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Modeling Services Liberalization:

The Case of Kenya

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Abstract

In this paper, the authors employ a 55 sector small open economy computable general equilibrium model of the Kenyan economy to assess the impact of the liberalization of regulatory barriers against foreign and domestic business service providers in Kenya. The model incorporates productivity effects in both goods and services markets endogenously, through a Dixit-Stiglitz framework. The ad valorem equivalents of barriers to foreign direct investment have been estimated based on detailed questionnaires completed by specialists in Kenya. We estimate that Kenya will gain about 11 percent of the value of Kenyan consumption in the medium run (or about 9 percent of gross domestic product) from a full reform package that also includes uniform tariffs. The estimated gains increase to 50 percent of consumption in the long run steady state model, where the impact on the accumulation of capital from an improvement in the productivity of capital is taken into account. Decomposition exercises reveal that the largest gains to Kenya will derive from liberalization of costly regulatory barriers that are non-discriminatory in their impacts between Kenyan and multinational service providers.

Modeling Services Liberalization: The Case of Kenya

by

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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] In many of the services sectors in Kenya, however, the regulatory regime imposes significant burdens on the cost of providing services, both by Kenyan service providers and by multinationals. Consequently, the number of service providers and their quality is lower than it could be. Reform of the regulatory regimes in Kenyan services sectors could therefore result in an increase in the number and quality of business service provision in Kenya.

In the context of the negotiations under the Doha Development Agenda, Kenya has received numerous requests for further commitments in the business services area. In addition, Kenya is involved in negotiations of commitments in services in the European Partnership Agreements as well as in its

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[1] 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 more recent economic geography literature (e.g., Krugman, 1991; Porter, 1992; 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.

regional trading arrangements, COMESA[2] and the East African Customs Union.[3] We shall argue that while there are barriers against foreign investment in business services, *in practice,* the Kenyan regulatory regime does not discriminate heavily against multinationals. However, Kenyan commitments at the WTO or in its regional arrangements are considerably less open than its practice. Binding commitments made at the WTO or in regional agreements provide a signal to investors in the services sectors that they are welcome and that the regulatory regime will not be turned against them arbitrarily.

What would be the consequences for Kenya of responding to the requests of its trading partners by agreeing to further commitments? How much would Kenya gain from reform of its regulatory regime if reform could reduce the costs of providing business services by both its domestic firms as well as multinationals? What would be the impact on industry, agriculture, wages, returns to capital, exports and imports, as well as the services sectors themselves from reforms in the services sectors? .

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. Our key modeling assumptions are that: we allow foreign direct investment in business services (as well as cross border trade) since a substantial portion of business services require a domestic presence; and business services supplied with a domestic presence are supplied by imperfectly competitive firms who produce a unique variety of the service. We adopt the Dixit-Stiglitz-Ethier structure for business services (as well as for increasing returns to scale goods) that implies endogenous productivity gains from the net introduction of new varieties of service providers. We also allow for endogenous productivity effects from additional varieties of imperfectly competitive goods.[4]

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[2] The Common Market for Eastern and Southern Africa (COMESA) is a preferential trade area among Djibouti, Kenya, Madagascar, Malawi, Mauritius, Sudan, Zambia and Zimbabwe.
[3] The East African Customs Union is a customs union among Kenya, Uganda and Tanzania and more recently Rwanda and Burundi.
[4] Elasticities of substitution for product categories in the Dixit-Stiglitz framework have been estimated by Broda and Weinstein (2004). They estimate that, although there are variances within the groups, for agriculture, services and goods the Dixit-Stiglitz elasticitiy of substitution is close to three. We choose three as our central Dixit-Stiglitz elasticity of substitution.

Crucial to our analysis, we estimate the ad valorem equivalents of the regulatory barriers in business services in Kenya, both discriminatory against foreign investors as well as non-discriminatory barriers that apply to domestic and multinational service providers. Among our business services sectors, we find that the regulatory costs are the highest in the transportation sector (especially the maritime sector). Although the regulatory costs are higher for foreign firms, they are very high for domestic firms as well. Regulatory barriers in the communications sector are also quite significant.

We find that the Kenyan tariff structure on average is not very high. On the other hand, there is high dispersion in the tariff structure with some sectors, like sugarcane, beverages and tobacco, poultry, maize and rice, with rather high tariffs. Consequently, we also evaluate the potential gains to the Kenyan economy and the impact on different sectors of moving to a uniform tariff.

In our "full reform" package, we estimate that Kenya will gain 11.1 percent of consumption or 9.3 percent of GDP per year. We argue that the gains to Kenya derive from three principal effects: (1) the largest gains derive from a reduction in regulatory barriers against service providers. This will increase the number of service varieties available in Kenya . The variety increase will increase total factor productivity (or lower the quality adjusted costs) in sectors that use business services. Due to their larger share of the market, there are greater gains from liberalization of the regulatory barriers against domestic service providers than from liberalization against foreign service providers; (2) tariff uniformity alone induces gains of 0.7 percent of GDP per year. The reason is that the distortion costs of a tariff increase with the square on the tariff. Then moving to uniformity can be expected to benefit the country since it is the very high tariffs that cause the most of distortion costs; and (3) positive effects on the accumulation of capital from an increase in the productivity of capital due to better access to services will result in an increase in the capital stock in the long run. We use our comparative steady state model to assess that the gains to the economy, when the positive impact on the long run capital stock is taken into account. The estimated gains increase to 50 percent of consumption or 42 percent of GDP per year. In the long run, we estimate a generalized expansion of the output of the manufacturing sector, both the competitive and the imperfectly competitive parts.

This paper is innovative since it is the first paper to numerically assess liberalization of barriers against both domestic and multinational service providers in a multi-sector applied general equilibrium model where the Dixit-Stiglitz endogenous productivity effects are important to the results; and it is the first to assess services liberalization in a sub-Saharan African country. Earlier related work includes 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. [5] The papers by Jensen, Rutherford and Tarr (2007) and Rutherford and Tarr (forthcoming) on Russian WTO accession are the closest to this model; but the impact of liberalization of domestic regulatory barriers is not considered in those papers.

The paper is organized as follows. In section II we provide an overview of the key business services sectors and the estimation of the ad valorem equivalents of the regulatory barriers. In section III we describe the model and the most important data. In section IV we describe and interpret the central policy scenarios. We conclude briefly in section V.

II. Overview of the Kenyan Services Sectors
and the Estimation of the Tariff Equivalence of the Regulatory Barriers[6]

Transportation

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[5] There have also been numerical estimates of the benefits of services liberalization where services trade is treated analogously to goods trade, i.e. trade in services is assumed to be entirely cross-border and subject to tariffs. For example, see Brown, Deardorff, Fox and Stern (1996).

[6] For more detailed discussions of the regulatory regimes and performance in the Kenyan services sector see Tarr (2007a), Matano and Njeru and Telecommunications Management Group (2007) for telecommunications and Tarr (2007b), Helu (2007) and Ochieng (2007) for 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 Tarr, 2007b). 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 five 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.

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.

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[7] World Bank staff estimates.
[8] In the hope of improved performance, in November 2006 the Kenyan government gave Rift Valley Railways, a South African company, a temporary monopoly to operate and invest in the railroads.
[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.

Telecommunications

Kenya's telecommunications services are 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 has 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 requires that telephone companies must be at least 30 percent owned by Kenyan nationals. Problems related to the licensing off the third mobile telephone provider[10] and the "Second National Operator" are primarily due to this restraint. In fact, the Government has acknowledged that the 30 percent ownership requirement is delaying licensing of additional telecom operators.[11] Data transmissions are especially expensive by international standards. In early 2007, these are being done by satellite. The government is attempting to connect to a fiber optic cable on the seabed. When successful, it is estimated that the costs per month for data transmissions will drop several fold. On international surveys of doing business, long distance telecommunication charges are considered burdensome on average less than ten percent of the time; but in Kenya the figure is 44 percent. The World Bank (2007, p. 46) assesses that delays in implementing the reform agenda are the reason for the high cost and low quality of telecommunication services in Kenya.

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 sector is outlined in the Postal and Telecommunications Policy Statement of 1997.[12] The strategy outlines

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

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

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 four internet backbone suppliers have been licensed; seven public data operators were licensed; and five commercial VSAT operators and local loop operators were licensed. Mobile operators were awarded international gateway licenses and the licensing process for a "Second National Operator" is underway. Moreover, a draft law for the sector was undergoing review in late 2007. Once passed, many new reforms would be implemented designed to attract new private investment into the sector by licensing new players in various sub-sectors of telecommunications. The main regulatory challenges are the licensing of the second national operator, passage of the draft law for the sector, planned establishment of a national backbone infrastructure and development of a universal access strategy. (See Tarr, 2007a for an elaboration). 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.[13] 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.

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[13] 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.

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 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, **c**ross 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 is the wholesale and retail trade sector of the economy. In Kenya in 2004 this sector accounted for about ten percent of GDP, there were 217 thousand 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 see 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.

Ad Valorem Equivalence of Barriers to Foreign Direct Investment in Services Sectors.

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 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. [14] We supplemented this information based papers by: Kiptui (2007) on financial services; Ndaro (2007) or communication services; Helu (2007) on maritime services; Ochieng (2007) on transport services; and Oresi (2007) on railway services, all of which 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 sectors and the Telecommunications Management Group (2007) provided extensive details in telecoms. Tarr (2007a, 2007b) summarized this information in his Kenyan policy notes on telecommunications and transportation.

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 scoring a matrix of questions on the regulatory regimes in each sector to converting the information from the questionnaires and other sources into an index of restrictiveness in

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[14] We thank Ms. Sonal Sejpal of the law firm of Anjarwalla & Khanna Advocates for leading this research effort.

each industry. Mircheva followed the methodology of Kimura, Ando and Fujii (2004a, 2004b, 2004c) to generate these estimates. This methodology 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, authors in the Findlay and Warren volume 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 then assumed that the international regression applies to Kenya. 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 barriers to foreign direct investment in these services sectors.[15] Mircheva then weighted her fixed line and mobile telecommunications estimates by their market shares to obtain her estimate for communications, and similarly for banking and insurance to get the estimate for financial services. In the case of transportation, we take maritime transportation as a proxy for all transportation sectors. The results of the estimates are listed in table 4.

III. Overview of the Model and Key Data

Overview of the Model Formulation

This paper follows the algebraic structure of the model of Jensen, Rutherford and Tarr (2007). Here we provide a general description. 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. In our central model, we assume that 50 percent of the

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15   Warren estimated quantity impacts and then using elasticity estimates was able to obtain price impacts. The

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capital in each of the imperfectly competitive sectors in sector specific. We conduct sensitivity analysis with respect to this share by allowing 25 percent, 75 percent and 100 percent of the capital in each sector to be sector specific.

Regardless of sector, all firms minimize the cost of production. One category of sectors is *competitive goods and services sectors* produced under constant returns to scale and where price equals marginal costs with zero profits. This includes all twenty of the agriculture sectors, apparel, footwear, baked goods, and services such as administration, hotels, health and real estate.[16] 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.

Goods produced subject to increasing returns to scale are differentiated at the firm level. We assume that manufactured goods may be produced domestically or imported. 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. We employ the standard Chamberlinian large group monopolistic competition assumption within a Dixit-Stiglitz framework, which results in constant markups over marginal cost.

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estimates by Mircheva that we employ are for "discriminatory" barriers against foreign direct investment.
[16] Although electricity is monopolistically supplied, it is prices are controlled by the government. Thus, pricing to exploit market power is excluded by the government, and we maintain the assumption of price equal to marginal costs.

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.

The third category of sectors is *services sectors that are produced under increasing returns to scale and imperfect competition,* namely telecommunications, financial services, transportation services and other business services. In 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.[17] 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.[18]

There are also multinational service firm providers that choose to establish a presence in Kenya in order to compete with Kenyan firms directly. 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

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

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

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).

      Comparative Steady State Formulation. In this version of our model, we allow the capital

stock to adjust to its steady state equilibrium along with all of the model features we employ in our central

scenario, i.e., we allow for tariff and FDI liberalization with endogenous productivity effects as above.

The increased availability of services results in an endogenous increase in productivity and an increase in

the marginal productivity of capital in particular. An increase in the marginal productivity of capital

should increase the accumulation of capital and, in the long run steady state, increase the capital stock. In

this scenario the impact on the accumulation of capital from an improvement in the productivity of capital

is taken into account. We call this our comparative steady state model.

      In the comparative static model, we assume that the capital stock is fixed and the rental rate on

capital is endogenously determined. In the comparative steady state model, the logic is reversed. We

assume that the capital stock is in its initial steady state equilibrium in the benchmark dataset, but that the

capital stock will adjust to a new steady state equilibrium based on a fixed rate of return demanded by

investors. That is, if the trade policy shock happens to induce and increase in the rate of return on capital

so that it exceeds the initial rate of return, investors will invest and expand the capital stock. Expansion of

the capital stock drives down the marginal product of capital, i.e., it drives down the rental rate on capital,

until the rate of return on capital falls back to the initial level.[19] To analyze trade policy, this comparative steady state approach has been employed by many authors, including Harrison, Rutherford and Tarr (1996, 1997) and Baldwin et al. (1999) and Francois et al. (1996). The approach, however, dates back to the 1970s, when both Hansen and Koopmans (1972) and Dantzig and Manne (1974) used it. The approach ignores the foregone consumption necessary to achieve the higher level of investment and thus, is an upper bound estimate on the long run gains within the framework of the model assumptions.

Data

   Input-output table. 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 set of twenty household accounts integrated into the social accounting matrix. These are twenty households are ten rural and ten urban, ranked according to income.

   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

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[19] The rate of return on investment in our model is the rental rate on capital divided by the cost of a unit of the capital good.

increase the demand for Kenyan labor in these sectors.[20] 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. In particular, the estimated share of foreign inputs used by multinationals in Kenya is: telecommunications, 10 percent plus or minus 2 percent; financial services, 3 percent, plus or minus 2 percent; maritime transportation, 3 percent, plus or minus 2 percent; and air transportation, 12.5 percent, plus or minus 2.5 percent.

Tariff and Sales Tax data. Most-Favored Nation (MFN) tariff rates at the eight digit level were 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. Since these are MFN tariff rates, they exceed the collected tariff rates due to tariff preferences to regional partners and due to other preference items or tariff exemptions. Thus, they exaggerate the protection received by Kenyan industry and agriculture. Consequently we obtained the value of overall customs duties and other taxes applied only on imports.[21] We then took the ratio of the total taxes on imports to the total value of imports to obtain the average value of import taxes in the Kenyan economy. In 2005, this was 8.4 percent. 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. We then scaled all the MFN tariffs in our model so that the weighted average import tax is 8.4 percent.

Our estimates for sales tax data are taken from Kiringai. Thurlow and Wanjala (2006).

IV. Results

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[20] 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.

[21] Economic Survey (2006, pp. 103, 115).

In our "full reform" scenario, we assume that regulatory barriers in business services sectors against both foreign direct investment and domestic investors are cut in half. (The ad valorem equivalent of the barriers against new domestic or multinational entrants in specified in table 4.) We also assume that tariffs, as specified in table 4, are set at a uniform tariff level that leaves tariff revenue unchanged. We first discuss (and present in table 5) our estimates of the full reform scenario. We assess the impact on aggregate variables such as welfare and the real exchange rate, aggregate exports, the return to capital, skilled labor, semi-skilled labor, unskilled labor and land, and the percentage change in tariff revenue. In order to obtain as assessment of the adjustment costs, we estimate the percentage of each of our five factors of production that would have to change industries. The gains come from a combination of effects, so we also estimate the comparative static impacts of the various components of the full reform scenario in order to assess their relative importance. We then discuss the results of our steady state scenario, where we allow the capital stock to adjust to its long run equilibrium. Finally, we show that the modeling formulation with endogenous productivity effects is crucial to the results by, for diagnostic purposes, considering a constant returns to scale model. After discussing the aggregate results, we discuss the impacts at the sector level, both in the comparative static and the comparative steady state models.

Aggregate Effects

We estimate that the welfare gains to Kenya of full reform are equal to 11.1 percent of Kenyan consumption (or 9.3 percent of GDP) in the medium term. In the long run, we estimate that the gains could be as high as 50 percent of consumption. These medium terms gains derive from three key effects: (1) removal of non-discriminatory inefficient regulatory barriers against service providers; (2) removal of regulatory barriers against multinational service providers in Kenya; and (3) gains from moving to a uniform tariff. We execute several scenarios that allow us to understand the relative impact of these various elements and the mechanisms through which they operate. We discuss three of these below.

The improvement of aggregate welfare is accompanied by a significant increase in wages. We estimate that in the medium term the wages of skilled labor, semi-skilled labor and unskilled labor will increase by 10.6 percent, 7.0 percent and 14 percent, respectively. The return on capital also increases by 11.4 percent, while rents on land increase by 4.4 percent. Rents on land increase the least due to the

relative greater expansion of sectors outside of agriculture. In the long run, wages rise by between 39 percent for semi-skilled labor to 52 percent for unskilled labor.

Due to the demand for skilled and semi-skilled workers in the services sectors, about 9.5 percent of skilled and semi-skilled labor change sectors of employment. On the other hand, only 2.2 percent of unskilled labor changes the sector of employment.

Impact of Removing non-discriminatory regulatory Barriers Against Kenyan and Multinational Service Providers. In this scenario, labeled "only non-discriminatory services barriers," we reduce by 50 percent the ad valorem equivalent of the non-discriminatory barriers on domestic and multinational service providers in Kenya, but there is no reduction in the discriminatory tax on multinationals in the services sectors; nor is there any movement toward tariff uniformity. At 8.8 percent of the value of Kenyan consumption, the largest share of the gains derives from the liberalization of non-discriminatory regulatory barriers. The results are explained by the fact that the estimated barriers are rather high in the services sectors, especially in the transportation sectors, by the fact that services are a substantial part of the market economy of Kenya. In addition, we assume that there are real resource costs of the barriers which are freed through the liberalization.

The reduction in the regulatory barriers on the provision of services in Kenya reduces the cost of providing services in Kenya for both Kenyan and multinational service providers. This increases profitability for the provision of services in Kenya, thereby inducing new entry by both domestic and multinational service providers until zero profits are restored. Consequently, there is an increase in new varieties of services. Kenyan businesses will then have improved access to services in areas like telecommunication, banking, insurance, transportation and other business services. The additional service varieties in the business services sectors should lower the cost of doing business and result in a productivity improvement for users of these goods through the Dixit-Stiglitz-Ethier effect.

Impact of Foreign Direct Investment Liberalization in Business Services.. In this scenario, labeled only FDI, , we reduce by 50 percent the ad valorem equivalent of the discriminatory barriers against multinational service providers who may wish to serve the Kenya market, but there is no reduction in the non-discriminatory tax equivalent of the regulatory burden on business service; nor is

there any movement toward tariff uniformity. Reducing discriminatory barriers against multinational service providers yields a gain of 2.1 percent of Kenyan consumption. The reduction in the discriminatory tax equivalent on multinational service providers increases profitability for multinational provision of services in Kenya, thereby inducing new entry by multinational service providers until zero profits are restored. Although there is a loss of domestic service varieties due to increased competition from multinational service providers, there is a net increase in varieties. Kenyan businesses will then have improved access to services.

        Impact of Tariff Uniformity. In this scenario, labeled only tariffs, we impose tariff uniformity, but we do not change the ad valorem tax equivalent of regulatory barriers on domestic or multinational service providers. In moving to tariff uniformity, the average level of the Kenyan tariff is unchanged. The level of the tariff is imposed that results in the same average collected tariff rate in Kenya—the difference in the highs and lows are eliminated and replaced with a unique tariff for all sectors. Moving to uniform tariffs yields and estimated welfare gain of 0.7 percent of consumption. Our result of gains from tariff uniformity is consistent with the results of Martinez de Pereira (2000) in 13 countries and Harrison, Rutherford and Tarr (1993) for Turkey. These authors have found that moving to tariff uniformity results in welfare benefits. The reason is that the distortion costs of a tariff increase with the square on the tariff. Then moving to uniformity can be expected to benefit the country since it is the very high tariffs that cause the most of distortion costs.[22] Moreover, the typical lobbying for protection environment in a country is one-sided as industry groups receive concentrated benefits and lobby but diverse consumer interests face a free-rider problem and typically do not lobby. Panagariya and Rodrik (1993) have shown, uniformity dramatically reduces the incentive to lobby the government for protection. And the experience of Chile shows that industry groups may lobby in favor of lower protection in such a case. Thus, in his evaluation of the arguments for and against tariff uniformity, Tarr (2002) has argued that the overwhelming advantage of a uniform tariff is that it is likely to lead to a lower level of protection due to the change in the political economy for protection.

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[22] These results show that, in practice, tariffs do not differ from uniformity due to Ramsey optimal tax considerations.

Comparative Steady State Formulation. The increased availability of services results in an increase in the productivity of capital, which should increase the accumulation of capital and, in the long run steady state, increase the capital stock. In this scenario, we allow the capital stock to adjust to its long run equilibrium value. Then the gains to the Kenyan economy increase to 50 percent of consumption or 41.9 percent of GDP per year. In this formulation, the incentive to accumulate more capital due to an increase in the marginal productivity of capital is taken into account, but the costs of foregone consumption to achieve the higher capitals stock are not taken into account. So in the context of this model, the estimates should be considered upper bound estimates. On the other hand, Rutherford and Tarr (2002) have shown that in a fully dynamic model with endogenous productivity effects, the gains can be even larger than those estimated here.

Constant Returns to Scale Formulation. In order to assess the importance of the modeling assumption of endogenous productivity effects from additional varieties, we also consider a "constant returns to scale" (CRTS) version of the model. In this version, there are no endogenous productivity effects from additional varieties of imperfectly supplied goods or services. We estimate that the gains fall to 3.4 percent of consumption or 2.8 percent of GDP. While this is considerably smaller than our estimates with endogenous productivity effects, the gains are large by the standards of CRTS trade models. The reasons is that we are considering reforms of regulatory barriers against both foreign and domestic service providers and we assume that the regulatory barriers impose real resource costs in the initial equilibrium, i.e., there are large "rectangles of rent losses in the CRTS model. The value of fifty percent of the rents in the benchmark is 2.2 percent of GDP

Sector Results

In tables 6, 7 and 8 we present various sector results. In table 6 we present our estimates of the impact on employment by sector and the change in exports and imports by sector. In table 7, we present our estimates of the change in prices by sector and by scenario. In this discussion, we focus on the output effects by sector in the full reform (comparative static) and steady state scenarios. These results may be

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found in table 8. We discuss the medium term results from our "full reform" scenario first and then our long run results from our steady state scenario.

Medium Run Results. In the full reform scenario, reduction in the cost of business services (both from removal of regulatory barriers and from the Dixit-Stiglitz variety externality) leads to an increase in the demand for business services and their expansion. Since the barriers in transportation are the highest, the expansion if the greatest in the transportation sector. We estimate an increase in the output of the transportation sector by between 46 and 59 percent (including the output of multinational firms operating in Kenya).

Several agriculture sectors realize modest output expansion. This includes many of the meat and dairy sectors, fruits, cotton and maize. We estimate very substantial expansion of the coffee sector. In addition, grain milling and sugar and bakery products expand. All these sectors benefit significantly from the lower quality adjusted costs of business services, but the input-output table indicates that the coffee sector is a very intensive user of business services, so it benefits strongly from the services liberalization and substantially expands. Moreover, the coffee sector exports intensively, and benefits from the real exchange rate depreciation.

Given that we assume that total employment and the capital stock is 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. We estimate declines in output in many sectors, especially those that use business services less intensively. Moreover, since we assume uniform tariffs in our full reform scenario, sugarcane, which is the most highly protected sector, is estimated to decline.

Long Run Results. The basic pattern in the long run, i.e., the steady state scenario, is that we estimate very substantial expansion of the services and manufacturing sectors. The increasing returns to scale sectors expand the most, but even the constant returns to scale manufacturing and services sectors expand on average. Agriculture expands the least, so agricultural output declines as a share of GDP. These results are consistent with the empirically observed broad pattern of economic development:

namely, as countries become more productive and wealthier, agricultural output becomes a smaller share of total output, without necessarily declining in absolute amounts.

In more detail, the competitive part of the manufacturing sector expands with an overall average increase of 34 percent. Among these competitive sectors that we estimate to expand by more than 45 percent includes forestry, fishing, meat and dairy, grain milling, sugar and bakery, leather and footwear, electricity, construction and trade. We estimate that the imperfectly competitive part of the manufacturing sector will expand by 89 percent on average in the long run. All the imperfectly competitive manufacturing sectors expand in the long run except for "other manufactures." With a small overall gain, the different agricultural sectors have very mixed results.

The reason for the general expansion of the manufacturing sector in the long run is two-fold. First, liberalization of the regulatory barriers in services reduces the costs of producing services. These gains would also be realized in a constant returns to scale model. We also allow for the fact that greater availability of varieties of business services allows sectors that use these services to purchase them at a reduced quality adjusted price, and this acts to increase the productivity of sectors that use business services. Finally, the increase in the productivity of capital, results in an improvement in the profitability of investment, and accumulation of capital and an increase in the capital stock in the steady state equilibrium. Then compared with the comparative static model, output can expand much more broadly in the economy in the new steady state equilibrium due to the greater capital stock.

Lobbying Interests in the Business Services Sectors.

Kenyan business and labor interests in these sectors are not the same, and we discuss the impact on labor in these sectors first. We find that skilled, semi-skilled and unskilled employment will expand in all the business services sectors, in some cases rather substantially. This is an application to a full economy model of the result found by Markusen, Rutherford and Tarr (2005). They have shown in a more stylized model that even when foreign direct investment is a partial equilibrium substitute for domestic skilled labor, it may be a general equilibrium complement. The reason is as follows. As a result of a reduction in the barriers to foreign direct investment in these sectors, we estimate that there will be an expansion in the number of multinational firms who locate in Kenya to provide business services from

within Kenya , and a contraction in the number of purely Kenyan firms. Although multinationals also demand Kenyan labor, though they use Kenyan labor slightly less intensively than Kenyan firms, i.e., since multinationals import primary inputs, foreign direct investment is a partial equilibrium substitute for Kenyan labor. But as more service firms enter the market, the quality adjusted price of services falls, and industries that use services expand their demand for business services. On balance, the increase in labor demand from the increase in the demand for business services typically exceeds the decline in labor demand from the substitution of multinational supply for Kenyan supply in the Kenyan market. That is, FDI is a partial equilibrium substitute but a general equilibrium complement to Kenyan labor. Thus, we estimate that labor in the business services sectors will typically gain from an expansion in foreign direct investment and multinational provision of services in Kenya .

Regarding capital, as a result of the removal of restrictions, we estimate there would be significant increase in foreign direct investment and an increase in multinational firms operating in Kenya . We estimate that specific capital owners in imperfectively competitive sectors will lose from this increase in competition. We expect, however, that the increase in foreign direct investment to have diverse impacts on Kenyan firms. We define a firm as a multinational even if a foreign firm and a Kenyan firm have formed a joint venture. Multinationals will often look for Kenyan joint venture partners when they want to invest in Kenya . Kenyan companies that become part of the joint ventures in the expanding multinational share of the business services market will likely preserve or increase the value of their investments. Kenyan capital owners in business services who remain wholly independent of multinational firms, either because they avoid joint ventures or are not desired as joint venture partners, will likely see the value of their investments decline, and the least efficient will exit the industry.[23]

This suggests that domestic lobbying interests within a service sector could be diverse regarding FDI liberalization. We estimate that labor should find it in their interest to support FDI liberalization even if capital owners in the sector oppose it. But capital owners themselves may have diverse interests depending on their prospects for acquisition by multinationals.

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[23] We assume that firms in the business services sectors must use a specific factor in order to produce output. This specific factor results in an upward sloping supply curve in each business services sector.

VI. 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 liberalization of regulatory barriers against both domestic and multinational service providers. We find that the reform package we consider in this paper (in many cases reforms under consideration by the Kenyan government) could provide very substantial gains to the Kenyan economy. Reduction of the barriers against potential service providers, both foreign and domestic, is the largest source of the gains. Moving to tariff uniformity, could provide additional significant gains and provide an improved environment for the political economy of protection.

Reforms that lead to greater access to business services will improve the productivity of labor and capital in all the sectors of the economy. We find that in the long run, the increased productivity of capital will induce an accumulation of capital and an increase in the capital stock, which will result in a general expansion of Kenya manufacturing.

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Table 1. Sectoral and Factor Structure of the Kenya Model

Business Services	CRTS Goods and Services	
Communication	Maize	Other livestock
Insurance	Wheat	Fishing
Banking and other financial services	Rice	Forestry
Other services	Barley	Mining
	Cotton	Meat & dairy
Transportation	Other cereals	Grain milling
Road services	Sugarcane	Sugar & bakery & confectionary
Railway transport	Coffee	Textile & clothing
Maritime transport	Tea	Leather & footwear
Pipeline transport	Roots & tubers	Wood & paper
Airline transport	Pulses & oil seeds	Water
	Fruits	Electricity
IRTS Goods	Vegetables	Construction
Beverages & tobacco	Cut flowers	Trade
Other manufactured food	Others crops	Hotels
Printing and publishing	Beef	Real estate
Petroleum	Dairy	Adminsitration
Chemicals	Poultry	Health
Metals and machines	Sheep goat and lamb for slaughter	Education
Non metallic products		
Other manufactures		

Factors of Production
Skilled labor
Semi-skilled labor
Unskilled labor
Capital
Land

Table 2. Sectoral Value Added

	Labor						
	Skilled	Semi-skilled	Unskilled	Capital	Land	GDP (MKS)	GDP (%)
IRTS Goods and Services	13.4	26.9	16.9	42.8		245.8	28.2
CRTS Goods and Services	9.7	22.2	14.4	46.1	7.5	625.4	71.8
Business Services	18.3	10.6	23.5	47.6		130.0	14.9
Communication	5.4	28.7	20.0	45.9		21.0	2.4
Insurance	2.0	8.6	30.7	58.7		13.3	1.5
Banking and other financial services	2.0	8.6	30.7	58.7		28.8	3.3
Other services	32.6	6.1	20.1	41.2		67.0	7.7
Transportation	13.2	46.1	7.3	33.3		50.2	5.8
Road services	13.2	46.1	7.3	33.3		31.5	3.6
Railway transport	13.2	46.1	7.3	33.3		0.9	0.1
Maritime transport	13.2	46.1	7.3	33.3		3.5	0.4
Pipeline transport	13.2	46.1	7.3	33.3		1.6	0.2
Airline transport	13.2	46.1	7.3	33.3		12.7	1.5
Dixit-Stiglitz Goods	3.9	44.4	11.0	40.7		65.7	7.5
Beverages & tobacco		1.1	50.5	48.4		9.3	1.1
Other manufactured food	11.4	49.9	0.7	38.0		0.6	0.1
Printing and publishing		61.9		38.1		4.1	0.5
Petroleum		0.7	2.5	96.8		2.0	0.2
Chemicals	21.7	7.1	39.2	32.0		5.4	0.6
Metals and machines	3.5	68.5	3.6	24.4		6.6	0.8
Non metallic products	0.9	17.8		81.3		12.8	1.5
Other manufactures	3.9	76.2	0.7	19.3		24.9	2.9
Agriculture	16.8	38.8	0.3	22.5	21.5	219.0	25.1
Maize	10.7	48.0	0.2	10.7	30.4	28.9	3.3
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	4.0
Roots & tubers	11.6	38.3	0.3	31.9	18.0	10.0	1.2
Pulses & oil seeds	12.0	38.0	0.5	11.9	37.7	19.0	2.2
Fruits	15.3	34.0	0.2	10.6	39.9	13.5	1.5
Vegetables	14.7	38.7	0.3	29.8	16.5	22.0	2.5
Cut flowers	35.2	19.7	0.1	10.3	34.7	11.7	1.3
Others crops	15.3	36.5	0.6	27.3	20.3	7.3	0.8
Beef	24.8	36.2	0.5	38.5		13.9	1.6
Dairy	26.1	35.7	0.2	38.1		23.6	2.7
Poultry	15.3	43.4	0.8	40.5		15.2	1.7
Sheep goat and lamb for slaughter	28.2	36.9	0.2	34.6		5.1	0.6
Other livestock	6.5	35.4	0.2	58.0		3.8	0.4

Table 2, continued

	Labor						
	Skilled	Semi-skilled	Unskilled	Capital	Land	GDP (MKS)	GDP (%)
Other CRTS	5.8	13.2	22.1	58.9		406.4	46.7
Fishing	3.7	7.4		88.8		3.9	0.4
Forestry	3.1	23.2		73.7		7.0	0.8
Mining	16.4	30.9		52.7		3.2	0.4
Meat & dairy	3.2	27.6	0.0	69.2		11.9	1.4
Grain milling	2.1	9.5	2.9	85.5		9.6	1.1
Sugar & bakery & confection	7.9	36.8	11.7	43.6		4.4	0.5
Textile & clothing	57.0	9.3	0.6	33.1		5.4	0.6
Leather & footwear	13.9	2.3		83.9		5.2	0.6
Wood & paper	4.4	7.1	27.1	61.4		2.9	0.3
Water		28.8	10.9	60.3		13.1	1.5
Electricity	0.7	25.4	1.5	72.3		12.9	1.5
Construction	1.5	14.9	2.5	81.1		51.8	5.9
Trade	16.6	5.6	7.0	70.8		63.6	7.3
Hotels	51.1	5.0	0.9	43.1		9.8	1.1
Real estate	0.3	29.8	13.0	57.0		56.2	6.5
Adminsitration	1.1	12.1	8.0	78.8		49.3	5.7
Health	1.6	2.6	92.5	3.2		21.2	2.4
Education	0.8	2.9	66.4	30.0		74.9	8.6

Table 3. Trade Flows (in percentage or billions of Kenyan shillings, BKS)

	Imports			Exports	
	BKS	% Total a/	% Supply b/	BKS	% Total
IRTS Goods and Services	0.3	86.0	31.0	0.1	46.0
CRTS Goods and Services	0.0	14.0	5.6	0.1	54.0
Business Services	0.0	2.3	2.6	0.0	1.3
Communication				0.0	0.7
Insurance	0.0	0.7	7.4	0.0	0.2
Banking and other financial	0.0	1.5	7.4	0.0	0.4
Other services					
Transportation	0.1	16.0	29.7	0.0	14.3
Road services	0.0	10.0	29.7	0.0	9.0
Railway transport	0.0	0.3	29.7	0.0	0.3
Maritime transport	0.0	1.1	29.7	0.0	1.0
Pipeline transport	0.0	0.5	29.7	0.0	0.5
Airline transport	0.0	4.0	29.7	0.0	3.6
Dixit-Stiglitz Goods	0.2	67.7	46.9	0.1	30.4
Beverages & tobacco	0.0	0.5	5.2	0.0	4.6
Other manufactured food	0.0	5.2	60.2	0.0	1.1
Printing and publishing	0.0	2.5	26.2		
Petroleum	0.1	18.2	56.4	0.0	6.0
Chemicals	0.1	15.7	66.6	0.0	5.8
Metals and machines	0.1	16.8	63.8	0.0	5.9
Non metallic products	0.0	0.9	8.7	0.0	1.4
Other manufactures	0.0	8.0	34.7	0.0	5.5
Agriculture	0.0	5.7	11.1	0.1	39.3
Maize	0.0	0.2	2.0	0.0	0.1
Wheat	0.0	3.3	96.1	0.0	0.0
Rice	0.0	1.2	53.7		
Barley				0.0	0.0
Cotton				0.0	0.0
Other cereals				0.0	0.0
Sugarcane	0.0	0.4	42.5	0.0	0.6
Coffee				0.0	4.4
Tea	0.0	0.1	9.0	0.0	17.7
Roots & tubers					
Pulses & oil seeds	0.0	0.1	3.4	0.0	3.1
Fruits				0.0	0.8
Vegetables	0.0	0.1	2.7	0.0	3.0
Cut flowers				0.0	8.0
Others crops	0.0	0.2	6.0	0.0	1.7
Beef					
Dairy					
Poultry					
Sheep goat and lamb for slaughter					
Other livestock					

a/ Percentage of total is the percentage of economy-wide imports.

b/ Total use includes final consumption, intermediate use, investment and government demand.

		Imports			Exports	
		BKS	% Total a/	% Supply b/	BKS	% Total
Other CRTS		0.0	8.3	4.1	0.0	14.7
	Fishing					
	Forestry					
	Mining	0.0	0.1	31.5	0.0	2.3
	Meat & dairy	0.0	0.3	2.9	0.0	4.8
	Grain milling	0.0	0.3	2.7		
	Sugar & bakery & confection	0.0	1.3	17.4	0.0	0.9
	Textile & clothing	0.0	2.8	43.6	0.0	1.6
	Leather & footwear	0.0	0.5	9.9	0.0	1.3
	Wood & paper	0.0	0.9	43.4	0.0	3.2
	Water					
	Electricity					
	Construction					
	Trade					
	Hotels					
	Real estate	0.0	2.2	10.1	0.0	0.6
	Adminsitration					
	Health					
	Education					

a/ Percentage of total is the percentage of economy-wide imports.

b/ Total use includes final consumption, intermediate use, investment and government demand.

Table 4. Benchmark Distortions (ad valorem rates in percentage)

		Tariff	Sales Tax	Service Barriers--Ad Valorem	
IRTS Goods and Services		8.2	7.3	All Firms	Foreign Firms
CRTS Goods and Services		12.9	3.3		
Business Services			0.2		
	Communication	0.0	0.0	8.0	4.0
	Insurance	0.0	0.6	13.0	26.0
	Banking and other financial services	0.0	0.6	17.0	0
	Other services	0.0	0.0	10.0	10.0
Transportation					
	Road services	0.0	0.0	15.0	30.0
	Railway transport	0.0	0.0	25.0	0.0
	Maritime transport	0.0	0.0	57.0	40.0
	Pipeline transport	0.0	0.0	0.0	0.0
	Airline transport	0.0	0.0	2.0	2.0
Dixit-Stiglitz Goods		10.5	12.8		
	Beverages & tobacco	25.1	42.3		
	Other manufactured food	19.3	5.5		
	Printing and publishing	0.0	12.1		
	Petroleum	9.3	22.0		
	Chemicals	7.7	4.6		
	Metals and machines	7.4	4.2		
	Non metallic products	17.6	0.7		
	Other manufactures	20.9	3.0		
Agriculture		17.5	1.0		
	Maize	27.0	0.0		
	Wheat	10.1	0.0		
	Rice	25.2	0.0		
	Barley	9.0	0.0		
	Cotton	11.4	12.5		
	Other cereals	9.0	0.0		
	Sugarcane	58.6	19.4		
	Coffee	18.0	0.0		
	Tea	18.0	5.1		

	Pulses & oil seeds	6.1	0.0
	Fruits	17.8	0.0
	Vegetables	18.0	0.1
	Cut flowers	18.0	0.0
	Others crops	2.4	3.4
	Beef	18.0	0.0
	Dairy	26.4	0.0
	Poultry	18.0	0.0
	Other livestock	18.0	0.0
	Sheep, goats and lambs for slaughter	0.0	0.0
	Roots and tubes	0.0	0.0
Other CRTS		9.7	3.8
	Fishing	18.0	0.0
	Forestry	0.0	0.0
	Mining	1.1	4.1
	Meat & dairy	25.2	15.5
	Grain milling	17.7	9.4
	Sugar & bakery & confectionary	14.4	17.1
	Textile & clothing	13.1	8.5
	Leather & footwear	12.6	14.5
	Wood & paper	8.4	5.9
	Trade	0.0	1.9
	Hotels	0.0	13.9
	Water	0.0	0.0
	Electricity	0.0	0.0
	Construction	0.0	0.0
	Real Estate	0.0	0.0
	Administration	0.0	0.0
	Health	0.0	0.0
	Education	0.0	0.0

Table 5: Summary of Policy Measures

(results are percentage change from initial equilibrium, unless otherwise indicated)

Scenario definition	Benchmark	Full Reform	All services barriers	Only non-discriminatory services barriers	Only barriers against FDI in services	Only uniform tariffs	CRTS	Steady State
Liberalization of regulatory barriers for all services firms	No	Yes	Yes	Yes	No	No	Yes	Yes
Liberalization of discriminatory barriers on foreign services firms	No	Yes	Yes	No	Yes	No	Yes	Yes
Uniform import tariffs?	No	Yes	No	No	No	Yes	Yes	Yes
Steady-state capital stock	No	No	No	No	No	No	No	Yes
Dixit-Stiglitz variety-induced productivity gains	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Aggregate welfare								
Welfare (EV as % of consumption)		11.1	10.4	8.8	2.1	0.7	3.4	50.0
Welfare (EV as % of GDP)		9.3	8.7	7.4	1.7	0.6	2.8	41.9
Government budget								
Tariff revenue (% of GDP)	2.9	2.7	2.9	2.9	2.9	2.9	2.9	2.1
Tariff revenue		0.0	7.3	5.8	1.8	0.0	0.0	0.0
Aggregate trade								
Real exchange rate		1.6	1.2	1.1	0.4	0.3	0.5	3.4
Aggregate exports		3.1	4.0	1.7	2.2	-3.0	-0.6	54.6
Factor Earnings								
Skilled labor		10.6	9.7	8.1	2.3	0.3	2.9	42.6
Semi-skilled labor		7.0	6.4	4.9	0.2	0.8	1.3	39.0
Unskilled labor		14.0	12.1	10.1	3.2	1.4	5.2	52.0
Capital		11.4	9.8	8.1	2.4	1.0	3.8	-3.2
Land		4.4	7.3	4.5	2.7	-1.6	-1.3	2.2
Factor adjustments								
Skilled labor		9.4	9.3	7.7	4.8	1.9	4.0	9.8
Semi-skilled labor		9.7	8.8	7.9	4.9	2.1	4.6	10.9
Unskilled labor		2.2	2.2	1.8	0.8	0.6	1.0	5.3
Capital		3.8	3.6	3.1	1.4	1.0	1.8	1.1
Land		24.1	24.8	21.2	15.7	3.6	11.8	28.3
Capital stock and investment								56.8

Source: Authors' estimates.

Table 6: Impacts on Industry and Factor Use of Full Reform

| | % change from benchmark | | | Labor | | | | |
| | | | | | semi- | | | |
	output	exports	imports	skilled	skilled	unskilled	capital	land
IRTS Goods and Services	15.2	12.6	-2.9	14.4	8.7	4.8	6.7	
CRTS Goods and Services	1.4	-4.6	21.2	-7.8	-4.1	-2.2	-2.4	0.0
Business Services								
Communication	8.9	-3.3		2.7	6.2	-0.3	2.0	
Insurance	11.9	-6.9	-23.9	6.7	10.3	3.5	6.0	
Banking and other financial services	11.8	-7.0	-25.3	6.5	10.1	3.4	5.8	
Other services	19.2			14.4	18.3	11.0	13.6	
Road services	51.6	74.6	-46.7	30.1	34.5	26.3	29.3	
Railway transport	53.9	77.3	-52.6	32.1	36.6	28.2	31.2	
Maritime transport	58.6	82.6	-75.2	36.1	40.7	32.1	35.2	
Pipeline transport	45.8	67.9	-29.7	25.1	29.4	21.5	24.3	
Airline transport	46.7	68.9	-32.0	25.9	30.1	22.2	25.0	
Dixit-Stiglitz Goods								
Beverages & tobacco	-0.8	-6.7	72.7		-1.5	-7.5	-5.3	
Other manufactured food	-36.5	-39.7	10.6	-37.4	-35.3	-39.2	-37.8	
Printing and publishing	-1.6		-18.5		-2.3		-6.1	
Petroleum	8.9	13.4	2.5		-2.1	-8.1	-6.0	
Chemicals	-12.8	-17.1	10.7	-17.0	-14.2	-19.5	-17.6	
Metals and machines	-34.2	-43.9	-2.3	-36.1	-33.9	-38.0	-36.5	
Non metallic products	-9.9	-26.8	43.3	-10.0	-7.0		-10.6	
Other manufactures	-8.2	-8.6	33.5	-11.7	-8.7	-14.3	-12.2	
Agriculture	5.2	7.8	24.6	-9.0	-8.0	-8.1	-3.7	0.0
Other CRTS								

Source: Authors' estimates.

Table 6: Impacts on CRTS Industry and Employment of Full Reform

| | | % change from benchmark | | | Labor | | | | |
| | | | | | | semi- | | | |
		output	exports	imports	skilled	skilled	unskilled	capital	land
Agriculture		5.2	7.8	24.6	-9.0	-8.0	-8.1	-3.7	0.0
	Maize	5.4	1.9	93.2	-2.5	0.8	-5.4	-3.2	3.3
	Wheat	-9.2	-18.8	8.6	-14.3	-11.4		-14.8	-9.2
	Rice	-17.2		45.8	-24.4	-21.9		-24.9	-19.9
	Barley	-1.0	-12.0		-6.5	-3.4		-7.1	-1.0
	Cotton	7.4	6.1		-2.1	1.2	-4.9	-2.7	3.8
	Other cereals	-7.7	-18.5		-12.5	-9.5	-15.0	-13.0	-7.3
	Sugarcane	-26.8	-3.4	70.1	-37.0	-34.8	-38.8	-37.4	-33.2
	Coffee	465.0	497.2		408.4	425.6	393.5	405.1	438.7
	Tea	-86.3	-88.4	12.2	-87.0	-86.6	-87.4	-87.1	-86.3
	Roots & tubers	9.3			-0.8	2.6	-3.7	-1.4	5.1
	Pulses & oil seeds	4.8	-1.0	3.6	-2.9	0.4	-5.8	-3.5	2.9
	Fruits	6.2	-1.3		-1.5	1.8	-4.4	-2.1	4.4
	Vegetables	-0.2	-12.5	65.2	-5.2	-2.0	-8.0	-5.8	0.4
	Cut flowers	-44.9	-45.7		-50.1	-48.4	-51.5	-50.4	-47.1
	Others crops	3.1	1.6	-16.9	-6.2	-3.1	-9.0	-6.8	-0.7
	Beef	3.5			2.3	5.7	-0.7	1.6	
	Dairy	2.6			1.0	4.5	-1.9	0.4	
	Poultry	2.8			1.1	4.5	-1.9	0.4	
	Sheep goat and lamb for slaughter	3.0			1.8	5.2	-1.2	1.1	
	Other livestock	1.8			1.0	4.4	-2.0	0.3	
Other CRTS		-0.1	-35.8	18.9	-5.9	2.0	-2.1	-2.2	
	Fishing	2.7			3.0	6.5		2.3	
	Forestry	2.8			2.5	6.0		1.9	
	Mining	-75.6	-78.3	8.6	-76.6	-75.8		-76.8	
	Meat & dairy	2.3	-5.8	89.4	-1.4	1.9	-4.3	-2.0	
	Grain milling	8.0		36.5	8.4	12.0	5.2	7.7	
	Sugar & bakery & confectionary	5.3	3.9	29.2	4.7	8.2	1.6	4.0	
	Textile & clothing	-14.0	-25.4	22.1	-14.0	-11.1	-16.6	-14.6	
	Leather & footwear	-5.1	-18.8	31.7	-4.6	-1.4		-5.3	
	Wood & paper	-75.0	-81.4	13.8	-74.9	-74.1	-75.7	-75.1	
	Water	-1.3				1.7	-4.5	-2.3	
	Electricity	9.4			7.2	10.8	4.1	6.5	
	Construction	0.1			-2.4	0.9	-5.3	-3.1	
	Trade	6.1			-3.2	0.0	-6.1	-3.9	
	Hotels	5.0			-2.7	0.6	-5.6	-3.3	
	Real estate	3.6	-20.2	-3.2	1.5	4.9	-1.5	0.8	
	Adminsitration	0.3			-0.7	2.7	-3.6	-1.3	
	Health	0.4			2.9	6.3	-0.1	2.2	
	Education	0.1			1.7	5.1	-1.3	1.0	

Source: Authors' estimates.

Table 7: Impacts on Market Prices   % change from benchmark equilibrium

	Full Reform	All services barriers	Only non-discriminatory services barriers	Only barriers against FDI in services	Only uniform tariffs	CRTS	Steady State
IRTS Goods and Services	-3.0	-3.0	-2.4	-0.7	0.2	-0.8	-7.4
CRTS Goods and Services	5.3	5.1	4.2	1.1	0.1	1.2	6.2
Business Services	-5.6	-6.6	-5.0	-1.6	0.8	-2.7	-7.5
Communication	-1.6	-2.0	-1.6	-0.4	0.4	-0.9	-3.6
Insurance	-9.5	-11.0	-5.0	-5.2	1.5	-5.4	-15.6
Banking and other financial services	-5.5	-6.9	-7.4	0.9	1.5	-3.2	-11.6
Other services	-6.1	-7.0	-4.9	-2.5	0.5	-2.4	-4.8
Road services	-13.5	-14.2	-12.0	-3.0	1.0	-0.8	-11.3
Railway transport	-16.7	-17.3	-16.7	-1.3	1.0	-2.8	-14.4
Maritime transport	-34.4	-34.8	-32.0	-3.7	1.0	-14.7	-31.6
Pipeline transport	-4.6	-5.5	-4.8	-1.3	1.0	4.2	-2.8
Airline transport	-5.7	-6.6	-5.7	-1.4	1.0	3.7	-3.8
Dixit-Stiglitz Goods	1.1	1.8	1.5	0.3	-0.4	0.1	-6.4
Beverages & tobacco	1.1	3.3	2.7	0.8	-2.1	0.0	-8.1
Other manufactured food	-4.8	1.4	1.2	0.4	-6.1	-5.3	-15.3
Printing and publishing	8.6	4.8	4.2	1.9	5.4	2.4	1.3
Petroleum	0.6	0.5	0.6	0.2	0.1	0.4	-7.6
Chemicals	1.1	-0.5	-0.2	-0.6	1.5	2.4	-5.8
Metals and machines	5.2	2.9	2.5	0.5	3.0	1.7	-3.2
Non metallic products	5.3	5.2	4.4	1.2	0.2	1.6	-9.2
Other manufactures	-4.8	1.2	0.9	-0.1	-5.7	-3.8	-5.4
Agriculture	3.2	4.0	3.2	0.6	-0.8	-0.2	9.5
Other CRTS	5.8	5.4	4.5	1.3	0.4	1.6	5.4

Source: Authors' estimates.

Table 7: Impacts on Prices in CRTS Industry

	% change from benchmark						
	Full Reform	Only Entry Barriers	Only Domestic	Only FDI	Only Tariffs	CRTS	Steady State
Agriculture	3.2	4.0	3.2	0.6	-0.8	-0.2	9.5
Maize	2.0	2.3	1.8	0.1	-0.2	-0.1	8.3
Wheat	0.7	1.4	1.2	0.4	-0.6	-0.4	0.1
Rice	-5.9	1.8	1.5	0.4	-7.4	-7.2	-6.2
Barley	4.9	5.8	4.0	1.4	-0.3	0.2	7.1
Cotton	1.9	2.0	1.5	0.3	0.0	0.0	7.1
Other cereals	6.7	7.3	5.3	1.6	-0.2	0.7	9.9
Sugarcane	-20.6	-2.0	-1.9	-0.3	-19.7	-19.9	-19.2
Coffee	-10.6	-11.2	-10.7	-10.7	2.0	-8.7	6.0
Tea	22.8	25.9	21.4	7.1	-1.4	4.0	41.8
Roots & tubers	1.7	1.4	1.3	0.0	0.2	0.1	6.6
Pulses & oil seeds	3.4	3.5	2.6	0.5	0.2	0.3	11.0
Fruits	3.6	3.6	2.7	0.7	0.2	0.4	11.2
Vegetables	5.3	5.0	3.9	0.8	0.4	1.4	12.0
Cut flowers	18.4	22.0	9.1	8.8	8.3	3.3	81.4
Others crops	2.5	1.5	1.4	-0.3	0.9	0.5	8.4
Beef	6.8	5.8	4.7	1.0	0.9	2.2	12.5
Dairy	7.5	6.7	5.4	1.2	0.6	2.1	17.3
Poultry	7.6	6.8	5.5	1.2	0.6	2.1	16.9
Sheep goat and lamb for slaughter	7.6	6.6	5.3	1.2	0.8	2.2	16.9
Other livestock	8.9	7.8	6.3	1.5	0.9	2.6	10.9
Other CRTS	5.8	5.4	4.5	1.3	0.4	1.6	5.4
Fishing	7.9	7.0	5.8	1.7	0.6	2.5	-0.5
Forestry	7.8	6.8	5.6	1.5	0.7	2.4	3.9
Mining	12.0	8.0	7.0	2.5	4.2	6.5	3.5
Meat & dairy	3.4	4.4	3.6	1.0	-0.9	-0.2	-1.3
Grain milling	0.4	2.8	2.3	0.6	-2.6	-2.0	0.0
Sugar & bakery & confectionary	1.0	2.6	2.2	0.4	-1.6	-0.7	-1.5
Textile & clothing	1.9	3.5	2.9	0.9	-1.5	-0.7	1.6
Leather & footwear	5.1	5.3	4.4	1.3	-0.2	0.9	-1.5
Wood & paper	6.9	5.1	4.5	2.2	3.8	3.0	2.1
Water	9.6	8.4	6.8	1.7	0.9	3.0	11.3
Electricity	6.6	5.7	4.7	1.2	0.8	2.0	2.2
Construction	4.9	4.2	3.5	1.0	0.7	1.6	-3.3
Trade	2.5	1.5	1.4	0.7	0.8	0.7	-1.2
Hotels	3.9	3.4	2.9	0.8	0.3	0.9	4.5
Real estate	8.8	6.7	5.5	1.4	1.8	3.3	11.3
Adminsitration	6.7	6.0	4.9	1.3	0.6	2.1	1.8
Health	10.7	9.3	7.7	2.4	1.1	3.9	33.5
Education	10.5	9.2	7.6	2.3	1.0	3.7	24.2

Source: Authors' estimates.

Table 8: Impacts on Sectoral Activity

	Full Reform	All services barriers	Only non-discrimina-tory services barriers	Only barriers against FDI in services	Only uniform tariffs	CRTS	Steady State
			% change from benchmark				
IRTS Goods and Services	15.2	13.8	11.9	4.0	1.3	5.8	71.5
CRTS Goods and Services	1.4	2.1	1.4	0.7	-1.0	-0.2	25.1
Business Services	14.9	14.9	12.3	5.4	0.8	5.9	50.2
Communication	8.9	8.2	7.0	2.0	0.5	3.5	46.8
Insurance	11.9	11.1	8.8	3.0	1.3	6.2	67.9
Banking and other financial services	11.8	10.7	9.4	1.9	1.3	5.9	67.9
Other services	19.2	19.9	16.2	8.6	0.6	6.7	40.0
Road services	51.6	42.3	36.4	8.5	10.4	15.8	79.1
Railway transport	53.9	45.2	40.2	7.1	10.4	17.2	81.8
Maritime transport	58.6	52.6	48.2	9.0	10.4	22.8	87.7
Pipeline transport	45.8	34.5	29.5	7.1	10.4	12.1	72.1
Airline transport	46.7	35.6	30.5	7.2	10.4	12.6	73.1
Dixit-Stiglitz Goods	-8.3	-5.6	-4.5	-0.2	-4.2	-0.8	88.5
Beverages & tobacco	-0.8	-0.9	-0.4	-0.3	0.6	2.7	60.4
Other manufactured food	-36.5	-25.2	-20.8	-6.9	-4.7	-7.6	477.8
Printing and publishing	-1.6	-8.7	-7.9	-5.1	-0.4	-2.5	38.4
Petroleum	8.9	6.3	4.9	2.4	1.7	4.8	370.9
Chemicals	-12.8	-16.8	-15.4	-0.4	6.5	1.6	97.6
Metals and machines	-34.2	-26.7	-21.9	-3.0	-18.9	-9.8	18.6
Non metallic products	-9.9	-5.5	-4.6	-1.3	-4.6	-4.1	60.2
Other manufactures	-8.2	0.3	1.3	2.1	-8.0	-0.6	-8.3
Agriculture	5.2	8.6	5.7	4.3	-2.0	-0.1	0.3
Other CRTS	-0.1	-0.3	-0.3	-0.6	-0.7	-0.2	34.3

Source: Authors' estimates.

Table 8: Impacts on Sectoral Activity in CRTS Industry

	Full Reform	Only Entry Barriers	Only Domestic	Only FDI	Only Tariffs	CRTS	Steady State
			% change from benchmark				
Agriculture	5.2	8.6	5.7	4.3	-2.0	-0.1	0.3
Maize	5.4	5.9	5.0	1.5	-0.4	1.1	29.4
Wheat	-9.2	-11.4	-6.4	-3.1	1.4	1.5	14.1
Rice	-17.2	5.7	4.9	1.5	-21.0	-19.5	6.5
Barley	-1.0	-1.7	-1.0	-0.5	0.9	2.2	42.3
Cotton	7.4	5.4	4.7	1.2	2.1	3.7	43.9
Other cereals	-7.7	-8.9	-6.5	-2.2	0.8	-0.4	-6.3
Sugarcane	-26.8	29.5	27.0	5.2	-48.5	-45.0	-24.7
Coffee	465.0	522.8	416.3	321.2	-11.6	190.9	29.8
Tea	-86.3	-86.5	-82.9	-55.4	8.3	-46.4	-92.3
Roots & tubers	9.3	9.0	7.4	2.2	0.4	2.9	38.5
Pulses & oil seeds	4.8	3.2	3.6	1.4	1.0	3.4	25.7
Fruits	6.2	5.3	5.0	1.2	0.5	2.7	28.1
Vegetables	-0.2	0.6	1.2	0.6	-1.0	-0.7	18.8
Cut flowers	-44.9	-51.7	-25.8	-27.2	-26.1	-10.4	-87.4
Others crops	3.1	0.9	0.5	2.3	2.4	4.3	120.3
Beef	3.5	3.9	3.3	1.0	-0.2	0.8	34.1
Dairy	2.6	2.9	2.5	0.8	0.0	0.5	25.7
Poultry	2.8	3.0	2.6	0.8	0.0	0.7	26.9
Sheep goat and lamb for slaughter	3.0	3.2	2.8	0.8	0.0	0.9	31.5
Other livestock	1.8	2.3	2.0	0.6	-0.3	0.1	32.1
Other CRTS	-0.1	-0.3	-0.3	-0.6	-0.7	-0.2	34.3
Fishing	2.7	2.9	2.5	0.4	0.0	0.5	47.9
Forestry	2.8	3.2	2.7	0.6	-0.1	0.4	46.0
Mining	-75.6	-75.7	-70.8	-34.6	-17.2	-44.3	63.9
Meat & dairy	2.3	1.8	2.0	0.2	0.8	2.4	62.6
Grain milling	8.0	6.0	5.2	1.2	2.2	3.8	48.8
Sugar & bakery & confectionary	5.3	5.6	4.9	1.6	0.2	0.7	52.5
Textile & clothing	-14.0	-10.6	-8.3	-3.4	-3.9	-6.3	16.3
Leather & footwear	-5.1	-7.2	-6.2	-3.4	-0.7	-2.5	56.1
Wood & paper	-75.0	-67.5	-62.4	-42.1	-60.1	-47.2	-10.5
Water	-1.3	-0.3	-0.1	-0.4	-1.6	-1.2	32.3
Electricity	9.4	8.5	7.4	1.8	0.9	3.3	50.4
Construction	0.1	0.1	0.1	0.0	0.0	0.0	54.4
Trade	6.1	6.5	5.2	2.0	-0.6	2.2	59.6
Hotels	5.0	4.8	4.1	0.9	0.3	1.9	32.6
Real estate	3.6	1.0	1.2	0.2	2.4	3.4	33.4
Adminsitration	0.3	0.3	0.3	0.1	0.0	0.2	2.0
Health	0.4	0.7	0.7	-0.1	-0.2	-0.2	7.1
Education	0.1	0.2	0.2	0.0	-0.1	0.0	4.2

Source: Authors' estimates.

Table 9: Piecemeal Sensitivity Analysis–Welfare effects

Parameter[a]	Parameter value			Hicksian equivalent variation[b] with corresponding parameter		
	Lower	Inter-mediate	Upper	Lower	Inter-mediate	Upper
$\sigma(va, bs)$	0.5	1.25	2	8.5	11.1	15.6
$\sigma(q_i, q_j)$	2	3	4	55.1	11.1	7.2
$\sigma(D, M)$	2	4	6	11.0	11.1	11.3
$\sigma(Ls, Lu, K)$	0.7	1	1.3	11.1	11.1	11.2
$\sigma(A_1,…A_n)$	0	0	0.25	11.1	11.1	11.3
$\sigma(D, E)$	2	4	6	10.8	11.1	11.3
$\varepsilon(d_i)$	2	4	6	8.9	11.1	13.0
$\varepsilon(f_i)$	2	4	6	8.9	11.1	13.2
$\theta m(i)$	see table below			11.1	11.1	11.2
$\theta fdi(i)$	see table below			10.2	11.1	13.2

[a] The piecemeal sensitivity analysis employs central values for all parameters (see below) other than the tested parameter and lump sum tax replacement.

[b] Mean value of Hicksian equivalent variation as a percent of the value of consumption in the benchmark equilibrium.

Key:

Parameter	Central value	Definitions of the parameter
$\sigma(va, bs)$	1.25	Elasticity of substitution between value-added and business services
$\sigma(q_i, q_j)$	3	Elasticity of substitution between firm varieties in imperfectly competitive sectors
$\sigma(D, M)$	3	"Armington" elasticity of substitution between imports and domestic goods in CRTS sectors
$\sigma(Ls, Lu, K)$	1	Elasticity of substitution between primary factors of production in value added
$\sigma(A_1,…A_n)$	0	Elasticity of substitution in intermediate production between composite Armington aggregate goods
$\sigma(D, E)$	5	Elasticity of transformation (domestic output versus exports)
$\varepsilon(d_i)$	7.5	Elasticity of Russian service firm supply with respect to price of output
$\varepsilon(f_i)$	15	Elasticity of multinational service firm supply with respect to price of output
$\theta m(i)$	varies	share of value added in multinational firms in sector I due to specialized primary factor imports, in the benchmark equilibrium
$\theta fdi(i)$	varies	share of output of service sector I captured by multinationals firms in the benchmark equilibrium

Parameter values for:	theta_fdi(i)			theta_m(i)		
	low	central	high	low	central	high
comm	0.165	0.33	0.66	0.025	0.05	0.1
osrv	0.165	0.33	0.66	0.025	0.05	0.1
bnkg	0.165	0.33	0.66	0.025	0.05	0.1
insr	0.165	0.33	0.66	0.025	0.05	0.1
road	0.05	0.1	0.2	0.025	0.05	0.1
rail	0.05	0.1	0.2	0.025	0.05	0.1
mari	0.05	0.1	0.2	0.025	0.05	0.1
pipe	0.05	0.1	0.2	0.025	0.05	0.1
airl	0.05	0.1	0.2	0.025	0.05	0.1

Figure 1: Production and Allocation of Output