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GAINERS AND LOSERS WITH SUPPLY CONTROL: *An Economywide Perspective*

◆ Output quotas, non-farm marketing certificates, domestic sales quotas, and acreage controls are four different approaches to supply control of U.S. agriculture. Each of these methods transfers income from foreign and domestic consumers to U.S. farmers. However, they differ in the nature of their effects on budget outlays, farm supply industries, and global "well-being." Land retirement is shown to be a very costly form of supply control. It is estimated that acreage controls sufficient to raise grain, oilseeds, and cotton prices by 10 percent in 1984 would have resulted in a global welfare loss of more than \$11 billion.

by Thomas W. Hertel

In his Third Quarter 1987 *CHOICES*' article, Senator Harkin made a case for the use of mandatory supply controls in U.S. agriculture. He argued that they would reduce government costs while raising net farm incomes. This is achieved by transferring program costs from taxpayers to consumers. Furthermore, he contended that the food processing industry is the main beneficiary under current programs. To look at the case for mandatory controls, this article systematically summarizes some of the economywide effects of alternative supply control options. The effects on farm income, consumers, taxpayers, food manufacturers, and farm suppliers are all considered.

Supply control has been a topic of discussion in U.S. agriculture since colonial times. Interest in such proposals tends to vary inversely with farm prices. With market prices currently on the rise, it is safe to predict that public debate over supply control will subside for the time being. However, this topic will undoubtedly move to the forefront in the future, when another succession of good harvests leads to large stock accumulations and depressed prices.

Evaluating the economic effects of supply control is a complicated and controversial undertaking. One reason this is the case is because there are so many different ways to implement production restraints. In his *CHOICES*' article, Senator Harkin suggests that quantity limits be placed directly on production, as opposed to acreage, in order to "reduce the incentive to pile on chemicals and fertilizers to achieve maximum production"

(per acre). However, he still envisions some sort of unpaid set-aside, the amount of which could not exceed 35 percent of any farm's total acreage.

Other supply control proposals have sometimes included provisions for export subsidies designed to keep the U.S. competitive in foreign markets. One of the main lessons from our study presented in this article is that the method chosen for implementing supply controls makes a big difference. While each approach may raise farm incomes, the implications for consumers, taxpayers and the non-farm economy vary considerably.

Four Alternatives

Since it is not feasible to examine all potential supply control alternatives, I examine four distinct possibilities. Each is somewhat stylized, but together they serve to highlight the range of plausible alternatives for raising farm prices by restricting agricultural supplies.

Output Quotas. The first possibility is that suggested by Senator Harkin, namely, direct controls on production. This could be implemented by issuing quotas to individual farm owners (or operators) on the basis of historical production. I assume that these quotas are to be tradeable, and not tied to the land, so any individual farm operation could expand production (on their own land or elsewhere) by purchasing someone else's quota.

In keeping with the September 1986 Senate Bill entitled "Save the Family Farm Act" (of which Senator Harkin was a primary author), these quotas are applied to foodgrains, feed-

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grains, cotton and soybeans. That particular piece of legislation has strict sanctions against unauthorized sales or purchases of these commodities. Any surplus production, over and above the quantity for which the producer has marketing certificates, must be consumed on the farm, donated, or sold at a minimum price, to the CCC. Potential restraints on milk production—also proposed in this legislation—are ignored in this discussion.

Off Farm Quotas. Of course in practice it is very difficult to monitor transfers of farm commodities—especially inter-farm sales. It is very likely that some of the surplus grain capacity arising after imposition of production quotas would be diverted to livestock enterprises. In order to explore this possibility, I have specified a second type of quota regime which applies only to non-farm marketings. With this approach inter-farm transactions are freely permitted and production over and above the non-farm marketing quotas may be freely sold to livestock producers. These inter-farm opportunities tend to moderate the food price increases associated with imposition of quotas.

Domestic Sales Quotas. The third supply control alternative examined is the case of domestic sales quotas, whereby farmers (or commodity merchandisers) dispose of surplus crops in foreign markets at prevailing world prices. As with the previous scenario, this creates a two-price market for each program commodity. In this alternative all domestic uses (including livestock feed purchases) are restricted, resulting in higher U.S. crop prices. Meanwhile, export prices adjust so that the remaining output is absorbed in the international marketplace. This approach permits U.S. agriculture to roughly maintain its current international market share, while enhancing producer incomes by transferring money from domestic consumers.

Acreage Diversion. The fourth and final supply control regime analyzed does not require the introduction of tradeable quotas for grains, cotton and oilseeds. Rather, it entails a more intensive use of voluntary acreage controls. In particular, under this alternative I assume that additional land is diverted from production, by means of a bid system. Furthermore, this additional acreage is targeted in such a way as to achieve a prespecified set of price increases for individual commodities.

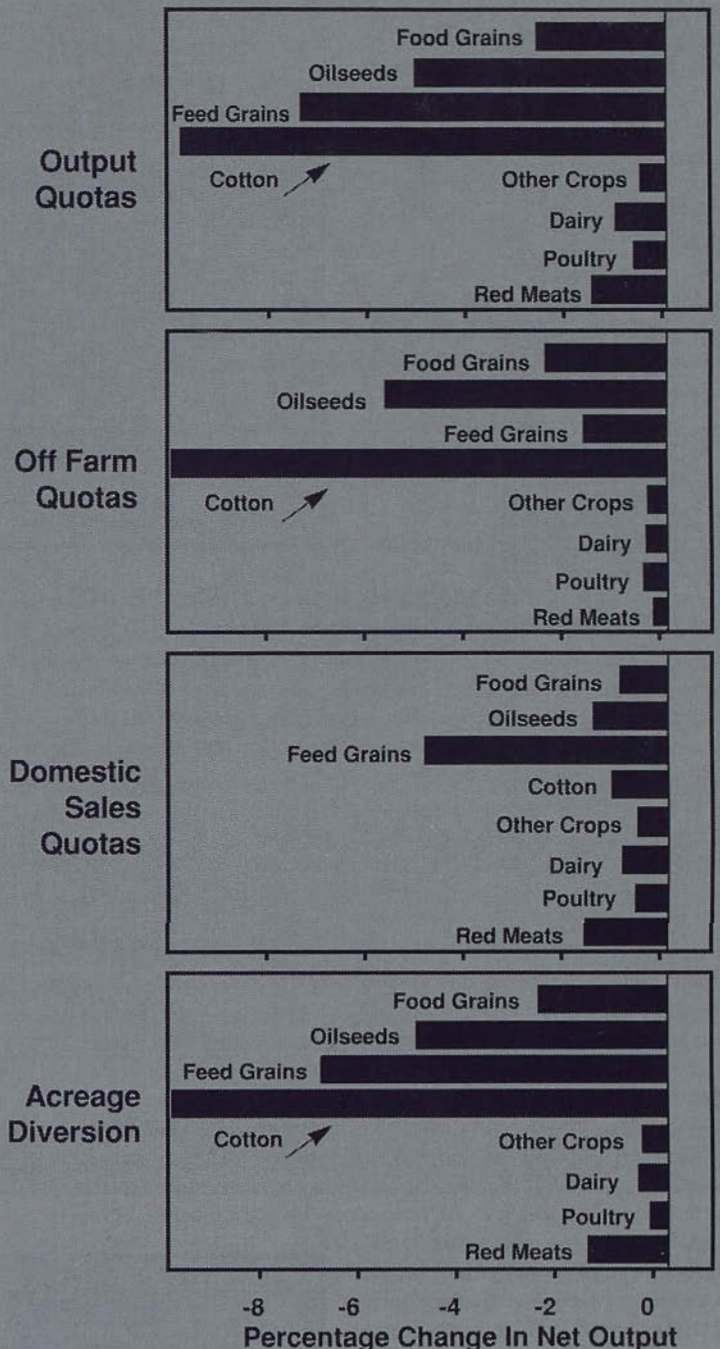
Some Results

In order to easily compare economywide effects of the four supply control alternatives, I assume that each is implemented with the goal of raising market prices for grains, oilseeds, and cotton by 10 percent (from their 1984 levels). Thus, the results reported are less dramatic than would be associated with Senator Harkin's recent proposal to permanently raise commodity prices to 80 percent of parity.

The estimated effects of supply control on farm supplies, production, food manufacturers, consumers, and taxpayers are presented in Figures 1-4. These estimates refer to the average annual impact after agriculture has adjusted to supply control measures. Thus, they should *not* be interpreted as short term effects.

Commodity Output Impacts. The simultaneous reduction in foodgrains, oilseeds, feedgrains and cotton output necessary

Figure 1—Production Impacts Vary*



*Estimated percentage changes associated with supply control alternatives designed to raise long run market prices of grains, oilseeds, and cotton by 10 percent over 1984 levels.

to induce market price increases of 10 percent for each of these crops for each of the four program alternatives is given in Figure 1. The more responsive the quantity of commodity demanded at the farm level is to price, the larger the cut in output necessary to achieve the 10 percent price target.

The first bar chart in Figure 1 shows the required output reductions that would be associated with the output quotas alternative. The largest production cut is required of cotton producers, who face very price responsive export demand conditions. Feedgrains and oilseeds producers must also cut output substantially to achieve the 10 percent price increases. This is due to changes in the level and mix of livestock feed

requirements in both the U.S. and abroad. The smallest output cuts are associated with foodgrains (-2.7 percent). Other crop and livestock outputs are affected indirectly through this program of production quotas. They too fall, although by much smaller amounts. These products are largely consumed domestically and the quantities of these commodities demanded are not very responsive to price changes.

The second bar chart in Figure 1 shows similar results for the case where quotas only apply to off-farm marketings. The diversion of surplus feedgrains into livestock uses almost neutralizes the impact which this type of quota has on feedgrain production. This in turn dampens the deleterious effects of higher prices for other feed ingredients (e.g., soymeal) on livestock prices and production.

The third bar chart in Figure 1 refers to the case of domestic sales quotas. When surplus production is diverted into overseas markets, foodgrain, oilseeds and cotton outputs are only slightly affected. This is because export demands for U.S. farm products are generally much more price responsive than their domestic demands. By charging a high price domestically, while keeping export prices relatively lower, income can be transferred to producers with a minimal effect on production. It is important to note that, in this case, the postulated 10 percent farm price increase applies only to that portion of crop production that is used domestically.

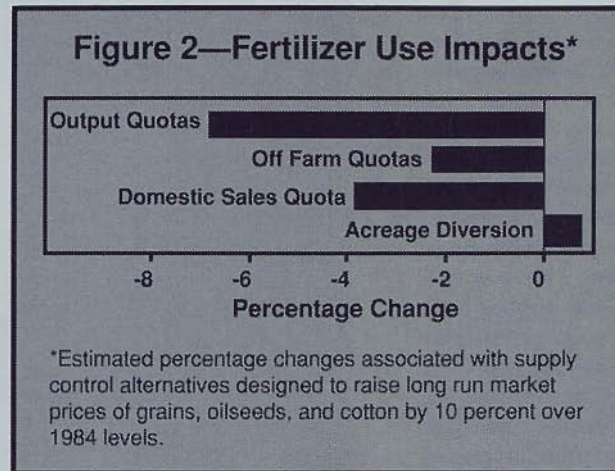
The final bar chart in Figure 1 depicts the output effects of a program of acreage retirement designed to raise market prices for each of the program commodities by 10 percent. The pattern of net outputs is quite similar to those associated with the output quotas alternative. However, as pointed out by Senator Harkin and others, the way in which these two types of controls are implemented has very different implications for the use of resources in agriculture. Acreage controls tend to raise the perceived scarcity value of land, encouraging farmers to use more fertilizer and other non-land inputs to raise yields. By contrast, output controls lower the scarcity value of land, giving rise to the opposite effect on purchased input use. Thus it is important to consider the differential effects on farm suppliers of each of the four supply control alternatives.

Farm Supply Industry Impacts

Farmers purchase many different types of inputs from the non-farm economy. However one of the most vocal opponents of supply control in U.S. agriculture has been the fertilizer industry. For this reason, I have chosen to focus on the differential effects of alternative supply control measures on fertiliz-

er use.

Declining crop output tends to lower input use. As shown in Figure 2 the use of fertilizer under the output quota alternatives drops by nearly 7 percent. However, both two-price alternatives (off-farm quotas and domestic sales quotas) moderate the decline in fertilizer use because the cuts in output are less than with the output quota alternative. The most striking result is that additional acreage controls tend to raise farm fertilizer demand. Fewer acres are farmed. But, increased purchased input usage per acre more than offsets the effect of fewer acres on fertilizer use. This is the first of several points indicating the important role which the chosen method of supply control plays in determining the program's economywide effects.



Food Manufacturers Impacts

Senator Harkin identifies the food industry as being a prime beneficiary of current programs, due to greater farm output, and hence larger food industry "throughput." Figure 3 reports the effect of the four alternative supply control approaches on aggregate food manufacturing output, which includes most of the processed products destined for human consumption. Food manufacturing output falls for each of the alternatives, but the declines are quite small—less than 0.5 percent of total production in every case.

Gainers and Losers

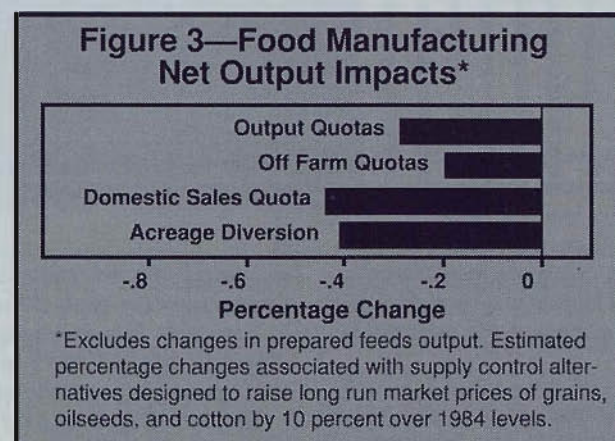
In the end we are left with two key questions. How much do farmers gain? And, who pays the bill? Figure 4 summarizes the effects on gainers and losers under each of the four supply control alternatives. Net gains to farmers include the sum of any changes in annual payments to land, labor and capital currently employed in farming from the payments received in 1984 plus the estimated annual rents for quotas. The more stringent the supply control measure (given a particular set of price targets), the greater the gains to farmers. Thus, production quotas and acreage controls give rise to the largest transfers to farmers.

Consumers clearly foot the bill for the increased farm incomes, although the size of this bill (which includes changes in both food and non-food prices) varies

somewhat across the four alternatives. In particular, permitting surplus production to be transferred among farmers (off-farm quotas) moderates increases in consumer costs.

The results in Figure 4 show, as Senator Harkin has suggested, that restricting output via production quotas lowers gov-

Consumers clearly foot the bill for the increased farm incomes.



ernment costs, hence lessening the burden of farm programs on taxpayers. For example, with less output and higher market prices, deficiency payments fall.

A more subtle benefit to the treasury is associated with the movement of labor and capital out of the relatively lightly taxed farm sector, into the more heavily taxed non-farm economy. Both of the two-price marketing quotas yield similar, although somewhat smaller treasury savings. However with acreage diversion sufficient to realize the 10 percent crop price increases, budget expenditures rise, rather than fall. This is because the Treasury must cover the rental payments required to bid farmland out of production. Furthermore, these rental payments are higher as market prices rise, resulting in a very costly program of supply control.

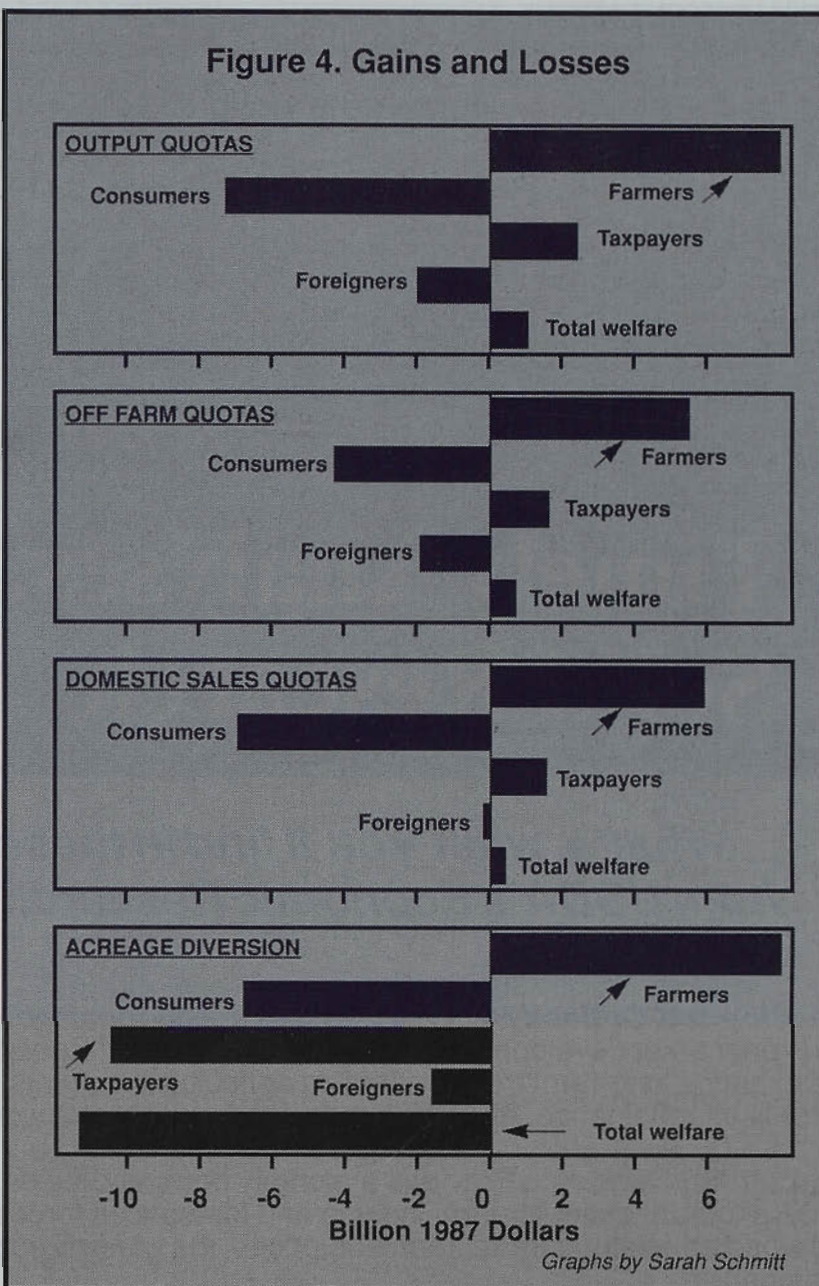
The final group of potential beneficiaries (or losers) from supply control in U.S. agriculture are foreign countries and people who import U.S. farm commodities. On the negative side (for them), they must pay more for U.S. farm products. The effect on them of higher U.S. farm commodity prices is offset partially by a rise in the price of their products, relative to those produced in the United States. As shown in Figure 4, the effect of higher priced farm exports is greater in each of the four alternatives and foreigners, as a group, are worse off as a result of supply control. However, when excess commodity production is permitted to be sold overseas (domestic sales quotas), the two effects are small and essentially offsetting.

Totaling up all of the gains and losses under supply control gives a measure of the change in "global well-being" resulting from incremental supply control for grains, oilseeds and cotton in the United States. The most striking number is the very large negative total resulting from the implementation of supply control through further acreage reduction measures (the fourth bar chart in Figure 4). Not only does acreage diversion retire productive land (or force it into less productive uses), it also distorts the mix of inputs used in agriculture, by encouraging farmers to employ excessive amounts of fertilizer and other land-substituting inputs. This is a very costly type of program, yet it is currently the preferred method for limiting crop production in U.S. agriculture!

The large societal losses associated with the acreage diversion alternative are even more disturbing in light of the positive (although small) total welfare gains under each of the three quota regimes. These gains reflect the economywide benefits to be realized from an improved allocation of resources in the United States. In particular, current approaches to supporting agriculture encourage excessive amounts of labor and capital to either enter or remain in farming. Alternatively, restricting output (or sales) with the use of quotas and permitting these quotas to be freely traded would encourage resources to leave the agricultural sector.

In this particular analysis I have not considered another major alternative approach that would downsize the agricultural economy—remove farm and food subsidies altogether. This approach has been shown to generate much larger total gains for society, but it would give rise to a very different pattern of gainers and losers when conditions in 1984 are used as base. Unless the free market approach were accompanied with a scheme that compensated farmers, income to farmers would

Figure 4. Gains and Losses



be lower and real incomes of consumers would be higher. These effects are opposite those associated with production quotas whereby income is transferred from foreigners and non-farm households to farmers. **C**

For More Information

An unpublished manuscript "General Equilibrium Analysis of Supply Control in U.S. Agriculture," by Thomas W. Hertel and Marinos E. Tsigas, dated June 1988, provides information about the model used to develop the estimates included in this article. It is available from the Department of Agricultural Economics, Purdue University, West Lafayette, IN 47907.