Groundnut Trade Liberalization: A South-South Debate?

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Abstract

We use a new partial-equilibrium, multi-market international model to analyze trade and agricultural policies affecting markets for peanut/groundnut products. The model covers four goods in thirteen countries/regions, including a large set of developing countries. Welfare is evaluated by looking at consumers' equivalent variation, quasi-profits in farming, quasi-profits in crushing, and taxpayers' revenues and outlays implied by distortions. We calibrate the model on recent historical data and current policy information. We analyze several groundnut trade liberalization scenarios in deviation from the recent historical baseline. Trade liberalization in groundnut markets has a strong South-South dimension, opposing India and, to a lesser extent, China to smaller developing countries mainly located in Africa. In the former, current policies, exacerbated by their market size, depress the world prices of groundnut products. Under free trade, African exporters present in these world markets would gain because they are net sellers of groundnut products. In India, consumers would be better off, with lower consumer prices resulting from the removal of prohibitive tariffs and large imports of groundnut products. The cost of the adjustment would fall on Indian farmers and crushers. In China, crush margins would improve because of the large terms-of-trade effects in the oil market relative to the seed market. China's groundnut product exports would expand dramatically. Net buyers of groundnut products in OECD (Organisation of Economic Co-operation and Development) countries would be worse off. We draw implications for Doha negotiations.

Keywords: distortion, Doha, groundnuts, negotiations, oil, peanut, protection, trade liberalization.

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Introduction

Until 2002, the former policy debate on groundnut/peanut[1] markets was always conducted in a North-South context, where U.S. farm and trade policies severely distorted world markets, causing large inefficiencies. Distortions in the South were often overlooked in that debate. Radical reforms under the 2002 U.S. farm bill have removed the worst features of the former U.S. peanut program. Trade barriers were an essential pillar of the former U.S. peanut program, which generously subsidized U.S. growers. With a system of supply controls and price discrimination, U.S. farmers received a very high price for "food" peanuts on infra-marginal output (a rectangle of rents) but received a lower price equal to the world price at the margin for peanuts that had to be exported.[2] This scheme was made feasible only by limiting imports to minimum levels to force U.S. food processors to buy domestic "food" peanuts. The U.S. government restricted imports through tight tariff-rate quotas under the Uruguay Round Agreement on Agriculture (URAA).

The policy shift was caused by trade liberalization under NAFTA (North American Free Trade Agreement), which acted as a disciplining device for U.S. domestic policies. As part of its NAFTA obligations, the United States has had to increase the tariff rate quota (TRQ) gradually for groundnut imports from NAFTA members. The rising imports undermined the domestic price discrimination scheme, as cheaper peanut imports started competing with high-price domestic food peanuts.

As we show later in the paper, the current U.S. policy is a minor source of distortion in world groundnut markets.[3] This policy change in the North has brought forth significant distortions within the South, and the new policy debate in groundnut markets is occurring in a South-South context, hence our title. Trade liberalization in groundnut product markets now opposes vested interest in India and, to a lesser extent, China to income generation in smaller developing countries, especially in Africa—and thus the potential rift within the South. The heterogeneity of interests within the South is all too present in these markets. India's policies are nearly prohibitive in all markets, whereas China protects processed product markets, although it is a natural exporter of groundnuts. The size of these two countries magnifies their distortions, which substantially depress the world prices of the three traded commodities considered in our analysis. These distortions reduce the potential for farm income generation in Africa, and their removal is essential to an effective trade liberalization of groundnut product markets.

Many developing countries have been reluctant participants in the Doha Round. They stand to lose their preferential-trade-partner status, as multilateral tariff reductions and greater market access erode their preferences. However, in some markets such as groundnuts and cotton, many African countries have a comparative advantage that would enable them to compete in world markets and generate rural income and exports earnings, and alleviate rural poverty (see Baffes 2003 for cotton). If not wasted after the Cancun debacle, such opportunities provide these countries with a stake in the Doha Round. India and China have other opportunities to reap from the Doha process, especially in services and manufacturing trade in the context of their diversified economies. Resuming the Doha Round and bringing it to a successful conclusion will hinge on, among other things, identifying opportunities and trade-offs palatable to all parties—thus overcoming entrenched vested interests in protected markets.

Despite their importance for small developing countries, groundnut product markets have been systematically neglected in policy analysis related to the Doha Round using computable general equilibrium models (Beghin, Roland-Host, and van der Menbrugghe 2003; Anderson et al. 2000), mostly because of the constraints of data in the GTAP commodity coverage. Previous partial-equilibrium investigations of groundnut policy do not model world price formation; they have focused instead on unilateral reforms that assume either parametric border prices or simple world price reduced forms (e.g., Chvosta et al. 2003; Hathie and Lopez 2002; Rucker and Thurman 1990).

Our paper fills this void. We use a new partial-equilibrium, multi-market international model to analyze trade and agricultural policies affecting groundnut products markets. The model covers four goods (food-quality groundnuts, crush-quality groundnuts, groundnut oil, and groundnut cake) in 13 countries/regions (Argentina, Canada, China, the EU-15, the Gambia, India, Malawi, Mexico, Nigeria, Senegal, South Africa, the United States, and the Rest of the World). Welfare is evaluated by looking at consumers' equivalent variation, quasi-profits in farming (groundnut farming, livestock), quasi-profits in crushing, and taxpayers' revenues and outlays implied by distortions. We calibrate the model on the recent historical data (1999-2001) and current (2003) policies. Through our analysis of several groundnut trade liberalization scenarios, in deviation from this recent historical baseline, we are able to shed new light on important issues.

First, we show that world trade liberalization, including the removal of trade distortions by India and China, would increase groundnut product prices by 10 to 27 percent above their current levels. As a result, net buyers of these products in OECD (Organisation of Economic Co-operation and Development) countries would be worse off. Further, we find that the poorest countries present in these world markets would mostly gain from full trade liberalization because they are net sellers of the cash crop and products. Farm income generation in Africa in particular would be substantial relative to the size of these economies, increasing by about $100 million of farm profit in 2001. In India, consumers would be better off, with lower consumer prices resulting from the removal of prohibitive tariffs more than offsetting the higher world prices of groundnut oil. Large imports of groundnut products would take place. The cost of adjustment would fall on Indian farmers and crushers.

In China, crush margins would improve because of the large terms-of-trade effects in the oil market relative to the seed market. China's production and exports of groundnut products would expand dramatically. Hence, China could benefit from multilateral trade liberalization based on mercantilist grounds. Finally, we find that aggregate trade would expand dramatically, and the thinness of groundnut product markets could be much reduced under free trade. We conclude the paper by drawing implications for the Doha negotiations with a South-South perspective.

Background Information and Policies

Groundnuts are one of the world's main oilseed crops. They are widely cultivated in developed and developing countries. World groundnut production grew at around 2.3 percent annually over the last 20 years, driven by a tremendous growth in China. Global export of edible groundnuts increased annually by 2.2 percent, which is in sharp contrast to exports of groundnut oil and meal, which declined by 1.0 and 2.5 percent per year, respectively, over the last 20 years despite growing global consumption of these two products. International trade in groundnuts remained thin, with only 5 percent of world production sold in the international market. As we show later, this thinness has been exacerbated by trade distortions.

Groundnuts provide livelihood and cash income to many poor farmers in the developing world, especially in sub-Saharan Africa (SSA) and Asia. In Senegal, for instance, an estimated one million people (one-tenth of the population) are involved in groundnut production and processing. Groundnuts account for about 2 percent of gross domestic product (GDP) and 9 percent of exports in Senegal (Akobundu 1998). In Gambia, about three-quarters of the farmers grow groundnuts on about 53 percent of the arable land.

China is the world's largest exporter of groundnuts (with 32 percent of world edible groundnut exports), followed by the United States (19 percent) and Argentina (10.5 percent). SSA (Senegal, Gambia, Nigeria, Malawi, South-Africa, and Sudan) has lost ground in world edible groundnut markets, collectively accounting for only 5 percent of the world market in 2001, down from 17 percent in 1976. In the groundnut oil market segment, however, Senegal is the world's largest exporter, but this market has become all the thinner as other vegetable oils are increasingly used as substitutes for groundnut oil. Unlike many other agricultural products traded internationally, world prices of groundnuts have not declined during the 1990s but have fluctuated widely at around $850 per metric ton for both edible groundnuts and groundnut oil. Diop, Beghin and Sewadeh (2003) provide further background information on these markets. Next, we review notable distortions in key producing regions.

Policies in the United States

The 2002 farm bill eliminated production quotas with a quota buyout and converted the former peanut price support program to a system of direct and countercyclical payments and a price floor *cum* production subsidy (non-recourse loans with marketing loan provisions). The key features of the new program are as follows.

1. All groundnut producers now have equal access to a marketing loan program, under which producers can pledge their crops as collateral to obtain a marketing loan rate ($355/short ton). Producers may repay the loan at a rate that is the lesser of the repayment rate set by the U.S. Department of Agriculture (USDA) plus interest or the marketing loan rate plus interest, or they can forfeit the loan (Revoredo and Fletcher 2002).
2. Producers with a history of groundnut production during the 1998-2001 period receive a fixed "decoupled" payment and a countercyclical payment. Eligible production is the product of average yield in the base period and 85 percent of base-period acres. The countercyclical payment kicks in when market prices fall below an established target price of $495 net of the direct payment ($36/short ton). The payment rate is the difference between the target price net of the fixed payment and the higher of the 12-month national average market price for the marketing year for groundnuts or the marketing assistance loan rate.
3. Former owners of groundnut quotas receive compensation payments for the loss of quota asset value (see Revoredo and Fletcher 2002 for details).

The elimination of production quotas decreased the price paid by U.S. food processors and thus increased domestic use of peanuts. It also took away the logic of importing confectionery peanuts to lower the cost of processing food items intensive in peanuts. The U.S. TRQ scheme is still in place but is redundant and the TRQs remain underfilled (Fletcher and Revoredo 2003). The lower cost of production of peanut butter/paste in the United States follows the same logic. The incentive to import cheaper peanut butter/paste from Argentina or Mexico has thus been seriously mitigated by the recent changes in the farm program. Production incentives created by the 2002 farm bill vary among different types of producers but the net effect is likely to be an increase in production. The fixed and countercyclical payments provide some incentives to increase production and can be viewed as supply-inducing subsidies (Adams et al. 2001); therefore, we treat them as fully coupled in our analysis to provide an upper bound on the impact of U.S. policy on world markets.

Policies in India and China

Since the mid-1990s, India and China have reduced direct government intervention in production, marketing, and international trade of groundnut products. In the last two years however, India has reversed its course and intensified trade barriers to protect its processors.

By 1998, India had removed most restrictions on domestic trade, storage, and export of groundnuts and had allowed futures trading. This latter decision has permitted an important increase in futures contracts and even a recent use of online trading. However, while groundnut exports have been freed and imports are subject to fewer restrictions, tariff levels have remained high for all the three groundnut products considered here. Applied tariff rates actually increased in the last two years from 30 percent ad valorem rate in 2001 to 85 percent in 2003 (Diop, Beghin, and Sewadeh 2003). As Table 1 shows, tariffs on groundnuts and groundnut meal stand at 45 percent, while the tariff on groundnut oil now reaches 85 percent. Some aspects of the Indian legislation are costly for producers and users of groundnuts and create inefficiencies in the marketing system and in processing. For example, sales and purchases of groundnuts have to occur in the "Agricultural Produce Wholesale Markets," a costly legislation for both farmers and processors who have to travel to the wholesale market, pay an agent commission, and pay other transaction fees.

China has liberalized groundnut trade to some degree in recent years. Imports of groundnuts, which, until 1999, were the responsibility of only six state companies, are now opened to private firms. However, while the government has committed to cap and reduce trade-distorting domestic subsidies as part of its WTO admission agreements, guaranteed prices and government procurement schemes have remained in place.[4] Furthermore, groundnut border protection remains important in China, particularly for processed groundnuts (with a 30 percent ad valorem tariff). The tariff on raw groundnuts is 15 percent but is redundant since China is a natural low-cost exporter of edible peanuts. Tariffs on groundnut oil and meal are 10 and 5 percent respectively. The uneven application of the Chinese value-added tax (VAT) on imported and domestic products is another trade barrier (Diop, Beghin and Sewadeh 2003). The VAT is significant (13 to 17 percent depending on the product). Industry sources claim that the

TABLE 1. Current trade and domestic policy parameters used in the model

Country	Commodity	Description	Unit	Current Level
Argentina	Peanuts	Export tax	% of border price	4%
Argentina	Peanut meal	Export rebate	%	3%
Argentina	Peanut oil	Export rebate	%	2%
EU-15 (European Union)	Peanut oil	Import Tariff	%	6%
EU-15 (European Union)	Peanut oil	Import subsidy for oil from Senegal	%	10%
China	Peanut raw	Import tariff	%	10%
China	Peanut processed	Import tariff	%	30%
China	Peanuts	Value added tax	%	17%
China	Peanut meal	Tariff	%	5%
China	Peanut oil	Tariff	%	10%
China	Peanut oil & meal	Value added tax	%	17%
India	Peanuts	Tariff	%	45%
India	Peanut meal	Tariff	%	45%
India	Peanut oil	Tariff refined oil	%	85%
Rest of World	Peanuts	Tariff	%	5%
Rest of World	Peanut meal	Tariff	%	0%
Rest of World	Peanut oil	Tariff	%	0%
Canada	Peanuts	Tariff	%	0%
Mexico	Peanuts	Tariff	%	0%
Senegal	Peanuts	Tariff	%	5%
Senegal	Peanuts	Tariff on processed	%	20%
Senegal	Peanut meal	Tariff	%	0%
Senegal	Peanut oil	Tariff refined oil	%	20%
Nigeria	Peanuts	Tariff	%	0%
Nigeria	Peanut meal	Tariff	%	0%
Nigeria	Peanut oil	Tariff refined oil	%	0%
Republic of South Africa	Peanuts	Tariff	%	0%
Republic of South Africa	Peanuts	Tariff processed peanut food	%	6%
Republic of South Africa	Peanut meal	Tariff	%	0%
Republic of South Africa	Peanut oil	Tariff refined oil	%	20%
Malawi	Peanuts	Tariff	%	5%

TABLE 1. Continued

Country	Commodity	Description	Unit	Current Level
Malawi	Peanuts	Tariff processed for consumption	%	25%
Malawi	Peanut meal	Tariff	%	0%
Malawi	Peanut oil	Tariff refined oil	%	20%
Gambia	Peanuts	Tariff	%	0%
Gambia	Peanut meal	Tariff	%	0%
Gambia	Peanut oil	Tariff refined oil	%	0%
United States	Peanuts	***Out-of-quota tariffs***		
United States	Peanuts	shelled out-of-quota tariffs	%	132%
United States	Peanuts	in-shell out-of-quota tariffs	%	164%
United States	Peanuts	duty-free imports from Mexico	1,000 mt	4.15
United States	Peanuts	***Mexico above-quota tariffs***		
United States	Peanuts	shelled peanuts (port price<652$/mt)	$/mt	592
United States	Peanuts	shelled peanuts (port price>652$/mt)	%	99%
United States	Peanuts	in-shell peanuts (port price<284$/mt)	$/mt	391
United States	Peanuts	in-shell peanuts (port price>284$/mt)	%	150%
United States	Peanuts	***GATT Schedule of U.S. Peanut Imports (shelled basis)***		
United States	Peanuts	Argentina	1,000 mt	43.9
United States	Peanuts	Mexico	1,000 mt	4.2
United States	Peanuts	Others	1,000 mt	9.0
United States	Peanuts	Total TRQ	1,000 mt	57.1
United States	Peanuts	Domestic target price	$/lb	0.2475
United States	Peanuts	Domestic producer price at calibration	$/lb	0.2340
United States	Peanuts	Domestic fixed payment (fully coupled)	$/lb	0.0180
United States	Peanuts	Domestic loan rate scaled up 1.1 for annual average	$/lb	0.1775
United States	Peanut meal	Tariff	%	0%
United States	Peanut oil	Tariff	%	0%

rules on domestic meal are not clear about who actually pays the VAT. Anecdotal evidence cited in USDA's attaché reports (USDA various) indicates that the VAT is frequently not paid by domestic processors. The anecdotal nature of the protection provided by the VAT is problematic for quantifying protection. Our policy analysis considers several cases (with and without the VAT included in the trade barriers).

Policies in Argentina

Argentina's groundnut trade policy contrasts sharply with those of India and China, as almost all of Argentina's distortions are associated with exports. Until 2001, exports of raw groundnuts were taxed at 3.5 percent while exports of processed products were not taxed. However, as a result of Argentina's recent financial crisis, export retention on groundnuts increased to 20 percent. This export tax may countervail the positive signal sent to groundnut exporters through the devaluation of the peso. Import tariffs on groundnuts and products in Argentina have escalated (5, 8, and 13 percent on groundnuts, cake, and oil), but these tariffs are redundant since the country is a net exporter of groundnut products.

Policies in Key African Exporting Countries

After decades of extensive intervention in the groundnut sector, African countries underwent, to a varying degree, market reforms in the 1980s under structural adjustment plans. One of the main objectives of market reforms was to eliminate direct and indirect taxation of farmers that had undermined production incentives in the 1970s and early 1980s and led to excess processing capacities in many groundnut producing countries (Badiane and Kinteh 1994). The reforms have, however, been piecemeal and partial. Governments have withdrawn from input markets. Credit and land market failures and high transaction costs have made credit access difficult for producers who want to purchase certified seeds and fertilizer. Governments have been reluctant to liberalize groundnut processing, for which privatization efforts started only recently (Senegal, Gambia).

Traditionally, African governments have used pricing policies as levers to conveniently tax or subsidize farmers based on countries' industrial policies and political circumstances. Taxation of groundnut farmers was high in the 1970s, but since the early 1990s when world prices declined the situation has reversed in most African countries (Badiane and Kinteh 1994).[5] In Senegal and Gambia, the main rationale for state intervention in the groundnut sector has been to safeguard the viability of state-owned processing mills. Consequently, groundnut farmers' share of the export price has been consistently lower than 60 percent in these two countries (Badiane and Gaye 1999). This policy has been counterproductive, since it has led farmers to bypass large public processing companies, leading to increased excess capacities and financial difficulties.

Trade policies vary widely among African traditional groundnut exporters. Senegal and Malawi apply tariffs to processed groundnuts and oil to encourage in-country processing of groundnuts (oil production in the case of Senegal). In contrast, Gambia and Nigeria have a liberal trade policy with no border intervention. South Africa's tariff structure exhibits a slight escalation; processed groundnuts are subject to a tariff of 6 percent while unprocessed groundnuts enter duty free. State trading occurs in several countries, allowing enforcement of duties on oil imports (e.g., Senegal). Table 1 shows the various tariff rates applied by African countries on processed products.

Trade Barriers in Major High-Income Groundnut Importing Countries

Tariff barriers for groundnuts are not an obstacle in major high-income importing countries: the two largest groundnut importers in this category, the European Union and Canada, have a zero tariff for unprocessed groundnuts and low-processed groundnuts for the Generalized System of Preferences and for least-developed countries. Assessment of market access in these countries should also take into account the strict quality standards and SPS (sanitary and phytosanitary) regulations (Otsuki, Wilson, and Sewadeh 2001). In contrast to the European Union and Canada, Japan and especially Korea have a higher tariff regime for groundnuts.

The Groundnut Product Model

We refer the interested reader to Beghin and Matthey 2003, which provides a detailed technical description of the model and its calibration.

Groundnut Markets

Groundnut supply. For exposition sake, we abstract from a country subscript when presenting the structure of the model. We make it clear whenever aggregation over countries is necessary. In each producing country, the aggregate groundnut supply, GS, is a function of the current domestic price, P_{gavrg}, the average of the domestic farmgate prices for food-groundnut production, FGS, and crush-groundnut production, CGS, or $P_{gavrg} = (CGS/GS)P_{cg}+(1-(CGS/GS))P_{fg}$. A linear specification is chosen for the supply:

$$GS = b_{go}+b_{g1} P_{gavw} = b_{go}+b_{g1}[(CGS/GS)P_{cg}+(FGS/GS)P_{fg}]. \qquad (1)$$

Shares (CGS/GS) and (1-(CGS/GS)) are endogenous and reflect the composition of aggregate output. Estimates of parameters $\mathbf{b_g}$ come from the econometric or consensus estimates of supply elasticities depending on availability. This convoluted approach to modeling the aggregate supply decision is motivated by the lack of data on individual land allocation and yield for the two types of groundnuts in many countries. This approach mimics two separate production decisions for which individual data are not available and that are "revealed" at harvest time. It is clear that if the price of food-quality groundnuts rises relative to the price of crush-quality groundnuts, then farmers will exert more effort to increase the average quality of their crop, resulting in a larger share of food-quality groundnuts in their aggregate groundnut crop.

The farmgate price of food-groundnuts, P_{fg}, is a function of the world price of food groundnuts expressed in local currency, P_{gw}, inclusive of distortions affecting the producer at the farmgate level, τ_g, and the transaction cost affecting the farmgate price from the border, tc_g. In sum, we have $P_{fg} = \psi (P_{gw}+ \tau_g)+ tc_g$. Parameter ψ represents a price transmission/pass-through scalar. If $\psi = 1$, then full transmission is assumed. We use values between 0.4 and 1.0 for this parameter in the simulations. The imperfect pass-through of world prices to domestic markets is also consistent with a quality differential across countries, since the world price (the so-called Rotterdam Price) corresponds to the best available quality worldwide.

The crush-quality groundnut price, P_{cg}, is determined by the domestic equilibrium for crush-quality groundnuts, since the latter are treated as a nontraded good market. Domestic supply satisfies the crush-quality groundnut demand, which is explained below. Relative to crush-quality, food-quality groundnuts receive a quality premium. This price premium is endogenous and driven by cost to reflect the relative marginal cost of food-quality groundnuts. World price P_{gw} is determined by the equilibrium of the world market for food-groundnuts.

The change in welfare of groundnut producers is measured by the change in the realized quasi-profit, from the initial situation reflecting the current distorted prices to a set of new prices. This welfare measure is

$$\mathbf{\Pi}_p = \int_{P_{gavrg}^{0}}^{P_{gavrg}^{1}} GS(P_{gavrg})\, dP_{gavrg}, \tag{2}$$

where superscripts 0 and 1 indicate old and new situations.

Total crush-quality groundnut demand. The total demand for crush-quality groundnuts, TGCD, is a sum of demands coming from seed use, GSEED, and crushing industry, GCD:

$$TGCD = GSEED + GCD. \tag{3}$$

The seed demand is assumed to be driven by the price of groundnuts and the expected production requirement for the year, which for simplicity is assumed to be equal to the actual output for the year. Hence, we assume instantaneous adjustment of seed demand to concurrent production changes. We also assume that the seed demand reflects an agronomic constraint, and we do not consider substitution with other inputs in groundnut production:

$$GSEED = \alpha_{s0} + \alpha_{s1} GS + \alpha_{s2} P_{cg}, \tag{4}$$

with α_{s0} denoting the intercept, α_{s1} denoting the seed requirement per unit of output, and α_{s1} denoting the price response of seed demand.

The crush demand is driven by groundnut oil demand and/or by cake demand. Given the joint product of oil and cake and the positive economic value attached to cake, the derived demand from crushing reflects both groundnut oil and its cake by-product. The derived demand for crush groundnuts is driven by the crush margin, b_{crush}:

$$GCD = GCD(b_{crush}) \text{ with } b_{crush} = \gamma_{oil} P_o + \gamma_{cake} P_{cake} - P_{cg}. \tag{5}$$

Parameters γ_{oil} and γ_{cake} reflect the jointness of cake and oil in crushing (the oil and cake produced per unit of crush-groundnuts).

Food-quality groundnut demand. Food-quality groundnut demand, GFD, represents a single aggregate food use representing several food items in groundnut-equivalent (e.g., prepared groundnuts, groundnut butter, and candies). The final demand for food-groundnuts is the first component of an incomplete final-demand system for food-groundnuts and groundnut oil, and an aggregate for other goods. The system explains final consumption decisions for the two groundnut goods as determined by corresponding prices described in a vector $\mathbf{P_{pg}}$, $\mathbf{P_{pg}} = (P_{gg}, P_o)$, and income, M. The demand is

$$GFD = GFD(P_{gg}, P_o, P_z, M). \tag{6}$$

The price of an aggregate representing all other goods is given as P_z. The parameterization of GFD is explained in the section dedicated to the final consumer. The consumer price, P_{gg}, is the world price of food-groundnuts inclusive of distortions, d_{gg}, affecting consumers and a price wedge dictated by transaction cost, tc_g. A net importer status would imply an additional transportation margin, a_{tg}, and $P_{gg} = P_{gw} + d_{gg} + tc_g + a_{tg}$ in the latter case.

Equilibrium in groundnut domestic markets. The crush-groundnut domestic market equilibrium is reached when the supply and demand for crush-groundnuts are set equal, or TGCD = CGS.

For food-groundnuts, the domestic equilibrium is reached with trade:

$$GFD\text{-}FGS = FGnetrade. \tag{7}$$

Net trade, FGnetrade, could be either imports or exports.

World market equilibrium for food-groundnuts. The sum of excess demands over all countries is equal to zero and determines the world price for food-quality groundnuts.

The Crushing Industry

Oil and meal production. We make the usual assumptions of fixed proportion in the jointness of cake and oil production and about price-taking in oilseed crushing. As the crush margin increases, the demand for crush-groundnuts increases, and the joint supply of oil and meal rises, increasing the scarcity for crush-quality peanuts and decreasing the scarcity of oil and meal, until equilibrium is reached.

The oil supply, GOS, and the cake supply, CakeS, are $GOS = \gamma_{oil}GCD$, and $CakeS = \gamma_{cake}\,GCD$. The welfare of the crusher is just the quasi-profit from crushing. The change in welfare between the two policy regimes is the difference in profits between the two states of the world:

$$\Delta\mathbf{\Pi}_{crush} = GCD^1(\, b^1_{crush}\,) - GCD^0(\, b^0_{crush}\,), \qquad (8)$$

where margin b^i_{crush} is evaluated at prices prevailing in period i.

Groundnut oil demand. Groundnut oil demand is the final consumer demand. Groundnut oil is the second component of the incomplete demand system, as previously explained. Demand for oil is structured similarly to that for prepared groundnuts:

$$GOD = GOD(P_{gg}, P_o, P_z, M). \qquad (9)$$

The calibration of GOD is explained in the next section.

Cake demand. Cake demand is a derived demand from livestock production. It is an output-constant demand, which is a function of livestock numbers (aggregate livestock animal units), LAU, and the price of cakes and of other feed products, P_{feed}. We assume that the animal unit numbers and prices of competing feed products are unaffected by the policy reform and abstract away from them in the policy scenario. The cake demand is

$$CakeD = CakeD(\, P_{cake}, P_{feed}, LAU). \qquad (10)$$

Oil and cake domestic market equilibrium. We assume trade in groundnut oil and cake is an excess demand/supply and that it provides closure in these markets:

$$GOD\text{-}GOS = GOnetrade, \text{ and} \qquad (11)$$

$$CakeD\text{-}CakeS = Cakenetrade, \qquad (12)$$

with GOnetrade and Cakenetrade representing the country import from or export to the world market for the two products. The link between the world price in domestic currency and the domestic price for these two products is made via a price transmission equation similar to the one for food-groundnut price with scalars ψ_{cake} and ψ_{oil}. The equations are

$$P_{cake} = \psi_{cake}\,(P_{cakew} + \tau_{cake}\,) + tc_{cake}, \qquad (13)$$

and

$$P_o = \psi_{oil}\,(P_{ow} + \tau_o) + tc_o\,, \qquad (14)$$

with parameters tc and τ representing the price wedge for transaction cost and distortions.

Oil and cake world market equilibrium. The sum of excess demand over all countries is equal to zero and determines the world prices for oil and cake, which are traded commodities in the model and for which systematic trade data exist.

Treatment and Calibration of Final Consumption

We follow the demand calibration procedure of Beghin, Bureau, and Drogué (2003). We have a representative consumer with expenditure function e(**P**, U) with **P** being the vector of relevant consumer prices, and with U denoting utility. We are interested in a vector of two groundnut-containing goods **GGD** = (GFD, GOD), that is, prepared groundnuts and groundnut oil, with prices $\mathbf{P_{pg}} = (P_{gg}, P_o)$. We have the aggregate other goods, Z, for completeness with price P_z. The approach allows us to derive an exact welfare measure from an incomplete demand system. The price vector **P** is to be decomposed into $\mathbf{P} = (P_{gg}, P_o, P_z)$, and income is denoted by M, with subscripts indicating the respective commodities. Marshallian demands for agricultural and food goods are quadratic in prices and linear in income:

$$\mathbf{GGD^M} = \boldsymbol{\varepsilon} + \mathbf{V}\ \mathbf{P_{pg}} + \boldsymbol{\chi}\ (M - \boldsymbol{\varepsilon}'\mathbf{P_{pg}} - 1/2\mathbf{P_{pg}}'\mathbf{V}\ \mathbf{P_{pg}} - \delta(p_z)). \tag{15}$$

The latter demands correspond to the expenditure function

$$e(\mathbf{P_{pg}}, \mathbf{p_z}, \theta) = \mathbf{P_{pg}}'\boldsymbol{\varepsilon} + \tfrac{1}{2}\mathbf{P_{pg}}'\mathbf{V}\ \mathbf{P_{pg}} + \delta(p_z) + \theta(P_\mathbf{z}, u)e^{\boldsymbol{\chi}'\mathbf{P_{pg}}}. \tag{16}$$

The elements of vectors $\boldsymbol{\varepsilon}$ and $\boldsymbol{\chi}$ in equations (15) and (16), together with the elements of matrix **V**, are calibrated as in Beghin, Bureau, and Drogué 2003.

Welfare Analysis

Consumer. Equations (15) and (16) lead to an equivalent variation, EV, equal to

$$EV = [M - \boldsymbol{\varepsilon}'\mathbf{P^1_{pg}} - 0.5\ \mathbf{P^1_{pg}}'\mathbf{V}\ \mathbf{P^1_{pg}}]\ \exp[(\boldsymbol{\chi}'\mathbf{P^0_{pg}} - \boldsymbol{\chi}'\mathbf{P^1_{pg}}] - [M - \boldsymbol{\varepsilon}'\mathbf{P^0_{pg}} - 0.5\ \mathbf{P^0_{pg}}'\mathbf{V}\ \mathbf{P^0_{pg}}]. \tag{17}$$

We compute the change in expenditure, which would keep utility at the free trade utility level under the distorted program prices. Superscripts 0 and 1 denote initial distorted and final free-trade prices.

Taxpayers. With policy reforms, there is a potential change in tax revenues for food-groundnuts, groundnut oil, and groundnut cake trade. These losses are captured by the accounting identity (new flow*new tax rate*new price - old flow*old tax rate*old price) in each market.

Net welfare gains from policy reform. Net welfare is defined as the EV of the consumer net of losses/gains to groundnut producers, changes in livestock producers' surplus, changes in profits in crushing, and gains (losses) for taxpayers.

Calibration and Policy Scenarios

Calibration

We calibrate the model for three years (1999/2000, 2000/01, and 2001/02) on historical data using Microsoft Excel. Then we measure the impact of policy scenarios in deviation from the historical baseline expressed in 1995 constant U.S. dollars for the three years. We use data from the USDA-Foreign Agricultural Service's Production, Supply, and Demand (PS&D) data to calibrate production, utilization, and trade of groundnuts and products. The latter dataset is completed by Food and Agriculture Organization (FAO 1999) data when USDA-FAS PS&D is not available. The macro data (GDP, GDP deflator, exchange rate) come from the International Monetary Fund's *International Financial Statistics* (various) and the World Bank's World Development Indicators database (various).

In most countries, the typical groundnut quality premium is such that P_{cg} is between 40 and 50 percent of P_{fg}. As more food groundnuts are produced relative to crush groundnuts, the premium for food groundnuts increases to reflect the higher relative marginal cost of food-quality groundnuts. We calibrate the two prices as follows: $P_{cg} = P_{fg}\,(0.42+0.05\ CGS/GS))$, which reflects the stylized facts of the two prices' relationship.

The analysis reflects the current (2003) level of trade and domestic policies presented in the policy section of the paper. The policy coverage allows for the analysis of the separate impact of border measures on groundnuts, oil, and cake in all countries, their combined effects, and U.S. domestic peanut policy. Table 1 presents the parameterized policy instruments by country. The coverage of border measures is extensive. The coverage of domestic distortions (farm support, other taxes/subsidies) is spottier. Domestic distortions are documented for OECD countries but are harder to collect for developing economies, especially when parastatals are involved in marketing and trade. We cover the major features of the 2002 U.S. farm bill for peanuts (loan rate, countercyclical payments based on the target price, and fixed payments which are assumed fully coupled). Value-added taxes are available for China and are incorporated into the model.

The various supply and demand elasticities used in the model are detailed in Beghin and Matthey 2003. Most of the elasticities come from the elasticity database of the Food and Agricultural Policy Research Institute (FAPRI) and are a combination of econometric and consensus estimates. Both demand and supply are price-inelastic. Income elasticities are positive but smaller than one.

Policy Reform Scenarios

We analyze multiple scenarios. First, we consider full multilateral trade liberalization for groundnuts, cake, and oil, with (FMTL&US) and without (FMTL) the removal of the U.S. peanut program. Then we consider multilateral groundnut trade liberalization, again with and without the removal of the U.S. farm peanut program (GMTL&US, and GMTL scenarios); next, we consider full trade liberalization in the two largest and most distorted groundnut markets, China and India (CIFTL scenario). We report results on these five key scenarios in Tables 2 through 7. We report the impact in levels, and then in proportional changes (the three-year average of proportional impacts) in the last column of Tables 2 through 6. Table 7 reports changes in welfare in 1995 purchase power parity in U.S. dollars (purchase power parity holding in 1995).

Results

The impact of moving to free trade can be described as follows. In countries with high groundnut protection, the combined effect of the world price increase and removal of their own protection is beneficial to final users of groundnuts, other things being equal. For countries with moderate or no groundnut protection prior to reform, the net impact (tariff removal and terms of trade) is an increase in domestic groundnut prices, handicapping groundnut users (final consumers, crushers) but benefiting producers, other things being equal.

TABLE 2. Full trade liberalization and removal of U.S. farm policy (FMTL&US scenario)

	New Levels After Reform			Baseline Levels			Average Change for
	99/00	00/01	01/02	99/00	00/01	01/02	Three Years
Peanuts Trade (1,000mt)							
Net exporters							
Argentina	241	190	196	226	177	185	7%
China	699	659	687	540	450	525	36%
Gambia	9	12	17	8	11	15	11%
India	89	-1	33	100	100	125	-62%
Malawi	0	1	1	2	3	3	-80%
Nigeria	30	39	42	0	0	0	3,667%
Senegal	-5	-10	-3	2	4	5	-287%
South Africa	26	20	38	20	16	35	22%
United States	272	162	234	255	141	231	8%
Total net exports	1,361	1,072	1,245	1,153	902	1,124	16%
Net importers							
Canada	111	102	105	116	107	110	-5%
European Union	441	428	448	457	441	463	-3%
Mexico	94	65	69	101	72	75	-8%
Rest of the World	525	467	563	290	272	415	63%
Residual	189	10	61	189	10	61	0%
Total net imports	1,361	1,072	1,245	1,153	902	1,124	16%
Peanut price U.S. run. 40/50 CIF Rotterdam $/mt	896	972	779	820	888	700	10%
Peanut meal trade (1,000 mt)							
Net exporters							
Argentina	73	54	63	67	50	52	13%
China	111	119	124	9	15	25	741%
Gambia	7	12	11	5	10	10	22%
India	-311	-297	-212	10	20	100	-1,702%
Malawi	0	0	0	0	0	0	9%
Nigeria	26	26	34	0	0	0	2,867%
Senegal	137	151	145	130	144	140	5%

Table 2. Continued

	New Levels After Reform			Baseline Levels			Average Change for Three Years
	99/00	**00/01**	**01/02**	**99/00**	**00/01**	**01/02**	
South Africa	-4	2	1	-5	0	0	95%
U.S.	33	29	31	6	5	5	484%
Rest of the World	134	136	103	8	14	-12	499%
Total net exports	206	233	300	230	258	320	-9%
Net importers							
European Union	162	169	158	186	194	178	-12%
Residual	44	64	142	44	64	142	0%
Total net imports	206	233	300	230	258	320	-9%
Meal price 48/50% CIF Rotterdam $/mt	144	159	147	122	134	125	18%
Peanut oil trade (1,000 mt)							
Net exporters							
Argentina	49	44	50	46	41	42	11%
China	55	64	76	0	5	2	3469%
Gambia	5	6	6	0	0	0	589%
India	-238	-225	-266	0	0	0	-24288%
Malawi	0	0	1	0	0	0	43%
Nigeria	72	72	77	35	35	30	123%
Senegal	102	108	114	98	102	109	5%
South Africa	0	1	1	0	0	0	49%
U.S.	23	-18	6	2	-30	-10	288%
Rest of the World	114	103	105	18	11	8	861%
Total net exports	185	155	170	199	164	181	-6%
Net importers							
European Union	136	101	109	150	110	120	-9%
Residual	49	54	61	49	54	61	0%
Total net imports	185	155	170	199	164	181	-6%
Peanut oil price CIF Rotterdam $/mt	933	866	851	744	685	659	27%
Welfare(million dollars)	690	920	763				791

TABLE 3. Full trade liberalization (FMTL scenario)

	New Levels After Reform			Baseline Levels			Average Change for Three Years
	99/00	00/01	01/02	99/00	00/01	01/02	
Peanut Trade (1,000 mt)							
Net exporters							
Argentina	241	190	195	226	177	185	6%
China	693	655	678	540	450	525	34%
Gambia	9	12	17	8	11	15	11%
India	87	-1	29	100	100	125	-64%
Malawi	0	1	1	2	3	3	-82%
Nigeria	29	38	40	0	0	0	3,564%
Senegal	-6	-10	-4	2	4	5	-298%
South Africa	26	20	38	20	16	35	22%
United States	287	169	259	255	141	231	15%
Total net exports	1,367	1,075	1,254	1,153	902	1,124	16%
Net importers							
Canada	111	102	105	116	107	110	-5%
European Union	442	428	448	457	441	463	-3%
Mexico	94	65	69	101	72	75	-8%
Rest of the World	531	470	571	290	272	415	65%
Residual	189	10	61	189	10	61	0%
Total net imports	1,367	1,075	1,254	1,153	902	1,124	16%
Peanut price U.S. Run. 40/50, CIF Rotterdam $/mt	895	972	778	820	888	700	10%
Peanut meal trade (1,000 mt)							
Net exporters							
Argentina	73	54	63	67	50	52	13%
China	111	119	123	9	15	25	739%
Gambia	7	12	11	5	10	10	21%
India	-311	-297	-212	10	20	100	-1,703%
Malawi	0	0	0	0	0	0	8%
Nigeria	26	26	34	0	0	0	2,862%
Senegal	137	151	145	130	144	140	5%

TABLE 3. Continued

	New Levels After Reform			Baseline Levels			Average Change for
	99/00	00/01	01/02	99/00	00/01	01/02	Three Years
South Africa	-4	2	1	-5	0	0	95%
United States	33	29	32	6	5	5	487%
Rest of the World	135	137	103	8	14	-12	499%
Total net exports	206	233	300	230	258	320	-9%
Net importers							
European Union	162	169	158	186	194	178	-12%
Residual	44	64	142	44	64	142	0%
Total net imports	206	233	300	230	258	320	-9%
Meal price 48/50% CIF Rotterdam $/mt	144	159	147	122	134	125	18%
Peanut oil trade (1,000 mt)							
Net exporters							
Argentina	49	44	50	46	41	42	11%
China	55	64	76	0	5	2	3,459%
Gambia	5	6	6	0	0	0	587%
India	-238	-225	-266	0	0	0	-24,304%
Malawi	0	0	1	0	0	0	43%
Nigeria	72	72	77	35	35	30	123%
Senegal	102	108	114	98	102	109	5%
South Africa	0	1	1	0	0	0	49%
United States	24	-17	6	2	-30	-10	290%
Rest of the World	115	103	105	18	11	8	864%
Total net exports	185	155	170	199	164	181	-6%
Net importers							
European Union	136	101	109	150	110	120	-9%
Residual	49	54	61	49	54	61	0%
Total net imports	185	155	170	199	164	181	-6%
Peanut oil price CIF Rotterdam $/mt	933	866	851	744	685	659	27%
Welfare(million dollars)	691	924	757				791

TABLE 4. Peanut trade liberalization and removal of U.S. peanut program (GMTL&US scenario)

	New Levels After Reform			Baseline Levels			Average Change for
	99/00	00/01	01/02	99/00	00/01	01/02	Three Years
Peanut trade (1,000 mt)							
Net exporters							
Argentina	260	208	249	226	177	185	22%
China	748	703	688	540	450	525	42%
Gambia	11	15	18	8	11	15	31%
India	-482	-553	-415	100	100	125	-556%
Malawi	-1	1	1	2	3	3	-93%
Nigeria	68	75	82	0	0	0	7,470%
Senegal	4	2	2	2	4	5	-8%
South Africa	25	20	38	20	16	35	20%
United States	355	244	301	255	141	231	48%
Total net exports	989	714	962	1,153	902	1,124	-17%
Net importers							
Canada	112	102	106	116	107	110	-4%
European Union	440	426	449	457	441	463	-3%
Mexico	95	66	70	101	72	75	-7%
Rest of the World	153	109	275	290	272	415	-47%
Residual	189	10	61	189	10	61	0%
Total net imports	989	714	962	1,153	902	1,124	-17%
Peanuts price U.S. Run 40/50, CIF Rotterdam $/mt	884	960	759	820	888	700	8%
Peanut meal trade (1,000 mt)							
Net exporters							
Argentina	64	47	47	67	50	52	-6%
China	-11	-9	12	9	15	25	-144%
Gambia	5	10	10	5	10	10	-2%
India	71	95	151	10	20	100	344%
Malawi	0	0	0	0	0	0	1%
Nigeria	-2	-2	-2	0	0	0	-193%
Senegal	129	143	140	130	144	140	-1%

TABLE 4. Continued

	New Levels After Reform			Baseline Levels			Average Change for
	99/00	00/01	01/02	99/00	00/01	01/02	Three Years
South Africa	-5	0	0	-5	0	0	-7%
United States	-14	-18	-13	6	5	5	-380%
Rest of the World	-7	-5	-25	8	14	-12	-70%
Total net exports	231	260	320	230	258	320	0%
Net importers							
European Union	187	196	178	186	194	178	1%
Residual	44	64	142	44	64	142	0%
Total net imports	231	260	320	230	258	320	0%
Peanut meal price 48/50% CIF Rotterdam	122	133	125	122	134	125	0%
Peanut oil trade (1,000 mt)							
Net exporters							
Argentina	44	39	38	46	41	42	-6%
China	-13	-11	-7	0	5	2	-705%
Gambia	0	0	0	0	0	0	-5%
India	45	55	38	0	0	0	4,591%
Malawi	0	0	0	0	0	0	0%
Nigeria	33	32	28	35	35	30	-6%
Senegal	97	101	109	98	102	109	-1%
South Africa	0	0	0	0	0	0	-4%
United States	-14	-48	-24	2	-30	-10	-194%
Rest of the World	7	-3	-2	18	11	8	-103%
Total net exports	200	165	181	199	164	181	0%
Net importers							
European Union	151	111	120	150	110	120	0%
Residual	49	54	61	49	54	61	0%
Total net imports	200	165	181	199	164	181	0%
Peanut oil price CIF Rotterdam $/mt	747	686	664	744	685	659	0%
Welfare (million dollars)	782	1024	799				868

TABLE 5. Impact of peanut trade liberalization (GMTL scenario)

	New Levels After Reform			Baseline Levels			Average Change for Three Years
	99/00	00/01	01/02	99/00	00/01	01/02	
Peanut trade							
Net exporters							
Argentina	260	208	248	226	177	185	22%
China	742	699	678	540	450	525	41%
Gambia	11	15	18	8	11	15	30%
India	-483	-554	-419	100	100	125	-557%
Malawi	-0.6	0.7	0.6	2	3	3	-95%
Nigeria	67	74	80	0	0	0	7,358%
Senegal	3	2	2	2	4	5	-20%
South Africa	25	20	37	20	16	35	20%
United States	371	253	327	255	141	231	55%
Total net exports	995	717	972	1,153	902	1,124	-16%
Net importers							
Canada	112	102	106	116	107	110	-4%
European Union	440	426	449	457	441	463	-3%
Mexico	95	66	70	101	72	75	-7%
Rest of the World	159	112	285	290	272	415	-45%
Residual	189	10	61	189	10	61	0%
Total net imports	995	717	972	1,153	902	1,124	-16%
Peanut price: U.S. runners 40/50, CIF Rotterdam	883	959	758	820	888	700	8%
Peanut meal trade							
Net exporters							
Argentina	64.42	46.98	47.23	67.00	50.00	52.00	-6%
China	-10.71	-9.49	11.42	9.00	15.00	25.00	-146%
Gambia	4.87	9.81	9.92	5.00	10.00	10.00	-2%
India	70.15	94.53	150.54	10.00	20.00	100.00	342%
Malawi	0.00	-0.03	0.06	0.00	0.00	0.00	1%
Nigeria	-1.89	-2.37	-1.64	0.00	0.00	0.00	-196%
Senegal	129.18	142.68	139.58	130.00	144.00	140.00	-1%
South Africa	-5.09	-0.19	-0.05	-5.00	0.00	0.00	-7%

TABLE 5. Continued

	New Levels After Reform			Baseline Levels			Average Change for
	99/00	00/01	01/02	99/00	00/01	01/02	Three Years
United States	-13.70	-17.66	-12.35	6.00	5.00	5.00	-376%
Rest of the World	-6.06	-4.64	-24.20	8.00	14.00	-12.00	-69%
Total net exports	231.18	259.63	320.50	230.00	258.00	320.00	0.4%
Net importers							
European Union	187	196	179	186	194	178	1%
Residual	44	64	142	44	64	142	0%
Total net imports	231	260	321	230	258	320	0%
Peanut meal price: 48/50% CIF Rotterdam	122	133	125	122	134	125	0%
Peanut oil trade							
Net exporters							
Argentina	44	39	38	46	41	42	-6%
China	-13	-12	-7	0	5	2	-713%
Gambia	-0.07	-0.16	0.04	0	0	0	-6%
India	44	55	38	0	0	0	4,558%
Malawi	-0.006	-0.027	0.023	0.000	0.000	0.000	0%
Nigeria	33	32	28	35	35	30	-6%
Senegal	97	101	109	98	102	109	-1%
South Africa	0	0	0	0	0	0	-4%
United States	-13	-48	-23	2	-30	-10	-192%
Rest of the World	8	-3	-1	18	11	8	-99%
Total net exports	200	165	181	199	164	181	0%
Net importers							
European Union	151	111	120	150	110	120	0%
Residual	49	54	61	49	54	61	0%
Total net imports	200	165	181	199	164	181	0%
Peanut oil price: CIF Rotterdam	746	686	664	744	685	659	0%
Welfare (million dollars)	783	1,028	795				869

TABLE 6. Impact of China and India with full liberalization (CIFTL scenario)

	New Levels After Reform			Baseline Levels			Average Change for
	99/00	00/01	01/02	99/00	00/01	01/02	Three Years
Peanut trade							
Net exporters							
Argentina	223	174	160	226	177	185	-6%
China	586	531	589	540	450	525	13%
Gambia	8	11	16	8	11	15	3%
India	55	-38	0	100	100	125	-94%
Malawi	4	5	5	2	3	3	84%
Nigeria	12	19	22	0	0	0	1,776%
Senegal	-24	-19	-9	2	4	5	-708%
South Africa	24	19	37	20	16	35	14%
United States	258	142	238	255	141	231	2%
Total net exports	1,147	845	1,058	1,153	902	1,124	-4%
Net importers							
Canada	112	103	106	116	107	110	-4%
European Union	448	433	453	457	441	463	-2%
Mexico	96	67	70	101	72	75	-6%
Rest of the World	302	232	369	290	272	415	-7%
Residual	189	10	61	189	10	61	0%
Total net imports	1,147	845	1,058	1,153	902	1,124	-4%
Peanut price U.S. Run. 40/50, CIF Rotterdam $/mt	877	952	763	820	888	700	8%
Peanut meal trade							
Net exporters							
Argentina	76	57	67	67	50	52	18%
China	114	122	126	9	15	25	759%
Gambia	7	12	11	5	10	10	22%
India	-309	-294	-210	10	20	100	-1,690%
Malawi	1	0	0	0	0	0	46%
Nigeria	26	26	34	0	0	0	2,867%
Senegal	150	165	155	130	144	140	14%
South Africa	-3	3	2	-5	0	0	139%
United States	37	33	35	6	5	5	563%
Rest of the World	108	108	80	8	14	-12	385%
Total net exports	205	233	300	230	258	320	-9%

TABLE 6. Continued

	New Levels After Reform			Baseline Levels			Average Change for
	99/00	**00/01**	**01/02**	**99/00**	**00/01**	**01/02**	**Three Years**
United States	37	33	35	6	5	5	563%
Rest of the World	108	108	80	8	14	-12	385%
Total net exports	205	233	300	230	258	320	-9%
Net importers							
European Union	161	169	158	186	194	178	-13%
Residual	44	64	142	44	64	142	0%
Total net imports	205	233	300	230	258	320	-9%
Meal price 48/50% CIF Rotterdam $/mt	144	159	147	122	134	125	18%
Peanut oil trade							
Net exporters							
Argentina	51	45	53	46	41	42	16%
China	53	61	74	0	5	2	3,354%
Gambia	5	6	6	0	0	0	567%
India	-240	-226	-269	0	0	0	-24,481%
Malawi	2	2	2	0	0	0	185%
Nigeria	71	71	76	35	35	30	120%
Senegal	116	126	126	98	102	109	19%
South Africa	2	2	2	0	0	0	224%
United States	26	-14	9	2	-30	-10	326%
Rest of the World	92	79	85	18	11	8	665%
Total net exports	180	151	166	199	164	181	-8%
Net importers							
European Union	131	97	105	150	110	120	-12%
Residual	49	54	61	49	54	61	0%
Total net imports	180	151	166	199	164	181	-8%
Peanut oil price CIF Rotterdam $/mt	924	857	844	744	685	659	26%
Welfare effects (million $)	765	1,013	815	-	-	-	864

TABLE 7. Welfare effects of policy scenarios in million dollars at 1995 prices (average 1999-2001)

Country	FMTL&US	FMTL	GMTL&US	GMTL	CIFTL
Argentina	16.07	15.94	9.97	9.84	12.66
EU-15	-51.83	-51.27	-34.40	-33.82	-58.87
China	666.25	668.76	650.65	653.33	716.25
India	213.27	214.11	196.57	197.79	228.59
Rest of the World	-126.69	-127.06	-4.21	-4.86	-71.06
Canada	-5.94	-5.87	-4.88	-4.81	-4.59
Mexico	-7.43	-7.34	-6.11	-6.01	-5.73
Senegal	41.03	40.96	21.93	21.86	21.39
Nigeria	15.93	15.77	7.22	7.07	13.45
South Africa	2.30	2.28	2.19	2.17	0.53
Malawi	7.45	7.45	7.60	7.61	-1.06
Gambia	0.43	0.42	0.24	0.24	0.36
United States	20.18	16.70	21.71	18.40	12.39
Africa-5 total[a]	67.14	66.89	39.18	38.95	34.67
Total	791.01	790.87	868.48	868.79	864.32

[a] Denotes the aggregate of Senegal, Nigeria, South Africa, Malawi, and the Gambia.

In countries with high protection of the oil and/or meal sectors (e.g., India), the oil and cake tariff removal, net of the world price hike, induces lower domestic prices for these two products and reduces crush margins. As a result of the lower crush margins, the domestic excess demand for oil and cake increases (reduced crush, larger local demand for oil and cake). In contrast, countries with moderate protection in their oil and cake markets face a net price increase for oil and cake after trade liberalization. Their final consumption of these value-added products decreases, and crushing increases as their crush margins improve with the reform, other things being equal. Their excess supply of these products increases, that is, they exhibit larger exports.

The two full trade liberalization scenarios with and without the removal of U.S. farm policy, FMTL&US and FMTL, have nearly identical effects. They bring strong price increases for all three products, 10 percent for groundnuts, 18 percent for groundnut cake, and 27 percent for groundnut oil, as shown in Tables 2 and 3. The welfare impact of the FMTL&US and FMTL reforms is influenced by the change in the groundnut oil price, which affects the crush margin. Specifically, crush margins deteriorate in the European Union and India. However, margins improve in China, Gambia, Nigeria, Senegal, South Africa, and the United States.

As shown in Tables 2 and 3, trade patterns change dramatically. China expands its exports of the three products. The high increase in the price of oil improves the crush margin and stimulates crush and excess supply in China. A higher price for oil in the domestic markets translates into more production and reduced oil consumption. By contrast, in India the lower crush margin reduces oil and meal production; lower consumer prices for all groundnut products stimulate oil and feed demands and eventually their imports because of reduced domestic supplies. African producers expand their exports of value-added products. Senegal and Malawi decrease their exports of groundnuts because of larger domestic use. Accounting for the trade reversals in Tables 2 and 3, aggregate trade in groundnuts increases by 16 percent, and trade in value-added products more than doubles. Trade distortions undoubtedly exacerbate the thinness of these markets.

The first two columns of Table 7 show the welfare impact of these two reforms. The aggregate net welfare effects of FMTL&US (and FMTL) amount to about $791 million at 1995 prices. Not surprisingly, China and India experience the largest welfare gains since they have the two largest and most distorted groundnut product markets. China's welfare gains are about $666 million, whereas India's' gains are about $213 million. The "moderate" world welfare effect first comes from offsets (some countries gain in aggregate whereas others, chiefly the EU-15, lose). Further, for many countries, besides China and India, individual net gains/losses are moderate, because of the small size of the three markets and their price-inelastic nature. The latter brings large transfers but small deadweight losses. Indeed, substantial transfers occur between consumers, crushers, and producers. These transfers offset each other.

World price effects induced by the reforms have a similar transfer impact (offsetting rectangles and small triangles), including in countries with undistorted markets. For example, in Nigeria following FMTL, groundnut producers gain $34 million of quasi-rents; consumers experience welfare losses of $65 million because of higher oil and processed groundnut prices; crushers gain $51 million; and meal users (feed users) lose about $3 million. The country in aggregate is better off by a mere $16 million. Rural net income (producer surplus) generated by groundnut production increases by about $100 million in 2001 for the five African countries included in our analysis, suggesting potential for poverty alleviation in these countries by stimulating small-holders' production.

Under multilateral trade liberalization for all three products, the removal of the U.S. program does not matter in terms of its impact on trade flows, terms of trade, or welfare. This result hinges on the fact that the price floor established by the U.S. loan rate and the countercyclical payments are not effective because of the strong price effects of trade liberalization. The only remaining production-distorting element is the fixed payment (fully coupled in our model), which is small. Results under both scenarios (FMTL and FMTL&US) are qualitatively identical. The United States experiences moderate additional welfare gains of $4 million for the removal of its domestic distortions (gains to U.S. taxpayers net of losses of U.S. producers). As noted earlier, world price effects are nearly identical. Similarly, trade flows are barely affected by the removal of the U.S. domestic program under free trade. U.S. peanut exports are about 15,000 metric tons (mt) lower in the FMTL&US scenario as compared to their level in the FMTL scenario. Given that our parameterization of U.S. farm policy assumes full coupling of payments received by producers to production, our assessment provides an upper bound on the effect of the current U.S. peanut program.[6]

Many debates of the Doha Round of the WTO revolve around specific agricultural markets (for example, cotton). Hence, it is useful to assess what a narrow agricultural liberalization would achieve relative to a full trade liberalization encompassing value-added products (oil and cake). The GMTL&US, and GMTL scenarios consider this type of reform, and their impacts are shown in Tables 4 and 5 and in the third and fourth columns of Table 7. Much is achieved by groundnut trade liberalization alone but with a large second-best component since distortions are present in the value-added markets. In these groundnut liberalization scenarios, the price of cake and oil is little affected, and crush margins are primarily affected by changes in groundnut prices.

Margins improve in India but deteriorate in countries with limited groundnut distortions. Consumer welfare implications are also different in these groundnut trade scenarios. In highly protected oil markets, oil prices are higher under the groundnut trade scenarios (GMTL scenarios) than they would be under all-product trade liberalization (FMTL scenarios). In countries with no oil distortions, prices roughly remain at their baseline level and consumers do better under the groundnut trade liberalization than under FMTL scenarios. For the latter reason, the Rest of the World fares better under

GMTL scenarios than under FMTL scenarios. In contrast, African economies do much better with the FMTL scenarios than they would do with groundnut trade liberalization reforms. The potential Africa-5 welfare gains nearly double when moving from GMTL scenarios to FMTL ones.[7]

If China and India liberalized alone (CIFTL scenario), the qualitative results of the FMTL scenarios would hold. What is striking in this last scenario is the importance of India's and to a lesser extent China's distortions and market size in the welfare, trade, and price effects. As suggested by Table 6 and the last column of Table 7, full trade liberalization really hinges on the removal of distortions in China and India. With the implementation of CIFTL, world price increases for the three products would be substantial: 8 percent for groundnuts, 18 percent for meal, and 26 percent for oil. The major welfare differences occur in the Rest of the World, where consumers are worse off than they would be under the GMTL, since oil prices are higher. Africa-5 improves its lot in aggregate but not as well as it would under the FMTL scenario, because Africa-5's own distortions are still in place and because groundnut prices are not as high in the former scenario.

We conducted sensitivity analysis to further investigate two key assumptions in the model: the prevailing groundnut market price underlying the U.S. market, and the level of protection of groundnut markets in China. We calibrated the model on 2002/3 U.S. prices ($389/mt) to see if the new U.S. policy would have had a stronger impact on world markets under lower prevailing prices. U.S. farm prices in 2002/3 were 25 percent lower in 2002/3 than they were in 2001/2. We remove the loan rate, countercyclical payments, and fixed payments (assumed fully coupled in our model), while holding all other distortions in place in all other countries. The price floor provided by the loan rate is effective under the lower 2002/3 farm price. U.S. output decreases by 7 percent under the new prices and U.S. exports decrease by 52 percent, inducing an increase of 0.9 percent in the world price of groundnuts and negligible price impacts in the other markets. The aggregate net welfare effect is negligible and negative because the higher world price exacerbates distortions in other markets or increases import costs in net-importing countries. The United States gains about $22 million (program cost savings net of producer losses). We also ran the same change but with all other distortions removed in all countries (FMTL&US scenario). In this scenario, the world price of groundnuts would have been 0.5 percent higher than the level under free trade *cum* U.S. farm bill. Removing the farm bill incentives in a free-trade world would decrease U.S. production by about 4 percent and would reduce U.S. exports by 31 percent. The aggregate welfare gains of FMTL vary by less than $1 million under these new assumptions. Hence, the conclusion that the current U.S. peanut policy is benign to world markets remains unaltered under lower U.S. market prices.

The sensitivity analysis on China's protection structure is more pivotal to the conclusions reached, especially the protection of the groundnut sector. We consider the following assumption changes: the protection of groundnut producers is assumed to be 15 percent (the tariff is redundant in the original model). The Chinese farm sector is no longer assumed to be a net exporter without assistance. Under this new assumption and following full trade liberalization (FMTL&US), China becomes a net importer of groundnuts because demand for edible and crush groundnuts increases. China's welfare gains are around $1.03 billion. Aggregate welfare gains are $1.16 billion. World prices increase by 18, 19, and 29 percent for groundnuts, cake, and oil respectively. We also lower the baseline protection of Chinese processed groundnuts to a 15 percent ad valorem tariff (the original tariff was 30 percent and the VAT was 17 percent). Under the latter assumptions, welfare gains from FMTL in China are only $266 million and aggregate gains are now $388 million. The world price of groundnuts increases by 9 percent in this modified scenario (1 percent less than in the original run). The major change in welfare occurs in China because Chinese consumers now gain much less from trade liberalization compared to the initial situation with original tariffs and a VAT on processed groundnuts.

Policy Implications and Conclusions

The groundnut market historically has been distorted by heavy government intervention in the United States, the only country in the North with a large stake in groundnut markets (Rucker and Thurman 1990). The 2002 U.S. farm bill has suppressed most unsustainable features of previous farm legislation, but new distortions it introduced have limited potential to depress world market prices and subsidize U.S. groundnut exports. The current U.S. peanut program is mostly a domestic issue, unlike U.S.

domestic policy for cotton, dairy, rice, and sugar. The distortion of groundnut product markets is essentially a South-South affair and debate. The remaining tariffs in the United States are high but redundant because the country is a net competitive exporter of high-quality groundnuts.

Developing country members would gain little by "forcing" further U.S. domestic policy reform unless groundnut prices fall to extremely low levels. Then the U.S. policy would further destabilize world prices given its anticyclical nature. U.S. producers actually would benefit from multilateral trade liberalization in groundnut product markets and are a natural ally of free traders in the South from a mercantilist perspective.

India is the prominent protectionist force in groundnut markets. India has a long track record of agricultural distortions and closed borders. China made major concessions under the terms of accession to the WTO; it has a competitive groundnut farming sector but it continues to subsidize its crush-groundnuts in one way or another. The governments of India and China have succeeded in stimulating production and creation of domestic value-added products at the cost of major distortions both at home and in world markets. The prohibitive protection in India and distortions in China, exacerbated by their market sizes, depress world market prices. The two countries impose onto themselves large welfare losses. What is worse, they impose sizeable welfare and agricultural income losses onto smaller producing and exporting countries—mainly in Africa, hence our title. African countries also have engaged in value-added protection, but their small size has limited their detrimental impact on world markets. Distortions in the South are a principal reason for the thinness of world groundnut product markets.

The removal of trade distortions by the two largest developing economies (India and China) is essential to successful reform of groundnut products markets. As we show, the poorest countries present in these markets would mostly gain from full trade liberalization because they are net sellers of these commodities. Although net world welfare effects of liberalizing these three markets are moderate, they are still significant for small agrarian economies such as Malawi, Senegal, and Gambia. Hence, in the context of poverty alleviation, liberalizing these markets would induce sizeable welfare gains and rural income generation in these countries. The simulations also show that beyond agricultural trade liberalization, the liberalization of the value-added markets is essential to achieving larger welfare gains in African countries. Although large world welfare gains occur with groundnut trade liberalization, the additional removal of distortions in value-added markets doubles net welfare gains in the African region via larger profits to groundnut producers, crushers, and exporters. China would also benefit from such trade liberalization on pure mercantilist grounds. Indeed, both farm and processing sectors would be better off.

As a block, the OECD countries would experience welfare losses after full trade liberalization (moderate gains in the United States offset by consumer losses in the EU-15, Canada, and Mexico). Mexico, Canada, and the EU-15 lose from the trade liberalization because they have limited distortions in these markets and are penalized by the price increases for the three products.

Identifying globally superior policy options is not difficult. However, the feasibility of reforms depends on the power of vested interests and the ability of governments to identify trade-offs and politically feasible packages that will allow them to continue to pursue multiple goals in a more efficient manner. Based on our analysis, acceptable concessions could be struck that allow African members to benefit from liberalization of markets, such as groundnuts and cotton, while mitigating the withering of preferential treatments. For India, concessions on groundnuts could be offset by potential mercantilist gains in other agricultural markets (e.g., dairy) or in other sectors such as services and manufacturing.

Our quantitative assessment has some limitations and abstractions from important problems. African producers need to reduce their export volatility through better water control (less dependence on rainfall) and higher efficiency in processing if they are to become dependable exporters in the context of global markets. Another limitation is that our modeling exercise did not address the cost of upgrading groundnut quality. Most developing-country exporters, except Argentina, face a “quality” challenge for meeting the requirements of the expanding confectionary markets and SPS requirements in OECD markets. Major challenges for developing countries include adapting research with an emphasis on yield but also on size and flavor, accessing fertilizer and pesticides, and controlling aflatoxin contamination.

Endnotes

1. The terms *groundnuts* and *peanuts* are synonymous. We use the latter to refer to U.S. markets and policies and the former for all other countries and their policies. We also use the terms *cake* and *meal* synonymously.

2. The former U.S. peanut program had additional features but the essence of the program was constituted by the two components described in the introduction. See Skinner 1999 for a detailed description of the former peanut program.

3. The negative impact of the former U.S. peanut policy on world prices may have been overstated as well (see Chvosta et al. 2003).

4. These policies provide little incentive for expanding production because of unattractive administrative price levels and greater involvement of the private sector in marketing operations (FAO 1999). Data on levels of domestic support are not available, but Chinese agricultural economists report that it is minimal (see Diop, Beghin, and Sewadeh 2003 for sources).

5. Taxation of producers was direct (i.e., when marketing boards or similar agencies captured a rent equal to the difference between net world price and the producer price) or indirect (via real exchange rate appreciation). This taxation was mitigated by input subsidies and border protection.

6. We also ran a U.S. distortion removal scenario under existing trade distortions. We obtain a 0.13 percent increase in the world price of peanuts and virtually no increase in world cake and oil prices. U.S. peanut exports decrease by 10 percent or about 20,000 mt. Hence unlike in the case of some other commodities subsidized by U.S. taxpayers and consumers (e.g., rice, cotton, sugar), the impact of the current U.S. peanut program on world prices and trade is nearly negligible.

7. Africa-5 denotes our aggregate of the Gambia, Malawi, Nigeria, Senegal, and South Africa.

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