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# Treatment of Domestic Agricultural Support and Implications for Reductions: The case for the United States

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**Abstract**

Recent changes in how domestic agricultural support is provided poses new challenges for database construction and modeling. Different views have emerged on how best to treat domestic support. The assumptions regarding direct payments are captured in subsidies to land. This paper used two databases with different treatment for land-based payments and conducts identical experiments with each. How these rates vary across sectors has important welfare implications. The current version of the database produces some questionable outcomes for U.S. production impacts.

## Introduction

Recent changes in how farm policies are administered pose a new challenge for constructing a suitable database for the Global Trade Analysis Project (GTAP). Previous versions of the GTAP database simply treat total domestic support as an output subsidy. How policies are implemented can have major implications for potential production and trade effects. Without taking such differences into account, support may be poorly represented and result in misleading model outcomes.

There are differing opinions among users of the GTAP database in how domestic farm support should be treated. One approach is to follow a scheme corresponding closely to the OECD's categorization for measuring the Producer Support Estimate (PSE) and apply a generic formula to all countries. Another approach is to treat each country independently by starting with more disaggregate information on specific farm programs in each country. This is the approach taken by USDA's Economic Research Service.

The United States made significant changes in its own domestic agricultural policies in recent years. Of most significance was the shift away from market price support toward direct payments to landowners. Such payments are made without specific requirements for planting decisions. When the payment is not linked (decoupled) to a specific commodity it raises many questions on how support might be accounted for in the GTAP database. There are different opinions how best to treat the U.S. payments. An important question is how much of a difference does it make in the final results. This paper provides some discussion on this issue by using alternative databases and performing identical experiments with each. Simple simulation exercises are carried out to illustrate some basic points.

### Policies and their Classification

An understanding of how policies are implemented is critical in determining the proper incidence of a subsidy. A detailed description of U.S. farm policies and how they are classified according to the OECD's classification for measuring the PSE is provided in table 1. Not all policies within the same category will have the same production effects. For example, assistance can be provided in an ad hoc manner such as emergency assistance, or on a more formal contractual basis, such as subsidized crop insurance. These two types of assistance can be classified in the same aggregate category even while their impacts on producer's

decision may be very different. The only way to make sensible judgements is to retrieve the details of specific programs. The Economic Research Service made use of this type of detailed information to appropriately designate support according their potential economic effects.

Similar information as shown in table 1 was obtained for other countries. In addition, consideration is given to how programs where notified to the WTO. In some instances when different types of assistance fell within the same category it was necessary to split the support value into separate categories. Table 2 provides the 1998 level of U.S. agricultural support and the components making up each broad category. Having finer detail provides guidance for splitting some components into other categories. As examples, about a 75 percent of the payment in the C1 category was a disaster payment (a green policy under WTO) while the remaining 25 percent is crop insurance (amber). In the E1 category there is noncredit (considered amber) and credit subsidies (considered green). The entire H category for the United States was notified to the WTO as minimally distorting (green policy) however in the current GTAP database it was placed as an output subsidy. There are numerous cases in other countries.

**Background on U.S. Direct Payments**

A new U.S. farm bill in 1996 made significant changes in U.S. agricultural policies. Of most significance, was that the act provided 7 years of predetermined direct payment in the form of direct payments to farmers and eliminates most acreage use restrictions. These are known as production flexibility contracts (PFC). Producers who receive these payments are eligible to receive market loss payments as well.

*Production Flexibility Contract (PFC) and Related Payments*:

The PFC payments were established by the Federal Agriculture Improvement and Reform Act of 1996. OECD classifies them as "payments based on historical entitlements," specifically, "payments based on historical support programmes." The payments are the annual predetermined total amounts fixed for the years 1996 to 2002, with minor statutory adjustments for payment limitations and other administrative matters. The 1996 Act fixed the annual totals and also fixed the factors for allocation to specific contract commodities based on projected shares of deficiency payments at the time of the legislation.

Eligible producers who signed up for the PFC in 1996 are required to comply with conservation and planting flexibility provisions, as well as to keep the land in agricultural uses. In return, they receive their proportionate share of the annual total payments for a commodity based on their share of the national contract payment quantity. The contract payment quantity for each participant is based on their 1995 program yield and their contract acreage. The producer's contract acreage is the base acreage that would have been applicable for 1996 had the previous base acreage provisions not been suspended by the 1996 Act. Neither current production nor current price affects the amount of current PFC payments a landowner receives.

For the PSE, the OECD does not use the amount of the payments allocated to each commodity as described above, since they are based on historical base acreage and program yields. Since the PSE attempts to measure current support related to current production activity and current government programs, some method is needed to allocate the available payments to the actual current activity. Therefore the OECD has decided to allocate the available PFC payments to commodities in proportion to the number of planted acres for the contract commodities—corn, grain sorghum, barley, oats, wheat, rice, and upland cotton.

*Crop Market Loss Payments:*
Emergency legislation in 1998, 1999, and 2000 provided for market loss payments to be made available to participants in the PFC payment program. These payments would be actually allocated to commodities in the same way the PFC payments are allocated. Consequently, for the PSE, the market loss payments are allocated to commodities by OECD in the same way that PFC payments are allocated to commodities by OECD for the PSE.

**Land Payments and Subsidy Rates**
Direct payments to landowners are accounted for in the GTAP database as a subsidy to land. This seems reasonable since the payments can be capitalized into land values raising the rental rate on land. Of importance is that there are wide variations in the rates. This has strong implications for support reduction scenarios. In the current database (version 5, pre-release 3) these rates vary substantially for the United State and the European Union (shown in table 3.) The relative size of the payment is based on OECD's prescribed method for PSE calculations while land usage (in value) by commodity is from the GTAP database. For the United States the subsidy rate is highest for wheat (83 percent) and likewise for European Union wheat receives a substantial subsidy (92 percent). Some commodities do not receive a subsidy through the land payment. These include vegetables and fruit and other crops.

The other important support system for the United States is output subsidies. Support for this policy is found in category B. As described in table 1, category B contains the loan-deficiency program. The program became increasingly important program in recent years due to unusually low commodity prices. This program applies especially to wheat, other cereal (corn), and oilseed (soybeans). In contrast, the output subsidy for the European Union is very small (table 4).

**An Alternative Scheme for U.S. land-based payments**
As an alternative to the land payment scheme currently used for the United States, it could be argued that the payment to land are not crop specific. This can be said because the policy has no planting requirement for dictating what crops are grown. Thus the payment could represent a payment to the general household

or owner of the land. The household seeks the highest return from all possible land uses in agriculture when restrictions are not imposed. The implication for this assumption would affect how the land payment is proportioned across uses. In that case the payment to land is distributed across all land uses, leaving the subsidy rate constant with the level of support to total land the same in both databases. This is what is done to reconstruct an alternative database. It leaves the land subsidy at a rate of 43 percent across all agricultural uses.

**Experiments**

There are three types of experiments conducted with each database. One experiment is a 50 percent reduction in global agricultural tariffs. Of interest is in how trade policies interact with domestic support in the two databases and what welfare implications are. This experiment is fairly straightforward with no reductions in domestic support. The critical question is whether it makes a difference for welfare gains from trade liberalization when changing assumptions on direct payment are given.

The second experiment involves a 50-percent reduction in global tariffs, plus a 50 percent reduction in U.S. agricultural support only. The final experiment is a simply a 50 percent reduction in land-based payments in the United States. This experiment is conducted to assess differences in structural shifts in U.S. agricultural production stemming from land payments. It is performed on both databases as well.

**Results**

For each set results a comparison is made between the current GTAP database (version 5) with disproportionate land payments with results produced from the alternative database with proportionate land payments for the United States. The first set of welfare results (displayed in table 5) shows a noticeable difference for the United States. For allocative efficiency effects the proportionate land-payment scheme yields higher welfare results ($660 million versus $160). Clearly, resources are allocated less efficiently when there are greater differences in subsidy rates across sectors. Although the same level of support is provided to land in both cases, by lessening differentials across sectors and making the subsidy inclusive of all land-using sectors this in effect makes direct land payments less distortionary.

A somewhat surprising outcome is that allocative efficiency is higher both for the European Union (EU) and for the rest of the world when U.S. payments to land are proportionate. This suggests the EU has more to gain in a trade liberalization when U.S. domestic policies are modeled correctly and less distorting. These results also point out the fact that even while users of the database may not be specifically interested conducting reforms of domestic policies, how the domestic policies are configured will certainly influences welfare results for all other trade reform scenarios. It is not the level of support but how it is provided that matters. Trade liberalization gains are larger with less-distortionary domestic policies.

The second experiment is a 50 percent reduction in global agricultural tariffs, plus a 50 percent reduction in U.S. domestic support (shown in table 6). In that case welfare impacts are reversed for the United States from the first experiment. Allocative efficiency gains are higher in this experiment than when only tariffs are removed. This suggests U.S. import tariffs on agricultural goods are less distorting than it's own domestic policies. But once again this reflects the more highly distortionary nature of the land- based payments found in the current GTAP database (pre-release version). When trade and domestic policies are reduced by 50 percent the gains are nearly $2 billion for the United States. Gains are much less under the proportionate land-base scheme (860 million), only a slight increase over the previous experiment when no domestic reforms took place. Gains for the European Union and the rest of world are once again higher when land-based payments are provided in a proportionate manner in the United States.

The next set of result (table 7) reports outcomes for the second experiment but on a sector specific basis for production impacts in the United States. There are major differences for several commodities. This reveals the importance of the land subsidy assumption. The most important difference is that for wheat. Wheat has the highest land subsidy rate in the version 5 database (table 4). Here we find results are reversed for the identical experiment. It is disturbing when the same model and experiments produce opposite results. When the high subsidy rate is applied (disproportionate payment) wheat in the United States declines by 428 million. However when the land subsidy is evenly distributed, wheat expands by $1 billion. Land in wheat is being substituted for other crops. There are major differences for vegetable and fruit sector where there is an expansion of this sector of $1.8 billion under the pre-release version but yields a change of only $309 million when proportional land rates are applied. When wheat expands there is less land for other crops making this sector decline by $1 billion. For other cereal crops the changes are also in the opposite directions.

These results highlight the importance of the database and how careful consideration is needed in its construction. The land-based subsidy is very important. The experiment also raises question concerning the relative ease that land can substitute across uses. The above results demand some further explanation.

The final experiment simply reduces the subsidy rate to land by 50 percent for the United States. This experiment provides some explanation for the significant structural shifts observed above. The effects of the land payment vary substantially across commodities using the disproportionate land payment scheme, whereas these effects are neutralized with the proportionate land-based scheme (table 8). The land payments reduction seems to dominate over the positive output effects created by trade liberalization. Even with a 50 percent reduction these results are far too dramatic to be taken seriously. A 100 percent reduction in U.S. domestic support would produce less reasonable outcomes. Since direct payments began land

devoted to wheat plantings in the U.S. did not increase but have actually declined casting further doubts on meaningfulness of this type of database and policy modeling in general.

**Conclusions**

Simple experiments conducted here reveal the importance of assumptions used in constructing data for domestic agricultural subsidies. How support is provided matters more than the overall rate of support for agriculture. By redistributing the direct payments over land all uses, the same experiments produce a set of outcomes from the current pre-release version. For users not familiar with specifics of domestic support it could lead them to wrong conclusions. These results raise questions regarding the effects that direct payments have on specific crops. Reductions in the land subsidy from artificially high rates generate questionable outcomes for the U.S. agriculture. Moreover the substantial shifts in crops from reduced support lacks credibility. Actual plantings do not support the policy impacts of the model.

There is a problem in making the GTAP database serve multiple purposes. It tries to serve as a complete and transparent accounting framework to store PSE information while at the same time it is used as a database to generate policy impacts. Applying a general formula across countries has the advantage of simplifying and making the methodology transparent to users. Making the methodology transparent comes at a cost of lessening the understanding of the actual policies the model intends to represent. As a result users of the database end up performing superficial experiments having less to do with measuring impacts of domestic farm support. The GTAP database should not be used as another source of the OECD's producer support estimates. The PSE information is without doubt an important input providing full accounting of all farm and related environmental programs. Increasingly programs are less oriented toward specific commodity support but are used to achieve other social objectives. . It seems the database is trying to serve multiple purposes but with inadequate capacity. The standard GTAP database does not have all the "compartments" to appropriately house and use this information sensibly in the standard model. It would be better that the database on domestic agricultural support be a more "refined" product tailored for the standard model rather than misusing it as an accounting framework for an exhaustive set of unrelated programs.

## References

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**Table 1. U.S PSE classification with detailed descriptions of categories**

***B. Payments based on output***

1. Based on unlimited output
   - Loan rate gain
   - Loan deficiency payments
   - Marketing loan gain
   - Commodity loan interest gain
   - On-farm storage
   - Crop emergency assistance
   - Dairy indemnity program
   - Dairy market loss payments
2. *Based on limited output*
   - *Loan rate gain*
   - *Loan deficiency payments*
   - *Marketing loan gain*
   - *Commodity loan interest gain*
   - *On-farm storage*

***C. Payments based on area planted/animal numbers***

1. Based on unlimited area or animal numbers
   - Crop disaster payments
   - Livestock disaster payments
   - Hogs production assistance
   - Dairy disaster payment
   - Crop insurance
2. Based on limited area or animal numbers
   - Deficiency payments
   - Diversion payments

***D. Payments based on historical entitlements***

1. Based on historical plantings/animal numbers or production
2. Based on historical support programmes
   - PFC payments
   - Crop market loss assistance

**Table 1. Continued…**

***E. Payments based on input use***

1. Based on use of variable inputs
   - Agricultural credit program
   - Energy subsidies
   - Irrigation subsidies
   - Grazing subsidies
   - Feed assistance
2. Based on use of on-farm services
   - Extension
   - Environmental quality improvement program
   - Grazing land conservation initiative
   - Pest and disease control

***State technical assistance (moved from Misc. this time)***

3. Based on use of fixed inputs
   - Agricultural credit program
   - Emergency conservation program
   - Farmland protection program

***F. Payments based on input constraints***

1. Based on constraints on variable inputs
   - Soil and water loans program
2. Based on constraints on fixed inputs
   - Conservation reserve program
   - Wetland reserve program
   - Flood risk reduction contracts
   - Water bank program
   - Dairy termination program
3. Based on constraints on a set of inputs
   - Colorado river basin salinity control program
   - Agricultural conservation program
   - Great plains conservation program
   - Environmental quality improvement program
   - Rural clean water program
   - Wildlife habitat incentive program

***G. Payments based on overall farming income***

1. Based on farm income level
   - Income tax concessions
2. Based on established minimum income

***H. Miscellaneous payments***

1. National payments
2. Sub-national payments (should inc. state/2)

Table 2. Level of Aggregate U.S. Farm Support by major category for 1998

| | PSE Category | Wheat | Rice | Coarse grains | Oilseeds | Sugar | Milk | Beef | Other Meat | Wool | Misc. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | millions U.S. dollars | | | | | |
| Market price support | A1, A2 | 0 | 0 | 13 | 0 | 840 | 14,301 | 173 | -2 | 5 | 8,218 |
| Output subsidy | B1,B2 | 517 | 20 | 1,776 | 1,291 | 0 | 0 | 0 | 0 | 0 | 431 |
| Intermediate inputs | C1,C2, E1 | 183 | 36 | 499 | 316 | 47 | 356 | 426 | 318 | 1 | 1,536 |
| Land payments | D2 part, F part | 3,132 | 163 | 4,603 | 145 | 17 | 147 | 157 | 175 | 0 | 1,474 |
| Capital payments | E3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Other payments | E2, E3 part F, H | 484 | 84 | 1,308 | 846 | 101 | 314 | 339 | 364 | 1 | 3,369 |
| Value of production | | 6,904 | 1,669 | 21,334 | 15,058 | 2,261 | 24,178 | 26,965 | 30,614 | 45 | 64,539 |

Prepared by ERS/USDA

Table 3. Rates of support of land subsidy from direct payments

| | U.S. | EU | ROW |
|---|---|---|---|
| Rice | 58 | 45 | 2 |
| Wheat | 83 | 92 | 4 |
| Other Cereals | 66 | 91 | 13 |
| Oilseeds | 26 | 93 | 1 |
| Dairy | 11 | 9 | 2 |
| Sugar | 17 | 32 | 0 |
| Beef | 10 | 6 | 2 |
| Other Meat | 7 | 11 | 1 |
| Wool | 98 | 0 | 2 |
| Vegetable and Fruit | 0 | 0 | 0 |
| Other Crops | 0 | 0 | 0 |

GTAP version 5, pre-release 3

Table 4. Rate of support as output subsidies

| | U.S. | EU | ROW |
|---|---|---|---|
| Rice | 0.56 | 0.09 | -0.73 |
| Wheat | 7.78 | 0.46 | 1.21 |
| Other Cereals | 6.81 | 0.24 | 0.24 |
| Oilseeds | 4.72 | 0.24 | 0.49 |
| Dairy | 0.18 | 0.12 | 0.51 |
| Sugar | 0.18 | 0.09 | 0.09 |
| Beef | 0.36 | 0.12 | 0.12 |
| Other Meat | 0.19 | 0.14 | -0.25 |
| Wool | 0.99 | -0.02 | -0.57 |
| Vegetable and Fruit | 0 | 0 | -0.46 |
| Other Crops | 0 | 0 | 0.78 |

GTAP version 5, pre-release 3

Table 5. 'Welfare effects of 50% Global Reduction in Agricultural Tariffs

| | Allocative Efficiency | | | Total Welfare | | |
|---|---|---|---|---|---|---|
| | U.S. | EU | ROW | U.S. | EU | ROW |
| | millions $U.S. | | | millions $U.S. | | |
| Disproportionate U.S. land payments | 160 | 7,937 | 23,450 | 2,371 | 7,793 | 21,333 |
| Proportionate U.S. land payments | 660 | 8,025 | 23,622 | 2,790 | 7,881 | 32,256 |

Disproportionate payments from current version 5, prerelease 3

Table 6. 'Welfare effects of 50% Global Reduction in Agricultural Tariffs and U.S. Domestic support

| | Allocative Efficiency | | | Total Welfare | | |
|---|---|---|---|---|---|---|
| | U.S. | EU | ROW | U.S. | EU | ROW |
| | millions $U.S. | | | millions $U.S. | | |
| Disproportionate U.S. land payments | 1,816 | 7,581 | 22,820 | 4,317 | 7,534 | 20,319 |
| Proportionate U.S. land payments | 860 | 7,787 | 23,208 | 3,211 | 7,660 | 20,936 |

Disproportionate payments from current version 5, prerelease 3

Table 7. U.S. changes in sectoral output from 50% reduction in global tariffs and U.S. support reductions

| | Disproportionate U.S. land payments | Proportionate U.S. land payments |
|---|---|---|
| | $ million | $ million |
| Rice | 498 | 667 |
| Wheat | -428 | 1,058 |
| Other Cereals | -252 | 421 |
| Oilseeds | 940 | 480 |
| Dairy | 190 | 313 |
| Sugar | -924 | -1,030 |
| Beef | 1,753 | 1,710 |
| Other Meat | 876 | 654 |
| Wool | -1 | -1 |
| Vegetable and Fruit | 1,817 | 309 |
| Other Crops | 318 | -1,006 |
| Processed food | 1,591 | 1,594 |
| Natural resources | -93 | -66 |
| Manufactures | -6,083 | -5,338 |
| Services | 1,890 | 1,272 |

Table 8. Change in U.S. Production from 50% reduction in U.S. land-based payments

| | Disproportional land payments base | | Proportional land payments base | |
|---|---|---|---|---|
| | volume | pct chg | volume | pct chg |
| Rice | -99 | -8.43 | 0 | 0 |
| Wheat | -1,146 | -11.86 | 0 | 0 |
| Other Cereals | -545 | -1.70 | 0 | 0 |
| Oilseeds | 448 | 4.22 | 0 | 0 |
| Dairy | -73 | -0.36 | 0 | 0 |
| Sugar | 112 | 2.69 | 0 | 0 |
| Beef | 152 | 0.75 | 0 | 0 |
| Other Meat | 250 | 1.13 | 0 | 0 |
| Wool | 0 | 0.00 | 0 | 0 |
| Vegetable and Fruit | 1,435 | 7.72 | 0 | 0 |
| Other Crops | 1,375 | 9.74 | 0 | 0 |
| Processed food | 106 | 0.07 | 0 | 0 |
| Natural resources | -36 | -0.04 | 0 | 0 |
| Manufactures | -1,192 | -0.08 | 0 | 0 |
| Services | 755 | 0.01 | 0 | 0 |