 0.069 | 0.366 | 1.000 |
| Food manu. | 79,712 | 98,905 | 106,990 | 31,678 | 317,284 | 0.251 | 0.312 | 0.337 | 0.100 | 1.000 |
| Printing and | 9,987 | 41,596 | 129 | 3,635 | 55,347 | 0.180 | 0.752 | 0.002 | 0.066 | 1.000 |
| Mineral fue | 15,225 | 86,515 | 139 | 72,263 | 174,143 | 0.087 | 0.497 | 0.001 | 0.415 | 1.000 |
| Chemicals | 68,878 | 175,389 | 1,057 | 106,367 | 351,691 | 0.196 | 0.499 | 0.003 | 0.302 | 1.000 |
| Metals and | 129,528 | 198,787 | 11,782 | 80,253 | 420,350 | 0.308 | 0.473 | 0.028 | 0.191 | 1.000 |
| Non-metall | 10,513 | 87,666 | 5,697 | 10,639 | 114,515 | 0.092 | 0.766 | 0.050 | 0.093 | 1.000 |
| Other manu | 45,774 | 88,777 | 26,412 | 32,468 | 193,431 | 0.237 | 0.459 | 0.137 | 0.168 | 1.000 |
| Agriculture | 211,253 | 29,739 | 877,333 | 627,966 | 1,746,291 | 0.121 | 0.017 | 0.502 | 0.360 | 1.000 |
| Other good | 47,183 | 97,723 | 43,737 | 351,997 | 540,640 | 0.087 | 0.181 | 0.081 | 0.651 | 1.000 |
| IMPORTS | | | | | | IMPORTS | | | | |
| All goods | 332,205 | 191,598 | 1,812,340 | 6,653,119 | 8,989,262 | 0.037 | 0.021 | 0.202 | 0.740 | 1.000 |
| Beverages | 11,958 | 27,881 | 15,716 | 13,650 | 69,204 | 0.173 | 0.403 | 0.227 | 0.197 | 1.000 |
| Food manu. | 73,603 | 19,352 | 38,219 | 436,903 | 568,077 | 0.130 | 0.034 | 0.067 | 0.769 | 1.000 |
| Printing and | 30,462 | 7,634 | 69,199 | 88,868 | 196,163 | 0.155 | 0.039 | 0.353 | 0.453 | 1.000 |
| Mineral fue | 45,727 | 427 | 60,393 | 1,811,868 | 1,918,415 | 0.024 | 0.000 | 0.031 | 0.944 | 1.000 |
| Chemicals | 58,989 | 4,172 | 322,652 | 754,982 | 1,140,796 | 0.052 | 0.004 | 0.283 | 0.662 | 1.000 |
| Metals and | 60,085 | 12,273 | 958,236 | 2,461,164 | 3,491,757 | 0.017 | 0.004 | 0.274 | 0.705 | 1.000 |
| Non-metall | 5,118 | 491 | 30,219 | 90,373 | 126,201 | 0.041 | 0.004 | 0.239 | 0.716 | 1.000 |
| Other manu | 7,117 | 2,616 | 152,026 | 257,025 | 418,784 | 0.017 | 0.006 | 0.363 | 0.614 | 1.000 |
| Agriculture | 33,340 | 96,683 | 64,962 | 328,230 | 523,215 | 0.064 | 0.185 | 0.124 | 0.627 | 1.000 |
| Other good | 5,804 | 20,070 | 100,720 | 410,055 | 536,649 | 0.011 | 0.037 | 0.188 | 0.764 | 1.000 |

Source: Based on UN COMTRADE Statistics.

Appendix B: Documentation of the Calculation of Ownership Shares for Kenya

I. Telecommunications Shares in Kenya

The primary source of data was various publications of Paul Buddle Communications, including “Kenya—Telecoms Market Statistics and Forecasts,” March 20, 2008. Table 10 contains mobile phone subscription statistics by company and Table 2 lists the number of fixed-line phone subscribers. We defined market share as the share of total subscribers, summing fixed-line and mobile subscribers.

The telecommunications companies are: Telkom Kenya, Safaricom and Celtel. Ownership shares are as follows. France Telecom purchased 51% of Telkom Kenya in 2007 with the Government of Tanzania holding the remaining 49 percent.³² Vodafone held 35% of Safaricom network, with the remainder held by Telkom Kenya (60%) and a local company Mobitelea (5%).³³ “Celtel was acquired by MTC of Kuwait for US\$3.4 billion in March 2005”. MTC was later renamed “Zain Group”.³⁴

The results for market share by country (in percent) are as follows: Kenya, 26; EU, 49; EAC, 0; COMESA, 0; Rest of World, 25.

II. Bank Shares in Kenya.

Bank Market Shares

The data source for bank market shares was Bankscope, an on-line data source for about 29,000 banks world-wide.³⁵ Through Bankscope, we obtained data on total assets by bank in Kenya, owners -shareholders of the bank and the percent of the bank owned by each owner-shareholder. Market share of each bank was defined based on the bank’s assets as a share of total bank assets in the country. We divided the regions into the European Union, East African Customs Union, COMESA and Rest of the World.³⁶

Ownership Shares of Banks

Each bank’s market share was then allocated among geographic regions according to the shares of ownership of the bank. We then summed across the banks to obtain total market shares by region. In many cases, however, the Bankscope data were inadequate to allocate ownership shares by region. In these cases, we investigated bank websites, to obtain the required ownership information. The results of our supplementary inquiries are listed below.

The results we get are that owners of the banking sector of Kenya are as follows, in percent: Kenya, 61.8.; EU, 28.7; EAC, 0; COMESA, 0.2; ROW, 9.3. Detailed results on the ownership of the banks are in the tables below.

³² http://www.orange.com/en_EN/press/press_releases/cp080917uk.html Accessed 17 April 2009

³³ See Paul Buddle Communications, “The Kenya Regulatory and Fixed-Line Telecoms Overview,” March 20, 2008.

³⁴ See Paul Buddle Communications, “The Kenya Mobile Market Overview,” March 20, 2008.

³⁵ It combines data from the main information provider, Fitch Ratings, and nine other sources, with software for searching and analysis. Each bank report contains balance sheet and income statements with up to 200 data items.

³⁶ Although we calculated data for the U.S. and the U.K. separately, these were aggregated into the Rest of the World and the European Union, respectively.

Table 1: Kenya Banking Sector Ownership Shares, by Region (1 of 6)

| Bank | Shareholder (ISO Country Code) | Ownership % | Total Assets (2006 USD) | Company Market Share | Market Share by Region (%) | | | | | | |
|---|--------------------------------------|-------------|-------------------------|----------------------|----------------------------|-------|-------|-------|---------|----|-------|
| | | | | | KE | GB | EU | EAC | COME SA | US | ROW |
| ABN AMRO Bank NV | Abn Amro Holding Nv (NL) | | | | | | | | | | |
| African Banking Corporation Limited | Queens Holdings Ltd (KE) | 25.00 | 77,200 | 0.56% | 0.56% | | | | | | |
| African Mercantile Banking Company Limited - AMBANK | | | | | | | | | | | |
| Bank of Africa Kenya Limited | | | 93,493 | 0.68% | | | | | | | |
| | African Financial Holding Sa-African | 19.89 | | | | | 0.16% | | | | |
| | Bank Of Africa - Madagascar (MG) | 20.00 | | | | | | 0.16% | | | |
| | Nederlandse Financierings-Maatsch | 20.00 | | | | | 0.16% | | | | |
| | Bank Of Africa - Côte D'Ivoire (CI) | 15.00 | | | | | | | | | 0.12% |
| | Bank Of Africa - Benin (BJ) | 10.11 | | | | | | | | | 0.08% |
| Bank of Baroda (Kenya) Ltd | Bank Of Baroda (IN) | 86.70 | 169,651 | 1.23% | | | | | | | 1.23% |
| Barclays Bank of Kenya Ltd | | | 1,700,672 | 12.30% | | | | | | | |
| | Barclays Bank Plc (GB) | 68.50 | | | | 8.43% | | | | | |
| | Kenyan Public & Institutions (KE) | 31.50 | | | 3.88% | | | | | | |
| Biashara Bank of Kenya Limited | | | | | | | | | | | |
| Calyon | Calyon (FR) | | | | | | | | | | |
| Central Bank of Kenya | Government Of Kenya (KE) | 100.00 | 3,067,136 | 22.19% | 22.19% | | | | | | |
| CFC Stanbic Holdings Limited | Stanbic Africa Holdings Limited (GB) | 60.00 | 581,708 | 4.21% | | 4.21% | | | | | |
| Charterhouse Bank Limited | | | | | | | | | | | |
| Chase Bank (Kenya) Limited | Chase Bank (Kenya) Limited (US) | 100.00 | 59,405 | 0.43% | | | | | | | 0.43% |
| Citibank NA | Citibank Na (US) | 100.00 | 544,612 | 3.94% | | | | | | | 3.94% |
| City Finance Bank Limited | | | | | | | | | | | |
| Commerce Bank Limited | | | | | | | | | | | |
| Commercial Bank of Africa | Commercial Bank of Africa (KE) | 100.00 | 539,477 | 3.90% | 3.90% | | | | | | |
| Consolidated Bank of Kenya Limited | Consolidated Bank of Kenya (KE) | 100.00 | 49,528 | 0.36% | 0.36% | | | | | | |
| Co-operative Bank of Kenya Ltd | | | 831,354 | 6.01% | | | | | | | |
| | Co-Operatives Societies (??) | 83.82 | | | | | | | | | |
| | Individual Members Of Co-Operative | 16.18 | | | | | | | | | |
| Credit Bank Limited | | | 37,606 | 0.27% | | | | | | | |
| Daima Bank Limited | | | | | | | | | | | |
| Development Bank of Kenya Ltd | Development Bank of Kenya (KE) | 100.00 | 47,115 | 0.34% | 0.34% | | | | | | |

Table 1: Kenya Banking Sector Ownership Shares, by Region (2 of 6)

| Bank | Shareholder (ISO Country Code) | Ownership % | Total Assets (2006 USD) | Company Market Share | Market Share by Region (%) | | | | | | | |
|--------------------------------------|--|-------------|-------------------------|----------------------|----------------------------|-------|----|-----|------|----|----|-------|
| | | | | | KE | GB | EU | EAC | COME | SA | US | ROW |
| Diamond Trust Bank Kenya Limited | | | 313,234 | 2.27% | | | | | | | | |
| | Aga Khan Fund For Economic Development | 17.32 | | | | | | | | | | 0.76% |
| | Barclays (Kenya) Nominees Ltd (KE) | 9.85 | | | 0.43% | | | | | | | |
| | Habib Bank Limited (PK) | 9.72 | | | | | | | | | | 0.43% |
| | The Jubilee Insurance Company Ltd (KE) | 8.77 | | | 0.39% | | | | | | | |
| | Diamond Jubilee Investment Trust (C) | 1.87 | | | | 0.08% | | | | | | |
| | Craysell Investments Ltd (KE) | 1.62 | | | 0.07% | | | | | | | |
| | Nooralii Mohan Manji (KE) | 1.27 | | | 0.06% | | | | | | | |
| | Ameerali Nazarali Esmail (KE) | 0.92 | | | 0.04% | | | | | | | |
| Dubai Bank Kenya Limited | | | | | | | | | | | | |
| EABS Bank Limited | | | 128,389 | 0.93% | | | | | | | | |
| | Private Shareholders (KE) | 65.59 | | | 0.61% | | | | | | | |
| | LP Holdings (KE) | 16.95 | | | 0.16% | | | | | | | |
| | Rajmuk Holdings (KE) | 9.41 | | | 0.09% | | | | | | | |
| | Emperor Holdings (KE) | 8.05 | | | 0.07% | | | | | | | |
| East African Building Society - EABS | | | | | | | | | | | | |
| Equatorial Commercial Bank Limited | | | | | | | | | | | | |
| Equity Bank Limited | British-American Investments Company | 11.06 | 288,544 | 2.09% | 2.09% | | | | | | | |
| Euro Bank Limited | | | | | | | | | | | | |
| Faulu Kenya Limited | Faulu Kenya Limited (CH) | 70.00 | 29,829 | 0.22% | | | | | | | | 0.22% |
| Fidelity Commercial Bank Limited | | | | | | | | | | | | |
| Fina Bank Limited | | | 141,005 | 1.02% | | | | | | | | |
| | Entreprise Banking Group (BW) | 20.75 | | | | | | | | | | 0.21% |
| | Dhabaria Ltd (KE) | 19.81 | | | 0.20% | | | | | | | |
| | Rare Ltd (KE) | 17.83 | | | 0.18% | | | | | | | |
| | Sirus Ltd (KE) | 15.85 | | | 0.16% | | | | | | | |
| | Snow Point (K) Ltd (KE) | 9.91 | | | 0.10% | | | | | | | |
| | Harupa Ltd (KE) | 3.96 | | | 0.04% | | | | | | | |
| | Kushan Ltd (KE) | 3.96 | | | 0.04% | | | | | | | |
| | Reena Ltd (KE) | 3.96 | | | 0.04% | | | | | | | |

Table 1: Kenya Banking Sector Ownership Shares, by Region (3 of 6)

| Bank | Shareholder (ISO Country Code) | Ownership % | Total Assets (2006 USD) | Company Market Share | Market Share by Region (%) | | | | | | |
|---|---------------------------------------|-------------|-------------------------|----------------------|----------------------------|----|-------|-----|---------|----|-----|
| | | | | | KE | GB | EU | EAC | COME SA | US | ROW |
| First American Bank of Kenya | | | | | | | | | | | |
| First National Finance Bank Ltd. | | | | | | | | | | | |
| Giro Commercial Bank Limited | | | | | | | | | | | |
| Guardian Bank Limited | | | | | | | | | | | |
| Guilders International Bank Limited | | | | | | | | | | | |
| Habib Bank Limited | Habib Bank Limited (PK) | | | | | | | | | | |
| Housing Finance Company of Kenya Limited | | | 142,700 | 1.03% | | | | | | | |
| | Equity Bank Limited (KE) | 20.00 | | | 0.44% | | | | | | |
| | National Social Security Fund (KE) | 7.87 | | | 0.17% | | | | | | |
| | Government Of Kenya (KE) | 7.32 | | | 0.16% | | | | | | |
| | Barclays (Kenya) Nominees Ltd 9347 | 4.90 | | | 0.11% | | | | | | |
| | Northbound Holdings Ltd (??) | 4.60 | | | | | | | | | |
| | Steel Son Limited (KE) | 3.55 | | | 0.08% | | | | | | |
| | Nomura Nominees Ltd A/C Jmm (KE) | 3.15 | | | 0.07% | | | | | | |
| | Ndungu Paul Wanderi (??) | 2.35 | | | | | | | | | |
| | Kibuwa Enterprises Ltd (??) | 0.91 | | | | | | | | | |
| | Kirinyaga Construction Ltd (KE) | 0.52 | | | 0.01% | | | | | | |
| Imperial Bank Limited | | | 135,537 | 0.98% | | | | | | | |
| | Abdumal Investments Ltd (??) | 14.00 | | | | | | | | | |
| | Simba Colt Motors Limited (KE) | 14.00 | | | 0.38% | | | | | | |
| | Janco Investments Limited (??) | 13.50 | | | | | | | | | |
| | Kenblest Ltd (??) | 12.50 | | | | | | | | | |
| | Momentum Holdings Limited (KE) | 12.50 | | | 0.34% | | | | | | |
| | Rex Motors Ltd (??) | 12.50 | | | | | | | | | |
| | Ea Motor Industries (Sales & Service) | 11.00 | | | | | | | | | |
| | Reynolds & Co. Limited (IE) | 10.00 | | | | | 0.27% | | | | |
| Industrial and Commercial Development Corporation | Government Of Kenya (KE) | 100.00 | | | | | | | | | |
| Industrial Development Bank Limited | | | | | | | | | | | |

Table 1: Kenya Banking Sector Ownership Shares, by Region (4 of 6)

| Bank | Shareholder (ISO Country Code) | Owner ship % | Total Assets (2006 USD) | Company Market Share | Market Share by Region (%) | | | | | | | |
|---|-------------------------------------|-----------------|----------------------------------|----------------------------|----------------------------|----|-------|-----|------------|----|-----|-------|
| | | | | | KE | GB | EU | EAC | COME SA | US | ROW | |
| Investments and Mortgages Bank Limited - I&M Bank Limited | | | 322,035 | 2.33% | | | | | | | | |
| | Biashara Securities Ltd (KE) | 21.55 | | | 0.53% | | | | | | | |
| | Minard Holdings Limited (KE) | 17.54 | | | 0.43% | | | | | | | |
| | Tecoma Limited (KE) | 15.72 | | | 0.38% | | | | | | | |
| | Ziyungi Limited (KE) | 15.72 | | | 0.38% | | | | | | | |
| | Mnana Limited (KE) | 14.52 | | | 0.36% | | | | | | | |
| | City Trust Limited (KE) | 10.14 | | | 0.25% | | | | | | | |
| | Sachit Shah (??) | 2.40 | | | | | | | | | | |
| | Sarit S. Shah (??) | 2.40 | | | | | | | | | | |
| Kenya Commercial Bank LTD | | | 1,333,300 | 9.64% | | | | | | | | |
| | Permanent Secretary To The Treasury | 26.23 | | | 5.87% | | | | | | | |
| | National Social Security Fund (KE) | 6.80 | | | 1.52% | | | | | | | |
| | Stanbic Nominees Kenya Limited A/C | 3.49 | | | 0.78% | | | | | | | |
| | Sunil Narshi Shah (??) | 2.33 | | | | | | | | | | |
| | Kcb Staff Pension Fund (KE) | 2.32 | | | 0.52% | | | | | | | |
| | Stanbic Nominees Kenya Limited A/C | 1.53 | | | 0.34% | | | | | | | |
| | Nomura Nominees Ltd A/C Jmm (KE) | 1.01 | | | 0.23% | | | | | | | |
| | Kenya Reinsurance Corporation Limi | 0.87 | | | 0.19% | | | | | | | |
| | Barclays (Kenya) Nominees Ltd A/C 9 | 0.82 | | | 0.18% | | | | | | | |
| | Barclays (Kenya) Nominees Ltd A/C 1 | 0.69 | | | | | | | | | | |
| Kenya Commercial Finance Company Limited | | | | | | | | | | | | |
| Kenya Post Office Savings Bank | | 100.00 | 215,015 | 1.56% | 1.56% | | | | | | | |
| Kenya Women Finance Trust | | | | | | | | | | | | |
| K-REP Bank | | | 75,223 | 0.54% | | | | | | | | |
| | African Development Bank (II) | 15.14 | | | | | | | | | | 0.41% |
| | Netherlands Dev. Finance Co (NL) | 5.00 | | | | | 0.14% | | | | | |
| Middle East Bank Kenya Limited | | | 49,015 | 0.35% | | | | | | | | |
| | Fortis Bank (BE) | 25.03 | | | | | 0.18% | | | | | |
| | Banque Belgo-laise-Belgo-laise Bank | 25.00 | | | | | 0.18% | | | | | |
| National Bank of Kenya Ltd | | | 520,526 | 3.77% | | | | | | | | |
| | National Social Security Fund (KE) | 48.00 | | | 2.58% | | | | | | | |
| | Government Of Kenya (KE) | 22.00 | | | 1.18% | | | | | | | |

Table 1: Kenya Banking Sector Ownership Shares, by Region (5 of 6)

| Bank | Shareholder (ISO Country Code) | Ownership % | Total Assets (2006 USD) | Company Market Share | Market Share by Region (%) | | | | | | |
|-------------------------------------|--------------------------------------|-------------|-------------------------|----------------------|----------------------------|-------|-------|-----|---------|----|-----|
| | | | | | KE | GB | EU | EAC | COME SA | US | ROW |
| NIC Bank Limited | | | 376,210 | 2.72% | | | | | | | |
| | First Chartered Securities Ltd (??) | 16.44 | | | | | | | | | |
| | Icea Investment Services Ltd (??) | 9.42 | | | | | | | | | |
| | Livingstone Registrars Ltd. (KE) | 8.13 | | | 1.11% | | | | | | |
| | Rivel Kenya Ltd (KE) | 7.73 | | | 1.05% | | | | | | |
| | Duncan Nderitu Ndegwa (??) | 4.56 | | | | | | | | | |
| | Saimar Ltd (KE) | 4.13 | | | 0.56% | | | | | | |
| | Amwa Holdings Ltd (??) | 1.97 | | | | | | | | | |
| | Kenya Commercial Bank Nominees L | 1.65 | | | | | | | | | |
| | Thuthuma Ltd (??) | 1.27 | | | | | | | | | |
| | Makimwa Consultants Ltd (??) | 1.26 | | | | | | | | | |
| Oriental Commercial Bank Ltd | | | 20,886 | 0.15% | | | | | | | |
| | Pasha Investments Ltd (KE) | 13.40 | | | 0.08% | | | | | | |
| | Sag Investments Ltd (KE) | 13.30 | | | 0.08% | | | | | | |
| Paramount Universal Bank Limited | | | | | | | | | | | |
| Prime Bank | | | 150,617 | 1.09% | | | | | | | |
| Prime Capital & Credit Limited | | | | | | | | | | | |
| Prudential Bank Limited | | | | | | | | | | | |
| Reliance Bank Limited | | | | | | | | | | | |
| Southern Credit Banking Corporation | | | 66,003 | 0.48% | | | | | | | |
| | Others (??) | 28.00 | | | | | | | | | |
| | Fincity Investments Ltd (??) | 23.00 | | | | | | | | | |
| | Southern Shield Holdings Ltd (??) | 20.00 | | | | | | | | | |
| | Southern Shield Securities Ltd (??) | 19.00 | | | | | | | | | |
| | Sadrudin Karim Kurji (??) | 10.00 | | | | | | | | | |
| Stanbic Bank Kenya Limited | | 100.00 | 372,120 | 2.69% | | 2.69% | | | | | |
| Standard Chartered Bank Kenya | | | 1,169,151 | 8.46% | | | | | | | |
| | Standard Chartered Holdings (Africa) | 73.81 | | | | | 8.11% | | | | |
| | Kabarak Limited (??) | 1.03 | | | | | | | | | |
| | Old Mutual Life Assurance Company | 0.69 | | | 0.08% | | | | | | |
| | National Social Security Fund (KE) | 0.68 | | | 0.07% | | | | | | |
| | Barclays (Kenya) Nominees Ltd A/C 1 | 0.59 | | | | | | | | | |
| | Kenya Commercial Bank Nominees L | 0.51 | | | 0.06% | | | | | | |
| | Standard Chartered Africa Holdings L | 0.48 | | | | 0.05% | | | | | |
| | Barclays (Kenya) Nominees Ltd A/C 1 | 0.45 | | | 0.05% | | | | | | |
| | Barclays (Kenya) Nominees Ltd A/C 9 | 0.36 | | | 0.04% | | | | | | |

Supplementary Information on Ownership Shares of Tanzanian Banks from Bank Websites

(Quotes are from the websites listed.)

National Microfinance –“Rabobank, 34.9%; The Government of the United Republic of Tanzania, 30.0%; Public, 21.0%; National Investment Company Limited (NICOL), 6.6%; Exim Bank Tanzania, 5.8%; Tanzania Chambers of Commerce Industries and Agriculture (TCCIA), 1.7%.

http://www.nmbtz.com/about_nmb/shareholder_information.html.

- CRDB Bank Plc – TZ 38.8% – shareholders are listed as follows: “Private individuals, 37.0; Co operatives , 14.0; Companies, 10.2; DANIDA investment fund, 30.0; Parastatals (NIC & PPF), 8.8. ”
<http://www.crdbbank.com/aboutUs.asp> Accessed 3 April 2009.
- Commercial Bank of Africa –according to their website they are “wholly Kenyan owned.” http://www.cba.co.ke/default2.php?active_page_id=117
- Citibank NA – US 100%
- Kenya Post Office Savings Bank “The bank is wholly owned by the Government of Kenya and reports to the Ministry of Finance.”
<http://www.postbank.co.ke/index.php?do=about>.
- K-REP Bank “ International Finance Corporation, 16.7%; The African Development Bank, 15.1%; The Netherlands Dev. Finance Co. (FMO), 5.0%; Triodos, 11.0%; ShoreCap International, 8.2%; Kwa (ESOP), 10.0%; K-Rep Group, 25.0%; Founding Members, 5.2%. ICDC-I (Public investment company) 3.8%”
http://www.k-repbank.com/index.php?option=com_content&task=view&id=71&Itemid=109 .
- Chase Bank (Kenya) Limited – U.S. 100%
- Development Bank of Kenya Ltd – KE 100% - “Consequently after forty five years the bank ownership changed to one that is Kenyan owned and directed as follows; Industrial & Commercial Development Corporation (ICDC), 89.3%; Transcentury Ltd, 10.7%. ” <http://www.devbank.com/about.php?subcat=27&title=Shareholders>.

III. Kenyan Insurance Companies

The premium information came from the Insurance Industry Annual Report for 2007 of the Association of Kenya Insurers.³⁷ Table 9 of their report lists premium income by company and type of insurance. We define market share of a company by the company share of total market premia.

For ownership shares, we commissioned a survey from a specialist at the Association of Kenyan Insurers.³⁸ He provided the data on the ownership shares of the Kenyan companies. In the table below, we list the result of these calculations.

³⁷ Available at: <http://www.akinsure.com/images/aki-annual-report-2007.pdf>

³⁸ We thank Mr. Joseph Luvisia Jamwaka (a fellow of the Life Management Institute of the U.S. and Associate of the Chartered institute of Insurance of the UK) for providing this information.

Table 2: Kenya Insurance Sector Ownership Shares, by Region (1 of 7)

| Insurance Company | Shareholder (ISO Country Code) | Ownership % | Income (million KSH 2007) | Company Market Share | Market Share by Region (%) | | | | | | | |
|------------------------------------|------------------------------------|-------------|---------------------------|----------------------|----------------------------|----|----|-----|---------|----|-------|--|
| | | | | | KE | GB | EU | EAC | COME SA | US | ROW | |
| African Merchant Assurance Company | | | 563 | 1.71% | 1.71% | | | | | | | |
| | Hon. William Ruto (KE) | 80.00 | | | | | | | | | | |
| | Silas Simatwo (KE) | 20.00 | | | | | | | | | | |
| AIG Insurance Company | AIG (US) | 100.00 | 1,801 | 5.48% | | | | | | | 5.48% | |
| APA Insurance Company | | | 2355 | 7.17% | 7.17% | | | | | | | |
| | Apollo Insurance (KE) | 60.00 | | | | | | | | | | |
| | Pan Africa Insurance Holdings (KE) | 40.00 | | | | | | | | | | |
| Blue Shield Insurance Company | | | 2,273 | 6.92% | 6.92% | | | | | | | |
| | Beth Ngonyo Mungai (KE) | 40.05 | | | | | | | | | | |
| | Bermuda Holdings Ltd (KE) | 33.10 | | | | | | | | | | |
| | African Theatres Ltd (KE) | 13.55 | | | | | | | | | | |
| | James Muigai Ngengi (KE) | 3.31 | | | | | | | | | | |
| | Jean Muigai Ngengi (KE) | 3.31 | | | | | | | | | | |
| | Peter Kamau Ngengi (KE) | 3.31 | | | | | | | | | | |
| | Martha Vincent & Paul Vincent (KE) | 3.31 | | | | | | | | | | |
| | Simon Evans Githinji (KE) | 0.02 | | | | | | | | | | |
| | Simon Munyi Gachoki (KE) | 0.01 | | | | | | | | | | |
| British American Insurance Company | | | 679 | 2.07% | | | | | | | | |
| | British America (K) Ltd (??) | 66.67 | | | | | | | | | | |
| | Jimnah Mbaru (KE) | 25.00 | | | 1.55% | | | | | | | |
| | Peter K Munga (KE) | 5.00 | | | 0.31% | | | | | | | |
| | Benson I Wairegi (KE) | 3.33 | | | 0.21% | | | | | | | |
| Cannon Assurance Company | | | 557 | 1.70% | 1.70% | | | | | | | |
| | Inder Jit Talwar (KE) | 0.00 | | | | | | | | | | |
| | Cannon Holdings (KE) | 40.00 | | | | | | | | | | |
| | Evisa Investments (PVT) Ltd (KE) | 28.70 | | | | | | | | | | |
| | PBM Nominees (KE) | 31.30 | | | | | | | | | | |
| Concord Insurance Company | | | 585 | 1.78% | 1.78% | | | | | | | |
| | Dorse Gems International Inc (KE) | 32.00 | | | | | | | | | | |
| | Kirumba Mwaura (KE) | 36.00 | | | | | | | | | | |
| | James Gacheru (KE) | 32.00 | | | | | | | | | | |

Table 2: Kenya Insurance Sector Ownership Shares, by Region (2 of 7)

| Insurance Company | Shareholder (ISO Country Code) | Ownership % | Income (million KSH 2007) | Company Market Share | Market Share by Region (%) | | | | | | | |
|----------------------------------|--|-------------|---------------------------|----------------------|----------------------------|----|----|-----|---------|----|-----|--|
| | | | | | KE | GB | EU | EAC | COME SA | US | ROW | |
| Co-operative Insurance Company | | | 1,028 | 3.13% | 3.13% | | | | | | | |
| | Harambee Co-operative Movement (KE) | 9.06 | | | | | | | | | | |
| | Aembu Farmers Co-operative Society Ltd (KE) | 8.30 | | | | | | | | | | |
| | Kiambu Unity Finance Co-operative Union (KE) | 8.15 | | | | | | | | | | |
| | CIC Staff Co-operative Savings and Credit (KE) | 7.27 | | | | | | | | | | |
| | The Co-operative Bank of Kenya (KE) | 6.13 | | | | | | | | | | |
| | Bandari Co-operative Savings and Credit (KE) | 3.34 | | | | | | | | | | |
| | Mwalimu Co-operative Savings and Credit (KE) | 1.59 | | | | | | | | | | |
| | Kipsigis Teachers Savings and Credit (KE) | 1.32 | | | | | | | | | | |
| | Nacico Savings and Credit Co-operative (KE) | 1.10 | | | | | | | | | | |
| | Stima Savings and Credit Co-operative (KE) | 1.09 | | | | | | | | | | |
| | Emmanuel Kipkemboi Birech (KE) | 1.30 | | | | | | | | | | |
| | Isaac Waitthaka Kamunya (KE) | 1.12 | | | | | | | | | | |
| | Teresa Wanjiru Thimba (KE) | 1.10 | | | | | | | | | | |
| | Leonard Obura Oloo (KE) | 0.89 | | | | | | | | | | |
| | Gerald Mbaabu M'ikunyua (KE) | 0.84 | | | | | | | | | | |
| | Francis Kamau Ng'ang'a (KE) | 0.64 | | | | | | | | | | |
| | Others (KE) | 46.76 | | | | | | | | | | |
| Corporate Insurance Company | | | 351 | 1.07% | 1.07% | | | | | | | |
| | Xanthippe Holdings Ltd (KE) | 63.30 | | | | | | | | | | |
| | Ejax Investments Ltd (KE) | 36.70 | | | | | | | | | | |
| CFC Life Assurance Company | | | 674 | 2.05% | | | | | | | | |
| | CfC Stanbic Holdings Group (GB) | 60.00 | | | 1.23% | | | | | | | |
| | C Njonjo (KE) | | | | | | | | | | | |
| | U P Jani (KE) | | | | | | | | | | | |
| | J G Kiereini (KE) | | | | | | | | | | | |
| | J H D Milne (UK) | | | | | | | | | | | |
| | M Soundararajan (KE) | | | | | | | | | | | |
| | A Munda (KE) | | | | | | | | | | | |
| | R E Leakey (KE) | | | | | | | | | | | |
| Directline Assurance Company Ltd | | | 259 | 0.79% | 0.79% | | | | | | | |
| | Royal Credit Limited (KE) | 99.70 | | | | | | | | | | |
| | Samuel S. K. Macharia (KE) | 0.10 | | | | | | | | | | |
| | Purity G. Macharia (KE) | 0.10 | | | | | | | | | | |
| | Dan Korobia (KE) | 0.10 | | | | | | | | | | |

Table 2: Kenya Insurance Sector Ownership Shares, by Region (3 of 7)

| Insurance Company | Shareholder (ISO Country Code) | Owner ship % | Income (million KSH 2007) | Company Market Share | Market Share by Region (%) | | | | | | | |
|-----------------------------------|-------------------------------------|--------------|---------------------------|----------------------|----------------------------|----|----|-----|---------|----|-----|--|
| | | | | | KE | GB | EU | EAC | COME SA | US | ROW | |
| Fidelity Shield Insurance Company | | | 684 | 2.08% | 2.08% | | | | | | | |
| | Southern Shield Holdings Ltd (KE) | 66.70 | | | | | | | | | | |
| | Southern Credit Banking Corp. (KE) | 24.40 | | | | | | | | | | |
| | Soli Limited (KE) | 6.40 | | | | | | | | | | |
| | Kenya Shipping Agency (KE) | 1.40 | | | | | | | | | | |
| First Assurance Company | | | 1,038 | 3.16% | 3.16% | | | | | | | |
| | First Assurance Investment Ltd (KE) | 83.00 | | | | | | | | | | |
| | Syndicate Nominee Ltd (KE) | 17.00 | | | | | | | | | | |
| Gateway Insurance Company | | | 436 | 1.33% | 1.33% | | | | | | | |
| | Godfrey W Karuri (KE) | 21.20 | | | | | | | | | | |
| | John N Muchuki (KE) | 1.40 | | | | | | | | | | |
| | Bethuel M Gecaga (KE) | 8.30 | | | | | | | | | | |
| | Muvokanza Limited (KE) | 1.40 | | | | | | | | | | |
| | Eliud Ndirangu (KE) | 4.30 | | | | | | | | | | |
| | Jerome P N Kariuki (KE) | 0.30 | | | | | | | | | | |
| | Raymond Matiba (KE) | 0.30 | | | | | | | | | | |
| | Francis Thuo (KE) | 1.80 | | | | | | | | | | |
| | Kihara Waithaka (KE) | 2.10 | | | | | | | | | | |
| | Mubiru Housing Company (KE) | 0.90 | | | | | | | | | | |
| | Maina Kimere & Partners (KE) | 5.40 | | | | | | | | | | |
| | Isaac G. Wanjohi (KE) | 14.50 | | | | | | | | | | |
| | Wilson Kiragu (KE) | 1.40 | | | | | | | | | | |
| | Chief Ezekiel N Onwere (KE) | 7.60 | | | | | | | | | | |
| | Isaac Njoroge (KE) | 0.60 | | | | | | | | | | |
| | James M Gacheru (KE) | 1.10 | | | | | | | | | | |
| Geminia Insurance Company | | | 460 | 1.40% | 1.40% | | | | | | | |
| | Gikoi Development Co. Ltd (KE) | 8.16 | | | | | | | | | | |
| | Mbagi Limited (KE) | 34.70 | | | | | | | | | | |
| | Stanley M. Githunguri (KE) | 26.53 | | | | | | | | | | |
| | Leonard M Kabetu (KE) | 0.30 | | | | | | | | | | |
| | Bimal R. Shah (KE) | 5.67 | | | | | | | | | | |
| | Harsha R. Shah (KE) | 1.19 | | | | | | | | | | |
| | Hasit K Shah (KE) | 1.38 | | | | | | | | | | |
| | Khetsi K Shah (KE) | 1.38 | | | | | | | | | | |
| | Universal Roadways (K) Ltd (KE) | 5.53 | | | | | | | | | | |
| | Kiriti Shah (KE) | 2.67 | | | | | | | | | | |
| | Jay K Shah (KE) | 1.38 | | | | | | | | | | |
| | Mona D Shah (KE) | 1.38 | | | | | | | | | | |
| | Mona D Shah (KE) | 5.68 | | | | | | | | | | |
| | Devchand A. Shah (KE) | 2.67 | | | | | | | | | | |

Table 2: Kenya Insurance Sector Ownership Shares, by Region (4 of 7)

| Insurance Company | Shareholder (ISO Country Code) | Owner ship % | Income (million KSH 2007) | Company Market Share | Market Share by Region (%) | | | | | | |
|--------------------------------|---|--------------|---------------------------|----------------------|----------------------------|-------|-------|-------|---------|----|-------|
| | | | | | KE | GB | EU | EAC | COME SA | US | ROW |
| General Accident Insurance | Rapun Limited (KE) | 49.00 | 682 | 2.08% | 2.08% | | | | | | |
| | J S Insurance Limited (KE) | 49.00 | | | | | | | | | |
| | Shantilal Shah (KE) | 2.00 | | | | | | | | | |
| Heritage All Insurance Company | CFC (GB) | 64.08 | 1505 | 4.58% | | 2.94% | | | | | |
| | African Liason Consultant Services (KE) | 35.92 | | | | | | | | | |
| | First Chartered Securities Limited (KE) | 100.00 | | | 1,173 | | 3.57% | 3.57% | | | |
| Intra Africa Assurance Company | | | 402 | 1.22% | | | | | | | |
| | Robert T. Gachecheh (KE) | 10.50 | | | 0.18% | | | | | | |
| | Archibald Githinji (KE) | 7.50 | | | 0.13% | | | | | | |
| | Mahendra Chandulal (KE) | 5.00 | | | 0.09% | | | | | | |
| | Upendra Ambalal Patel (KE) | 5.00 | | | 0.09% | | | | | | |
| | Jitenra Ambalal Patel (KE) | 5.00 | | | 0.09% | | | | | | |
| | Dinesh Chandulal Patel (KE) | 10.00 | | | 0.17% | | | | | | |
| | Henry Mkangi (KE) | 3.00 | | | 0.05% | | | | | | |
| | Bharat Kumar Patel (KE) | 5.00 | | | 0.09% | | | | | | |
| | Joseph Muriu (KE) | 5.00 | | | 0.09% | | | | | | |
| | Premji Ratna (KE) | 5.00 | | | 0.09% | | | | | | |
| | Ranjaben Suresh Patel (KE) | 5.00 | | | 0.09% | | | | | | |
| | Eleyo Saw Mills (??) | 20.00 | | | | | | | | | |
| | Praful C Patel (KE) | 5.00 | | | 0.09% | | | | | | |
| Invesco Insurance Company | | | 958 | 2.92% | | | | | | | |
| Jubilee Insurance Company | | | 2,450 | 7.46% | | | | | | | |
| | Jubilee Holdings Ltd (KE) | 100.00 | | | 7.46% | | | | | | |
| | Kenneth Hamish Wooller Shah (KE) | 0.00 | | | | | | | | | |
| | Neville Patrick Gibson Warren (IN) | 0.00 | | | | | | | | | |
| Kenindia Assurance Company | | | 3,028 | 9.22% | | | | | | | |
| | Life Insurance Corp. Of India (IN) | 10.00 | | | | | | | | | 0.92% |
| | General Insurance Corp Of India (IN) | 9.00 | | | | | | | | | 0.83% |
| | New India Assurance Co. Ltd. (IN) | 9.00 | | | | | | | | | 0.83% |
| | Oriental Insurance Co. Ltd. (IN) | 9.00 | | | | | | | | | 0.83% |
| | United India Insurance Co. Ltd. (IN) | 9.00 | | | | | | | | | 0.83% |
| | National Insurance Co. Ltd. (IN) | 9.00 | | | | | | | | | 0.83% |
| | Pv Karia (IN) | 1.39 | | | | | | | | | 0.13% |
| | M N Mehta (KE) | 0.00 | | | | 0.00% | | | | | |
| | M P Chandaria (KE) | 0.00 | | | | 0.00% | | | | | |
| | Sadasiv Mishra (KE) | 0.00 | | | | 0.00% | | | | | |
| | Simeon Nyachae (KE) | 7.00 | | | | 0.64% | | | | | |
| | Chandaria Foundation Trustees (KE) | 7.01 | | | | 0.65% | | | | | |
| | Mehta Group Of Companies (KE) | 6.02 | | | | 0.55% | | | | | |
| | Lex Holdings (KE) | 3.66 | | | | 0.34% | | | | | |
| | Others (KE) | 20.00 | | | | 1.84% | | | | | |

Table 2: Kenya Insurance Sector Ownership Shares, by Region (5 of 7)

| Insurance Company | Shareholder (ISO Country Code) | Owner ship % | Income (million KSH 2007) | Company Market Share | Market Share by Region (%) | | | | | | |
|-------------------------------------|-------------------------------------|--------------|---------------------------|----------------------|----------------------------|----|----|-----|---------|----|-----|
| | | | | | KE | GB | EU | EAC | COME SA | US | ROW |
| Kenya Orient Insurance Company | | | 283 | 0.86% | 0.86% | | | | | | |
| | Thanak Investments (KE) | 90.39 | | | | | | | | | |
| | Rajwinder Singh (KE) | 5.95 | | | | | | | | | |
| | Avtar Singh Ubhi (KE) | 1.80 | | | | | | | | | |
| | Kahn Singh Ubhi (KE) | 1.80 | | | | | | | | | |
| | Luka Daudi Galgalo (KE) | 0.06 | | | | | | | | | |
| Kenya Alliance Insurance Company | International Controls Limited (??) | 100.00 | 353 | 1.07% | | | | | | | |
| Lion of Kenya Insurance Company | First Chartered Security (KE) | 80.00 | 1,217 | 3.71% | 3.71% | | | | | | |
| | Kenya Holdings (KE) | 20.00 | | | | | | | | | |
| Madison Insurance Company | Amedo Madison Holdings Limited (K | 100.00 | 625 | 1.90% | 1.90% | | | | | | |
| Mayfair | | | 273 | 0.83% | 0.83% | | | | | | |
| | Adrea Ltd (KE) | 27.77 | | | | | | | | | |
| | Corporate Investments (KE) | 12.48 | | | | | | | | | |
| | A 2 Enterprises (KE) | 9.32 | | | | | | | | | |
| | Tinker Bird Securities (KE) | 9.15 | | | | | | | | | |
| | Kazkazi Maritime Ltd (KE) | 3.12 | | | | | | | | | |
| | Union Logistics (KE) | 3.12 | | | | | | | | | |
| | Marenyo Ltd (KE) | 8.32 | | | | | | | | | |
| | Muhwai Ltd (KE) | 6.55 | | | | | | | | | |
| | Mahesh Doshi And Sheila Doshi (KE) | 6.24 | | | | | | | | | |
| | Nsp Holdings Ltd (KE) | 6.24 | | | | | | | | | |
| | Lakdawalla Investments Ltd (KE) | 4.16 | | | | | | | | | |
| | Bharasa Investments Ltd (KE) | 3.54 | | | | | | | | | |
| Mercantile Life & General Insurance | | | 369 | 1.12% | 1.12% | | | | | | |
| | Ecobank Kenya Ltd (KE) | 20.00 | | | | | | | | | |
| | L.P Holdings (KE) | 21.00 | | | | | | | | | |
| | Barclays Trust (KE) | 24.00 | | | | | | | | | |
| | Eabs Bank (KE) | 35.00 | | | | | | | | | |
| Occidental Insurance Company | | | 740 | 2.25% | 2.25% | | | | | | |
| | Park Enterprises Ltd (KE) | 30.00 | | | | | | | | | |
| | Oak Investments Ltd (KE) | 15.00 | | | | | | | | | |
| | Landsend Kenya Ltd (KE) | 15.00 | | | | | | | | | |
| | Hansing Ltd (KE) | 15.00 | | | | | | | | | |
| | Rock Investment Ltd (KE) | 15.00 | | | | | | | | | |
| | Ngamacu Ltd (KE) | 5.00 | | | | | | | | | |
| | Maganlal Lakhmshi Dodhia (KE) | 2.50 | | | | | | | | | |
| | Kantilal Maganlal Dodhia (KE) | 2.50 | | | | | | | | | |

Table 2: Kenya Insurance Sector Ownership Shares, by Region (6 of 7)

| Insurance Company | Shareholder (ISO Country Code) | Ownership % | Income (million KSH 2007) | Company Market Share | Market Share by Region (%) | | | | | | |
|----------------------------------|---|-------------|---------------------------|----------------------|----------------------------|-------|----|-----|---------|----|-----|
| | | | | | KE | GB | EU | EAC | COME SA | US | ROW |
| Pacis Insurance Company Ltd | | | 162 | 0.49% | 0.49% | | | | | | |
| | Luna Registered Trustees (KE) | 35.87 | | | | | | | | | |
| | Archdiocese Of Nairobi (KE) | 32.56 | | | | | | | | | |
| | Association Of Sisterhoods (KE) | 5.42 | | | | | | | | | |
| | Diocese Of Nakuru (KE) | 4.65 | | | | | | | | | |
| | Religious Superior Confrence (KE) | 2.34 | | | | | | | | | |
| | Diocese Of Muranga (KE) | 2.20 | | | | | | | | | |
| | Diocese Of Ngong (KE) | 2.09 | | | | | | | | | |
| | Diocese Of Kisii (KE) | 1.71 | | | | | | | | | |
| | Diocese Of Isiolo (KE) | 1.63 | | | | | | | | | |
| | Diocese Of Machakos (KE) | 1.12 | | | | | | | | | |
| | Diocese Of Nyahururu (KE) | 1.00 | | | | | | | | | |
| | Diocese Of Embu (KE) | 0.90 | | | | | | | | | |
| | Diocese Of Garissa (KE) | 1.00 | | | | | | | | | |
| | Diocese Of Marsabit (KE) | 1.00 | | | | | | | | | |
| | Archdiocese Of Kisumu (KE) | 1.00 | | | | | | | | | |
| | Catholic University Of East Africa (KE) | 1.63 | | | | | | | | | |
| | Others (KE) | 4.00 | | | | | | | | | |
| Pioneer Life Assurance Company | | | 89 | 0.27% | 0.27% | | | | | | |
| | Rose Waruinge (KE) | 9.00 | | | | | | | | | |
| | Mtalaki Mwashimba (KE) | 11.00 | | | | | | | | | |
| | James Olubayi (KE) | 80.00 | | | | | | | | | |
| Phoenix of East Africa Assurance | | | 525 | 1.60% | 1.60% | | | | | | |
| | Transworld Investment Limited (KE) | 77.87 | | | | | | | | | |
| | Kiruma International (KE) | 8.93 | | | | | | | | | |
| | Bawan Limited (KE) | 3.40 | | | | | | | | | |
| | Others (KE) | 10.00 | | | | | | | | | |
| Real Insurance Company | | | 746 | 2.27% | | | | | | | |
| | Mureka Investments (KE) | 69.00 | | | 1.57% | | | | | | |
| | Zaniki Holdings Ltd (KE) | 15.00 | | | 0.34% | | | | | | |
| | The Globe Insurance Company (UK) | 15.00 | | | | 0.34% | | | | | |
| | Kenya Farmers Association (KE) | 1.00 | | | 0.02% | | | | | | |
| Standard Assurance Company | | | 522 | 1.59% | | | | | | | |

IV. Railroad Transportation

In the hope of improved performance, in November 2006, Kenya's (and Uganda's) railways were turned over to Rift Valley Railways, a consortium led by South Africa's Sheltam Trade Close. This consortium won the right to operate the railways for 25 years. They are a monopolist, so **we infer 100 percent ownership to the Rest of the World.**³⁹

V. Pipeline Transportation

The Kenya Pipeline Company operates 800 kilometers of pipeline within Kenya for the transport of refined oil products. The pipeline runs from the refinery at the port of Mombassa to the capital of Nairobi, and with its western extension to Eldoret and to Kisumu. This pipeline is operated by the Kenya Pipeline Company, a wholly owned entity of the Government of Kenya.⁴⁰

In addition, there is a 320 kilometer pipeline under construction to extend the pipeline from Eldoret to Kampala Uganda. It is a Public-Private Partnership with the Governments of Uganda and Kenya originally each holding 24.5 percent shares. The remaining 51 percent was to be held by a consortium. Tamoil East Africa, a company registered in Uganda, owns 70 percent of the remainder. Tamoil East Africa is a wholly owned subsidiary of Tamoil Holdings, the Libyan state owned oil firm. The remaining 30 percent in the private consortium is held by Habib Investments, an investment company belonging to Habib Kagimu, a Ugandan businessman. However, in 2008, the Government of Uganda agreed to take only half of its 24.5 percent share and sell the other half to the private sector consortium. Thus, the share of the pipeline extension to Kampala of Tamoil East Africa increased to 44.3 percent and of Habib Investments to 19.0 percent.⁴¹

We assume that shares of the market are proportional to the kilometers of the pipeline, and allocate ownership shares accordingly. There are 1120 kilometers of pipeline. The finished pipeline is 60 percent of the total and the Kampala extension is 40 percent. The Kenyan government holds 100 percent ownership interest in 800 kilometers (or 60 percent of the total) and 24.5 ownership interest in the remaining 320 kilometers (or 9.8 of the total) for a total share of 69.8 percent. The Uganda ownership share is the sum of the share of the Government of Uganda and the share of Habib Investments, i.e., 12.5 percent (equals .4 * (12.25 + 19.0)). The results are as follows.
Kenya, 69.8; Uganda, 12.5; Rest of World, 17.7.

³⁹ On May 7, 2009, the Kenyan government announced it would like to renegotiate the contract and build (along with the government of Uganda) a second line to haul more cargo to the inland countries like Uganda, Rwanda and Burundi. See The New Vision, May 7, 2009. Available at: <http://www.newvision.co.ug/D/8/220/680519>.

⁴⁰ See Kenya Pipeline Company on Wikipedia at: http://en.wikipedia.org/wiki/Kenya_Pipeline_Company, and the company website at: <http://www.kpc.co.ke/>

⁴¹ See "Uganda cedes stake of oil pipeline to Tamoil of Libya, local investors," Libya On-Line, July 21, 2008. Available at: <http://www.libyaonline.com/news/details.php?cid=75&id=4830>

Appendix C : Estimates of the Dixit-Stiglitz Elasticities of Substitution for Kenyan Imperfectly Competitive Goods

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It was necessary for us to obtain estimates of the Dixit-Stiglitz product variety elasticities of substitution for the imperfectly competitive sectors in our model. Christian Broda, Joshua Greenfield and David Weinstein (2006) estimated Dixit-Stiglitz product variety elasticities of substitution at the 3 digit level in 73 countries. Among the 73 countries, there were four in sub-Saharan Africa: the Central African Republic, Madagascar, Malawi and Mauritius. We judged that Madagascar was the country closest in characteristics to Kenya, so we took the values of the elasticities estimated for Madagascar as a proxy for the elasticities for Kenya.

Broda et al., estimate 3 digit elasticities for 130 goods sectors, but there are 34 goods sectors in our model. It was necessary to map the sectors estimated by Broda et al. into the sectors of our model. In table C1 of this appendix, we show the mapping for the imperfectly competitive sectors. (These elasticities are not relevant in our model for perfectly competitive sectors.)

Next, since there are often multiple sectors from Broda et al. mapped into a single sector in our model, it was necessary to determine a method of weighting the Broda et al. elasticities. There are reasons to use both export shares as well as import shares. A larger share of a subcategory in imports reflects more imports, and more likely there are more varieties of imports. So weighting by the import share of a subcategory is better than an unweighted measure. Domestic varieties are also important. Since we do not have production data for the subcategories, we use export shares as a proxy for domestic production by subcategory. Analogously, weighting subcategories by export shares is better than unweighted categories. Since both import shares and export shares are useful in the weighting, we take one half the shares of both exports and imports as the weights. The resulting elasticities are reported in table C1.

Broda, Christian, Joshua Greenfield and David Weinstein (2006), "From Groudnuts to Globalization: A Structural Estimate of Trade and Growth," National Bureau of Economic Research Working Paper 12512. Available at: <http://faculty.chicagobooth.edu/christian.broda/website/research/unrestricted/TradeElasticities/TradeElasticities.html>.

| Sector in our Model | Matching HS-3 Code from Broda et al estimates | weighted elasticity of substitution |
|--------------------------------|--|--|
| Beverages & tobacco | 220, 240 | 2.3 |
| Petroleum | 271 | 3.6 |
| Chemicals | 280-391, 390, 393 | 2.8 |
| Metals and machines | 720-854 | 16.7 |
| Non metallic products | 680-702 | 5.6 |
| Grain milling | 110 | 3.2 |
| Sugar & bakery & confectionary | 170 | 2.9 |

Source: Authors calculations based on estimates from Broda, Greenfield and Weinstein (2006).

Appendix D: Engineering Services in Kenya - Restrictiveness Index

The components of the engineering restrictiveness index as well as the scoring options are presented in Table D1.

Table D1: Professions Restrictiveness Index

| Weight - foreign index | Weight - domestic index | Score | Restriction |
|------------------------------|-------------------------------|-------|---|
| | | | <i>Barriers to establishment</i> |
| 0.0800 | 0.0800 | | Form of establishment |
| | | 1.00 | Prohibition on incorporation |
| | | 0.50 | Some form of incorporation permitted |
| | | 0.00 | No restrictions |
| 0.0800 | | | Foreign partnership/association/joint venture |
| | | 1.00 | Prohibition on partnership/association/joint venture with foreign professionals |
| | | 0.50 | Partnership/joint venture with foreign professionals required |
| | | 0.00 | No restrictions |
| 0.0500 | | | Investment and ownership by foreign professionals |
| | | | The score will be proportional to maximum equity participation permitted in a professional firm. For example, ownership to a maximum of 49 per cent of law firm would receive a score of 0.51. |
| 0.0500 | 0.0500 | | Investment and ownership by non-professional investors |
| | | | The score will be proportional to maximum non-professional equity participation permitted in a professional firm. For example, ownership to a maximum of 49 per cent of law firm would receive a score of 0.51. |
| 0.1350 | | | Nationality/citizenship requirements |
| | | 1.00 | Nationality required to qualify, become member of professional body, or to practice |
| | | 0.25 | Nationality required to obtain professional title, but practice is relatively free |
| | | 0.00 | No restrictions |
| 0.1350 | | | Residency and local presence |
| | | 1.00 | Permanent or prior residency (more than 12 months) required |
| | | 0.75 | Less than 12 months prior residency |
| | | 0.50 | Prior residency required for local training |
| | | 0.25 | Domicile or representative office only |
| | | 0.00 | No restrictions |
| 0.1000 | | | Quotas/economic tests on the number of foreign professionals and firms |
| | | 1.00 | Quotas/economic needs tests |
| | | 0.50 | Some restrictions apply |
| | | 0.00 | No restrictions |

| Weight - foreign index | Weight - domestic index | Score | Restriction |
|------------------------|----------------------------|--------|---|
| 0.1000 | | 1.00 | Licensing and accreditation of foreign professionals |
| | | 0.75 | Local retraining required for full license |
| | | 0.50 | Local examination required in all cases |
| | | 0.25 | Case by case assessment of foreign qualification/licence |
| | | 0.00 | Aptitude tests |
| 0.0500 | | 0.25 | Foreign licence/qualifications sufficient to practice |
| | | | Licensing and accreditation of domestic professionals (scores additive) |
| | | 0.25 | Compulsory membership of professional association |
| | | 0.25 | Professional examination requirements |
| | | 0.25 | Practical experience requirements |
| 0.0200 | | 0.25 | Higher education requirements |
| | | | Movement of People - Permanent |
| | | 1.00 | No entry of executives, senior managers or specialists |
| | | 0.80 | Executives, specialists or senior managers can stay a period of up to 1 year |
| | | 0.60 | Executives, specialists or senior managers can stay a period of up to 2 years |
| | | 0.40 | Executives, specialists or senior managers can stay a period of up to 3 years |
| | | 0.20 | Executives, specialists or senior managers can stay a period of up to 4 years |
| | | 0.00 | Executives, specialists or senior managers can stay a period of 5 or more years |
| | | | <i>Barriers to ongoing operations</i> |
| | | 0.0500 | 0.0500 |
| 0.75 | 4 core activities and over | | |
| 0.50 | 3 core activities | | |
| 0.25 | 2 core activities | | |
| 0.00 | 1 core activity | | |
| 0.0500 | 0.0500 | 0.00 | None |
| | | | Multidisciplinary practices |
| | | 1.00 | Prohibition on partnership with other professionals |
| 0.0500 | 0.0500 | 0.50 | Majority partnership required |
| | | 0.00 | No restrictions |
| | | | Advertising, marketing and solicitation |
| 0.0500 | 0.0500 | 1.00 | Advertising, marketing and solicitation restricted |
| | | 0.50 | Some form of advertising, marketing or solicitation allowed |
| | | 0.00 | No restrictions |

| Weight - foreign index | Weight - domestic index | Score | Restriction |
|------------------------|-------------------------|-------|--|
| 0.0500 | 0.0500 | 1.00 | Fee setting |
| | | 0.50 | Mandatory minimum or maximum fees |
| | | 0.00 | Restrictions for some groups or activities No restrictions |
| 0.0200 | | 1.00 | Licensing requirements on management |
| | | 0.75 | All directors/managers or at least a majority of them must be nationals or residents |
| | | 0.50 | At least one director/managers must be nationals or residents |
| | | 0.25 | Directors and managers must be locally licensed |
| | | 0.00 | Directors and managers must be domiciled No restrictions |
| 0.0200 | | 0.33 | Other restrictions (scores additive) |
| | | 0.33 | Restrictions on hiring professionals |
| | | 0.33 | Restrictions on the use of firm's international names |
| | | 0.00 | Government procurement - restrictions towards foreigners No restrictions |
| 0.0100 | | 1.00 | Movement of people - Temporary |
| | | 0.75 | No temporary entry of executives, senior managers or specialists |
| | | 0.50 | Temporary entry of executives, senior managers or specialists up to 30 days |
| | | 0.25 | Temporary entry of executives, senior managers or specialists up to 60 days |
| | | 0.00 | Temporary entry of executives, senior managers or specialists up to 90 days |
| | | 0.00 | Temporary entry of executives, senior managers or specialists over 90 days |
| 1.0000 | 0.3800 | | Total |

Source: Nguyen-Hong (2000).

The scoring for Kenya is described below. It is based on the results of the World Bank Regulatory Survey in East Africa⁴² and the World Bank Survey on Applied Policies in Services⁴³.

Barriers to establishment

Form of establishment Score 0.5

Foreign service providers are required to incorporate or establish the businesses locally. There are no restrictions on forms of incorporation.

Foreign partnership/joint venture/association Score 0

No restrictions.

Investment and ownership by foreign professionals Score 0

No restrictions.

Investment and ownership by non-professional investors Score 0.5

An engineering/ consulting firm must have at least one Partner/Director registered as Consulting Engineer who has in force an Annual Practising Licence in the specified disciplines.

Nationality/citizenship requirements Score 0

No restrictions.

Residency and local presence Score 0

No restrictions.

Quotas/economic tests on the number of foreign professionals and firms Score 1

Entry permits are issued to non-citizens with skills not available at present in the Kenya (class A entry permits for management and technical staff - horizontal measure in Immigration Act Cap 172).

Licensing and accreditation of domestic professionals Score 1

Membership in association is compulsory. Professional examination, practical experience and proof of higher education are required.

Licensing and accreditation of foreign professionals Score 0.75

Foreign professionals must be registered members of the Engineers Association. Foreign professionals must be holder of a diploma, degree or other qualification recognized by the Association of Engineers of Kenya.

Movement of people - permanent Score 0.5

There are limits on the duration of stay; in general, duration of stay is determined on a case by case basis.

On-going operations

Activities reserved by law to the profession Score 1

⁴² The regulatory surveys were conducted by local consultants who interviewed the professional associations in the examined East African countries in 2009.

⁴³ The policy surveys were conducted by DECRG in 2008-2009.

The engineering profession has an exclusive right to perform the following services: design and planning, representation for obtaining permits (signature of designs), tender and contract administration, project management including monitoring of execution, planning and managing maintenance, survey sites, testing and certification and expert witness activities. There is no law prohibiting a foreign provider with a commercial presence in Kenya from providing these services. The engineering profession has a shared right to provide the following services: feasibility studies, environmental assessment, and construction cost management. There is no law prohibiting a foreign provider with a commercial presence in Kenya from providing these services. Apart from design and planning, which can be done elsewhere and sent to Kenya, a foreign provider supplying services (i.e., without commercial presence in Kenya) will need a work permit in order to provide these services.

Multidisciplinary practices Score 0

There are no restrictions on cooperation between engineering professionals and other professionals. The same applies to foreign suppliers.

Advertising, marketing and solicitation Score 1

Advertising and marketing by Kenyan professional engineers as well as foreign suppliers is prohibited.

Fee setting Score 0.5

Prices /fees in the engineering services applicable to the private sector and other institutions outside the government are not regulated. In the case of professional engineering services rendered to the government, prices/fees are determined the Ministry in charge of engineering services but as of 2010, this function will be performed by the Engineering Registration Board (ERB). The ERB will set the prices/fees to be paid for professional engineering services rendered to the government; the service providers will be expected to compete on the technical aspect only.

Licensing requirements on management Score 0

No restrictions.

Movement of people - Temporary Score 0

No restrictions.

Other restrictions (Addition categories) Score 0.33

Restrictions on hiring professionals: Investment Promotion Act 2004 (cap 172) section 13.1. The employment of foreign natural persons for the implementation of foreign investment shall be agreed upon by the contracting parties and approved by Government.

Sources:

- Dee, P. (2005), "A compendium of barriers to services trade", prepared for the World Bank, http://www.crawford.anu.edu.au/pdf/staff/phillippa_dee/Combined_report.pdf
- Nguyen-Hong, D. (2000), "Restrictions on Trade in Professional Services", Productivity Commission Staff Research Paper, Ausinfo, Canberra. Available at: <http://www.pc.gov.au/research/staffresearch/rotips>
- World Bank Regulatory Survey in East Africa conducted in the context of the Project "Trade in Professional Services in East Africa" in 2009.
- World Bank Survey on Applied Policies in Services conducted by Development Research Group, in 2008-2009.

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Appendix E: Data on Research and Development Expenditures and Sales for the United States in 2004 and 2005.

TABLE E.1. Funds for industrial R&D and sales for companies performing industrial R&D in the United States, by industry: 2004 and 2005

| Industry and company size | NAICS codes | All R&D | | | Sales in \$millions in 2005 | Ratio of R&D expenses to sales (x 1,000) |
|--|-----------------------------|------------|---------|-------------------|-----------------------------|--|
| | | 2004 | 2005 | 2004-2005 average | | |
| | | \$millions | | | | |
| All industries | 21-23, 31-33, 42, 44-81 | 208,301 | 226,159 | 217,230 | 6,119,133 | 36 |
| Manufacturing industries | 31-33 | 147,288 | 158,190 | 152,739 | 3,998,256 | 38 |
| Food | 311 | 2,254 | 2,716 | 2,485 | 374,342 | 7 |
| Beverage and tobacco products | 312 | 555 | 539 | 547 | 38,003 | 14 |
| Textiles, apparel, and leather | 313-16 | 570 | 816 | 693 | 51,639 | 13 |
| Wood products | 321 | D | D | 0 | 27,002 | 0 |
| Paper, printing, and support activities | 322, 323 | D | D | 0 | 159,608 | 0 |
| Petroleum and coal products | 324 | 1,603 | D | 802 | 404,317 | 2 |
| Chemicals | 325 | D | 42,995 | 21,498 | 624,344 | 34 |
| Pharmaceuticals and medicines | 3254 | 31,477 | 34,839 | 33,158 | 273,377 | 121 |
| Plastics and rubber products | 326 | D | 1,760 | 890 | 90,176 | 10 |
| Nonmetallic mineral products | 327 | 787 | 894 | 841 | 50,344 | 17 |
| Primary metals | 331 | 727 | 631 | 679 | 110,960 | 6 |
| Fabricated metal products | 332 | 1,512 | 1,375 | 1,444 | 174,165 | 8 |
| Machinery | 333 | 6,579 | 8,531 | 7,555 | 230,941 | 33 |
| Computer and electronic products | 334 | 48,296 | D | 24,148 | 472,330 | 51 |
| Electrical equipment, appliances, and components | 335 | 2,664 | 2,424 | 2,544 | 101,398 | 25 |
| Transportation equipment | 336 | D | D | 0 | 957,051 | See note |
| Motor vehicles, trailers, and parts | 3361-63 | 15,677 | D | 7,839 | 646,486 | 12 |
| Aerospace products and parts | 3364 | 13,086 | 15,005 | 14,046 | 227,271 | 62 |
| Other transportation equipment | other 336 | D | D | 0 | 63,294 | 0 |
| Furniture and related products | 337 | 408 | 400 | 404 | 48,534 | 8 |
| Miscellaneous manufacturing | 339 | 4,388 | 5,143 | 4,766 | 63,103 | 57 |
| Medical equipment and supplies | 3391 | 3,343 | 4,374 | 3,859 | 56,661 | 68 |
| Other miscellaneous manufacturing | other 339 | 1,045 | 769 | 907 | 26,442 | 34 |
| | | All R&D | | | | |
| Industry and company size | NAICS codes | 2004 | 2005 | 2004-2005 average | | |
| | | \$millions | | | | |
| Nonmanufacturing industries | 21-23, 42, 44-81 | 61,013 | 67,969 | 64,491 | 2,120,877 | 30 |
| Mining, extraction, and support activities | 21 | D | D | 0 | 33,665 | 0 |
| Utilities | 22 | 202 | 210 | 206 | 223,395 | 1 |
| Construction | 23 | 1,481 | D | 741 | 57,187 | 13 |
| Wholesale trade | 42 | D | D | 0 | 107,485 | 0 |
| Retail trade | 44, 45 | 1,596 | D | 798 | 232,150 | 3 |
| Transportation and warehousing* | 48, 49 | D | D | 0 | 79,436 | See Note |
| Information | 51 | 22,593 | 23,836 | 23,215 | 445,489 | 52 |
| Finance, insurance, and real estate | 52, 53 | 1,708 | 3,030 | 2,369 | 580,380 | 4 |
| Professional, scientific, and technical services | 54 | 28,709 | 32,021 | 30,365 | 261,500 | 116 |
| Architectural, engineering, and related services | 5413 | 4,265 | 4,687 | 4,476 | 50,121 | 89 |
| Computer systems design and related services | 5415 | 11,575 | 13,592 | 12,584 | 136,376 | 92 |
| Scientific R&D services | 5417 | 11,355 | 12,299 | 11,827 | 34,516 | 343 |
| Other professional, scientific, and technical services other | 54 | 1,514 | 1,444 | 1,479 | 40,487 | 37 |
| Health care services | 621-23 | 500 | 989 | 745 | 25,076 | 30 |
| Other nonmanufacturing* | 55, 56, 61, 624, 71, 72, 81 | 1,595 | 2,137 | 1,866 | 75,115 | 25 |

*We evaluate transportation as a medium R&D sector since three sectors dominate R&D expenditures of US multinationals operating abroad. These are transportation, chemicals and computers and electronics. Moreover, about two-thirds of all R&D expenditures of foreign multinationals operating in the US was performed in the same three sectors. See "U.S. and International Research and Development: Funds and Technology Linkages," at <http://www.nsf.gov/statistics/seind04/c4/c4s5.htm>.

SOURCE: Calculated from data in National Science Foundation, Division of Science Resources Statistics, *Survey of Industrial Research and Development: 2005, Data Tables*. Available at http://www.nsf.gov/statistics/nsf10319/content.cfm?pub_id=3750&id=3.

Appendix F:

Kenya Model with Multiple FDI and Trade Partners

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June 2010

This document presents the algebraic formulation of a general-equilibrium numeric-simulation model of the Kenya economy. The model is currently under development by the authors. An earlier version of this model was used to analyze unilateral services liberalization in Kenya [Balistreri et al. (2009)]. The model now includes features that allow for an analysis of regional trade agreements.

The model includes 55 goods and services, which are purchased by households, firms, and the government. Let the goods and services be indexed by $g \in G$. Divide these goods and services into the following three categories that define their treatment in the model formulation: (*i.*) Business Services, characterized by monopolistic competition and foreign direct investment (FDI), indexed by $i \in I \subset G$; (*ii.*) Dixit-Stiglitz manufacturing sectors, characterized by monopolistic competition, indexed by $j \in J \subset G$; and (*iii.*) Constant Returns To Scale (CRTS) goods indexed by $k \in K \subset G$. In the current aggregation there are 9 elements in I , 7 elements in J , and 39 elements in K . Goods and services are also classified by their associated region, indexed by $r \in R$, where there are 4 regions.¹ The accounts track the incomes of 10 rural and 10 urban households, indexed by $h \in H$, and

¹The current formulation includes Kenya or the domestic region (D), the European Union (EU), important African trade partners (AFR), and the rest-of-world region (ROW), such that $R = \{D, EU, AFR, ROW\}$.

there are 5 primary factors of production indexed by $f \in F$.

Table 1 summarizes the equilibrium conditions and associated variables. The non-linear system (of 1,364 equations and variables) is formulated in GAMS/MPSGE and solved using the PATH algorithm. We proceed with a description and algebraic representation of each of the conditions itemized in Table 1.

1 Dual representation of technologies and preferences

Technologies and preferences are represented in the Kenya model through value functions that embed the optimizing behavior of agents. Generally, any linearly-homogeneous transformation of inputs into outputs is fully characterized by a unit-cost (or expenditure) function. Setting the output price equal to optimized unit cost yields the equilibrium condition for the activity level of the transformation. That is, a competitive constant-returns activity will increase up to the point that marginal benefit (unit revenue) equals marginal cost. In the case of the Kenya model not all transformations are constant returns, so there are exceptions. In general, however, we will use the convention of setting unit revenues (left-hand side) equal to unit cost (right-hand side) and associating this equilibrium condition with a transformation activity level.

Agents in Kenya wishing to purchase a particular good or service g face an aggregate price PA^g . Let ts^g equal the sales tax rate such that $(1 - ts^g)PA^g$ is the net-of-tax price of the aggregate of domestic, foreign, and FDI (if applicable) varieties of g . In constructing the aggregate, we will rely on the following notation for the component prices:

- PD^g Gross price of domestic output ($\forall g \in G$),
- PM_r^g Gross price of cross-border imports from region r of Business Services and CRTS goods ($\forall g \in (I \cup K)$),
- P_r^g Dixit-Stiglitz price index on region- r varieties ($\forall g \in (I \cup J)$).

Table 1: General equilibrium conditions

| Equilibrium Condition | (Equation) | Associated Variable | Dimensions |
|---|--|--|--------------------|
| Dual representation of preferences and technologies: | | | |
| Armington unit-cost functions | (1) $\forall i \in I$ | A^g : Armington Activity | G |
| | (2) $\forall j \in J$ | | |
| | (3) $\forall k \in K$ | | |
| Dixit-Stiglitz price indexes | (4) $\forall g \in (I \cup J)$ | Q_r^g : D-S Activity by region | $(I + J) \times R$ |
| Zero Profits for Dixit-Stiglitz firms | (5) $\forall g \in (I \cup J)$ | N_r^g : Number of Firms | $(I + J) \times R$ |
| Dixit-Stiglitz composite input prices | (6) $\forall g \in (I \cup J)$ and $r = D$ | Z_r^g : IRTS resource use | $(I + J) \times R$ |
| | (7) $\forall j \in J$ and $r \neq D$ | | |
| | (8) $\forall i \in I$ and $r \neq D$ | | |
| Input-output technologies | (9) $\forall g \in G$ | Y^g : Production level | G |
| Constant elasticity of transformation | (10) $\forall k \in K$ | X^g : Index on CET activity | G |
| | (11) $\forall g \in (I \cup J)$ | (No Export Coefficients for $g \in (I \cup J)$) | |
| Exports | (12) $\forall k \in K$ and $r \neq D$ | EX_r^g : Exports | $G \times (R - 1)$ |
| | (13) $\forall g \in (I \cup J)$ and $r \neq D$ | | |
| Imports | (14) $\forall g \in G$ and $r \neq D$ | IM_r^g : Imports (net of FDI-firm imports) | $G \times (R - 1)$ |
| Unit expenditure function | (15) | U : Household utility index | 1 |
| Unit cost of public purchase | (16) | PUB : Government Activity | 1 |
| Unit cost of investment | (17) | INV : Investment Activity | 1 |
| Market clearance conditions: | | | |
| Composite goods and services | (18) $\forall g \in G$ | PA^g : Composite price indexes | G |
| D-S composites | (19) $\forall g \in (I \cup J)$ and $r \neq D$ | P_r^g : Prices of D-S composites | $(I + J) \times R$ |
| | (20) $\forall g \in (I \cup J)$ and $r = D$ | | |
| Markets for IRTS composite input | (21) $\forall g \in (I + J)$ | PMC^g : Composite input prices | $(I + J) \times R$ |
| Markets for domestic output | (22) $\forall k \in K$ | PD^g : Domestic output prices | G |
| | (23) $\forall i \in I$ | | |
| | (24) $\forall j \in J$ | | |
| Markets for export output | (25) $\forall k \in K$ and $r \neq D$ | PX_r^k : Export output prices | $K \times (R - 1)$ |
| Markets for gross output | (26) $\forall g \in G$ | PY_r^g : Output prices | G |
| Markets for imports | (27) $\forall i \in I$ and $r \neq D$ | PM_r^g : Import prices | $G \times (R - 1)$ |
| | (28) $\forall j \in J$ and $r \neq D$ | | |
| | (29) $\forall k \in K$ and $r \neq D$ | | |
| Factor markets | (30) $\forall f \in F$ | PF_f : Factor prices | F |
| IRTS specific factors | (31) $\forall g \in (I \cup J)$ | PZ_r^g : Sector-specific capital price | $(I + J) \times R$ |
| Fixed real investment | (32) | $PINV$: Unit cost of investment | 1 |
| Fixed real public spending | (33) | PG : Unit cost of public good | 1 |
| Enterprise owner transfers | (34) | PE : Price of a claim on firm income | 1 |
| Nominal utility equals Income | (35) | PC : Unit expenditure index | 1 |
| Balance of payments | (36) | $PFEX$: Price of foreign exchange | 1 |
| Income balance: | | | |
| Domestic agent income | (37) $\forall h \in H$ | RA_h : Household Income | H |
| Government budget | (38) | $GOVT$: Government spending | 1 |
| Enterprise income | (39) | ENT : Enterprise income | 1 |
| Foreign Entrepreneur | (40) | FE : External agent income | 1 |
| Auxiliary Conditions: | | | |
| Fixed real public spending | (41) | T : Index on direct taxes | 1 |
| Foreign Savings | (42) | KA : Capital Account | 1 |
| Total Dimensions: | | $6G + 6[(I + J) \times R] + 3[G \times (R - 1)] + [K \times (R - 1)] + F + H + 13 =$ | 1, 364 |

Assuming a Constant Elasticity of Substitution (CES) aggregation of the components we equate the net-of-tax prices to the CES unit-cost functions:

$$(1 - ts^g)PA^i = \left(\sum_r (P_r^i)^{1-\sigma_F^i} + \sum_r \phi_r^i (PM_r^i)^{1-\sigma_F^i} \right)^{1/(1-\sigma_F^i)} \quad (1)$$

$$(1 - ts^g)PA^j = \left(\sum_r (P_r^j)^{1-\sigma_F^j} \right)^{1/(1-\sigma_F^j)} \quad (2)$$

$$(1 - ts^g)PA^k = \left(\phi_D^k (PD^k)^{1-\sigma_{DM}^k} + \sum_r \phi_r^k (PM_r^k)^{1-\sigma_{DM}^k} \right)^{1/(1-\sigma_{DM}^k)}, \quad (3)$$

where $\sigma_F^g \forall g \in (I \cup J)$ is the Dixit-Stiglitz elasticity of substitution and σ_{DM}^k is the Armington elasticity of substitution on CRTS goods. The arguments of these functions are the component prices. The ϕ parameters are CES distribution parameters that indicate scale and weighting of the arguments. These are calibrated to the Kenyan social accounts such that the accounts are replicated in the benchmark equilibrium.

For the IRTS sectors we have the Dixit-Stiglitz price indexes. These are functions of the number of varieties, firm-level costs, and the optimal markup. Assuming each firm is small relative to the size of the market the demand elasticity for a firm's variety is σ_F^g and the optimal markup over marginal cost is given by $1/(1 - \frac{1}{\sigma_F^g})$. Let marginal cost equal $PMC_r^g \forall g \in (I \cup J)$, which is the price of a composite input to the Dixit-Stiglitz firms associated with region- r , and let the number of varieties by region equal $N_r^g \forall g \in (I \cup J)$. The price indexes for the Dixit-Stiglitz goods are thus given by

$$P_r^g = \left[N_r^g \left(\frac{PMC_r^g}{1 - \frac{1}{\sigma_F^g}} \right)^{1-\sigma_F^g} \right]^{1/(1-\sigma_F^g)} \quad \forall g \in (I \cup J). \quad (4)$$

In equilibrium, the number of varieties by region adjusts such that we have zero profits. Denote the Dixit-Stiglitz composite activity level associated with equation (4) by $Q_r^g \forall g \in (I \cup J)$. Given the Dixit-Stiglitz aggregation of varieties each firm produces a quantity

$Q_r^g(N_r^g)^{\sigma_F^g/(1-\sigma_F^g)}$. Assuming that fixed and variable costs are satisfied using the same input technology, and a firm-level fixed cost of f_r^g (in composite input units), we have the zero profit condition

$$f_r^g - \frac{Q_r^g(N_r^g)^{\sigma_F^g/(1-\sigma_F^g)}}{\sigma_F^g - 1} = 0 \quad \forall g \in (I \cup J). \quad (5)$$

The technologies for producing the composite inputs for use in the Dixit-Stiglitz sectors depend on the type of sector. For all of the sectors there is a sector-specific capital input from the respective source region. Let $PZ_r^g \forall g \in (I \cup J)$ be the price of this sector-specific capital input. Domestic firms (producing goods or services) use domestic inputs, so the unit cost function is given by

$$PMC_r^g = \left[\theta_{Zr}^g (PZ_r^g)^{1-\epsilon_r^g} + \theta_{Dr}^g (PD^g)^{1-\epsilon_r^g} \right]^{1/(1-\epsilon_r^g)}, \quad \text{for } r = D; \quad (6)$$

where ϵ_r^g is the elasticity of substitution between the sector-specific capital input and other inputs, and the θ 's are the CES distribution parameters. Imports of Dixit-Stiglitz goods embody the gross of tariff imported inputs:

$$PMC_r^j = \left[\theta_{Zr}^j (PZ_r^j)^{1-\epsilon_r^j} + \theta_{Mr}^j (PM_r^j)^{1-\epsilon_r^j} \right]^{1/(1-\epsilon_r^j)}, \quad \text{for } r \neq D. \quad (7)$$

FDI firms, on the other hand, use domestic inputs as well as a specialized imported service from the sources region. The price of the specialized imports equals the price of foreign exchange (denoted PFX) times one plus the tariff rate (denoted t_r^i). The unit cost for FDI firms is thus given by the following:

$$PMC_r^i = \left[\theta_{Zr}^i (PZ_r^i)^{1-\epsilon_r^i} + (\theta_{Dr}^i PD^i + \theta_{Mr}^i (1 + t_r^i) PFX)^{1-\epsilon_r^i} \right]^{1/(1-\epsilon_r^i)}, \quad \text{for } r \neq D. \quad (8)$$

For the CRTS sectors and upstream of the IRTS technologies, we have domestic production in accordance with the input output data. Denote the price of this output PY^s , for $s \in G$. The technology includes an upstream Cobb-Douglas value-added nest which then combines with intermediates (trading at PA^g) in fixed proportions. Let PF_f indicate the price of primary factor of production $f \in F$. The unit cost function is given by

$$PY^s = \beta_{VA}^s \prod_f PF_f^{\alpha_f^s} + \sum_g \beta_g^s PA^g \quad (9)$$

where the β are distribution parameters and α are value shares within the value-added nest ($\sum_f \alpha_f^s = 1 \forall s$).

For the CRTS sectors a constant elasticity of transformation (CET) activity splits domestic output (with a unit value PY^k) into goods destined for domestic versus the region-specific export markets. Let the export price (for goods destined for region $r \neq D$) be PX_r^k then the CET technology is given by

$$\left[\gamma_D^k (PD^k)^{1+\sigma_\tau} + \sum_{r \neq D} \gamma_r^k (PX_r^k)^{1+\sigma_\tau} \right]^{1/(1+\sigma_\tau)} = PY^k, \quad (10)$$

where σ_τ indicates the elasticity of transformation and the γ are the CET distribution parameters. In the case of IRTS sectors, we assume that domestic firms use domestic output to produce Dixit-Stiglitz varieties. Thus the CET technology collapses without export coefficients [$\gamma_r^g = 0 \forall g \in (I \cup J)$]:

$$PD^g = PY^g \quad \forall g \in (I \cup J). \quad (11)$$

For CRTS sectors the export commodity is traded for foreign exchange at a fixed rate. Let PFX equal the price of foreign exchange, and with a choice of units such that all unit export prices are one at the benchmark, we have the following specification for the CRTS

export activities:

$$PFX = PX_r^k \text{ for } r \neq D. \quad (12)$$

For the IRTS sectors, domestic firms export the firm-level good where foreign agents are assumed to behave according to Dixit-Stiglitz preferences that are the same as domestic agents. Domestic IRTS firms face an export demand elasticity for their variety of σ_F^g and thus price their exports using the optimal markup. In aggregate the IRTS export activities by region are characterized by

$$EX_r^g = \xi_r^g \left[\left(1 - \frac{1}{\sigma_F^g} \right) \frac{PFX}{PMC_D^g} \right]^{\sigma_F^g} \quad \forall g \in (I \cup J) \text{ and } r \neq D. \quad (13)$$

Cross-border imports are purchased at the price of foreign exchange times one plus the tariff rate, which sets up the arbitrage condition for each import activity;

$$PM_r^g = (1 + t_r^g) PFX \text{ for } r \neq D. \quad (14)$$

Final demand includes three categories: household demand, government demand, and investment. The representative agents for each household h are assumed to have identical Cobb-Douglas preferences over the aggregated goods and services. The preferences are specified via a unit expenditure function associated with an economy-wide utility index (U). Let PC be the true-cost-of-living index indicated by the following unit expenditure function:

$$PC = \prod_g (PA^g)^{\mu_C^g}, \quad (15)$$

where the μ are value shares. The government faces a Leontief price index, PG , for

government purchases:

$$PG = \sum_g \mu_G^g (PA^g). \quad (16)$$

Similarly the price of investment, $PINV$ is a Leontief aggregation of commodity purchases:

$$PINV = \sum_g \mu_{INV}^g (PA^g). \quad (17)$$

Equations (1) through (17) define all of the transformation technologies for the model.

Next we turn to a specification of the market clearance conditions for each price.

2 Market clearance conditions

For each good or service there is a market, and, for any non-zero equilibrium price, supply will equal demand. We will use the convention of equating supply, on the left-hand side, to demand, on the right-hand side. The unit-value functions presented above are quite useful in deriving the appropriate compensated demand functions, by the envelope theorem (Shephard's Lemma).

Supply of the composite goods and services, trading at PA^g , is given by the activity level, A^g , and demand is derived from each production or final demand activity that uses the good or service. The market clearance condition is given by

$$A^g = \sum_s \beta_g^s Y^s + \mu_C^g U \frac{PC}{PA^g} + \mu_G^g PUB + \mu_{INV}^g INV \quad (18)$$

For the IRTS sectors we have market clearance for the Dixit-Stiglitz regional composites:

$$Q_r^g = A^g \left(\frac{(1 - ts^g) PA^g}{P_r^g} \right)^{\sigma_F^g} \quad \forall g \in (I \cup J), \text{ for } r \neq D; \quad (19)$$

and for domestic firms we include demand for the Dixit-Stiglitz exports

$$Q_D^g = A^g \left(\frac{(1 - ts^g)PA^g}{P_D^g} \right)^{\sigma_F^g} + \sum_r EX_r^g \quad \forall g \in (I \cup J). \quad (20)$$

The IRTS composite input (trading at PMC_r^g) is supplied by an activity, denoted $Z_r^g \forall g \in (I \cup J)$, and is demanded by the firms:

$$Z_r^g = f_r^g N_r^g + Q_r^g (N_r^g)^{1/(1-\sigma_F^g)} \quad \forall g \in (I \cup J). \quad (21)$$

To derive (21) recall that firm-level output is $Q_r^g (N_r^g)^{\sigma_F^g/(1-\sigma_F^g)}$ so the use of the input across all firms is $Q_r^g (N_r^g)^{1/(1-\sigma_F^g)}$ plus the total input use on fixed costs, $f_r^g N_r^g$.

Market clearance for the domestic output of CRTS sectors depends on supply from the CET activity and demand from the Armington activity:

$$\gamma_D^k X^k \left(\frac{PD^k}{PY^k} \right)^{\sigma_\tau} = \phi_D^k A^k \left(\frac{(1 - ts^k)PA^k}{PD^k} \right)^{\sigma_{DM}^k}. \quad (22)$$

For IRTS sectors, supply is simply given by the CET activity (as there are no export coefficients in the CET technology for IRTS sectors). Output is then demanded by either the domestic or FDI firms. The market clearance conditions are given by

$$X^i = \theta_{DD}^i Z_D^i \left(\frac{PMC_D^i}{PD^i} \right)^{\epsilon_D^i} + \sum_{r \neq D} \theta_{Dr}^i Z_r^i \left(\frac{PMC_r^i}{\theta_{Dr}^i PD^i + \theta_{Mr}^i (1 + t_r^i) PFX} \right)^{\epsilon_r^i} \quad (23)$$

for the service sectors, and

$$X^j = \theta_{DD}^j Z_D^j \left(\frac{PMC_D^j}{PD^j} \right)^{\epsilon_D^j} \quad (24)$$

for the Dixit-Stiglitz goods sectors.

Market clearance for exports of CRTS output is given by the CET supply function and demand is given by the export activity level (export demand is perfectly elastic):

$$\gamma_r^k X^k \left(\frac{PX_r^k}{PY^k} \right)^{\sigma_\tau} = EX_r^k, \quad \text{for } r \neq D. \quad (25)$$

Reconciling gross output with the CET activities, we have market clearance for the commodities that trade at PY^g :

$$Y^g = X^g. \quad (26)$$

Import supply is perfectly elastic and import demand is derived from the Armington activities or embodied in the foreign Dixit-Stiglitz firm's inputs. For $r \neq D$, we have the following:

$$IM_r^i = \phi_r^i A^i \left(\frac{(1 - ts^i) PA^i}{PM_r^i} \right)^{\sigma_F^i} \quad (27)$$

$$IM_r^j = \theta_{Mr}^j Z_r^j \left(\frac{PMC_r^j}{PM_r^j} \right)^{e_r^j} \quad (28)$$

$$IM_r^k = \phi_r^k A^k \left(\frac{(1 - ts^k) PA^k}{PM_r^k} \right)^{\sigma_{DM}^k}. \quad (29)$$

Factor markets clear, where factor supply is given by the exogenous endowments to households, denoted \bar{S}_{fh} , and input demands are derived from the cost functions:

$$\sum_h \bar{S}_{fh} = \sum_s \alpha_f^s Y^s \left(\frac{PY^s - \sum_g \beta_g^s PA^g}{PF_f} \right). \quad (30)$$

In addition, we have the market for the specific factor used in the IRTS sectors. Denoting

the regional endowments of the specific factors $\overline{SF}_r^g \quad \forall g \in (I \cup J)$, we have:

$$\overline{SF}_r^g = \theta_{Z_r}^g Z_r^g \left(\frac{PMC_r^g}{PZ_r^g} \right)^{\epsilon_r^g} \quad \forall g \in (I \cup J). \quad (31)$$

Real investment equals real savings by households, enterprises, the government, and indirect foreign investment:

$$INV = \sum_h \overline{sav}_h + \overline{sav}_{ent} + \overline{sav}_G + \overline{sav}_{row}. \quad (32)$$

Real government purchases equal the nominal government budget scaled by the government price index:

$$PUB = \frac{GOVT}{PG}. \quad (33)$$

Enterprises earn net income of ENT , other agents (households, the government, and foreign entrepreneurs) own claims to this income. We set up the transfer of income as a market clearance condition for claims, which trade at a price PE . The claims are indicated by the $\bar{\zeta}$ coefficients and these are serviced by net enterprise income scaled by the price of the claims:

$$\sum_h \bar{\zeta}_h + \bar{\zeta}_{gov} + \bar{\zeta}_{FE} = \frac{ENT}{PE}. \quad (34)$$

Thus the nominal value of enterprise income transferred to households, the government, and foreign entrepreneurs equals ENT .

Household utility (U) equals nominal income across households scaled by the true-cost-of-living index. That is, we represent an aggregate activity U , which supplies *utils* to the households. For the representative agent of household type h denote nominal income

RA_h . The market clearance condition for *utils* is thus

$$U = \frac{\sum_h RA_h}{PC}. \quad (35)$$

The final market clearance condition reconciles the balance of payments. The supply of foreign exchange includes its generation in the export activities and net borrowing from the rest of the world (net capital account surpluses). The real capital account surplus includes an endogenous component, denoted KA , and an exogenous residual transfer (from foreigners to the domestic government), denoted \overline{ftrn} . Foreign exchange is demanded for direct import purchases as well as the payments to foreign agents for their contribution to production.

$$\begin{aligned} \sum_{r \neq D} \sum_g EX_r^g + (KA + \overline{ftrn}) &= \sum_{r \neq D} \sum_g IM_r^g \\ &+ \sum_{r \neq D} \sum_i \theta_{Mr}^i Z_r^i \left(\frac{PMC_r^i}{\theta_{Dr}^i PD^i + \theta_{Mr}^i (1 + t_r^i) PFX} \right)^{\epsilon_r^i} \\ &+ \frac{FE}{PFX}, \end{aligned} \quad (36)$$

where FE equals the nominal claims that the foreign entrepreneurs have on specific factor rents and enterprise income.

3 Income Balance Conditions

The representative agent for household h earns income from factor endowments and claims on enterprise income, but disposable income nets out savings and direct taxes. Real savings is held fixed (by the coefficient \overline{sav}_h). We also hold fixed the real level of government spending, but this requires an adjustment in direct taxes on households. Removal of tariffs, for example, impact the government budget and the shortfall is made up for by an

endogenous increase in the direct taxes on households. We use the auxiliary variable T to scale the direct taxes appropriately. Household h 's budget is given by

$$\begin{aligned}
RA_h &= \sum_f PF_f \bar{S}_{fh} \\
&+ \bar{\zeta}_h PE \\
&- \bar{sav}_h PINV \\
&- \overline{dta}x_h PG \times T
\end{aligned} \tag{37}$$

The government budget is given by direct taxes, sales taxes, tariff revenues, and claims on enterprise income. The government budget also captures the capital account balance and its conversion to investment by foreign agents.² In addition, the government's budget is augmented by foreign transfers of foreign exchange and reduced by direct public savings. The full nominal government budget is

$$\begin{aligned}
GOVT &= \overline{dta}x_h PG \times T \\
&+ \overline{dta}x_{ent} PG \\
&+ \sum_g ts^g PA^g A^g \\
&+ \sum_{r \neq D} \sum_g t_r^g (PFX) IM_r^g \\
&+ \sum_{r \neq D} \sum_i t_r^i (PFX) \theta_{Mr}^i Z_r^i \left(\frac{PMC_r^i}{\theta_{Dr}^i PD^i + \theta_{Mr}^i (1 + t_r^i) PFX} \right)^{\epsilon_r^i} \\
&+ \bar{\zeta}_{gov} PE \\
&+ (PFX) KA - \bar{sav}_{row} PINV \\
&+ \overline{ftrn} PFX
\end{aligned}$$

²Nominal government income is increased by $(PFX)KA$ but this is offset by nominal investments of $(\bar{sav}_{row})PINV$. Equation (42) is added to the equilibrium system to ensure that the nominal value of capital inflows equals the nominal investment by the modeled government agent acting on behalf of the foreign investors.

$$- \overline{sav}_G PINV \tag{38}$$

Again, the index T is adjusted endogenously to hold the real level of public spending fixed.

We now turn to enterprise income. Enterprises earn income on the domestic specific factors. Real spending by enterprises on direct taxes and savings are held fixed. The net income is then available to be transferred to one of the agents [via equation (34)]. Enterprise income is given by

$$\begin{aligned} ENT &= \sum_g PZ_D^g \overline{SF}_D^g \\ &- \overline{sav}_{ent} PINV \\ &- \overline{dtax}_{ent} PG \end{aligned} \tag{39}$$

We also need an agent representing the foreign entrepreneur. The foreign entrepreneur's nominal income is FE , which is spent on foreign exchange, and consists of the specific factor payments and the distributed enterprise payments:

$$FE = \sum_{r \neq D} \sum_g PZ_r^g \overline{SF}_r^g + \overline{\zeta}_{FE} PE \tag{40}$$

4 Auxiliary Conditions

In addition to the three sets of standard conditions presented above, we need to close the model with a couple of auxiliary conditions. First, we need to determine the index on direct taxes of households. Associated with the variable T is the following condition:

$$PUB = \overline{pb}. \tag{41}$$

This holds fixed the real size of the government at the exogenous level \overline{pb} . Lastly, we reconcile relative price changes that affect capital flows. Foreign agents interested in investing in Kenya will consider the relative price of investment to the price of foreign exchange. Associated with the variable KA is the following condition:

$$(PFX)KA = (\overline{sav}_{row})PINV. \quad (42)$$

From the perspective of the foreign agent, real indirect investment in Kenya is held fixed, and the term $[(PFX)KA - \overline{sav}_{row}PINV]$ drops out of the government budget.

Equations (1) through (42) define the general equilibrium simulation model of Kenya. The functions are calibrated to the social accounts, such that the social accounts are replicated in the benchmark solution.

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Appendix G:

A note on the relationship between sector specific capital and the elasticity of supply in applied general equilibrium models of imperfect competition*

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June 2, 2010

The models developed by Balistreri et al. (2009) and Jensen et al. (2008) to analyze services liberalization in Kenya and Tanzania utilize a specific-factor formulation. The specific-factor formulation facilitates a calibration of the FDI and domestic service responses. This is important because the empirical evidence [Hummels and Klenow (2005)] indicates that varieties expand less than proportionately to market size. The expansion of services bids up the price of the specific factor resulting in increasing costs (upward sloping supply). These increasing costs ensure that the varieties expand less than proportionately to market size. The predetermined elasticity of supply controls the magnitude of these effects. This note outlines the calibration procedure.

One can calibrate a linearly-homogeneous (constant-returns) Constant Elasticity of Substitution (CES) technology to an arbitrary price elasticity of supply if some of the input value is allocated to a specific factor. In the context of the Kenyan and Tanzania models the supply elasticity applies to the composite input that is used in both fixed and variable costs associated with the services sectors.

To simplify the presentation, consider the composite input for a single type of firm (say domestic firms) and for a single industry (say Communications). Let the quantity of this

*This note is largely based on lecture notes from Thomas F. Rutherford's graduate course on Computational Economics at the University of Colorado (late 1990's)

composite input be denoted y with a market price of p . Denote the associated nested CES unit cost function $c(\vec{r})$, where \vec{r} is a vector of input prices. With competition for the composite input we have

$$p = c(\vec{r}) \equiv \min \{ \vec{r}'\vec{x} \text{ s.t. } f(\vec{x}) = 1 \}, \quad (1)$$

where \vec{x} is the vector of inputs and the function, $y = f(\vec{x})$, is the CES technology for aggregating inputs. Denote the fixed quantity of the sector specific input \bar{R} with price r_1 , and assume that all of the mobile inputs can be combined into a separable composite X with composite price r_2 (that is, $\vec{x} = \{\bar{R}, X\}$ and $\vec{r} = \{r_1, r_2\}$).¹ We thus have the explicit expression:

$$p = c(r_1, r_2) \equiv \min \left\{ r_1 \bar{R} + r_2 X \text{ s.t. } \left[\alpha_R \bar{R}^\rho + \alpha_X X^\rho \right]^{1/\rho} = 1 \right\}, \quad (2)$$

where ρ indicates the elasticity of substitution, $\sigma = 1/(1 - \rho)$, and α_R and α_X are the CES distribution parameters. Choosing units carefully (such that $p = r_1 = r_2 = 1$) at the benchmark and solving (2) we have the unit cost function:

$$c(r_1, r_2) = \left[\theta r_1^{1-\sigma} + (1 - \theta) r_2^{1-\sigma} \right]^{\frac{1}{1-\sigma}}, \quad (3)$$

where θ is the benchmark value share of the sector specific input. Given that the quantity \bar{R} is fixed in supply the price r_1 is a residual. The technology *de facto* exhibits decreasing returns (upward sloping supply) because the only way to increase y is to increase X at

¹The variable X is a nested CES subcomposite of all of the inputs excluding \bar{R} . Define \vec{z} as the vector of all inputs other than \bar{R} , and define \vec{s} as the vector of corresponding input prices. Let $X = g(\vec{z})$, so we have $r_2 = \min \{ \vec{s}'\vec{z} \text{ s.t. } g(\vec{z}) = 1 \}$, where $g(\vec{z})$ is a nested CES function and the input vector \vec{z} may include intermediates. The actual specification of $g(\vec{z})$ is not a concern here because the supply elasticity is inherently dependent on the concept of partial differentiation (changes in the elements in \vec{s} are not considered). In fact, we are only concerned with the supply elasticity local to the benchmark equilibrium, where r_2 takes on a specific numeric value.

diminishing marginal product (as the \bar{R} to X ratio falls).

Using Shepard's lemma to derive demand for \bar{R} we can represent the overall resource constraint on the specific factor as follows:

$$\begin{aligned}\bar{R} &= y \frac{\partial c(\vec{r})}{\partial r_1} \\ &= \theta y \left(\frac{p}{r_1} \right)^\sigma.\end{aligned}\tag{4}$$

Solving for the residual price

$$r_1 = p \left(\frac{\theta y}{\bar{R}} \right)^{1/\sigma},\tag{5}$$

and then substituting this back into the unit cost function we have:

$$p^{1-\sigma} = \theta p^{1-\sigma} \left(\frac{\theta y}{\bar{R}} \right)^{\frac{1-\sigma}{\sigma}} + (1-\theta)r_2^{1-\sigma}.\tag{6}$$

Solving for y as a function of the resource constraint and the price ratio (r_2/p) we have supply:

$$y = \bar{R} \theta^{\frac{1}{\sigma-1}} \left[1 - (1-\theta) \left(\frac{r_2}{p} \right)^{1-\sigma} \right]^{\frac{\sigma}{1-\sigma}}.\tag{7}$$

The supply elasticity is given by

$$\eta \equiv \frac{\partial y}{\partial p} \frac{p}{y} = \frac{\sigma(1-\theta)}{-1 + \theta + \left(\frac{r_2}{p} \right)^{\sigma-1}},\tag{8}$$

and evaluating this local to the benchmark equilibrium ($r_2 = p = 1$) we have

$$\eta = \frac{\sigma(1-\theta)}{\theta}.\tag{9}$$

This equation gives us the fundamental relationship between the local supply elasticity and the CES parameters.

Notice that there are many combinations of value shares and substitution elasticities that yield the same local supply elasticity. If the goal is to calibrate the model to a given value of η there are a couple of options. For example, one could simply lock down the value of σ (at say $\sigma = 1$, which is Cobb-Douglas) and then calculate the appropriate overall value share of the specific factor (at $\sigma = 1$ we have $\theta = 1/(1 + \eta)$). In empirical applications, however, this calibration method can be problematic, because the value of θ may be constrained by the social accounts.

In the Kenya and Tanzania models we choose a different calibration strategy. We observe the value of capital payments in the social accounts, and it is logical that these include payments to the specific factor. Denote the observed capital payments vk and the overall value of output vy . Now if we choose a share of the capital payments that should be allocated to the specific factor, call this θ_k , we can calculate the appropriate elasticity of substitution as follows:

$$\sigma = \frac{\eta\theta}{1 - \theta}, \tag{10}$$

where $\theta = \theta_k(vk/vy)$.

In sensitivity analysis on the Kenya and Tanzania models we hold fixed the value of $\theta_k = 0.5$ and vary the value of η . As η increases the calibrated elasticity of substitution increases and we observe a more elastic supply response. In terms of varieties, we observe that the change in the number of varieties is closer to proportional to the change in market size as η increases.

One might consider sensitivity analysis on the value of θ_k , but this will not necessarily generate intuitive responses. In fact, as long as the counterfactual is local to the benchmark equilibrium there should be no effect of changing θ_k . As θ_k increases the value of $\theta/(1 - \theta)$ falls and, according to equation (10), the calibrated value of σ falls to compensate. So larger value shares will not necessarily generate larger supply responses. In fact, by design, the

local impact of a change in θ_k is zero.

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