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Shortrun Effects of U.S. Macroeconomic Policies on U.S. Grain Exports

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ABSTRACT

Treating exchange rates as the only exogenous U.S. macroeconomic variable, many studies are able to unambiguously predict the effects of changes in the value of the dollar on the volume, price, and share of U.S. grain exports and government program expenses. Using the neo-Keynesian paradigm, this study develops a theoretical framework to assess the overall impact of changes in U.S. macroeconomic policy on the same variables via real income, interest and exchange rates, and the general price level. The analysis demonstrates that the shortrun impacts cannot be always unambiguously predicted. The direction of the impacts are shown to be crucially dependent on (1) the initial equilibrium point, (2) the extent of the linkage variable responses, and (3) relative magnitudes of price and real income elasticities of domestic demand, the real interest elasticity of domestic supply, and the price elasticity of export demand curves.

Keywords: Macroeconomic policy; linkage variables; oligopolistic markets; grain volume, price, and share of U.S. grain exports; government program expenditures

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INTRODUCTION

The role of macroeconomic policy in the determination of volume, price, and share of U.S. grain exports in the short run has received considerable attention in this decade. Many economists now contend that agricultural economic analyses which exclude the macroeconomic policy influences are incomplete because they miss the significant effects of macroeconomic variables (referred to as the linkage variables). In many of the papers that include linkage variables, exchange rates are the only mechanism of transmission from macroeconomic policy to the commodity markets (Schuh 1974, Chambers and Just 1981 and 1982, and Dornbusch 1986). In this sense the derived impacts are partial. A more complete analysis would modify the partial results by adding the simultaneous influences of changes in other linkage variables to the exchange rate effects.

The primary objective of this study is, therefore, to assess theoretically the overall impact of simultaneous, shortrun responses of linkage variables to changes in macroeconomic policy. The overall impact contains the effects of changes in four macroeconomic variables: real GNP, general price level, real rate of interest, and real value of the dollar. The analysis, however, is subject to the principal controversy among macroeconomists regarding the effects of macroeconomic policy on economic activity (for a brief review, see Andrews and Rausser 1986). I use the neo-Keynesian paradigm to explain the linkage variables' responses to macroeconomic policies in the short run. 1/

MACROECONOMIC POLICY AND LINKAGE VARIABLE RESPONSES

Neo-Keynesians' argument for the differing responses of the linkage variables in the short and the long run to macroeconomic policy is based on the recognition that some market prices adjust instantaneously to changes in supply and demand while others respond sluggishly. The fixed/flex price

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1/ The diversity of macroeconomic thought is fully represented in the macroeconomic literature. Here, the main focus is the overall effects of simultaneous responses of linkage variables to macroeconomic policy. Macroeconomic disputes are, therefore, not addressed in this analysis, and an eclectic approach is adopted.

characteristic implies that changes in macroeconomic policy lead to changes in shortrun relative prices, real GNP, interest rates, and exchange rates. Consider first the impacts of expansionary monetary policy. In the long run, all prices are expected to rise by the same percentage as the increase in the money supply. But, some prices are "fixed" in the short run. Thus, the increase in the nominal money supply translates into an increase in the real money supply in the short run, which reduces the nominal interest rate. Further, by increasing the aggregate demand, the higher real money supply increases the economywide output.

In the long run, the higher inflation rate will be incorporated into the nominal interest rate. In the short run, the drop in the nominal rate of interest, in spite of the increased rate of expected longrun inflation, implies a lower real interest rate. The lower real interest rate reduces the profitability of U.S. financial assets and results in both a nominal and real dollar depreciation.

Consider now the impacts of a bond-financed fiscal expansion. Through its effect on total expenditures, fiscal expansion results in higher prices and output. Higher prices reduce the real money supply while higher output increases the demand for money. Hence, to equilibrate the money market, the nominal interest rate rises. On the other hand, because the general price level adjustment is notoriously sluggish and because additional expenditure is financed by borrowing (rather than by money creation), the nominal interest rate rises by more than the inflation rate. The increase in the real interest rate, then, enhances the profitability of U.S. financial assets compared to foreign assets which, in turn, results in both a nominal and real dollar appreciation.

THE GRAIN MODEL

The following model portrays both the domestic and international dimensions of the problem. The domestic demand and supply curves are first specified in the absence of U.S. grain policy and in a manner which recognizes the linkages to macroeconomic variables. The relationships are then modified to represent the influence of U.S. agricultural price policy. Finally, assuming an oligopolistic world grain market, the rest-of-the-world demand and supply schedules are specified to complete the model.

Domestic Supply and Demand

Grains are supplied mainly by producers in the farm sector. Since for a given marketing year output is predetermined, the producers' choice variables in the short run reduce to a joint decision about how much of their available product to market and how much of it to carry over to the next period as stocks. Panel (a) in figure 1 depicts the supply-inventory behavior of the producers, SS', where GP and Q denote nominal grain price and quantity, respectively. Quantity supplied is specified as a positive function of the real grain price and the opportunity cost of stockpiling, represented by the real rate of interest. For the current period, Q1 represents the available grain; i.e., stocks carried over from the previous period plus this period's production. At P_A, P_AH will be supplied and ($Q1-P_AH$) will be carried over to the next period. As the opportunity cost of holding stocks changes with real interest rate movements, for given grain prices the willingness of domestic producers to hold stocks (or to market less) responds negatively to the

interest rate fluctuations: a rise in interest rates shifts the shortrun supply curve, SS', down in a parallel fashion. SS' represents the private sector's supplying behavior only. The government's supplying behavior will be added later.

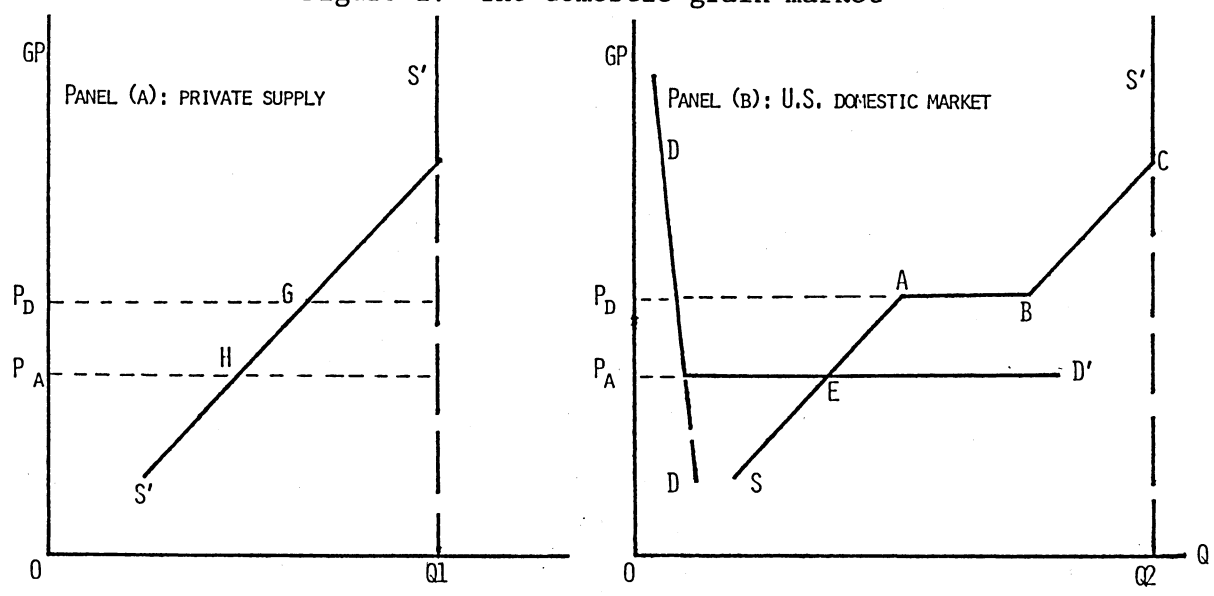
A large portion of the domestic market demand is attributed to the combined final and intermediate private uses. The remaining portion of the demand, described below, is attributed to the government's policy involvement in the market. The private demand is specified as a function of the real grain price, expectation of future GP, and output of the economy. Panel (b) depicts the private demand, DD, as negatively sloped in price-quantity space. Final demand is assumed to be negatively related to the current real grain price and positively to real income, while intermediate demand is a positive function of expectation of future GP. Intermediate demand reflects the behavior of the food processing industry in choosing the optimal levels of their stock used as input. Thus, higher expectations of GP, for example, would shift the demand up by increasing the optimum level of the inventory.

Farm Policy Influence

To regulate the market, U.S. agricultural policy has been designed to actively manage demand and supply, thereby affecting the shapes and positions of the private demand and supply curves illustrated above. U.S. agricultural policy has traditionally emphasized income maintenance and price stability via stock acquisition (or disposal) and voluntary control of planted area programs. As Bredahl and Green (1983, p. 787) indicate:

> "until 1977, the stock acquisition and disposal of CCC [Commodity Credit Corporation] stocks influenced short-run price formation. The nonrecourse loan program provides a domestic price floor [loan rate]. The disposal price of CCC stocks served as a price ceiling as long as stocks were held. The Agricultural Act of 1977 established the farmer-owned reserve [program] and significantly increased the difference between the loan rate and the price at which CCC stocks are released."

Figure 1. The domestic grain market



This implies that the public supply and demand curves are perfectly elastic at two different and prespecified price levels: the release price P_D and the acquisition price, or the loan rate, P_A.

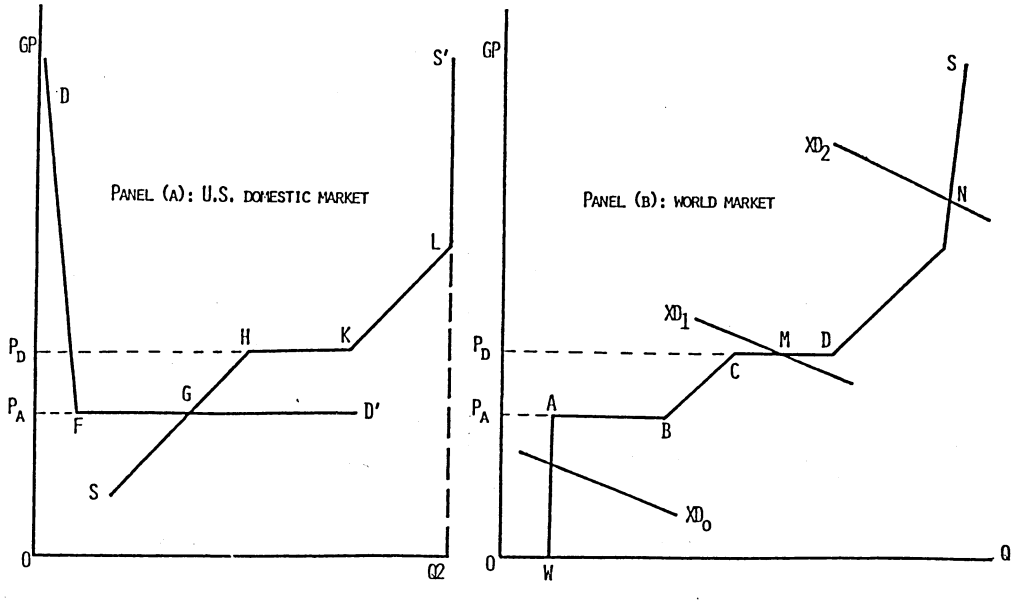
The policy-augmented domestic market demand and supply curves are derived in panel (b) by horizontally summing the demand and supply curves. The flat portion of DD' (the market demand curve) represents the government's commitment to support the price level at P_A. SA and BC segments in panel (b) are parallel to SS' in panel (a). On the supply side, the total current available grains, Q2, is equal to Q1, in panel (a), plus the government's carryover stocks from the previous period, AB. For prices below P_D, the market supply is equal to the private supply. At market prices equal to and above the release price, P_D, the government stocks are supplied entirely to the market.

International Market

The export supply schedule of the United States, AS, is obtained in panel (b) of figure 2 by horizontal subtraction of DD' from SS'. The shape of the U.S. export supply schedule depends upon the intersection of the domestic U.S. demand and supply curves. Since, by definition, P_A is always smaller than P_D, three possible solutions exist for the U.S. excess supply curve. As depicted in panel (a), we assume a situation under which, in the absence of the international market, the U.S. Government would be adding to its existing stocks. As argued below, the AS portion of the world export supply curve, WS in panel (b), is identical in shape to the U.S. export supply.

To complete the model, the behavior of other international market participants must be included. To do so, an oligopolistic world market with U.S. price leadership is assumed. The assumption is based on the findings of studies by Harrison (1980), Paarlberg (1980), and Hillman (1983) which argue that the importance of the United States in the world grain markets (consisting of few significant exporters) and the nature of its domestic

Figure 2. Domestic and world grain markets



grain policies enable the Unites States to set the world price levels. This implies an oligopolistic structure with the United States as the price leader. Consequently, small exporters are able to sell their supplies at prices which are slightly less than the U.S. price. Many economists have referred to the U.S. position under such conditions as a "residual supplier." 2/ That is, buyers would first purchase the bargain products from cheaper sources, then turn to the United States to round out their remaining needs.

Under the residual supplier assumption, the world export supply curve has the same slope as the U.S. excess supply function, but is shifted rightward to account for the perfectly inelastic export supply curve of the other competing nations. 3/ The price-formation process can now be illustrated by coupling the world export supply and demand curves in panel (b) of figure 2. Export demand is assumed to be positive and negative functions of the importers' real income and grain price, respectively.

In this model, the shortrun effects of macroeconomic policy depend critically on the initial equilibrium position and the price formation process. During the time of depressed export demand, for example XD_o in panel (b) of figure 2, the size of the world market would be limited to the total foreign available supply of grain, OW. The U.S. price will be at the loan rate, P_A, and the AB portion of the domestic supply, P_AB, would be transferred to the government stocks.

Now, suppose the export demand shifts up to XD_1. The export price and quantity increase. However, the price does not increase by as much as it would in the absence of the policy intervention. The government supplies the CM portion of its stocks to cap the price at P_D. Further expansion of export demand will be beneficial to both private and public sectors. For example, at point N, as all available grain supplies are consumed at higher prices, stocks are completely drawn down and, thus, program expenses are reduced to zero. Notice that export demand expansion increases the size of the world market and the residual share of U.S. grain exports. But, it would not cause the demand to shift away from exporters to U.S. exports.

2/ For applications of the U.S. "residual supplier" position, see McCalla (1967, 1980), MacGregor and Kulshreshtha (1980), and Bredahl and Green (1983).

3/ Note that the U.S. residual supplier position in the world grain market depends on the presumption that the export competing excess supply curve is perfectly price inelastic. The assumption that the international grain market is oligopolistic does not guarantee that presumption. The necessary, but not sufficient, condition is for the export competing nations to conduct price insulating domestic policies. The sufficient condition requires the export competing nations to avoid development of domestic shortages when prices are high and to avoid stock accumulation when prices are low. Whether export competing nations' excess supply curves are perfectly inelastic or not is, therefore, an empirical question. The empirical analyses of the U.S. residual supplier position in the world grain markets are limited to coarse grains. The analyses indicate that the excess supply of the export competing nations are in fact inelastic with respect to the world coarse grain price (for example, see Bredahl and Green 1983). For this analysis, it is assumed that the excess supply curves of non-U.S. grain exporting nations are perfectly price inelastic.

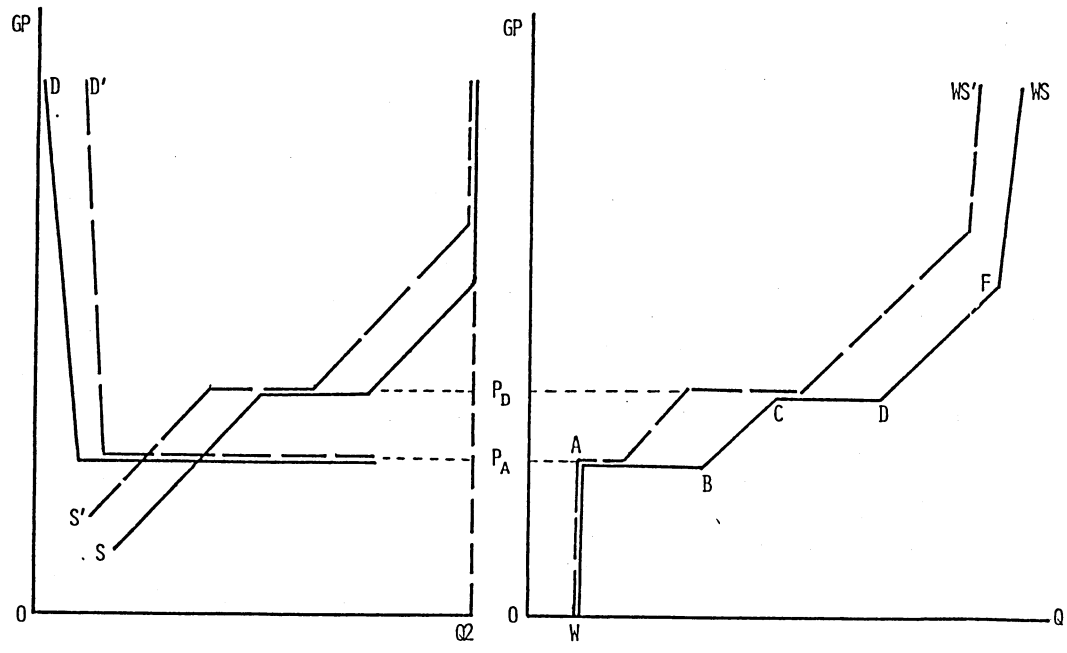
MACROECONOMIC POLICY IMPACTS

We now turn to assessing the grain market impact of expansionary monetary and fiscal policies, comparing the results with those of the partial model. The partial model takes exchange rate as exogenous and shows how volume, share, and price of grain export behave when the value of the dollar changes. The model developed in this paper focuses on the exogenous factors that affect the economy and shows how these may affect the macroeconomic linkage variables, the volume, price, and share of U.S. grain exports, and the U.S. Government's agricultural program expenses. The more general model does not neatly fall into a full simultaneous model. For although it specifies that macroeconomic policies cause all variables to change, the volume, price, and share of grain exports logically, but not temporally, follow the linkage variables' responses. Specifically, while developments in the macroeconomy feed into the grain market through macroeconomic variables, the reverse does not occur in this model.

Monetary Policy Effects

First, recall that accommodative monetary policy increases the general price and total output of the economy while it results in lower real interest rates and value of the dollar. Earlier, the domestic demand was specified as a function of the real grain price and income. The increase in total output shifts the demand curve to the right in a parallel fashion. At the same time, for given grain prices, the increase in the general price level rotates the demand curve to the right. The demand rotation from D to D', in panel (b) figure 3, reflects the combined output and price effects. Note that for a fixed loan rate, the horizontal portion of the demand slides over its original position.

Figure 3. Expansionary monetary policy and shift in the world export supply



Also, recall that the decrease in the real rate of interest reduces the opportunity cost of stockpiling and, hence, shifts the supply curve in a parallel fashion to the left, S' in panel (a) of figure 3. Consequently, for any given price the world supply curve rotates back to WS', in panel (b) of figure 3, reducing its price elasticity. 4/

World export demand, as specified earlier, is a function of the foreign real income and the real price of foreign grain. If the law of one price holds for tradable commodities, then the real foreign grain price would be equal to the U.S. real grain price multiplied by the real U.S. exchange rate. 5/ Therefore, the declines in the real value of the dollar and the U.S. grain price rotate the export demand upward.

The impact of expansionary monetary policy on the price, volume, and share of U.S. grain exports as well as the government program expenses can now be addressed using panel (b) of figure 3. For partial models, where effects are transmitted only through exchange rate and export demand, the directions of the impacts are always (irrespective of the initial equilibrium point) unambiguous. This certainty results from the fact that influences of the other linkage variables, particularly on the shortrun behavior of the domestic grain supply (inventory), are not accounted for. Consequently, the new equilibrium point is determined along the world export supply curve, WS. Specifically, volume and share of U.S. grain exports always respond positively to lower real value of the dollar and, in general, prices tend to rise. If the world export demand initially intersects with any of the two flat portions of the world export supply curve, the new equilibrium point could remain on the same flat portion, leaving the price unchanged.

The effects are not always unambiguous for the more general model. The direction (and the magnitude) of the export quantity impact depends not only on the magnitude of real exchange rate response to monetary expansion and price elasticity of export demand, but also on the magnitude of changes in the other linkage variables and all other elasticities of the domestic supply and demand curves. The direction of the grain price impact could, however, be always unambiguously predicted. The upward pressure on prices, by higher

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4/ Adding real grain price to the arguments of the supply function would further reduce the price elasticity of WS'.

5/ In nominal terms, the law of one agricultural price specifies that:

$$GP^* = E \cdot GP \qquad (1)$$

where E is the price of a dollar in terms of foreign currency. Defining the general price levels as P and P* for the United States and the foreign country, we can rewrite (1) as:

$$(GP^*/P^*) = ((E.P)/P^*) \cdot (GP/P) \qquad (2)$$

The first term on the right hand side of expression (2) is the relative price of a unit of U.S. good with respect to a foreign good in general. Notice the units in this term: the rate at which foreign goods, in general, are traded for a unit of the U.S. good; that is, the real U.S. exchange rate. Purchasing power parity (PPP) requires that the ratio be equal to one. Here, we have recognized that deviations from PPP can exist in the short run.

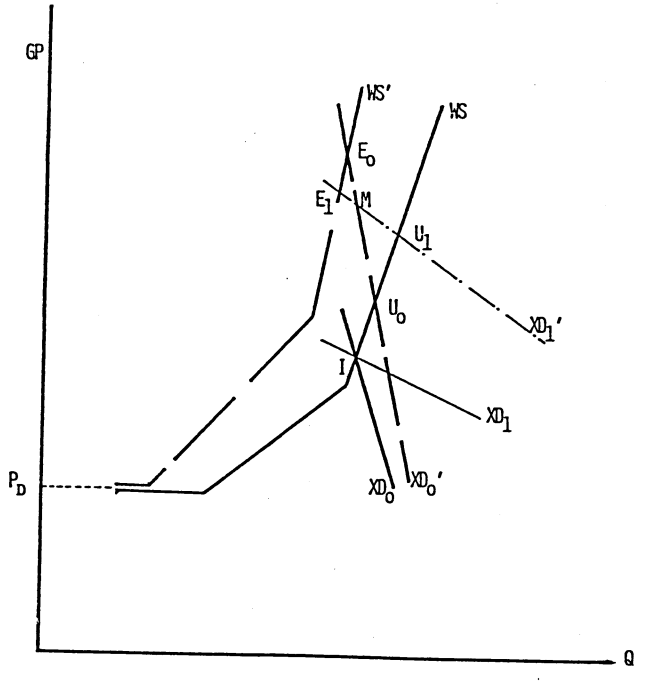
export demand in the partial model, is compounded by the backward rotation of the export supply curve.

The impact of monetary expansion differs quantitatively and possibly qualitatively for the two models. As we will see, comparing new equilibrium solutions makes it clear that, regardless of the position of the export demand curve, export quantities are larger and prices are smaller for the partial model. Quantitatively, while the grain price tends to increase in both models, volume and share of exports could fall in the more general model.

Consider periods during which export demand is high enough for all available supplies (Q2 in panel (a) of fig. 3) to be marketed. Notice that over this range the price elasticity of export supply, WS, is even more price inelastic than the domestic demand, D (fig. 3, panel (a)). This is because for this range the price elasticity of the domestic supply curve, S (fig. 3, panel (a)) is zero. Therefore, as expansionary monetary policy reduces the price elasticity of the domestic demand, it does the same to the export supply curve.

Over this range, expansionary monetary policy benefits grain producers and the partial model underestimates the benefit. This is illustrated in figure 4. Take, for example, the price inelastic export demand XD_o. The partial model responds by moving the equilibrium point to U_o, predicting both higher price and exports. However, since all available supplies are marketed and domestic demand does not shift, higher exports result at the cost of lower domestic grain consumption and a higher price level. For the given shift in export demand to XD_o', the new equilibrium solution for the more general model, E_o, depends on how much the export supply (or the domestic demand in this case) shifts. If real income and general price responses to expansionary monetary policy are sufficiently large and domestic demand for grains is

Figure 4. Expansionary monetary policy impact when export demand is at a high level

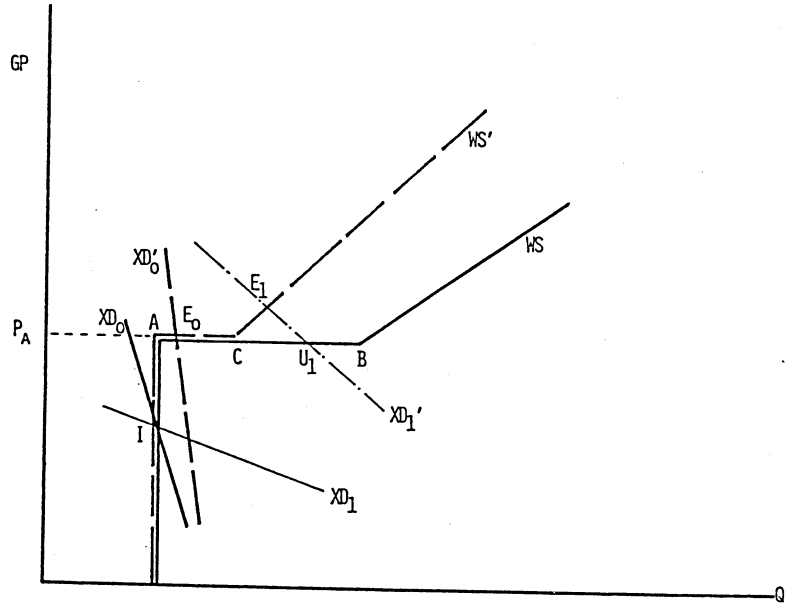


income elastic, then the export supply curve could rotate beyond point M to WS'. In this case, the volume and share of exports fall. Since the price elasticity of the world export supply curve, WS', is lower, the price level rises by more than it does in the partial model. Consequently, the producers' benefit will be larger than that predicted by the partial model. This is because in this range all available supplies are sold. The drop in export volume is compensated by domestic consumption at a higher price.

Of further interest with regard to qualitative differences is the "counter-intuitive" implications of price elasticity of the export demand in the more general model when the export supply shifts to the left of point M, figure 4. For a more price elastic export demand, such as XD_1, the partial model predicts greater price and quantities at point U_1 than those of the less price elastic demand XD_0. However, when the overall effects of linkage variables are considered simultaneously, a more price elastic export demand would result in price and export volume, point E_1, that are lower than they would be for a less price elastic demand.

Much of the discussion above applies to the other portions of the export supply curve, AF in figure 3. The difference relates to inventory adjustments of both producers and the public. In this respect, two cases merit further discussions. Consider a period when the world demand for grains is so depressed, XD_0' in figure 5, that the government would have to absorb the entire excess supply, AB, to support the price at the loan rate, P_A. The partial model indicates that expansionary monetary policy would result in higher exports if the real appreciation of the dollar results in XD_0'. Export volume increases by AE_0 which directly reduces the volume of grain that the government would have to acquire to support the price level. The partial model, however, underestimates the reduction in the government program expenses and it does so for reasons that are related to the domestic market. The direct reduction under the partial model results from the assumption that domestic demand and supply do not respond to expansionary

Figure 5. Expansionary monetary policy impact when export demand is depressed

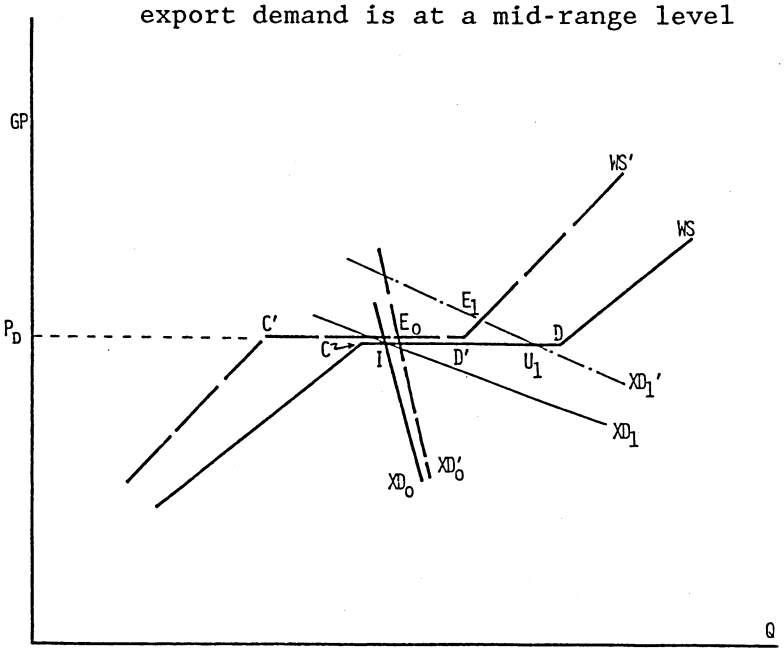


monetary policy. Thus, the government would have to absorb E_oB. However, as discussed earlier, for any given price, expansionary monetary policy increases the domestic demand while it reduces the domestic supply, reducing the export supply in the short run. Consequently, as the export and the domestic demands rise and the domestic supply falls, lower quantities of grain, E_oC, will have to be absorbed by the government to support the price level at P_A. Notice that when the solution to the partial model lies on the positively sloped portion of the export supply curve, both models predict the same level of government program expenses.

In figure 5, assumed values for changes in linkage variables and various elasticities of the domestic supply and demand, and the export demand curves produce identical volume and price of exports at E_o for both models. For the given shifts in the domestic and export demand curves, a higher real interest elasticity of domestic supply, for example, would result in a smaller export increase, a larger price response, and lower government outlays for price support programs for the general model. Similarly, given the shifts in the domestic demand and supply curves, a higher price elasticity of export demand would result in higher exports and prices and smaller government program expanses.

Finally, consider figure 6 where export demand is at a mid-range level, XD_o; the equilibrium price is at the CCC release price; and the government markets CI of its existing stocks, CD, to regulate the price. It is possible that the new equilibrium solution is identical for the partial and the more general models, E_o. This will be the case if, for the given shift of XD_o to XD_o', changes in the linkage variables, the magnitudes of the real interest rate elasticity of the domestic supply, and income and price elasticities of the domestic demand shift the WS to WS'. While the price, volume, and share of exports respond equally for both models, once again the partial model over predicts the government inventory (by D'D) and the associated outlays. Under

Figure 6. Expansionary monetary policy impact when export demand is at a mid-range level



the more general model, increases in domestic demand, inventory, and exports force the government to market more of its stocks (by C'C), further reducing its outlays.

The export and price responses do not have to be the same under the two models. As depicted in figure 6, for the given shift in WS to WS', a price-elastic export demand, such as XD_1', could result in different equilibrium solutions, U_1 and E_1. The partial model over predicts the volume and share of exports and the government program expenses. It under predicts the price response. And, it leaves domestic supply and demand unchanged. Furthermore, given the linkage variable responses and price elasticity of the export demand, the larger the real interest rate elasticity of domestic supply and the larger the income and price elasticities of domestic demand, the more the model results will differ. Finally, as with the upper portion of the WS, for a given shift in export demand, a sufficiently large interest elasticity of domestic supply curve and/or sufficiently large income and price elasticities of domestic demand could rotate the WS back far enough for the export share and volume to fall, prices to rise even higher, and government inventories to be entirely marketed.

Fiscal Policy Effects

All macroeconomic variables, except interest rates and exchange rates, respond to bond financed expansionary fiscal policy as they did to accommodative monetary policy. Total output and the price level, as well as the real interest rate and the real exchange rate, rise. As in the case of monetary expansion, increased real income and a higher general price level rotate the domestic demand curve to the right (panel (a) in fig. 7). However, in contrast to monetary expansion, higher interest rates associated with the fiscal expansion shift domestic supply in a parallel fashion to the right. Consequently, the shift in the world export supply curve depends on the relative shifts of the domestic supply and demand curves (panel (b) in

Figure 7. Fiscal policy expansion and shift in the world export supply curve

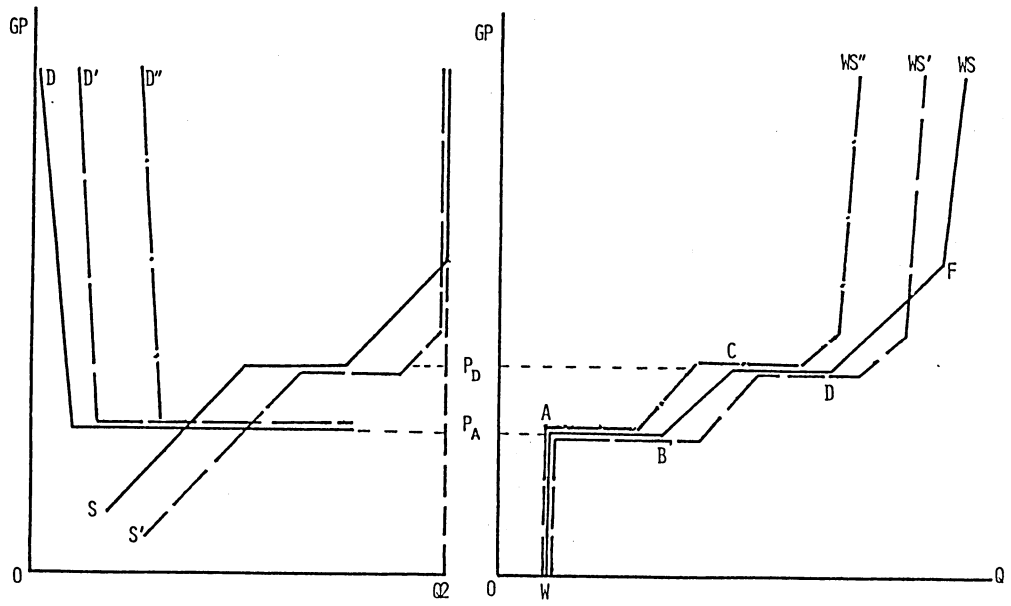
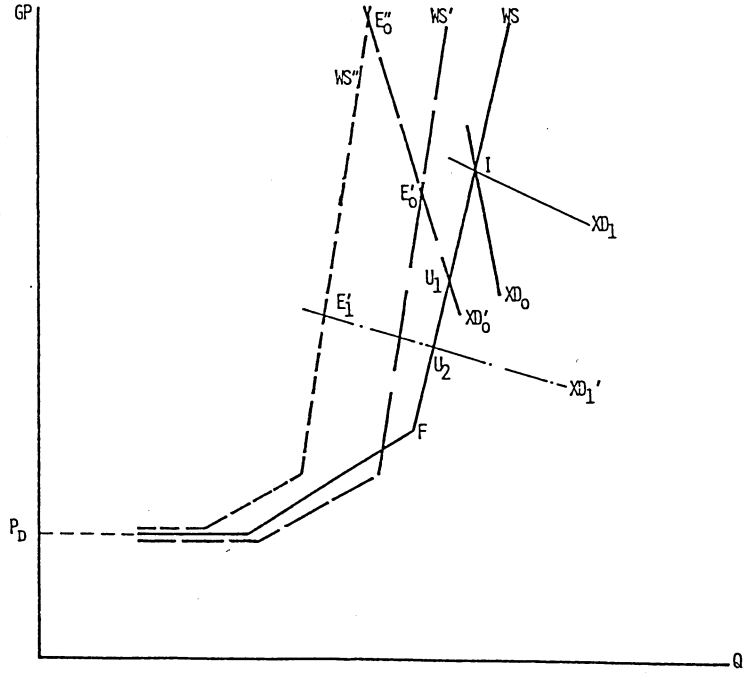


fig. 7). One thing is certain, however. A lower price elasticity of domestic demand would result in a lower price elasticity of the WS, whether it shifts to the right or the left of its original position. Finally, under fiscal expansion and unlike the case of monetary expansion, the export demand curve rotates downward as the real foreign price of grain declines with the real appreciation of the dollar. In the following analysis, the impacts are first assessed for the case where domestic supply is more responsive to the change in the interest rate than is the domestic demand to a higher general price level and real income; i.e., WS'. Then, the results are qualified for the reverse case; i.e., when the world export supply rotates to the left of its original position, WS".

Figure 8 illustrates the effects of expansionary fiscal policy for high export demand when all available supplies are marketed and the market price is above the CCC release price, P_D. Consider the case for a price inelastic export demand, XD_o. Comparing I to U_1, the partial model unambiguously predicts lower price, volume, and share of exports with an (along the curve) increase in domestic consumption. Once more, this is because in the partial model the domestic demand and supply curves are not allowed to respond to changes in the linkage variables.

The more general model also unambiguously predicts a lower volume and share of exports for this range, E_o'. With export supply curve shifting back, the drop in exports is larger than predicted by the partial model. Again, the reason is that, with zero price elasticity of the domestic supply, non-zero income elastic domestic demands result in backward rotation of the export supply curve. In addition, ceteris paribus, higher income elasticities of domestic demand are associated with a lower volume and share of U.S. exports.

Figure 8. Expansionary fiscal policy impact when export demand is at a high level

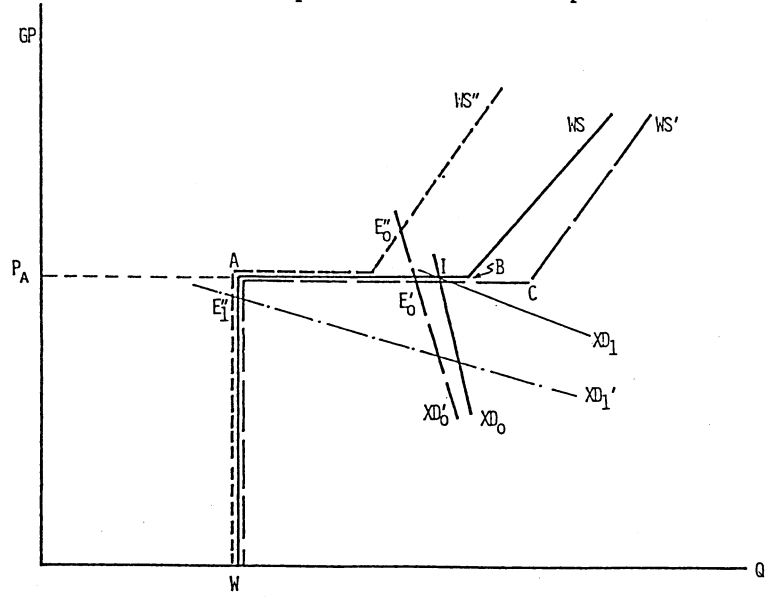


The more general model cannot unambiguously predict the direction of the impact on grain prices, however. Higher real GNP, real interest rates, and general price levels could increase domestic demand by more than domestic supply at any grain price, shifting the world export supply to WS" and thus increase the price from I to E''_o. 6/ In this case, expansionary fiscal policy benefits the producers despite a lower volume of exports. On the other hand, given linkage variables' responses and the shift in WS to WS", a sufficiently large price elasticity of the export demand, such as XD_1, could lower the equilibrium price.

Now, consider figure 9, which illustrates the case for a low export demand, XD_o. At the initial equilibrium point I, the government adds to its existing stock (by IB) to support the price level at the loan rate P_d. If the world export supply curve shifts to WS', then the two models predict the same price, share, and volume of exports at E'_o. In this case, however, the partial model underestimates the resulting increase in government program expenses. Under the more general model, excess supply, in the absence of international markets, increases by BC. Therefore, the drop in export volume increases the quantity of grains which will have to be accumulated by the government to support the price level at P_A.

The partial model overestimates the resulting government program expenses if the world export supply curve shifts to WS". Under the more general model, the volume and share of exports fall further for WS" at E''_o than they do for WS' at E'_o. Prices increase above the loan rates, however, eliminating the

Figure 9. Expansionary fiscal policy impact when export demand is depressed



6/ The shift will be larger if, given price and income elasticities of the domestic demand and changes in the linkage variables, the real interest rate elasticity of the domestic supply curve is smaller. Similarly, given the linkage-variable responses and real-interest-rate elasticity of the domestic supply curve, the backward shift would be greater for larger price and/or income elastic domestic demand curves.

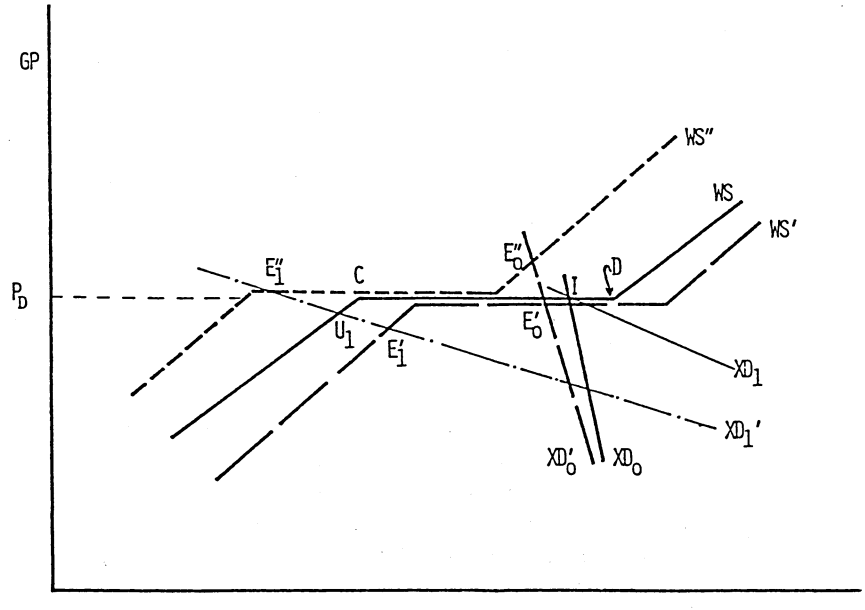
need for the government to acquire more stocks to support the price level. But, the partial model predicts prices and exports at E_o' and additional government stocks by E_oB.

The differences in the effects of expansionary fiscal policy on government program outlays depend not only on export supply but also on export demand. Consider the price elastic export demand curve, XD_1, in figure 9. For the same changes in linkage variables, XD_1 would shift to XD_1'. For WS', government stocks increase from IB to AC, larger than they are for the price inelastic demand XD_o, $E_o'B$. On the other hand, for WS", government program outlays increase relative to XD_o'.

The impact of fiscal expansion over two other ranges of the export supply curve merits further discussion. Like the previous two cases, the volume and share of exports fall for the CD portion (fig. 10). And, regardless of the shift in the world export supply curve, the drop will be larger for more price elastic export demand curves. The impact on price and government program expense is, however, qualitatively as unambiguous as for the AB portion of the WS (fig. 9). For given linkage variable responses, the price could rise above the CCC release price if WS shifts back to WS" and export demand is the price inelastic curve, XD_o. At the new equilibrium point, E_o'', all government stocks are marketed and program expenses are reduced to zero as exports fall. While exports always decline over this range, prices could decrease and program expenses could increase. This situation is illustrated in figure 10 for the price elastic export demand curve XD_1. For given changes in the linkage variables, the new equilibrium could move to E_1" for WS" and E_1' for WS'. Thus, as XD_1 to XD_1', grain prices fall for WS' and government stocks and program expenses increase more for WS' than for WS".

For the cases discussed so far, the direction of expansionary fiscal policy impact on the volume and share of exports could be unambiguously predicted for the more general model. For the remaining portions of the world export

Figure 10. Expansionary fiscal policy impact when export demand is at a mid-range level



supply, BC and DF in figure 7, the direction of fiscal policy impact may be described as "anything goes." Three factors could, however, be identified as determining variables: (1) the initial equilibrium point, (2) the extent of linkage variable responses, and (3) relative magnitudes of price and real income elasticities of domestic demand, the real interest elasticity of domestic supply, and the price elasticity of the export demand curves.

SUMMARY AND CONCLUDING REMARKS

Developed here is a model to examine the shortrun behavior of volume and price of U.S. grain exports within a broader context of U.S. macroeconomy. Unlike partial models which treat exchange rates as the only exogenous macroeconomic variable and show how volume and price of U.S. grain exports respond to changes in the value of the dollar, the more general model recognizes that (1) exogenous factors that affect the economy, such as macroeconomic policies, cause both macroeconomic and agricultural variables to change and (2) that macroeconomic policy effects on the grain market are carried logically, but not temporally, through its influence on real income, interest and exchange rates, and the general price levels. The more general model is used to evaluate the impacts of expansionary macroeconomic policies in the short run which are compared with those predicted by the partial model.

The results, summarized in table 1, demonstrate that the impacts for each policy could differ both quantitatively and qualitatively for the two models. The differences are generally attributed to two sets of forces that are not considered in the partial model: (1) influences exerted through real interest rate and income, and the general price level on domestic demand and supply, and, therefore, the export supply and (2) the role that stock acquisition and release policies of the Commodity Credit Corporation (CCC) play. Since the price stabilization policies of the CCC differ along the export supply curve, three specific cases are considered for each expansionary macropolicy: (1) when the world demand for grain is so high that all U.S. available supplies table 1 (private and government inventories) are marketed and, therefore, the initial equilibrium price is above the CCC release price; (2) when export demand is at a level (mid-range) which results in the release of a portion of the existing government stocks to keep market prices from rising above the CCC release price; and (3) when the world demand is so depressed that the government would have to absorb the entire U.S. excess supply to support the price at the loan rates.

Several general observations can be made. First, the directions of macroeconomic policy impacts, when influences of the other (than exchange rate) linkage variables and the CCC policies are incorporated, are not always unambiguous. As table 1 indicates, however, the partial model always unambiguously predicts the direction of the impacts: expansionary monetary policy tends to increase the volume, share, and price of exports and decrease the government program expenses. Fiscal expansion tends to do just the reverse. The results of the more general model, on the other hand, demonstrate that the volume and share of exports could fall for expansionary monetary policy, particularly when export demand is at a high or mid-range level. For fiscal expansion, however, the effects on the volume and share could always be predicted. What are not predictable are the price and the government program expenses. Secondly, where results are unambiguous, the direction of the impacts indicated by the partial model are consistent with those of the more general model. Third, for monetary expansion and high

Table 1. Summary and comparisons of the impacts

Export demand condition	Expansionary macroeconomic policy	Effects on U.S. grain: Export volume			Price			Government program expenses		
		Par.		Gen.	Par.		Gen.	Par.		Gen.
1. High										
	Monetary	+	>	?	+	<	+	ø		ø
	Fiscal	-	>	-	-	<	?	ø		ø
									or	
								+	> <	+
2. Mid-range										
	Monetary	+	>	?	+	≤ or no change	+	-	≥	-
	Fiscal	-	> < –	-	- or no change	> < –	?	+	> < –	?
3. Low										
	Monetary	+	≥ or ø	+	+	≤ or no change	+	-	> or no change	-
	Fiscal	-	≥ or ø	-	- or no change	≤	?	+	> < –	?

Par. -- Stylized partial equilibrium model
Gen. -- General model developed here

export demand case, a more price elastic export demand could result in qualitatively different impacts. For the partial model, a more price elastic export demand predicts greater price and quantity of exports. When the overall effects of linkage variables are considered, however, a more price elastic export demand function could result in price and export volume that are lower than those of a less price elastic demand function. Finally, comparing the new equilibrium solutions in table 1 shows that quantitative differences of the impacts across models depend on the type of expansionary macroeconomic policy and the initial equilibrium point.

No economic analysis is ever fully complete. In this sense, some caveats are present. A more complete impact should also include the effects of foreign macroeconomic policy reactions to changes in U.S. policies, a factor which was implicitly assumed to be exogenous in this study. In addition, monetary and fiscal policies are not conducted separately. Therefore, the effects of mixed policies need further investigation. Finally, the analytical structure of this study is based on a static and shortrun framework. A more complete analysis would consider the dynamic adjustment paths to new equilibria, even in the short run. For example, differing price and production dynamics of various sectors may render macroeconomic policy non-neutral in the short run. That is, when monetary policy is expansionary (contractionary), relative agricultural prices could rise above (fall below) their longrun equilibrium values, whereas the nominal interest rate and the foreign currency value of the dollar could fall below (rise above) their longrun equilibrium values. Further research is needed to investigate the resource allocation and the price and production implications of such divergences (known as over- or under-shooting) both in the short and the long run, and in an open economy setting.

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