THE IMPACTS OF U.S. COTTON SUBSIDIES ON COTTON PRICES AND QUANTITIES: SIMULATION ANALYSIS FOR THE WTO DISPUTE

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Brazil brought its complaint about U.S. cotton subsidies to the WTO dispute settlement process in the fall of 2002 and consultations were held through early 2003. The case involved several major challenges.

Brazil claimed first that U.S. support for cotton granted in the period 1999 to 2002 exceeded the support decide in 1992. This was required to avoid the restrictions of the “peace clause” of the Uruguay round agriculture agreement. The case would have been stillborn without a finding in favor of Brazil on this point.

On the substantive issues, Brazil made several separate claims about the separate U.S. programs that support cotton. Brazil claimed that (a) the step 2 payment to domestic users was a prohibited domestic content subsidy, (b) the step 2 payment to exporters was a prohibited export subsidy, (c) that credit guarantees were prohibited export subsidies, (d) that the flexibility contract payments and direct payments, the market loss assistance payments and countercyclical payments and the marketing loan gains were all support for cotton and contributed to serious prejudice of Brazil’s interests by causing cotton prices to be lower than they would otherwise be and by causing the U.S. export market share to rise. Brazil also argued that cotton crop insurance subsidies were support for cotton and had effects similar to the payment programs. Brazil claimed that the U.S. programs had these effects over the 1999 to 2002 period and threatened to have these effects into the future.

Literally thousands of pages of legal briefs, exhibits, written statements and answers to panel questions were filed by the United States and Brazil with the WTO. In addition oral arguments were conducted three times before the panel and once before the appellate body. The WTO panel met in July 2003 to consider peace clause issues. The panel met again to consider substantive issues of the effects of the subsidy programs in October 2003 and again in December 2003. Many detailed legal arguments were conducted related to the meaning and applicability of the operative texts in the various WTO agreements. In addition, considerable evidence and argument was conducted on the operation and economic effects of the various U.S. programs.

The United States argued that even though cotton program outlays were much higher in the later period than in 1992, this was due to market forces beyond the “decisions” of the United States and thus did not constitute a violation of the peace clause. They further argued that since several of the U.S. payment programs were “decoupled”
from current cotton production they could not be counted in peace clause calculations. In addition crop insurance, being broadly available to many crops did not constitute support for cotton. Similar arguments carried over to the serious prejudice claims. The United States argued that payment programs, except marketing loans were not support for cotton and thus had minimal impacts on production or prices. They argued further that during the years at issue futures markets had signaled high expected cotton prices so growers anticipated little if any support from the marketing loan program. The United States also pointed out the cotton prices were high in the fall of 2003 and were projected to remain high (although that did not turn out to be true as 2004 unfolded.)

The United States also argued that the step 2 program was a single unit and thus subsidized all demand for U.S. cotton and was therefore compatible with U.S. obligations under the WTO. Finally the U.S. argued that the credit guarantee programs were specially provided for in the Uruguay round agriculture agreement and were thus not subject to export subsidy rules.

The WTO cotton panel ruled largely in favor of the Brazil position (WTO, 2004b; Baffes 2004b; Schnepf). The results of the panel decision were released to the parties in June 2004 and released to public in September 2004. Aspects of the decision were appealed by both parties and the appeal was heard December 13 – 15 2004 in Geneva. Results of the appeal process are expected to be released on March 5, 2005. Implementation of any required cotton policy adjustments will likely occur beginning in late 2005 at the earliest. The WTO Appellate Body results will be known in time for the Doha Development Agenda negotiations and especially the DDA cotton initiative negotiations to use them as a starting point for further efforts. However, implementation is a significant issue, because even if Brazil prevails on its major claims, full implementation is uncertain at best.

The WTO dispute settlement panel ruled that the step 2 export program and the export credit guarantees for cotton (and some other commodities) were prohibited export subsidies and that the step 2 domestic program was a prohibited domestic content subsidy. These cotton programs were then listed by the panel for early elimination—within months of the final ruling. Clearly, if Brazil prevails and the United States indicates that it will comply with the ruling, there is no reason to target the step 2 program or export credit guarantees for vigorous negotiation in the DDA cotton initiative. The United States has already signaled a willingness to negotiate removal of the subsidy elements of the export credit guarantee program in the DDA so this program, in particular, seems likely to be
reformed. The cotton initiative could aid in the rapid reform of these “prohibited” programs by confirming that, if the United States fails to fully comply with the dispute resolution results, it would face extreme pressure from the supporters of the cotton initiative.

The second set of findings of the cotton dispute panel was that none of the U.S. domestic support programs for cotton properly belonged in the green box of minimally trade distorting programs. In particular, the direct payment program, by prohibiting production of fruits and vegetables on base land eligible for payments, more than minimally restricted the use of the land and thereby likely stimulated cotton production. These rulings suggest that the panel interpreted the green box more narrowly than the United States had done in its notifications under the Uruguay round. These rulings have implications for compliance with AMS constraints, even without tightening of definitions that have been proposed for the DDA. Thus the DDA and the cotton initiative could take this ruling (if upheld) as a starting point for tightening definitions and categories surrounding classification of subsidy programs.

Third, the WTO cotton panel found the step 2 programs, the marketing loan program, and the counter-cyclical program all caused serious prejudice to Brazil’s interests by depressing and suppressing the world price of cotton. The panel did not specify a quantitative threshold that the effects of these programs exceeded. However, the panel did find that the United States was required to withdraw the programs or remove the significant price suppression that they cause. This finding reinforces the claims that motivated the cotton initiative. If upheld by the WTO Appellate Body, this finding makes it more difficult for the United States to argue, for example, that the counter-cyclical program should be placed in an enhanced “blue-box” and secured from meaningful DDA disciplines.

Prolog References


Summary of Analysis and Key Results

Using an econometric simulation model adapted from and based largely on the key supply and demand elasticities from the well-known and respected FAPRI policy modeling framework, this simulation examines the export and world price effects of removing the six major U.S. subsidies supporting U.S. production and export of upland cotton. For the marketing years 1999-2002, had all these domestic and export subsidies for U.S. upland cotton been removed, U.S. exports would have declined on average by 41.2 percent, and the world (A-Index) price of upland cotton would have increased by 12.6 percent, or $0.065 per pound. For marketing years 2003-2007, removal of the upland cotton subsidies, provided by the 2002 FSRI Act and the Agricultural Risk Protection Act of 2000, would on average reduce U.S. exports by 44 percent, and increase world prices by 10.8 percent or $0.059 per pound compared to baseline projections of export quantities and world prices.

Overview of the simulation framework

The modeling framework combines a detailed model of the effects of U.S. upland cotton subsidy programs on U.S. upland cotton production, prices and associated variables with a detailed international model that maps the responses in other parts of the world to changes U.S. net exports. These two segments of the framework are linked through market clearing equilibrium relationships that allow feedback.

For the United States, the model uses state information on crop insurance and allows supply response and alternative crops to differ by regions in the country. The model is adapted from models developed by a well-known simulation framework used by the Food and Agricultural Policy Research Institute (FAPRI) to respond to agricultural policy questions in the United States, including questions from the U.S. Congress and U.S. Government Agencies leading up to the passage of the 2002 Farm Act. The key elasticities of demand and supply

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1 Here the term “cotton” refers exclusively to upland cotton.
2 As noted below, to improve accuracy, the model employs a distinct set of supply response parameters for each cotton-growing region. The model also includes state-by-state data on crop insurance participation and government subsidies.
relating to the U.S. cotton market used in our model are the same as those used in the FAPRI model.

In order to assess the impact of U.S. subsidy programs on world cotton prices we used the international model and parameters used in two recent publications from the Center for Agriculture and Rural Development (CARD) at Iowa State University. The approach used here is standard and has been applied by the USDA Economic Research Service in their analysis of the impacts of the FSRI Act of 2002 and by the IMF and World Bank in their analysis of the implication of farm subsidy programs.

The approach used here is standard and well-known modeling approach described above, used a multi-commodity, multi-country simulation framework that is calibrated to replicate historical data on prices and quantities of cotton and other commodities under actual supply and demand conditions, including existing U.S. Government domestic and export policies for upland cotton. The framework produces a 10-year projected baseline for prices and quantities under assumptions about the continuation of current policies and with normal climate and macroeconomic conditions. We used actual data from marketing years 1999-2001 and a baseline for the period of marketing years 2002-2007. The baseline is not a forecast but is used as a basis for comparison of estimated effects of changes in policies or other event on prices and quantities. The use of the baseline for comparison to policy alternatives is standard for policy economists and is used for example by FAPRI, and by the USDA and the U.S. Congressional Budget Office and for official policy analysis that guides U.S. government deliberations about legislation and implementation. Indeed, the FAPRI baseline itself and FAPRI analysis has often been influential in the policy formation process, including in analysis of the FSRI Act of 2002.

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6 USDA Agricultural Baseline Projections to 2012, Office of Chief Economist, USDA.

The model is used first to address the likely impact that U.S. cotton subsidies had on cotton markets over the marketing years 1999 to 2002 by simulating what prices and quantities would have obtained had U.S. subsidies not been applied during those years. We do this by comparing the actual prices and quantities that occurred in marketing years 1999-2001, as well as under the 2002 baseline scenario with alternative scenarios developed under the alternative policies.

The model is also used to address the likely impact of alternative U.S. policies on future prices and quantities for marketing years 2003-2007. It does this by comparing baseline projections, under the FSRI Act of 2002 and the Agricultural Risk Protection Act of 2000, to show how those projections of prices and quantities change if some or all of the domestic and export support for upland cotton were eliminated.

Besides U.S. cotton subsidies, the model accounts for the wide variety of factors that influence the supply and demand for upland cotton. The baseline projections include variations in costs of production across crops, exchange rate movements, demographic shifts, population and income growth, changes in prices of other crops, changes in prices and technical constraints in textile demand, and normal climate trends, all of which influence supply and demand for cotton. These non-U.S. subsidy factors are all part of the baseline from which the alternative policy scenarios are adjusted. Thus, the counterfactual and the baseline are both built on analysis of the numerous non-U.S. subsidy-related factors affecting supply and demand for upland cotton. This is the same approach taken by all modelers who assess quantitatively the impacts of alternative policies. In particular this is exactly the procedure undertaken by FAPRI, USDA and U.S. commodity organizations, including the National Cotton Council when they provide information to regulators, budget officials or other decision makers.8

It is important for a full agricultural policy simulation framework to include multiple commodities because the different crops can compete for the same land. Some crops have complement or substitute relationships in demand, as when livestock feeders choose between corn and sorghum in a feed ration. Linkages between the crop and livestock commodities are

8 The U.S. Congressional Budget Office uses projections of commodity prices and quantities under proposed legislation when they “score” the budget costs of proposals relative to current law. CBO uses baseline projections and models to assess the changes relative to the baseline. USDA uses the same approach as for example in Westcott, Young, and Price, November 2002. The National Cotton Council uses their own projections models and, in the past including during the consideration of the FSRI Act of 2002, contracted with FAPRI for such analysis. See for example, “The Economic Outlook for U.S. Cotton 2003,” National Cotton Council, 2003.
also important because feed crops are inputs into the livestock production process. A policy change for one crop can influence production and demand of other commodities. Our model uses the FAPRI framework for incorporating the other commodities into the simulation.  

Our framework contains the supply, demand and related equations for major commodities in the United States that are also used in the FAPRI framework. USDA in its FAPSIM model and others use similar frameworks to model the U.S. and international cotton markets. There is particular detail in our model about supply and demand relationships in the United States including regional supply response and alternative crops. The model also contains detailed equations dealing with how alternative policies (e.g., removal of or increases in subsidy levels) influences cotton supply and demand. It is also important to include multiple countries and regions in the model to reflect alternative sources of supply and demand when a policy condition changes. For example, a policy-induced increase in incentives to produce cotton in the United States (as under the marketing loan program) would engender indirect market responses in many other countries that produce or consume cotton. An increase in U.S. subsidies for upland cotton induces producers in other countries to reduce area planted to upland cotton in anticipation of higher U.S. exports and a decline in the world market price.

The world market impacts on prices and quantities are an amalgam of the direct and indirect responses from suppliers and demanders in many locations. The sum of production and demand responses outside the United States together with U.S. responses to policy determine the net effects of the policy change on the world supply and demand balance and this in turn determines prices in each market. Our framework is very similar to the international cotton model used by FAPRI to analyze WTO liberalization scenarios and the accession of China to the WTO.

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9 Major product groups for which the model includes supply and demand equations are: Wheat, Rice, Sugar, Feed Grains, Cotton, Soybeans and Products, Other oilseeds and Products, Beef and Veal, Pork, Poultry, Dairy Products.

10 Countries and regions for which the model includes cotton supply and demand equations are: Africa, Argentina, Australia, Brazil, Canada, China, Eastern Europe, European Union, India, Japan, Mexico, Other Asia, Other FSU-15, Other Latin America, Other Middle East, Other Western Europe, Pakistan, Rest of World, Russia, South Korea, Taiwan, Turkey, United States, and Uzbekistan.

In sum, while the overall framework addresses many non-cotton related factors and covers demand and supply factors throughout the world, key model relationships are directly related to upland cotton and especially upland cotton in the United States. As described below, the focus of our counterfactuals has been to analyze how the removal of some or all of U.S. domestic and export support for U.S. upland cotton affect cotton supply and demand.

**Policy Scenarios, Time Frames and Price and Quantity Data**

Let us first consider how the removal of U.S. domestic and export subsidy programs for upland cotton would have affected cotton markets over the 1999 to 2002 marketing years and then consider how removing U.S. cotton subsidy programs would affect prices and quantities between the 2003 through the 2007 marketing years (the end of current U.S. farm legislation).

Seven alternative policy scenarios are considered here. We investigate the impacts on prices, production and export quantities and other economic variables of removing individually each of the main cotton subsidy programs provided by the U.S. government. We then assess the cumulative impacts of removing all the six subsidies together. The six subsidy programs are (1) the marketing loan, (2) the production flexibility contract payments and direct payments; (3) the market loss assistance payments and the counter-cyclical payments; (4) the crop insurance subsidies; (5) the Step-2 payments to buyers of U.S. cotton; and (6) the export credit guarantee subsidies.

For the marketing years 1999 to 2001, the model compares the prices and quantities implied by the model under elimination of specific cotton subsidies in the United States to the actual data for each year, which includes the effect of the subsidies under the FAIR Act of 1996, the Agricultural Risk Protection Act of 2000 (as well as under its predecessor the Federal Crop Insurance Reform Act of 1994) and ad hoc farm subsidy laws passed in 1999, 2000, and 2001. For each of these years, under the current policy that existed during the period, the model is calibrated to reproduce the actual data outcomes. Then the model is run again for each of the alternative policy scenarios and we calculate the difference between the actual data and the “projection” under the alternative counterfactual subsidy policy. In the “but-for” or counterfactual analysis over the recent past (MY 1999-2001) the question is: *what supplies, demands and prices would have obtained in the cotton market without these policies?* To answer that question, we remove the U.S. cotton subsidy policies from the incentives facing U.S. cotton farmers and the policy driven incentives for buyers to purchase U.S. cotton. We then simulate
the resulting supplies, demands and prices in the United States as well as in the rest of the World. The differences between the two sets of projections comprise the effects of the subsidies. The baseline model we use is adapted from that developed by FAPRI for this purpose. The adaptation focuses on policies that had not been explicitly modeled by the FAPRI framework—crop insurance and export credit guarantee programs.

For the marketing years 2002 to 2007, the prices and quantities implied by the model under elimination of specific cotton subsidies in the United States are compared to the projections of the baseline, which assumes that U.S. subsidies all remain in place during this period. As noted above, FAPRI, USDA, and other US government agencies use this same baseline procedure when examining the likely consequences of alternative policies. The baseline is calibrated to provide a “current policy” projection for the future upland cotton market conditions under the subsidy program in the FSRI Act of 2002 and the Agricultural Risk Protection Act of 2000. The baseline contains projections that are very similar to those published by USDA and FAPRI.\textsuperscript{12}

As it is based on the FAPRI elasticities and approach, the model uses the accepted and well-established data definitions and sources. All basic data is taken from USDA sources. The quantities and prices are reported in the USDA baseline publications and in the cotton yearbook.\textsuperscript{13} These are standard data used by other cotton industry analysts in the USDA and FAPRI. The domestic U.S. price is the annual season average price of upland cotton received by U.S. farmers (also called the farm price) defined by the USDA and presented in the USDA Cotton and Wool Yearbook among other USDA publications. The “world price” is the A-Index as developed by Cotlook and also reported in the USDA Cotton and Wool Yearbook Appendix Table 14.

**Upland Cotton Supply Response to Economic Incentives**

\textsuperscript{12} See FAPRI Agricultural Outlook, 2003. \url{http://www.fapri.iastate.edu/pubs/outlook.html}; and Agricultural Baseline Projections to 2012, Office of Chief Economist, USDA. The next full or official updates of these baselines are scheduled to be released in the winter of 2004. It is therefore not possible to account quantitatively in the simulations for market evolution since the winter of 2003.

One of the key aspects of the policy analysis presented here is assessing the effect of U.S. subsidies on U.S. acreage planted to cotton. Effects on U.S. cotton acreage depend on how different subsidy programs (either collectively or individually) change the projected net returns per acre for cotton relative to competing crops. This change in projected profitability depends crucially on expectations that U.S. upland cotton farmers have about market prices and government program benefits associated with planting cotton. Acreage planted to cotton in a given year (normally between February and May) does not depend on actual realizations of prices, climate or other factors, which occur later. Instead, cotton plantings depend on costs and the expectations about production incentives that growers hold at the time they make their planting decisions. Thus, for marketing year 2000, which began on 1 August 2000, the expectations of cotton farmers about production incentives are those held during the previous winter, prior to planting the crop and several months before the beginning of the 2000 marketing year.

Of course, it is impossible to know precisely what individual growers expect. Our model adopts the long-standing approach of FAPRI, and other models to approximate these expectations by using the current year final realized market price as the expectation for the following season’s price. Thus, in the example concerning marketing year 2000, a representative or average grower may make the decision in January 2000 about how much acreage to plant for cotton that will be marketed in the 2000 marketing year. At the time of decision the farmer arranges for seed, fertilizer and other materials and plans for other crops that also will be planted on that farm. For the representative grower’s price expectation, we use the weighted average of actual market prices from marketing year 1999 (August 1999 through July 2000). The model credits the growers with good information about the conditions that will play out during the current (1999) marketing year and then uses that information to project what growers expect to obtain for the marketing year to come (2000). This expectation formulation is a compromise between thinking farmers have perfect foresight about the future year (even though such crucial inputs as weather, global plantings and demand shifts may be truly unknowable) and assumptions that growers only have information about prices that have already occurred. All supply models, including the FAPRI and USDA models, among others, depend on some
particular specification of grower expectations. The one adopted in our model is one standard and widely applied approach in the literature.\textsuperscript{14}

The supply specification implies that, for example, years in which net returns turn out to be high are not necessarily the years in which growers choose to plant the most acres of cotton. The reason is that growers do not have perfect foresight and cannot perfectly anticipate the higher returns.

In each year, a significant amount of acreage that is planted to cotton is abandoned before harvest, typically because of unforeseen weather or other unanticipated problems. Hence it is typical for cotton supply models to use historical ratios to convert area planted to cotton into area of cotton harvested. Our model, as with the FAPRI model, applies such ratios on a regional basis. Our model also uses historical information to apply the appropriate yield per acre to the harvested area projections. These yield figures are based on average figures adjusted to reflect the differences in planted and harvested area. Thus when harvested area expands in a region and less suitable cotton land is drawn into production, average yield in that region typically declines. Again this approach is taken directly from the FAPRI model and is similar to that applied by USDA in their baseline projections.\textsuperscript{15}

As noted above, my supply model for the United States is specified using a separate linear functional form for area planted to upland cotton. The model applies parameters that show the response of planted area as a function of the expected net revenue from upland cotton production. These parameters are taken directly from the FAPRI model for upland cotton and are based on statistical analysis conducted by FAPRI analysts.\textsuperscript{16} Table 1 shows the implied planted area elasticities for each cotton-growing region in the United States and the weighted average for three representative years. The implied elasticities are all less than 1.0. These show the percentage change in area planted for each percentage change in net revenue per acre. For


\textsuperscript{15} See FAPRI Agricultural Outlook, 2003. \url{http://www.fapri.iastate.edu/pubs/outlook.html}; and \textit{Agricultural Baseline Projections to 2012}, Office of Chief Economist, USDA.
example the Table 1 shows that the acreage response elasticity for the Southern Plains in 2000 is 0.327 which means that a ten percent decline in the expected net revenue per acre for cotton would cause a 3.27 percent decline in the area planted to cotton in the Southern Plains region. These supply elasticities are in the same range as many others estimated for cotton and other program crops in the United States.17

**U.S. Upland Cotton Demand Response**

Demand response facing the cotton industry in the United States is also specified in linear terms. To reflect demand response to price, the elasticity parameters are the same as used by the FAPRI cotton model, and are calibrated to historical prices and quantities, as in the FAPRI approach. Consistent with other models, and with industry experts, the demand from mill use is relatively unresponsive to market price. The implied elasticity is –0.2 meaning that a ten percent increase in the price of cotton would reduce the U.S. mill use of cotton by only two percent. The relatively inelastic demand reflects four facts. First, there are relatively few good substitutes for cotton in most current uses. Second, textile manufactures are often dedicated to the use of specific fiber combinations in their products. Third raw cotton comprises a relatively small share of final product costs in most cases. And, fourth, final consumers of finished textile products tend to be relatively insensitive to small price changes in product prices.

The export elasticities facing U.S. cotton in international markets reflect the response of international buyers to the price of U.S. cotton if the price of cotton from other countries were to remain unchanged. This demand elasticity is expected to be greater than one in absolute value because cotton from other countries is a close if not prefect substitute for U.S. cotton. The United States is the number one supplier in world markets and the U.S. market share is close to 40 percent, but that still leaves opportunities for substitution of other country cotton for U.S. cotton if the U.S. price were to rise significantly. As seen in Table 2, the export demand elasticity facing the United States varies annually and takes values of between –2.5 and –4.0. The export demand parameters are also taken from the FAPRI model.

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16 For recent FAPRI cotton analysis see, [http://www.fapri.missouri.edu/FAPRI_Publications.htm](http://www.fapri.missouri.edu/FAPRI_Publications.htm) for more about the FAPRI modeling system see [http://www.fapri.missouri.edu/About_FAPRI.htm](http://www.fapri.missouri.edu/About_FAPRI.htm).

17 See for example, Lin, William, Paul C. Westcott, Robert Skinner, Scott Sanford, and Daniel G. De La Torre Ugarte. *Supply Response Under the 1996 Farm Act and Implications for the U.S. Field Crops Sector*, TB-1888, U.S. Department of Agriculture, Economic Research Service, July 2000, especially page 24 where cotton supply elasticities are reported to be between 0.4 and 0.5 as used here. See also Paul C. Westcott, and C. Edwin Young. “U.S. Farm Program Benefits: Links to Planting Decisions & Agricultural Markets,” *Agricultural Outlook*, AGO-
International Supply and Demand Elasticities

Table 3 shows the cotton demand and cotton area price elasticities for other countries and regions. Demand elasticities are inelastic in all markets and the average is approximately −0.25, very similar to the price elasticity for mill use of cotton in the United States. The cotton area supply elasticities are also inelastic reflecting the difficulties in adjusting cotton area in response to price changes. The average elasticity is approximately 0.3, but the area supply for cotton are more inelastic in China and India, which are both large suppliers. Both the demand and supply elasticities are from the international cotton model developed by FAPRI staff.\(^{18}\)

Supply and Demand Adjustments, Stock Adjustments, Market Clearing

Given the basic supply and demand equations specified above the model is completed with a specification for ending stocks and for market clearing. These specifications are the same as those used by the FAPRI approach. Annual adjustments in ending stocks respond to expected adjustments in prices and available supply. Thus stocks adjust to the underlying supply and demand balance as well as to the current and expected prices of cotton. To complete the model and allow us to solve for the equilibrium prices and quantities, net trade for each country or region is determined by the domestic balance between supply and demand. Each country contributes a net export or net import to the world supply and demand situation and prices adjust until this net trade balance is zero and the markets clear.

The simulations specify that a policy change in the United States would shift the supply and demand equations for U.S. cotton and thus perturb the initial balance between supply and demand. Given the elasticities specified, price responds and encourages adjustments in the quantities demanded and supplied in the United States as well as in other countries and regions. This adjustment process proceeds until a new set of equilibrium prices and quantities are established. This approach to market equilibrium, adopted by the FAPRI framework is standard in economic simulation models used by the USDA and others.

The Effects of U.S. Upland Cotton Subsidies on Net Revenue Per Acre for Farmers and the Net Price of U.S. Cotton Facing Buyers

\(^{18}\) Bruce A. Babcock, John C. Beghin, Jacinto F. Fabiosa, Stephane De Cara, Amani El-Obeid, Cheng Fang, Chad E. Hart, Murat Isik, Holger Matthey, Alexander E. Saak, Karen Kovarik, and FAPRI Staff, *Doha Round of the World Trade Organization: Appraising Further Liberalization of Agricultural Markets*, November 2002. 02-WP 317; and

I assess the impacts of the separate U.S. government subsidy programs on the quantity of U.S. upland cotton supplied and the quantity of U.S. upland cotton demanded. The U.S. government has provided subsidy programs that increase the expected per acre net revenue received by farmers for planting cotton in the United States. Other U.S. government subsidies (i.e., Step-2 and export credit guarantee) effectively reduce the net price paid by buyers of U.S. cotton and thus increase the demand for U.S. upland cotton. This increased demand, in turn, stimulates increased production.

The subsidies that increase the expected net revenue per acre planted naturally increase the quantity supplied. These are the (1) marketing loan benefits (MLB), including both loan deficiency payments (LDP) and marketing loan gains; (2) production flexibility contract (PFC) payments (which applied during 1999 to 2001) and direct payments (DP) (which apply during 2002 to 2007); (3) market loss assistance (MLA) payments (which applied during 1999 to 2001) and counter-cyclical payments (CCP) (which apply during 2002 to 2007); (4) crop insurance subsidy (CIS).

Expected net revenue per planted acre may be written as a sum as follows:

\[
\text{Expected Net Revenue} = \text{Expected} \left[ (\text{Price} \times \text{Yield}) + (\text{MLB} \times \text{Yield}) + (b_{pfc} \times \text{PFC} + b_{dp} \times \text{DP}) + (b_{mla} \times \text{MLA} + b_{ccp} \times \text{CCP}) + \text{CIS} - \text{Cost per acre} \right].
\]

The impact of changes in price, cost, or any of the subsidy elements on the planted quantity impacts affect expected net revenue times the linear supply coefficient discussed above. In percentage change terms, a ten percent decline in the U.S. average expected net revenue per acre would reduce U.S. cotton acres planted by between 3.6 and 4.7 percent (depending on the year). A reduction in the expected amount of any of the four production subsidies affects planted acres and hence U.S. cotton production through the impact on expected net revenue per acre.\(^{19}\)

Note that the coefficients \(b_{pfc}, b_{dp}, b_{mla}, \) and \(b_{ccp}\) are all expected to be between zero and 1.0.

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\(^{19}\) This formulation through expected net revenue per acre is the same as specified in the FAPRI cotton model and is also very similar to that applied by the USDA as, for example, in William Lin, Paul C. Westcott, Robert Skinner, Scott Sanford, and Daniel G. De La Torre Ugarte. *Supply Response Under the 1996 Farm Act and Implications for the U.S. Field Crops Sector*, TB-1888, U.S. Department of Agriculture, Economic Research Service, July 2000.
They provide scaling to reflect that changes in these payment amounts would not affect the expected net revenue from an acre planted to cotton production as directly as would a change in the market price, marketing loan benefit, crop insurance subsidy or per acre cost. Among other issues, the scaling factors account for the relatively small proportion of these payments that are made to farms that no longer grow upland cotton on their upland cotton program base. The contributions of these payments to the per-acre net revenue and the magnitudes of these coefficients are discussed in detail below.

On the demand side, the step two programs and export credit guarantee subsidy each affect the net price paid by buyers of U.S. cotton and the quantity demanded as follows:

\[
(2) \quad \text{Quantity of U.S. Cotton Demanded by U.S. Mills} = a_d - b_d(\text{Price} - \text{Domestic Step-2 Payment}).
\]

\[
(3) \quad \text{Quantity of U.S. Cotton Demanded by Export Buyers} = a_e - b_e(\text{Price} - \text{Export Step-2 Payment}) + b_c(\text{export credit}).
\]

\[
(4) \quad \text{Total Quantity Demanded} = (2) + (3).
\]

To summarize, the economic logic behind these equations is based on traditional supply and demand principles. In any standard economic model the impacts of U.S. government subsidies on area planted to cotton and on the quantity of U.S. cotton demanded trace through the supply and demand system to affect domestic farm prices, exports and world prices (indexed by the A-Index). The net revenue and demand equation framework are standard in the FAPRI model, in USDA models, and in other agricultural policy models.

The following sub-sections explain the economic logic related to incentives created by each of the six main U.S. subsidy programs. These discussions apply well-established economic principles and are closely allied with other economic modeling undertaken by FAPRI and USDA among other groups.

**Marketing loans**

It is well-established and thoroughly discussed by USDA analysts and others that the U.S. marketing loan program in general provides benefits and incentives to produce specific commodities. For upland cotton in particular, the marketing loan provides a benefit to cotton
farms equal to the (non-negative) difference between the loan rate established by the U.S. cotton program and the cotton loan repayment rate, which is equal to the adjusted world price (AWP) of cotton. This benefit takes the form of either the marketing loan gain or the loan deficiency payment.

The effect on grower planting incentives is to increase the expected net returns per acre for growing cotton. The magnitude of the impact on incentives to produce cotton is equal to the expected difference between the loan rate, which is known at planting time, and the growers’ expectations about the AWP of cotton at the time of planting. The expectation of this difference operates on grower incentives to directly offset lower expected U.S. market prices on a dollar for dollar basis. Thus the impact of a reduction in expected marketing loan benefit on production is the same as a decrease in the expected price. The impact of the marketing loan program on planted area and production is direct and large whenever growers expect adjusted world prices to be low. The magnitudes of such effects applied in our model are the same as those found in the models used by FAPRI and the USDA.

The impact of removing the marketing loan program on quantities and prices is found by solving for a new equilibrium without these anticipated per unit government payments and comparing that “but for” set of quantities and prices with those actually observed when the program was in place.

For future crop years from 2002-2007, the same assumptions/analysis of the magnitude of the marketing loan/LDP subsidies are applied as in the earlier 1999-2001 period. The equilibrium prices and quantities with no marketing loan program are compared to those

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produced by the baseline projections that assume a continuation of the marketing loan program. The magnitude of the impact of removing the marketing loan program is larger in years expected to have low prices and smaller in years expected to have higher prices. As has been found by USDA economists and others for years, this means the marketing loan/LDP subsidy program causes U.S. cotton producers to maintain production at relatively high levels even in the face of low expected market prices.

**Production flexibility contract payments (1999 to 2001) and direct payments (2002 to 2007)**

The “production flexibility contract” payments (PFC payments) were established for cotton by the FAIR Act of 1996. The “direct payments,” (DP) established by the FSRI Act of 2002, continued the PFC payments under a new name and with a significant change in operation. The PFC payments for cotton were made on the basis of a farm’s historical base area and established historical program yield rather than on current production as is true for the marketing loan program. In equation (1) the impacts of the PFC payments and DP on net revenue per acre are dampened relative to the effects of market price or marketing loan benefits. The coefficients $b_{pfc}$ and $b_{dp}$ measure the impacts on net cotton revenue per acre of PFC payments and DP relative to the impacts of price and marketing loan benefits. This sub-section discusses the economic reasons and evidence supporting the relationships: $0 < b_{pfc} < b_{dp} < 1.0$. There is not conclusive evidence for specifying the levels of $b_{pfc}$ and $b_{dp}$ precisely, as no comprehensive statistical evidence has been produced. Indeed there are little data available to use for such econometric analysis. Nonetheless we can be confident that they are both between zero and 1.0.

While such effects are likely to be significantly less than effects from marketing loan/LDP subsidies, there are at least four major reasons why the PFC payments affected the area planted to cotton and the direct payments will continue to affect production under the FSRI Act, and why removal of the programs would reduce area planted to cotton.\(^{24}\)

\(^{24}\) For a USDA discussion of many of these points see Paul C. Westcott, C.E. Young, and M. Price, USDA, ERS, *The 2002 Farm Act, Provisions and Implications for Commodity Markets*, Economic Research Service, November 2002. Westcott, Paul C. and C. Edwin Young. “U.S. Farm Program Benefits: Links to Planting Decisions & Agricultural Markets,” *Agricultural Outlook*, AGO-275, October 2000, pp. 10-14. See also the discussion in, *Decoupled Payments: Household Income Transfers in Contemporary U.S. Agriculture*. M.E. Burfisher and J. Hopkins, Eds. USDA ERS Agricultural Economic Report Number 822, February 2003. Quantitative simulations in this publication are not relevant to the current case for several reasons. This publication discusses impacts of removing decoupled payments for all program crops simultaneously rather than for any one program crop. It also devotes relatively little attention to planting restrictions that are in place for U.S. programs that claim to be decoupled. This last point is particularly relevant for cotton. Nor does the analysis incorporate the value of updating of program bases.
First, the PFC payment program provided substantial added income directly to farms that had a history of growing cotton and most of these farms continued to grow cotton. For a typical commercial cotton farm with 3000 acres of upland cotton the PFC payments during the 1999 to 2001 period would have been in the range of $300,000. This money would be available to the farm to invest in production-increasing farm improvements and otherwise enhance the productivity of the farm. Another way to look at this effect is to note that these payments were a substantial source of farm income that would make the operation a more attractive customer for lenders. This secure income source would have improved access to working capital at more favorable rates. While the payments could have been used for other purposes, the fact that payments were made to those actively engaged in cotton farming naturally means that they provided encouragement to increase cotton output.\(^{25}\)

Second, the magnitude of the payments and the security of the payment contract afforded cotton farmers flexibility to take on more risk in their operations. With the income guarantee provided by the flex payments, farmers could extend cotton area, attempt new and potentially higher yielding technologies and generally expand their operations. Again the result is more cotton production because of the PFC payments.\(^{26}\)

Third, although eligibility for PFC payments under the FAIR Act allowed planting flexibility, there were significant remaining restrictions and these continued under the direct payments in the FSRI Act of 2002. To be eligible for the PFC payments, the program base land was required to remain in agricultural uses (including conservations uses) and thus could not be developed for urban, commercial or other non-agricultural activities. Also, the crops grown on the cotton base land were restricted. In particular, no fruits, tree nuts, vegetables, melons or wild rice could be planted (subject to some minor and restrictive exceptions). These banned alternatives include some of the most relevant alternative in some major upland cotton areas,


especially in the West where more than 15 percent of the cotton crop is produced. For example, in the San Joaquin Valley of California crops such as tomatoes, garlic, almonds, and grapes are all viable and important alternative crops to planting cotton. Thus, the restrictions that payments would be zero if any of these crops were produced on cotton base was an important limit that kept land in cotton that might have otherwise moved to one of these alternatives. Most analysts of general farm programs in the United States have undervalued the significance of this restriction, presumably because they have focused discussion of the impact of PFC payments on feed grains and wheat and the restricted crops are less important in those cases. Furthermore, these restrictions are far more important in the South and West, where cotton is grown than in the Northern regions where grain predominate.

Fourth, although the 1996 FAIR Act specified that payments would be made on historical area and established program yields, farmers quite naturally maintained some expectation that these rules might change. When there is a significant probability that the area base or yield used for payments will be updated in the future, a farm operation would have reasonably hesitated before shifting land with cotton base out of cotton. A farmer who assigned a significant chance that payment bases would be updated would attempt to stimulate higher yields and add cotton acreage in anticipation of higher payments later. In fact, just such an updating occurred in the FSRI Act of 2002, so that those farms that took advantage of the flexibility of the flex payments were penalized and those who maintained or expanded cotton production were rewarded. The potential for updating the payment base can have a powerful impact on grower incentives to plant the payment crop throughout the life of the FSRI bill (until the end of marketing year 2007 when a new Farm Bill can be expected to again permit updating).

Let us explore the degree of linkage between current production and payments and how this is affected by updating base area in a simplified example. In equations (5) the degree of linkage is the discounted sum over future years of the product of (a) the expected payment rate relative to the current payment rate \( E(R_t/R_n) \) and (b) the probability that an update occurs for year \( n+t \) (Probability \( U_t \)) that uses the current planted area in the update.

\[
\text{Degree of linkage} = \sum_i (1+r)^{-t}(E(R_t/R_n))(\text{Probability } U_t).
\]
This degree of linkage depends on expectations of the current program continuing and the probability of an update occurring in the future that relies on planted area in the current period. Consider a simple example to fix ideas about the magnitude of this linkage. Consider a cotton farmer who believes that an update is likely to occur five years in the future that uses current planted area in the calculation of the new base. He is not at all sure that such an update will occur and assigns a probability of 0.5 to this event (Probability \( U_5 = 0.5 \)). Using a discount rate of 0.05 the present value of income in five years hence is 0.78. Multiplying these factors yields the following calculation: Degree of linkage = \((0.78)(0.5) = 0.39\). Thus, if growers believe that there is only a 50 percent chance of a relevant update occurring in five years, the PFC payment would have an effect on current production that is 39 percent at large as a direct production subsidy or a price increase. The other three reasons for some linkage of the PFC payments to production only add to this supply effect.\(^{27}\)

All the reasons that support the significance of cotton production incentives attributed to PFC payments apply with even more force for the direct payments that were established in the FSRI Act of 2002. The FSRI Act allowed farms to update their historical payment bases to the 1998 to 2001 period so the payments will be larger for many growers. This increases the force of the wealth effect on credit availability and the reduced risk aversion. Moreover, by renewing the payments for another six years, they are even more secure than when first introduced.

Finally, as noted above, updating the base area for direct payments in 2002 has a potentially major impact on the expectation of growers about the future of the program and the likelihood that area and yield bases will be updated in the future. If growers strongly expect the bases to be updated, they will treat the direct payments as fully tied to production, simply with a lag determined by how long they anticipate they must wait for the update.

This is not to say that direct payments create production incentives as large as marketing loan benefits, only that, with the increased expectations about updating, growers naturally treat this payment program as significantly more tied to production. Therefore the program creates additional incentives for production of cotton.

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\(^{27}\) For USDA discussion of this points see Paul C. Westcott, C.E. Young, and M. Price, USDA, ERS, *The 2002 Farm Act, Provisions and Implications for Commodity Markets*, Economic Research Service, November 2002. They provide no quantitative analysis of updating and indeed leave the effect out of their analysis after noting that it may be important. Also see Sumner, Daniel A. “Implications of the USA Farm Bill of 2002 for Agricultural Trade and Trade Negotiations.” *Australian Journal of Agricultural and Resource Economics*, 46, 3 (March 2003): 117-140, for more on the calculation of the impact of expectations about updating on expected net revenue.
These production incentives of PFC payments and direct payments are identifiable and very likely important. However, the impacts have not been measured in the academic or government literature and the existing literature provides no guidance on their precise magnitude. For the PFC impacts a value of $b_{pfc}$ between 0.15 and 0.4 seems appropriate considering all four channels of influence together. In order to be conservative in the simulations reported below, we take the lower bound value of $b_{pfc} = 0.15$. For the reasons listed above, especially the impact of updating that occurred in 2002, we expect the impact of direct payments on expected net revenue to be larger than the impact of the PFC payments. A range of 0.25 to 0.5 seems appropriate, and again we have chosen to use the lower bound of this range and have set $b_{dp} = 0.25$ in the simulation model. Although these parameters cannot yet have been estimated empirically due to a lack of available data, there is no dispute in the literature that the effects on U.S. production are positive and potentially significant. The production effects then have implications for exports, prices and other economic variables as they work their way through the system.

**Market loss assistance payments and counter-cyclical payments**

These programs are similar to the production flexibility contract payments and the direct payments but with larger implied production incentives. Such larger incentives exist because the market loss assistance payments were applied in 1998 through 2001 each year explicitly to offset low prices. Such payments were made to the same producers on the same basis as the production flexibility contract payments during this period. Because they were used explicitly to offset the impact of low market prices, these payments provided additional income stabilization for growers. The production impact of additional income stabilization is to reduce the cost of capital for upland cotton farms and to reduce the amount of land that would have been removed from cotton production because of low farm incomes in years of low cotton prices.

Reflecting their added production distorting impacts, the United States notified these subsidies as production-distorting amber box programs to the WTO. In view of these factors, the degree of production incentive is clearly larger than that attributed to the PFC payments. Again, to be conservative, an estimate of $b_{MLA} = 0.25$ in equation 1 enters the simulation model.

The counter-cyclical payments that were established by the FSRI Act of 2002 and are tied directly to the U.S price of cotton and provide payments whenever the U.S average market price is falls below $0.6573$ cents per pound. Furthermore, in comparison to the market loss
payments, the CCP program allowed farmers to update both area and yield bases. The estimated amount of payments under the CCP program in marketing year 2002 to upland cotton farmers was approximately $1 billion or roughly double annual market loss payments for upland cotton. These payments clearly provide more production incentive than the market loss or the direct payments. Growers likely now anticipate relatively frequent updating of bases in the future, therefore these payments are almost fully tied to production, although operating with a lag. In terms of magnitude of effect, they are closer to the amount of impact caused by marketing loan payments rather than direct payments. However, we use a conservative figure of $\beta_{\text{ccp}} = 0.40$ in the simulation model. This coefficient reflects the farmers expectations of likely base and yield updating in the future as well as credit access, risk reduction and restricted flexibility effect that all imply a production impact for the payment programs that have less than complete connection to current production.\(^{28}\)

**Crop insurance subsidies**

Cotton crop insurance subsidies are among the largest available for any crop and as a result almost all cotton growers participate in the crop insurance program. The subsidies decrease the net cost of the crop insurance input and increase net returns to cotton growers. The expected difference between the premiums paid by producers and the insurance indemnities paid out by the program inflate the expected net returns from cotton production. This increase in expected returns induces more cotton acreage to be planted than if the crop insurance subsidies were not available. Under the alternative with the subsidies for crop insurance for cotton eliminated net returns per acre of cotton planted would decline.\(^{29}\)

The upland cotton crop insurance subsidy comes in two forms. First, the cotton crop insurance program provides a direct subsidy on the premium required to purchase the insurance. The Agricultural Risk Protection Act (ARPA) passed by the U.S. Congress in 2000 increased crop insurance subsidies substantially. Before ARPA, the per-acre subsidy was calculated as 41.7% of premium charged at the 65% coverage level (35% deductible). After ARPA the premium subsidy increased to 59% of the premium at 65% coverage (35% deductible) and to


\(^{29}\) USDA economists have also written on this topic with conceptual analyses consistent with those reported here. See C. Edwin Young, Monte Vandeveer, and Randall D. Schnepf. “Production and Price Impacts of U.S. Crop Insurance Programs,” *American Journal of Agricultural Economics*, Volume 83, 2001, pp. 1196-1203. Their
55% of the premium at the 75% coverage level (25% deductible). This change substantially increased the incentive to buy lower deductible cotton crop insurance policies. We use the amount of the cotton premium subsidy for each U.S. state for the year 2002 as the expected premium subsidy for all years in the model.

The second source of subsidy is that the upland cotton crop insurance program provides subsidies to cover the losses in excess of the total premium receipts. The average loss ratio by region over the period the past 8 years is used to calculate the additional subsidy for crop insurance in each region. The loss ratio for a region equals the sum of all insurance indemnities paid divided by the sum of all premiums charged.

In our model, the two forms of subsidy are summed for each cotton growing region and multiplied by the region-specific crop insurance participation rate, and then divided by total acres planted in 2002 to arrive at the per acre crop insurance effect on net revenue per acre planted to cotton. The national average crop insurance subsidy is approximately $19 per acre of cotton planted. The impact on production is the same as would be caused by a pure production subsidy with equal impacts on net revenue. Thus, a dollar of crop insurance subsidy has the same impact on net revenue as a dollar increase in revenue from a higher price or loan deficiency payments. Crop insurance premium subsidies increase net revenue per planted acre by reducing costs of acquiring insurance and thus a dollar of premium subsidy is equivalent to a dollar of added revenue (or, as the old American proverb has it, “a penny saved is a penny earned”). Crop insurance payments to cover excess losses have the same effect by either allowing crop insurance benefits to be larger or by reducing the premium that insurance companies would otherwise be required to charge. Thus in both cases the effect on net revenue is the same as if a payment were made to growers rather than a savings on the purchase of insurance. An additional impact, which is not included in the model, is the risk reduction impact of making crop insurance available in situations where it would otherwise not be sold. By leaving aside the risk reduction aspect of the crop insurance subsidy, the model underestimates the effect of crop insurance subsidy on production. Thus the results are a conservative estimate of the production impacts of crop insurance subsidy on cotton production.

analysis is not applied specifically to cotton and they do not produce quantitative estimates comparable to those presented below.
The practical effect of the crop insurance subsidy is to encourage farmers to plant cotton in marginal producing areas (such parts of the Southwest) where climate variability causes cotton yields to be extremely low in some years. Annual variations in crop insurance benefits depend on annual variations in cotton yield.

**Domestic Step-2 payments**

The domestic Step-2 program provides a direct government payment to domestic buyers of U.S. cotton when the U.S. market price of cotton is below the average of the five lowest prices used to compile the Cotlook A-Index of world upland cotton prices. The payments assure that the net cost to domestic buyers is lower for U.S. cotton than for import alternatives.\(^{30}\) As shown in equation 2, above, the domestic Step-2 payments stimulate the demand for U.S. cotton by U.S. mills to the same degree that a lower price of U.S. cotton would stimulate demand. Removing the domestic Step-2 program would, therefore, lower demand for U.S. cotton in domestic mills. The effect of this reduction in domestic demand would be to lower the market price received by U.S. producers, lower the amount of cotton produced in the United States, lower U.S. exports and raise the world price of cotton (the A-Index in our model). The Step-2 program lowers the net effective price that a domestic mill pays for U.S. cotton. This subsidy to buyers means that for a given market price, the effective cost per pound for a domestic buyer of U.S. cotton is less by the amount of the subsidy. Thus, the quantity purchased increases exactly as if the price of U.S. cotton were lower by the amount of the Step-2 payment. The increase in quantity demanded causes an increase in the price received and net revenue per acre for growers. As this is traced through the supply-demand system, the subsidy causes more U.S. output and exports and a lower world price. The modeling of the effects of the domestic Step-2 program is identical to its treatment in the FAPRI model (as are the elasticities and other inputs into the equations for the Step-2 impacts) and similar to how Step-2 program payments enter into assessments of USDA and other models.

**Export Step-2 payments**

The export Step-2 program operates like the domestic Step-2 program except that the payments are distributed to export shippers of U.S. cotton.\(^{31}\) Equation 3 above summarizes the impact of the export payments. It shows that they have an impact on export demand identical to a lower


export price faced by buyers (while allowing the net revenue to growers to remain high). Removing the export Step-2 payments would reduce the demand for exports of cotton from the United States, lower the price received by growers and lower U.S. cotton production and exports. The net effect would be to raise the price of cotton in international markets. As with the domestic Step-2 program, the effects of the export Step-2 program are identical to the treatment in the FAPRI model and similar to how Step-2 program payments enter into assessments of USDA and other models.\(^{32}\)

**Export credit guarantees**

The export credit guarantee program (GSM102 and GSM 103 and other programs) is an export subsidy and thus has effects like those of the export Step-2 program. The U.S. based National Cotton Council estimated that the export credit guarantees have increased the export demand for U.S. cotton by 500 thousand bales per year.\(^{33}\) In the simulations, we use this National Cotton Council estimate as a direct shift out in the quantity of U.S. cotton demanded by export buyers. The application of this estimate is set out in equation 3 above.

In summary the production (supply) subsidies (LDPs, Crop Insurance, PCP/DP, and marketing loss/CCPs), to differing degrees, each increase the supply of U.S. upland cotton. This stimulated production encourages exports and contributes to lower world prices of upland cotton. Removing these production subsidies would reverse the effects by decreasing U.S. production, decreasing U.S. exports, and with a resulting smaller world supply, allow the world price of cotton to rise.

Similarly, the two export (Step-2 and export credit guarantee) and one domestic (domestic Step-2) demand subsidies each stimulate the purchase of U.S. cotton. This drives up the effective net revenue received by U.S producers and stimulates production and U.S. exports. This again results in increased supply in response to the stimulated demand and lowers the world market price for upland cotton.

**Simulation results and interpretations**


\(^{33}\) Testimony of James Echols, Chairman of the National Cotton Council before the Committee on Agriculture, Nutrition and Forestry of the U.S. Senate, July 17, 2001, page. 12 (“We have estimated these changes could reduce annual U.S. cotton exports around 500,000 bales and have as much as a 3 cent per pound impact on prices.”).
The model described above was used to consider seven scenarios of policy alternatives, which were each compared to the status quo actual realizations and projections. These are set out in Table 4. The seven scenarios are the separate effects of the removal of each of the six major subsidies providing support to upland cotton and the cumulative effect of the removal of all six subsidies. In each of the seven scenarios, the tables present the effects on U.S. production, U.S. mill use, U.S. exports, U.S. prices, and the world price of upland cotton. The main results are provided in percentage changes in Table 4. Finally, the effects are analyzed for each year of the nine-year period between marketing year 1999 through marketing year 2007 and for various aggregates of years.

The baseline figures for marketing years 1999-2001 are equal to the actual historical data for each variable for the 1999, 2000 and 2001 marketing years. We use projections for the marketing years 2002 through 2007 because historical data are not available. These projections were based on data available in December 2002 and are very similar to the FAPRI and USDA baseline projections produced at the same time. Again, these baseline projections are not forecasts; they are used solely as a basis for examining changes in projections under alternative policies.

Focus first on the percentage deviations from the baseline under alternative policy scenarios. For each variable of interest, Table 4 reports a line of results applicable to the removal of each of the six U.S. subsidy programs individually. Table 4 also presents results from a scenario that models removing all six subsidy programs simultaneously. The results from removing the individual subsidies cannot simply be added up to get the impact of the full set because of interactions among the programs when they are removed simultaneously.

**U.S. Production, Use and Exports of Upland Cotton**

The first block of results in Table 4 relates to U.S. production impacts. Removal of all subsidy programs (labeled “FULL”) would lead to a reduction of U.S. production of an average of 27.4 percent (or an average of about 4.3 million bales) over the nine years presented. In the period 1999-2002, the reduction in U.S. production averaged 28.7 percent (about 4.9 million bales). In the period 2003 to 2007, the reduction in U.S. production averaged 26.3 percent (about 4.5 million bales each year). The largest impact was projected for the 2002-2003 marketing year (about 8.25 million bales) when planting decisions were made while U.S. market
prices were very low. The smallest impact was for the 2001-2002 marketing year. This is because our model used expected prices, at planting time in January 2000, which were relatively high. Percentage production declines in all the other years fall between 21 percent and 32 percent.

Removing any of the six cotton subsidy programs individually would reduce U.S. production of cotton. The largest individual program contributor to declines in U.S. production is the marketing loan program (labeled “LDP” in Table 4). Removing the marketing loan program alone would reduce U.S. production by an average of almost 12 percent (about 2 million bales). The biggest impact is again in 2002-2003. The effects of the marketing loan are bigger in the 1999 to 2002 period than in the 2003 to 2007 period because the baseline projects gradually rising cotton prices and so the marketing loan involves a lower per pound subsidy in the latter years. Removing the Step-2 program, which would lower both export and domestic demand for U.S. cotton, would reduce production by an average of about 5.6 percent. Note that the impacts of the production flexibility contract and direct payments (PFC/DP) are larger starting with the 2003-2004 marketing year because this is the first year that the FSRI Act was in place to affect area planted to cotton. This same pattern applies to the market loss assistance and counter-cyclical payments (MLA/CCP), again because of changes in production incentives created by the FSRI Act. Crop insurance subsidies (INSURANCE) have strong direct effects on production incentives and resulting output in every year. Removing crop insurance for cotton would reduce production by an average of almost 3 percent. Finally, the export credit guarantee programs (EXPORT CREDIT) also have a clear impact and their removal would reduce U.S. production by an average of almost 2 percent on average.

U.S. mill use would also fall with the removal of these programs. Removing the full set of programs would reduce U.S. mill use by an average of about 5.8 percent (about 0.4 million bales). Removing the marketing loan program alone would reduce mill use by about 3.4 percent. Because they stimulate export demand, removing the export credit guarantee programs alone would raise U.S. mill use, even though U.S. production would be down. The effects on U.S. mill use are larger in the 2003 to 2007 period because of the added importance of the DP and CCP programs under the FSRI Act of 2002.

The export results are of particular interest. Removing the full set of cotton subsidy programs simultaneously would cause a fall in U.S. exports by an average of almost 43 percent
or about 3.5 million bales per year. During the period 1999-2002, U.S. exports would have been 41.2 percent lower (about 3.4 million bales annually) without U.S. subsidies. For the 2003-2007 period, U.S. exports would be lower by an average of 44 percent (about 4.35 million bales).

Many of the programs have large export impacts individually. The biggest percentage impact is again attributable to the marketing loan program with an average impact of 17.3 percent or about 1.6 million bales. However, Step-2 and export credit guarantee programs also have large impacts on exports. Removing the Step-2 program alone would reduce the U.S. exports by an average of 10 percent or 0.9 million bales.

**U.S. Price of U.S. Cotton**

Turning to prices, Table 4 first reports the impacts on U.S. season average market prices received by farmers for upland cotton. Over the full nine year period, removing the full set of subsidies would raise the U.S. market price by 15.2 percent (about 6.9 cents per pound). Removing all the programs together during the period 1999-2002 would have raised the U.S. market price by an average of 15.1 percent or about 6.2 cents per pound. Removing the subsidies would raise the market price by about 15.3 percent in the 2003 to 2007 period. Removing each of the four supply-side subsidy programs would lead to increases in market prices, as production would decline and thus market price would rise to re-establish the supply-demand equilibrium. Again the marketing loan program is has the largest impacts. Removing the marketing loan program alone would raise the U.S. season average price by more than 17.4 percent (7.8 cents per pound). However, removing the two demand side programs would lower U.S. price as more cotton would remain in the U.S. market rather than be exported. By contrast, as noted below, the production-enhancing effects of these subsidies mean that their removal would increase the world price.

**World Price of Upland Cotton**

The impacts of most interest in the price analysis are those that show the impacts of U.S. subsidies for cotton on the world price of cotton. As noted above, the model uses the Cotlook A-Index price to represent the world price. The actual A-Index prices were used for the database of the model for marketing years 1999-2001. These A-Index prices are the underlying basis for calculating the U.S. adjusted world price used for determining the marketing loan gains and loan deficiency payments. On average, over the nine years modeled, removing all the subsidies simultaneously would cause the world price for upland cotton to rise by about 11.6 percent with
a range between 7.7 percent and 17.7 percent. For the period of marketing years 1999-2002, the average world price would have increased by 12.6 percent or 6.5 cents per pound. For the period of marketing years 2003-2007, the world price would increase by 10.8 percent (or 5.9 cents per pound) without the FSRI Act and Agricultural Risk Protection Act crop insurance subsidies. These impacts are smaller than the effects on net exports because the model accounts for supply increases by other countries and regions in response to supply reductions from the United States. These supply responses dampen the impacts on world price and the degree to which world price must rise to reestablish the world supply demand balance.

As with the U.S. production and export results, the impact is largest for the 2002-2003 marketing year and smallest for the 2001-2002 marketing year. It is useful to reiterate that the impact is smaller when expected prices are higher because during those years the impacts of marketing loans are smaller. For example, while the market price for marketing year 2001 eventually dropped to historic lows, at the time of planting for that marketing year (during February-May 2000), prices were much higher. Since our model and our analysis is premised on the expectations of farmers at the time of planting, the historic low prices in marketing year 2001 did not have the effect on U.S. production until the time for planting for marketing year 2002 – in February – May 2001. At that time, prices were at near historic lows and U.S. acreage planted (and production) was significantly impacted by the effect of the subsidies. The marketing loan effects in marketing year 2002 were large because the market price expected by growers was low. The production and export quantities were maintained at high levels despite low expected prices because of the availability of the marketing loan and other subsidies.

With respect to the demand subsidies, the impact of the Step-2 program on the world market price is consistent over time and ranges between 2 and 4 percent with an average of about 3 percent. The export credit guarantee programs also have a steady impact of about 1 percent. The demand side subsidies drive a wedge between the U.S price received by growers and the world price. These programs cause the net effective price paid by buyers to be below the price received by growers. The world price for cotton must compete with the net price paid by buyers of U.S. cotton and thus is below the price received by U.S. producers.

The impacts on world price may be translated from percentage changes into price impacts in cents per pound by multiplying the percentage changes by the baseline price. For example, in 2002 the baseline price was 51 cents per pound (or $1124 per ton). In 2002, removing the U.S.
subsidy programs would have raised the world market price to about $0.60 cents per pound (or $1322 per ton) for an increase of 9 cents per pound or almost $200 per ton of upland cotton.

In interpreting the pattern of impacts in specific years presented in Table 4 it is important to recall how price expectations affect production. As discussed above, farmers base production decisions on expectations about farm prices and government benefits for the year in which the crop will be marketed. For example, at the time of planting, expectations of farmers about the returns for marketing year 2002 are based on prices observed during marketing year 2001 and government program benefits anticipated given those prices (adjusted for any anticipated changes in the subsidy programs). For example, the marketing loan payments made in marketing year 2001 affected the area of U.S. cotton planted in marketing year 2002, and thus the resulting production, trade and prices for the 2002 marketing year. The impacts of market prices being as low as they were in marketing year 2001, and of the large marketing loan benefits triggered by the low prices were reflected in the production, trade and price effects as shown for marketing year 2002. Detailed results show that marketing loan program in 2002 caused 6.31 million bales of additional U.S. production, 3.12 million bales of additional U.S. exports, and world prices that were 5.23 cents per pound lower than they would have otherwise been.

Concluding remarks
The analysis and results presented above are consistent with a result that common sense and elemental notions of supply and demand would compel: that very large subsidies provided to U.S. producers and users of upland cotton have had and will continue to have large impacts on quantities of U.S. cotton produced, used and traded and on both U.S. and world prices of cotton. The model was designed to conservatively evaluate the impacts of U.S. subsidy policies. The results themselves are well within the plausible range. Other econometric studies of the effect of removing U.S. subsidies for upland cotton have found that the effects were even greater than those found in this study. Indeed, given the magnitude of the subsidies applied, these results may well be underestimated by the model.

The use and development of our economic simulation model relies to a great extent on existing, well-respected econometric agricultural models and the elasticity estimates used by FAPRI to analyze U.S. cotton policy options for the U.S. Congress, the USDA and the National Cotton Council among other organizations. Similar econometric models have long been relied upon by the U.S. Congress, by USDA, by the ICAC, as well as the World Bank and the IMF to
assess the impacts of different government support policies for commodities such as upland cotton. Finally, similar estimates of elasticities of demand and supply used in our model have been regularly used in models used by the U.S. Government as well as independent economic researchers.

There is no question that the projected increase in the world price of upland cotton that would follow from eliminating U.S. cotton subsidies is large enough to have a major positive impact on the revenues and profits of cotton producers in other countries. A price increase of about 12 percent is enough to make the difference between profit and loss for many farms. Thus, there is no question that these impacts are economically significant for farmers in Brazil and other countries and removing the U.S. subsidies would improve their economic situation substantially.
Table 1  Implied Acreage Elasticities with Respect to Revenue for Upland Cotton in Regions of the United States*

<table>
<thead>
<tr>
<th>Region</th>
<th>Elasticities implied by linear supply parameters at the quantity for specified year</th>
<th>2000</th>
<th>2003</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn belt</td>
<td></td>
<td>0.443</td>
<td>0.444</td>
<td>0.424</td>
</tr>
<tr>
<td>Central Plains</td>
<td></td>
<td>0.190</td>
<td>0.180</td>
<td>0.160</td>
</tr>
<tr>
<td>Delta</td>
<td></td>
<td>0.426</td>
<td>0.548</td>
<td>0.493</td>
</tr>
<tr>
<td>Far West</td>
<td></td>
<td>0.472</td>
<td>0.769</td>
<td>0.738</td>
</tr>
<tr>
<td>Southeast</td>
<td></td>
<td>0.338</td>
<td>0.445</td>
<td>0.396</td>
</tr>
<tr>
<td>Southern Plains</td>
<td></td>
<td>0.327</td>
<td>0.407</td>
<td>0.375</td>
</tr>
<tr>
<td>Weighted Average</td>
<td></td>
<td>0.361</td>
<td>0.466</td>
<td>0.424</td>
</tr>
</tbody>
</table>

* The supply model is linear and yield is not a function of price. Therefore, the implied elasticities (log linear supply parameters) vary across years as acreage varies. These parameters are the same as used in the FAPRI model for U.S. upland cotton.

Table 2  Implied Demand Elasticities for Upland Cotton Produced in the United States*

<table>
<thead>
<tr>
<th>Demand Source</th>
<th>Elasticities implied by linear demand parameters at the quantity for specified year</th>
<th>2000</th>
<th>2003</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Mill Use</td>
<td></td>
<td>-0.2</td>
<td>-0.23</td>
<td>-0.23</td>
</tr>
<tr>
<td>Export</td>
<td></td>
<td>-4.032</td>
<td>-2.576</td>
<td>-2.589</td>
</tr>
</tbody>
</table>

* The demand model is linear; therefore the implied elasticities (log linear supply parameters) vary across years as quantities vary. These parameters are the same as used in the FAPRI model for U.S. upland cotton.
Table 3  Demand and Planted Area Elasticities for Upland Cotton by Country and Region*

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Demand</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>-0.26</td>
<td>0.14</td>
</tr>
<tr>
<td>India</td>
<td>-0.20</td>
<td>0.13</td>
</tr>
<tr>
<td>Pakistan</td>
<td>-0.24</td>
<td>0.30</td>
</tr>
<tr>
<td>Japan</td>
<td>-0.33</td>
<td>N/A</td>
</tr>
<tr>
<td>Taiwan</td>
<td>-0.46</td>
<td>N/A</td>
</tr>
<tr>
<td>South Korea</td>
<td>-0.31</td>
<td>N/A</td>
</tr>
<tr>
<td>Other Asia</td>
<td>-0.20</td>
<td>0.30</td>
</tr>
<tr>
<td>Africa</td>
<td>-0.25</td>
<td>0.30</td>
</tr>
<tr>
<td>Australia</td>
<td>-0.47</td>
<td>0.30</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>-0.25</td>
<td>0.30</td>
</tr>
<tr>
<td>Turkey</td>
<td>-0.25</td>
<td>0.30</td>
</tr>
<tr>
<td>Other Middle East</td>
<td>-0.20</td>
<td>0.30</td>
</tr>
<tr>
<td>Russia</td>
<td>-0.23</td>
<td>N/A</td>
</tr>
<tr>
<td>Other FSU</td>
<td>-0.29</td>
<td>0.30</td>
</tr>
<tr>
<td>Argentina</td>
<td>-0.39</td>
<td>0.50</td>
</tr>
<tr>
<td>Brazil</td>
<td>-0.31</td>
<td>0.40</td>
</tr>
<tr>
<td>Other Latin America</td>
<td>-0.65</td>
<td>0.30</td>
</tr>
<tr>
<td>European Union</td>
<td>-0.16</td>
<td>0.60</td>
</tr>
<tr>
<td>Eastern Europe</td>
<td>-0.14</td>
<td>0.50</td>
</tr>
<tr>
<td>Canada</td>
<td>-0.09</td>
<td>0.30</td>
</tr>
<tr>
<td>Mexico</td>
<td>-0.14</td>
<td>0.50</td>
</tr>
</tbody>
</table>

### Table 4 Main results of simulated responses to removing U.S. subsidies for upland cotton

<table>
<thead>
<tr>
<th>Marketing Year</th>
<th>99-00</th>
<th>00-01</th>
<th>01-02</th>
<th>02-03</th>
<th>03-04</th>
<th>04-05</th>
<th>05-06</th>
<th>06-07</th>
<th>07-08 Minimum</th>
<th>Average</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>US Production</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline (million bales)</td>
<td>16.29</td>
<td>16.79</td>
<td>19.60</td>
<td>17.44</td>
<td>16.05</td>
<td>17.42</td>
<td>17.40</td>
<td>17.37</td>
<td>17.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PFC/DP</td>
<td>-1.18</td>
<td>-0.55</td>
<td>-1.07</td>
<td>-0.70</td>
<td>-3.12</td>
<td>-2.10</td>
<td>-1.36</td>
<td>-1.51</td>
<td>-1.56</td>
<td>-3.12</td>
<td>-1.46</td>
</tr>
<tr>
<td>MLA/CCP</td>
<td>-0.99</td>
<td>-1.26</td>
<td>-2.08</td>
<td>-1.05</td>
<td>-9.66</td>
<td>-5.90</td>
<td>-3.91</td>
<td>-4.32</td>
<td>-4.40</td>
<td>-9.66</td>
<td>-3.73</td>
</tr>
<tr>
<td>LDP</td>
<td>-15.63</td>
<td>-15.49</td>
<td>-1.02</td>
<td>-36.21</td>
<td>-4.16</td>
<td>-12.25</td>
<td>-7.63</td>
<td>-6.95</td>
<td>-5.99</td>
<td>-36.21</td>
<td>-11.70</td>
</tr>
<tr>
<td>STEP-2</td>
<td>-5.64</td>
<td>-10.08</td>
<td>-3.09</td>
<td>-3.67</td>
<td>-3.02</td>
<td>-6.88</td>
<td>-6.65</td>
<td>-6.67</td>
<td>-4.56</td>
<td>-10.08</td>
<td>-5.59</td>
</tr>
<tr>
<td>EXPORT CREDIT</td>
<td>-2.53</td>
<td>-1.72</td>
<td>-1.85</td>
<td>-1.32</td>
<td>-1.85</td>
<td>-1.59</td>
<td>-1.66</td>
<td>-1.71</td>
<td>-2.53</td>
<td>-1.77</td>
<td>-1.32</td>
</tr>
</tbody>
</table>

| **US Mill Use** |       |       |       |       |       |       |       |       |                |         |         |
| Baseline (million bales) | 10.10 | 8.74  | 7.62  | 7.79  | 7.78  | 7.70  | 7.63  | 7.59  | 7.52          |         |         |
| Percent Change from Baseline | FULL  | -2.85  | -5.54  | -3.21  | -8.79  | -7.07  | -7.53  | -6.27  | -5.81          | -8.79   | -5.81   | -2.85 |
| PFC/DP | -0.16  | -0.19  | -0.27  | -0.26  | -0.60  | -0.65  | -0.57  | -0.57  | -0.65          | -0.65   | -0.43   | -0.16 |
| MLA/CCP | -0.13  | -0.28  | -0.49  | -0.43  | -1.67  | -1.82  | -1.62  | -1.60  | -1.82          | -1.82   | -1.07   | -0.13 |
| INSURANCE | -0.44  | -0.57  | -0.84  | -0.94  | -1.04  | -1.07  | -0.97  | -0.95  | -0.95          | -1.07   | -0.86   | -0.44 |
| LDP | -2.08  | -3.87  | -1.91  | -6.97  | -3.66  | -3.88  | -3.04  | -2.59  | -2.17          | -6.97   | -3.35   | -1.91 |
| STEP-2 | -0.38  | -1.16  | -0.48  | -0.50  | -0.28  | -0.61  | -0.72  | -0.78  | -0.64          | -1.16   | -0.62   | -0.28 |
| EXPORT CREDIT | 0.12   | 0.10   | 0.10   | 0.18   | 0.17   | 0.18   | 0.18   | 0.18   | 0.18          | 0.10    | 0.16    | 0.18 |

| **US Exports** |       |       |       |       |       |       |       |       |                |         |         |
| Baseline (million bales) | 6.30   | 6.32   | 10.60 | 10.53 | 9.77  | 9.98  | 10.04 | 9.83  | 9.81          |         |         |
| Percent Change from Baseline | FULL  | -41.66 | -46.93 | -27.94 | -48.16 | -51.15 | -49.25 | -43.49 | -39.66        | -51.15  | -42.75  | -27.94 |
| PFC/DP | -1.23  | -1.14  | -1.34  | -1.08  | -2.74  | -2.83  | -2.35  | -2.29  | -2.25          | -2.83   | -1.92   | -1.08 |
| MLA/CCP | -1.03  | -1.77  | -2.42  | -1.78  | -7.63  | -7.91  | -6.64  | -6.50  | -6.37          | -7.91   | -4.67   | -1.03 |
| LDP | -15.95  | -22.98 | -10.08 | -29.67 | -19.87 | -18.26 | -15.02 | -12.91 | -11.06        | -29.67  | -17.31  | -10.08 |
| EXPORT CREDIT | -4.71  | -4.63  | -3.16  | -2.82  | -3.10  | -2.99  | -3.02  | -3.11  | -3.12          | -4.71   | -3.41   | -2.82 |
### US Season Avg. Price

<table>
<thead>
<tr>
<th>Marketing Year</th>
<th>99-00</th>
<th>00-01</th>
<th>01-02</th>
<th>02-03</th>
<th>03-04</th>
<th>04-05</th>
<th>05-06</th>
<th>06-07</th>
<th>07-08 Minimum</th>
<th>Average</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline ($/lb.)</td>
<td>0.45</td>
<td>0.50</td>
<td>0.32</td>
<td>0.40</td>
<td>0.45</td>
<td>0.48</td>
<td>0.50</td>
<td>0.51</td>
<td>0.54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FULL</td>
<td>1.72</td>
<td>16.01</td>
<td>10.07</td>
<td>32.67</td>
<td>18.63</td>
<td>19.07</td>
<td>13.61</td>
<td>14.05</td>
<td>11.05</td>
<td>1.72</td>
<td>15.21</td>
</tr>
<tr>
<td>PFC/DP</td>
<td>0.90</td>
<td>0.88</td>
<td>1.83</td>
<td>1.42</td>
<td>2.91</td>
<td>3.06</td>
<td>2.60</td>
<td>2.54</td>
<td>2.45</td>
<td>0.88</td>
<td>2.07</td>
</tr>
<tr>
<td>MLA/CCP</td>
<td>0.75</td>
<td>1.32</td>
<td>3.28</td>
<td>2.37</td>
<td>8.09</td>
<td>8.58</td>
<td>7.38</td>
<td>7.22</td>
<td>6.94</td>
<td>0.75</td>
<td>5.11</td>
</tr>
<tr>
<td>INSURANCE</td>
<td>2.58</td>
<td>2.66</td>
<td>5.66</td>
<td>5.13</td>
<td>5.14</td>
<td>5.03</td>
<td>4.36</td>
<td>4.26</td>
<td>4.09</td>
<td>2.58</td>
<td>4.32</td>
</tr>
<tr>
<td>STEP-2</td>
<td>-9.48</td>
<td>-0.09</td>
<td>-4.14</td>
<td>-2.20</td>
<td>-7.02</td>
<td>-5.80</td>
<td>-5.49</td>
<td>-3.20</td>
<td>-4.05</td>
<td>-9.48</td>
<td>-4.61</td>
</tr>
<tr>
<td>EXPORT CREDIT</td>
<td>-1.22</td>
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<td>-1.56</td>
<td>-1.31</td>
<td>-1.31</td>
<td>-1.26</td>
<td>-1.24</td>
<td>-1.20</td>
<td>-1.56</td>
<td>-1.27</td>
</tr>
</tbody>
</table>

### World Price

<table>
<thead>
<tr>
<th>Marketing Year</th>
<th>99-00</th>
<th>00-01</th>
<th>01-02</th>
<th>02-03</th>
<th>03-04</th>
<th>04-05</th>
<th>05-06</th>
<th>06-07</th>
<th>07-08 Minimum</th>
<th>Average</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline ($/lb.)</td>
<td>0.53</td>
<td>0.57</td>
<td>0.42</td>
<td>0.51</td>
<td>0.51</td>
<td>0.53</td>
<td>0.56</td>
<td>0.58</td>
<td>0.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PFC/DP</td>
<td>0.31</td>
<td>0.31</td>
<td>0.50</td>
<td>0.38</td>
<td>0.97</td>
<td>0.85</td>
<td>0.70</td>
<td>0.70</td>
<td>0.68</td>
<td>0.31</td>
<td>0.60</td>
</tr>
<tr>
<td>MLA/CCP</td>
<td>0.26</td>
<td>0.50</td>
<td>0.92</td>
<td>0.63</td>
<td>2.77</td>
<td>2.31</td>
<td>1.95</td>
<td>1.87</td>
<td>1.87</td>
<td>0.26</td>
<td>1.46</td>
</tr>
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<td>0.95</td>
<td>1.57</td>
<td>1.40</td>
<td>1.53</td>
<td>1.45</td>
<td>1.23</td>
<td>1.21</td>
<td>1.17</td>
<td>0.90</td>
<td>1.27</td>
</tr>
<tr>
<td>LDP</td>
<td>4.16</td>
<td>6.64</td>
<td>1.93</td>
<td>10.27</td>
<td>1.73</td>
<td>3.69</td>
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<td>1.46</td>
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<td>0.87</td>
<td>3.61</td>
</tr>
<tr>
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<td>3.95</td>
<td>2.29</td>
<td>2.00</td>
<td>2.71</td>
<td>3.24</td>
<td>3.28</td>
<td>2.68</td>
<td>2.54</td>
<td>2.00</td>
<td>2.95</td>
</tr>
<tr>
<td>EXPORT CREDIT</td>
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<td>1.35</td>
<td>1.03</td>
<td>1.02</td>
<td>0.96</td>
<td>0.96</td>
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<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
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</table>