

Services Liberalization in Preferential Trade Arrangements: The Case of Kenya

by

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and

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Abstract: In this paper we develop an innovative computable general equilibrium model with foreign direct investment that allows us to assess preferential trade agreements that include commitments to multinational investors in services. The model, which we apply to Kenya, contains Dixit-Stiglitz productivity effects from additional varieties of imperfectly competitive goods or 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. Our central estimate for Kenya regarding a preferential arrangement with the Africa region that includes services commitments is that it will obtain very small gains; but there is a two percent chance Kenya would lose from the agreement. These possible losses show that there is an imperfect competition analogy to trade diversion in goods, whereby preferential commitments in services could be immiserising. Further sensitivity analysis shows that losses are more likely the more technologically advanced are the excluded regions relative to the partner region, and the greater the rent capture on initial barriers in services. Estimated gains for a similar agreement with the European Union are two to three times larger, and these occur with probability one. Multilateral liberalization would yield gains five times greater than a preferential agreement with the European Union, but the largest estimated gains derive from removal of regulatory barriers that impose costs on Kenyan as well as multinational service providers.

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I. Introduction

Both economic theory (e.g., Markusen, 1989; Francois, 1990; Markusen and Venables, 1998) and empirical literature have shown that foreign direct investment and the wide availability of business services results in total factor productivity gains to the manufacturing sector and the economy broadly.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. But refusing to open up to FDI from the more technologically advanced Northern countries could mean that Southern countries do not obtain the most significant productivity advances, or possibly even regress if Northern technology is diverted.

Since the early 1990s, regional trade agreements have surged; 283 have been notified to the WTO and were in force as of February 2010, and policy-makers have expressed demand for analysis of their implications.² Applied general equilibrium modelers have responded with a substantial number of studies that examine regional agreements in goods, including Harris (1984), Levy and van Wijnbergen (1995), Smith and Venables (1988) and Harrison, Rutherford and Tarr (1996, 1997, 2002, 2003). There have also been several papers in recent years that examine FDI in services, without a regional dimension,

¹ See Francois and Hoekman (2010) for a survey of more than a dozen empirical studies that support this finding. Also see the survey in Jensen and Tarr (2010) for additional studies. Support comes from a variety of sources including studies that use firm level data, such as Arnold et al. (2007) for the Czech Republic and Fernandes and Paunov (2008) for Chile, and studies that use cross country growth regressions, e.g., Mattoo, Rathindran and Subramanian (2006) and Fernandes (2009).

² See 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.

including Markusen, Rutherford and Tarr (2005), Brown and Stern (2001), Dee et al. (2003), Jensen, Rutherford and Tarr (2007, 2010), Rutherford and Tarr (2008) and Balistreri, Rutherford and Tarr (2009). But given that commitments to foreign investors in services are key aspects of modern FTA agreements negotiated with the EU, the US and in some other agreements, and the evidence on the productivity gains of FDI in services, economists need to have a framework to be able to assess the impact of preferential commitments to foreign investors in services.

Kenya, like many developing countries, is faced with multiple preferential trade and FDI options as well as multilateral decisions. In 2011 it is involved in negotiations of commitments in services in various regional arrangements, including the Economic Partnership Agreements with the European Union, the Common Market for Eastern and Southern Africa (COMESA), the East African Customs Union and possibly the South African Development Community (SADC) as well.³ 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 making commitments in services within the East African Customs Union, including a mutual recognition agreement in professional services, but its policy-makers have sought advice on the impact of these agreements for Kenya as well as for its partners.

In this paper, we develop an innovative 55 sector small open economy computable general equilibrium model of Kenya to assess the impact of Kenya's preferential agreements that include commitments to foreign investors in services. We build on the model of Balistreri, Rutherford and Tarr (2009), but decompose the rest of the world into the European Union, our Africa region and the Rest of the World to assess regional trade issues. The model contains foreign direct investment in services (from all regions in the model) with Dixit-Stiglitz endogenous productivity effects from additional varieties of services. Based on the now extensive econometric literature begun by Coe and Helpman (1995), we allow the endogenous productivity effects to vary by the level of development of the partner region, and by sector.

³ See Balistreri and Tarr (2011, table 1) for a list of COMESA and East African Customs Union countries. While Kenya is not presently a member of the SADC, COMESA and SADC are negotiating a free trade agreement.

Estimated gains for an agreement with the African region are very small, but a similar agreement with the European Union is estimated to yield gains that are two to three times larger. Multilateral liberalization would yield gains five times greater than a preferential agreement with the European Union, but the largest estimated gains derive from removal of regulatory barriers that impose costs on Kenyan as well as multinational service providers.

To assess the robustness of the results to parameter uncertainty, we conduct systematic sensitivity analysis, where we execute the model 30,000 times, where each simulation is based on a random draw of all the parameter values, including the share of rents captured by Kenyan agents. We then present the key results as sample distributions and sample confidence intervals. We estimate that Kenya would realize gains from an agreement with the European Union with a probability of one, but there is a 1.9 percent chance that Kenya would lose from a preferential arrangement with the Africa region.

Preferential liberalization of services barriers results in an increase in varieties for regional partners, but losses of varieties from excluded countries. The possible losses for Kenya in a services agreement with our Africa region show that there is an imperfect competition analogy to trade diversion in goods whereby preferential commitments in services could be immiserising due to a loss of varieties of services from excluded countries.

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. We show that the parameter that captures the capacity of a region to transfer technology to Kenya is quite important in explaining why an agreement with the technologically advanced region (the EU) is worth about twice as much to Kenya as an agreement with the developing country region.

It is well known that preferential liberalization of goods can lead to welfare losses, due to the loss of tariff revenue on diverted trade from excluded partners. While there are no tariffs on FDI in services, if the home country captures rents from regulatory barriers, they play an analogous role as tariffs

in service liberalization. If Kenyans are assumed to capture the rents from barriers in services, then, even in a constant returns to scale version of our model, the mean estimate from is that Kenya would lose.

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. Conclusions are presented in section VIII.

II. Overview of the Kenyan Service Sectors

In this section, we briefly 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, which are summarized in more detail in Balistreri and Tarr (2011).

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 plagued by significant bureaucratic, regulatory as well as investment problems—problems that raise the costs of transportation of its goods. On the international Logistics Perception Index of 2004,⁴ Kenya was ranked as the least logistically friendly of the 70 countries (World Bank, 2007). For 2010, the survey expanded to include

⁴ 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.

155 countries, and Kenya ranked at number 99. In Africa, Kenya ranked number 11 out of 36 sub-Saharan countries.

Telecommunications

Kenya's telecommunications services have been expensive compared with other sub-Saharan African countries and even more when compared with those of East and South Asia. Data transmissions are especially expensive by international standards.⁵ Perhaps more important, is the low efficiency of service provision (see World Bank, 2007, pp.45-47). Kenya has required that telephone companies must be at least 30 percent owned by Kenyan nationals. Problems related to the licensing of the third mobile telephone provider and the "Second National Operator" were primarily due to this restraint. In fact, the Government has acknowledged that the 30 percent ownership requirement has delayed licensing of additional telecom operators.

Banking and Insurance

Relative to other countries in Africa, Kenya has a well developed financial sector. Nonetheless, medium, small and micro enterprises have severe problems accessing credit and obtaining insurance (World Bank, 2007). 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 in the sector by binding this commitment at the WTO (Kiptui, 2007). Branch banking by foreign banks, however, is not permitted. Regarding the regulatory environment in insurance, 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.

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

⁵ Surprisingly, this does not appear to have improved in 2010 after the completion of the underwater fiber-optic cable connection to Kenya.

mutual recognition agreements among the members. In appendix D, we provide details on the situation in engineering services sectors.

III. Estimation of the Ad Valorem Equivalence of the Regulatory Barriers

We first 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.⁶ We supplemented this information based on Kiptui (2007) and several other good studies on the services sectors that were presented at the conference on “Trade in Services” in Nairobi, Kenya on March 26-27, 2007. The study by the World Bank (2007) provided additional detail on the key issues in the telecommunications and transportation sectors. 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, based on a separate survey, we used engineering services as a proxy for all professional services.⁷ The details of the regulatory regime and the scoring are explained in appendix D of Balistreri and Tarr (2011).

This methodology further involves building on the estimates and methodology of several researchers who published the research in the volume by C. Findlay and T. Warren (2000), notably papers by Warren (2000) in telecom, McGuire and Schulele (2000) in financial services and Kang (2000) in transportation. 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

⁶ We thank Ms. Sonal Sejjal of the law firm of Anjarwalla & Khanna Advocates for leading this research effort.

⁷ 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.

the ad valorem impact of a reduction in barriers⁸ 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 1.

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 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 details of the regulatory regime and the scoring are listed as appendix D of Balistreri and Tarr (2011).

IV. Overview of the Model

A full algebraic description of the model may be found in Balistreri and Tarr (2011, appendix F). Here we provide a general description of the structure while focusing on the extensions to a model that can address preferential liberalization. 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. This is explained algebraically in appendix G of Balistreri and Tarr (2011).

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 from earlier work of Balistreri, Rutherford and Tarr (2009) is that we disaggregate the rest of the world region into three regions: (1) the European Union; (2) the union of the

⁸ 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.

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 does not vary with output) 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.

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 a 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.⁹ 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.¹⁰

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 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 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

⁹ 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).

¹⁰ Daniels (1985) found that service providers charge higher prices when the service is provided at a distance.

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 transfer¹¹

Winters et al. (2004, 84) 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.” Beginning with the path-breaking work of Coe and Helpman (1995), a rich literature exists that shows that the purchase of intermediate inputs is an important mechanism for the transmission of knowledge and the increase in total factor productivity growth in developing countries, and that for small countries, especially developing countries this mechanism is crucial.¹²

Regarding the impact of FDI on the productivity of firms, the results depend on intra-industry versus inter-industry impacts. Since FDI in the same industry may bring spillovers, but has an adverse competitive or market share impact, the literature has found mixed results on the productivity of firms in the same industry that receives the FDI. But several papers have found significant productivity spillovers from FDI in both upstream (supplying) industries and downstream (using) industries. Saggi (2006) summarizes the theory and empirical papers that show the spillovers of FDI on supplying industries. Regarding the productivity impacts specifically from FDI in services, we have summarized the literature in the first section.

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.¹³ Consequently, we take variety as a proxy for the various ways increased trade can increase productivity. A key article on the role of product variety is Broda and Weinstein (2004), which found that increased product variety contributes to a fall of 1.2 percent per year in the “true” import price index. Hummels and

¹¹ See Jensen and Tarr (2010) for details and references to additional empirical studies in this subsection.

¹² 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 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.

¹³ 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.

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.

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 firm supply with respect to the price. The primitive for this elasticity in our model is the share of sector specific capital associated with the production of a firm type in a sector. As explained in Balistreri and Tarr (2011, appendix F), given an elasticity of firm supply and the Dixit-Stiglitz elasticity of substitution, we solve for the share of sector specific capital consistent with these elasticities. Based on the literature summary in Jensen and Tarr (2010, Appendix E), we assign central values to the elasticities of firm supply 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 2. 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). 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 Kenyan Central Bureau of Statistics) and the single financial services sector into insurance, and banking and other financial services, from data in the same source. A full listing of the sectors and factors of production is provided in table 1.

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. In appendix A, we calculate and report data for the East African Customs Union and COMESA separately. We mapped two digit sectors from the COMTRADE database into the sectors of our model. The exact mapping of sectors and countries and results for both exports and imports are reported in appendix A of Balistreri and Tarr (2011).

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.¹⁴ 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.

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. Since zero tariffs apply on all imports from the East African Customs Union and from COMESA, 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

¹⁴ Economic Survey (2006, pp. 103, 115).

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 2. Documentation of the results, with listing by firm, sector and region, and the data sources are presented in appendix B of Balistreri and Tarr (2011).

Share of Expatriate Labor Employed by Multinational Service Providers.

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.¹⁵ Our estimated share of foreign inputs used by multinationals in Kenya is presented in table 4 on sensitivity analysis.

Estimates of the Dixit-Stiglitz Elasticities of Substitution for Goods

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. We explain in appendix C of Balistreri and Tarr (2011), how we mapped the 3 digit elasticities for 130 goods sectors estimated by Broda et al. into the sectors of our model.

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

¹⁵ 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.

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 fifty 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 fifty 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. These results are presented in table 3. 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.

Aggregate Effects¹⁶

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

¹⁶ Discussion of additional scenarios in the table may be found in Balestreri and Tarr (2011).

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 central results table, 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 2.¹⁷ In Balistreri and Tarr (2011) we show that the number of varieties from the EU substantially increases as a result of preferential liberalization with the EU, while 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.

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

¹⁷ 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.

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 Balistreri, 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 fifty 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.

VII. Sensitivity Analysis

In this section we assess the impact of parameter values and key modeling assumptions on the results. In table 4, we show the “piecemeal sensitivity analysis,” where we change the value of a single parameter while holding the values of all other parameters unchanged at our central elasticity values. This table also shows the impact of some key modeling assumptions. We devote special attention to the role of the elasticity of firm supply.

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 θ_r “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 forty 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 0.29 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 of Parameters

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 per cent of consumption from a preferential agreement with the EU and five 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 now 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 fifty 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 in this case 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 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 it also leads to a loss of service providers (varieties) from all excluded regions and the home country, which results in a loss of productivity. 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, thereby making it more likely that the preferential liberalization is welfare enhancing. 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 (the excluded country impact is more significant in figure 2). In addition to the variety impacts in imperfect competition, the rent and terms of trade impacts (which are present in perfect competition) 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 4), 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 sample distributions of the results for preferential reduction of barriers with African partners on welfare and output, respectively, are shown in figures 3 and 4, and similar figures for the preferential trade agreement with the EU in figures 5 and 6. For the Africa-Kenya FTA, we find that 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 be immiserizing. A 95 percent confidence interval for equivalent variation as a percent of consumption is: 0.008 to 0.417 around a sample mean of .203.¹⁸ For a free trade agreement with the EU that includes services, there are no negative welfare results. A 95 percent confidence interval for equivalent variation as a percent of consumption is: 0.37 to 0.94 around a sample mean of 0.63.¹⁹

To further establish the relative importance of technology transfer in the choice of partners in preferential trade arrangements, we executed a second systematic sensitivity analysis of 30,000 runs. In this alternative systematic sensitivity analysis, we choose uniform pdfs for ϵ_{AFR} , ϵ_{EU} and ϵ_{ROW} with lower and upper bounds for ϵ_{AFR} of 1 and 3, for ϵ_{EU} of 5 and 15 and for ϵ_{ROW} of 7.5 and 22.5. All other probability distributions for all other parameters are unchanged, i.e., are as in table 4. Our median estimate for the gains from a preferential agreement with the Africa region falls, and the chance of the agreement yielding negative values increases to 9.5 percent. Figures 1 and 2 suggest that the key change in this alternate systematic sensitivity analysis is the lower pdf for ϵ_{AFR} .

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, but the confidence intervals of expected output change are large for other manufactured food, maritime transportation, coffee and mining (among the expanding sectors) and (on the negative side) sugarcane, other manufactures and metals and machines. For several sectors, where the mean change in output is close to zero, notably wood and paper, and tea, 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

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

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

again of wood and paper). Confidence intervals are much less tight for sectors with significant predicted changes. For five sectors (other manufactured food, coffee, mining, road services and maritime services) 50 percent confidence intervals indicate the sectors will expand; but 95 percent confidence intervals contain negative values. We conclude the predicted output changes for these sectors are not robust.

VIII. 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 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. We have conducted extensive sensitivity analysis and find that mean estimate of the gains to Kenya from preferential reduction of barriers in services with the Africa region is very small, and there is a 1.9 percent chance that it would lose from such an agreement. Estimated gains for the agreement with the European Union are two to three times larger and occur with probability one. Both piecemeal and further systematic sensitivity analysis show that the estimated gains for the agreement with the Africa region are smaller because Africa is less technologically advanced than the European Union-- trade and FDI with the technologically advanced EU region leads to greater endogenous productivity gains. We also show that losses from a preferential agreement are more likely and the greater the rent capture on initial barriers in services. We estimate that multilateral liberalization dominates preferential liberalization, as it would yield gains five times greater than a preferential agreement with the European Union; but the largest estimated gains derive from removal of non-discriminatory regulatory barriers that impose costs on Kenyan as well as multinational service providers.

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Table 1 -- 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 2 -- Market Shares in Kenyan Services Sectors with FDI (%) and estimates of elasticity of firms' supply with respect to price for Kenya by sector and by Kenyan trading partner region

	Market Shares in Services Sectors with FDI				Elasticity of supply with respect to price by Kenyan trading partner region			R&D expenditures divided by sales (times 1000) for the US*
	Kenya	EU	Africa	ROW	Africa	EU	ROW	
BUSINESS SERVICES								
Communication	26	49	0	25	2.5	13.4	20	52-high
Insurance	85	4	0	11	3.3	3.3	10	4-low
Banking	62	29	0	9	3.3	3.3	10	4-low
Professional services	94	2	2	2	2.5	13.4	20	116-high
Road services	80	2	10	4	3.3	3.3	10	low
Railway transport**	0	0	0	100	1.9	10	15	medium
Maritime transport**	45	25	15	15	1.9	10	15	medium
Pipeline transport**	70	0	13	18	1.9	10	15	medium
Airline transport**	30	30	5	30	1.9	10	15	medium
MANUFACTURING								
beverages and tobacco					3.3	3.3	10	14-low
grain milling***					3.3	3.3	10	7-low
sugar&bakery&confectioners***					3.3	3.3	10	7-low
petroleum					3.3	3.3	10	2-low
chemicals					1.9	10	15	34-medium
metals and machines****					1.9	10	15	33-medium
non-metallic products****					3.3	3.3	10	0-17-low
*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 .								
confectioners; machinery is used for metals and machines; for non-metallic products, we used plastics, rubber, mineral and wood products.								
Source: Authors' estimates. For details, see Balistreri and Tarr (2011).								

Table 3: Summary of Results (results are percentage change from initial equilibrium, unless otherwise indicated)

No initial rent capture case except numbers in parentheses. Values in parentheses are for the initial rent capture case.

Scenario definition	Benchmark	EU Discriminatory			EU-Africa		Unilateral	Unilateral	Unilateral	Unilateral & Domestic
		EU FTA	Services	EU Tariffs	Africa FTA	FTA		Discriminatory Services		
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)		0.7 (0.5)	0.5 (0.3)	0.2 (0.2)	0.3 (0.1)	1.0 (0.5)	3.6 (2.9)	1.5 (0.9)	2.0 (2.0)	10.3 (7.0)
Welfare (EV as % of GDP)		0.6 (0.4)	0.4 (0.3)	0.1 (0.1)	0.2 (0.0)	0.8 (0.5)	3.0 (2.5)	1.3 (0.7)	1.7 (1.7)	8.6 (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	-0.3	-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 4: Piecemeal Sensitivity Analysis of Kenya-EU and Kenya-Africa FTAs

in Equivalent Variation (EV) as a percentage of consumption

Parameter	Parameter Value			EV of EU-Kenya FTA			EV of Africa-Kenya FTA		
	Lower	Central	Upper	Lower	Central	Upper	Lower	Central	Upper
$\sigma(q_i, q_j)$ – services s	2	3	4	1.19	0.67	0.54	0.62	0.29	0.19
$\sigma(q_i, q_j)$ – goods sectors	see below			1.06	0.67	0.59	0.32	0.29	0.28
$\sigma(va, bs)$	0.625	1.25	1.875	0.55	0.67	0.82	0.25	0.29	0.33
$\sigma(D, M)$	2	4	6	0.65	0.67	0.69	0.28	0.29	0.29
$\sigma(L, K)$	0.5	1	1.5	0.64	0.67	0.70	0.28	0.29	0.29
$\sigma(A_1, \dots, A_n)$	0	0	0.25	0.67	0.67	0.67	0.29	0.29	0.29
$\sigma(D, E)$	2	4	6	0.65	0.67	0.69	0.29	0.29	0.29
ε_{KEN}	Central values of all 4 sets of eta parameters are listed in table 3.			0.61	0.67	0.72	0.31	0.29	0.27
ε_{EU}				0.25	0.67	0.96	0.29	0.29	0.29
ε_{AFR}	Lower values are 0.5 central values and upper values are 1.5 times central values			0.68	0.67	0.67	0.14	0.29	0.43
ε_{ROW}				0.90	0.67	0.55	0.29	0.29	0.29
θ_r	0	0	1	0.67	0.67	0.49	0.29	0.29	0.05
θ_r - CRTS model	NA	0	1	NA	0.09	-0.06	NA	0.29	-0.06
θ_m	0.025	0.05	0.075	0.67	0.67	0.67	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						
grain milling	2.43	3.24	4.05						
nonmetallic products	2.805	5.61	8.415						
petroleum	2.75	3.56	4.37						

Key: $\sigma(q_i, q_j)$: Elasticity of substitution between firm varieties in imperfectly competitive sectors $\sigma(va, bs)$: Elasticity of substitution between value-added and business services $\sigma(D, M)$: Elasticity of substitution between domestic and imported varieties $\sigma(L, K)$: Elasticity of substitution between primary factors of production in value added $\sigma(A_1, \dots, A_n)$: Elasticity of substitution in intermediate production between composite Armington aggregate goods $\sigma(D, E)$: Elasticity of transformation (domestic output versus exports) ε_{TZA} : Elasticity of national service firm supply with respect to price of output ε_{EU} : Elasticity of EU service firm supply with respect to price of output ε_{AFR} : Elasticity of AFR service firm supply with respect to price of output ε_{ROW} : Elasticity of Rest of World service firm supply with respect to price of output θ_r : Share of rents in services sectors captured by domestic agents θ_m : Shares of value added in multinational firms due to specialized primary factor imports

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

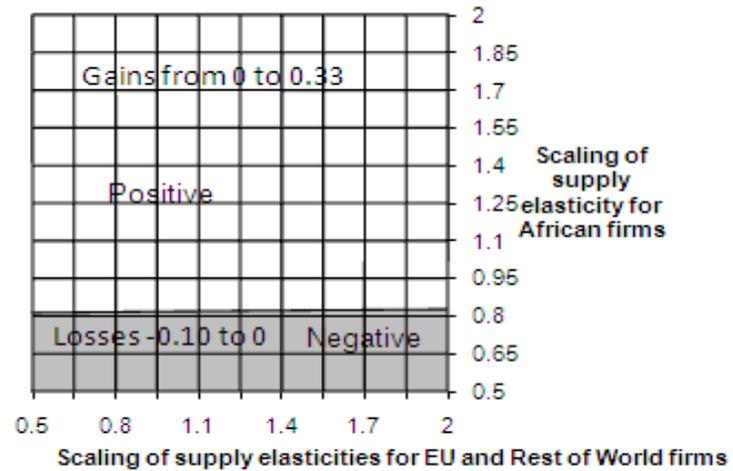
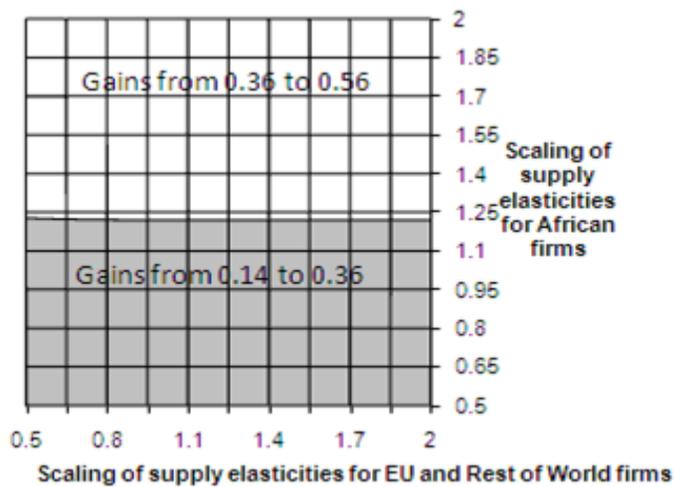
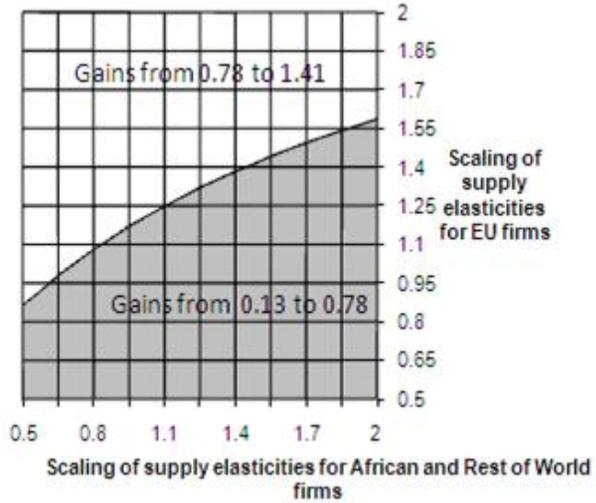


Figure 2: Sensitivity Analysis of Kenyan Preferential Liberalization of Services with the EU: Impact of Partner and Excluded Country Supply Elasticity, with and without Rent Capture

Case I: No initial rent capture by Kenya



Case II: Initial rent capture by Kenya

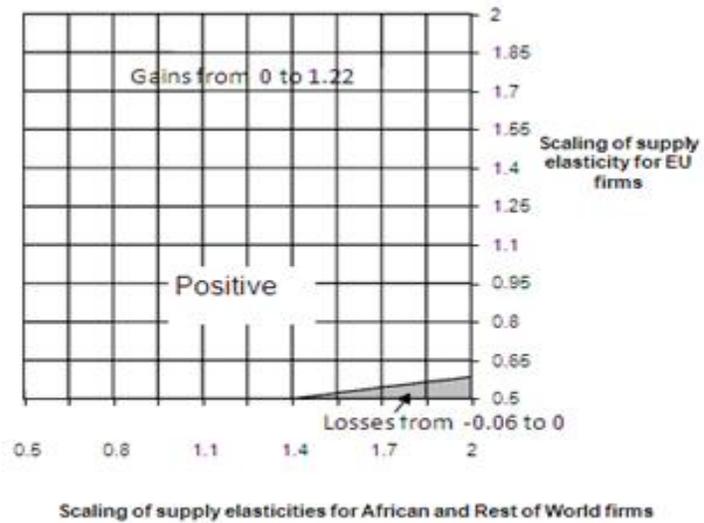


Figure 3: Sample Frequency Distribution of the Welfare Results of Kenyan Preferential Reduction of Services Barriers Against African Partners—30,000 simulations.

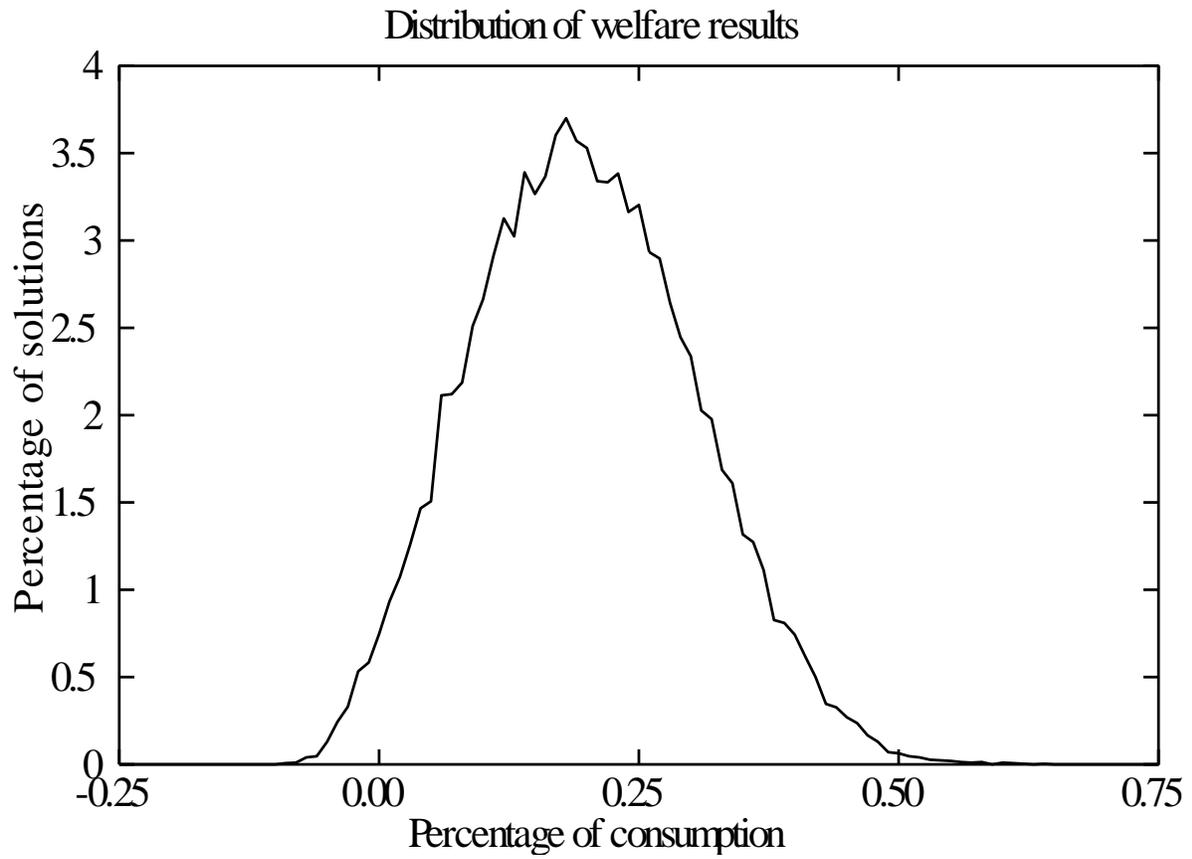
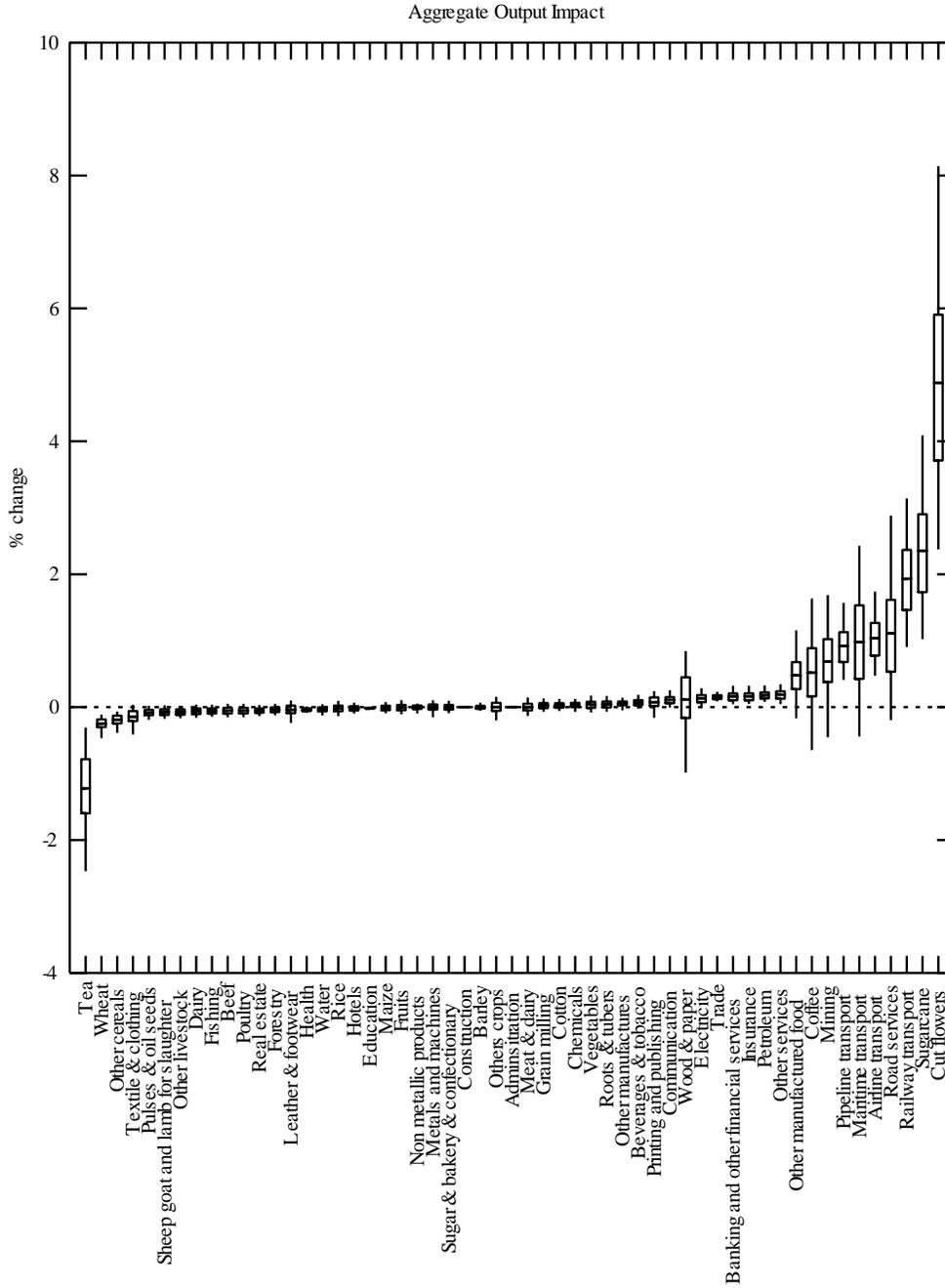


Figure 4: Means, 50 and 95 Percent Confidence Intervals of the Sample Frequency Distributions of the Output Changes by Sector from Kenyan Preferential Reduction of Services Barriers Against African Partners—30, 000 simulations.



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

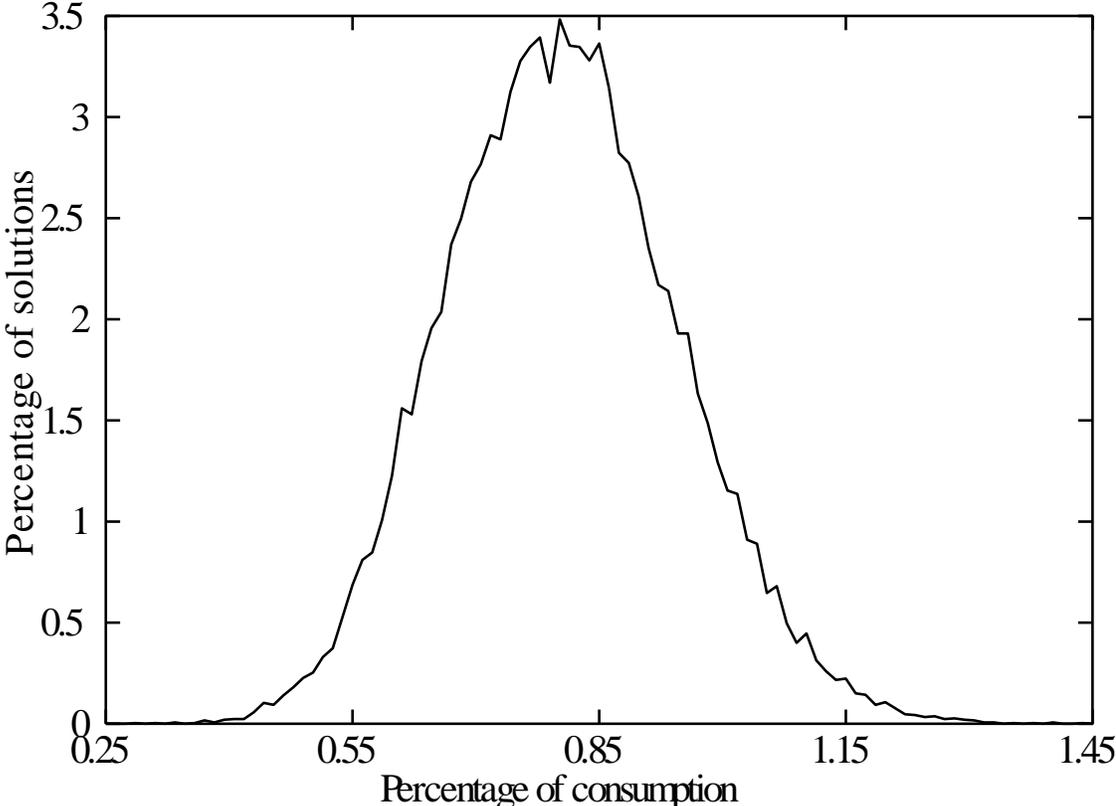
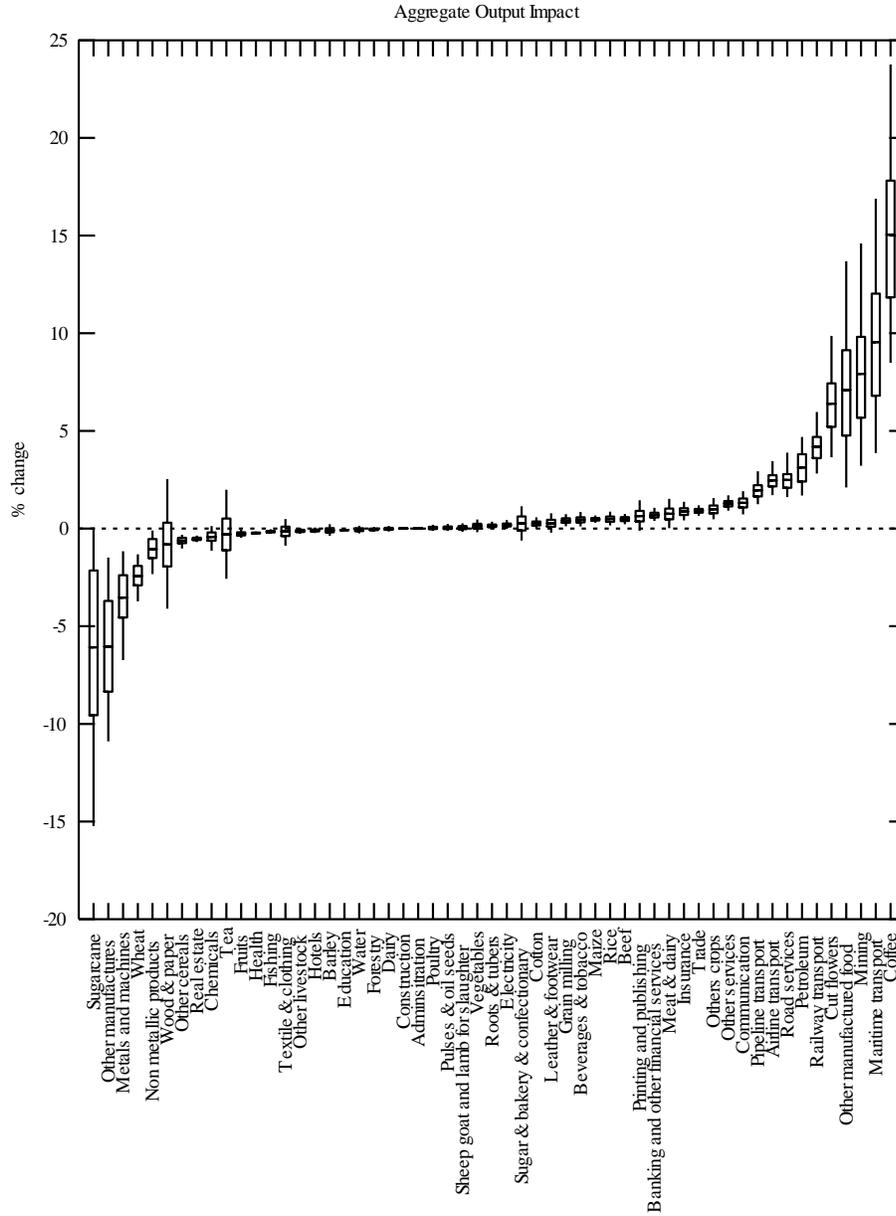


Figure 6: Means, 50 and 95 Percent Confidence Intervals of the Sample Distributions of the Output Changes by Sector from Kenyan Preferential Reduction of Services Barriers Against EU Partners—30,000 simulations.



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.