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Income Effects on the Trade Balance in the United States: Analysis by Sector

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This study examines the causes of the countercyclicality of the trade balance in the three major sectors of the U.S. economy: services, manufacturing, and agriculture. These results are compared with the results pertinent to the U.S. economy as a whole. At the macroscopic level, Sachs' hypothesis seems to explain the countercyclicality of the trade balance, while results are mixed across individual sectors. The services sector may be explained by Sachs' hypothesis, while results for the manufacturing sector are more consistent with the real business cycle hypothesis. The results for the agricultural sector, however, cannot be explained by either hypothesis.

Key Words: decomposition of variance, real business cycle, trade balance

JEL Classifications: F4, E32

Intertemporal models of trade balance predict that the correlation between income and the trade balance depends on underlying disturbances. They emphasize the distinction between transitory and permanent changes in income. Some of the standard examples of the transitory disturbances are changes in monetary or fiscal policy, or autonomous changes in money demand or consumption. Likewise, some of the standard examples of permanent disturbances include supply-side shocks such as technical improvements or economic growth. The empirical application of the transitory-permanent distinction has been limited, until recently, to exogenous disturbances such as war-related government spending (Ahmed) or oil-price increases (Bruno; Marion). Ahmed et al. and Ahmed and Park have shown that it is difficult to justify the exogeneity assumption for real income in the trade balance, even in the case of small open economies. Therefore, it seems reasonable to recognize the endogeneity of real income and assume that it is determined by fundamental shocks.

Real business cycle (RBC) models and the model based on work presented by Sachs both examine the effects of permanent versus transitory changes in income on the trade balance. There is mixed support for both models in the literature. Some of this ambiguity must come from the many different shocks that occur, their relative sizes, and all the relevant variable changes that are pertinent to the trade balance, such as domestic and foreign incomes, the exchange rate, and prices of exports and imports. No study to date has looked at the impact that transitory or permanent income disturbances may have on sectoral trade balances in the United States. This may be insightful due to the specific types of shocks that are most common to these sectors, such as government supply-side programs in agriculture.

The objective of this paper is to determine the causes of countercyclicality of the trade balance in the three major sectors of the U.S. economy: services, manufacturing, and agri-

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culture. These results are compared with the results pertinent to the U.S. economy as a whole. Results of this study should improve our understanding of how and why the determinants of the trade balance at the macroeconomic level and the disaggregate level differ. Most of all, these results should be useful to policy makers, who can gain a better understanding of the possible implications of their decisions on the trade balance of different sectors in the economy in the era of globalization of the U.S. economy.

The paper is organized as follows. Section two examines the role of shocks to income on the trade balance with respect to the RBC models and the model of Sachs. Section three studies the methodology, the model, and data used in the analysis. The fourth section contains empirical results and discusses the findings. Concluding remarks are given in section five.

RBC Models versus Sachs' Model

Two competing models that address the issue of the extent to which the trade balance is affected by permanent versus transitory changes in income are the real business cycle (RBC) models and the model based on work by Sachs. The RBC models state that changes in productivity lead to business cycles, and government intervention is not necessary in the presence of these cycles as they are real in nature. Also, the RBC models suggest that real supply shocks can explain both long-term growth in income and cyclical variations in income and the trade balance. Some of the models argue that demand shocks, such as fiscal or monetary disturbances, are not necessary to explain the countercyclicality of the trade balance. This countercyclicality can be compatible instead with permanent productivity shocks. Technological shocks lead to an increase in real income and a decrease in the trade balance due to investment increasing more than savings. Transitory productivity shocks lead to an increase in consumption with little to no response in investment. Some empirical applications that support the RBC hypothesis are Glick and Rogoff; Kim (1994); Razin; Mendoza; and Cardia.

The model presented by Sachs uses the national accounting identity for real income and the current account balance to illustrate that a permanent increase in income does not affect the trade balance, as income and consumption change by the same magnitude. However, a transitory increase in income may increase or decrease the trade balance. If the source of the increase of income is aggregate supply, the trade balance will increase; if the source of the increase in income is aggregate demand, the trade balance will decrease. Thus, the countercyclicality of the trade balance is due to the relative significance of demand disturbances relative to supply disturbances. Empirical studies that have supported Sachs' hypothesis include Ahmed and Park, and Kim (1996)

While both theories have appealing aspects, the actual change in the trade balance may be explained by a combination of the theories in the short run and the long run. Income shocks are relatively straightforward, as permanent shocks will increase income permanently, while government policies or transitory supply shocks will only change income in the short run. The exact length of the short run will vary from shock to shock, but in the long run, only real shocks should increase income permanently. Shocks to the trade balance can tend to be more complicated, as the following examples outline.

A transitory supply shock, such as an input price shock, could lead to an increase in the trade balance as income falls if this shock is related only to the domestic economy. If all trading partners' incomes are reduced by the same percentage by the input price shock, the trade balance should not change. When the extent of the change varies by country, however, the nations with the largest income decline will have the greatest increases in the trade balance due to the fall in imports. This, of course, assumes that purchasing power parity continually holds or that this domestic price rise will lead to a depreciation that will improve the trade balance. For this to occur, the Marshall-Lerner (M-L) condition must hold or, expressed in domestic currency units,

$$\frac{X}{M} * |\eta_{Dx}| + |\eta_{Dm}| > 1$$

must be satisfied. X and M refer to total expenditures on exports and imports, η_{Dx} is the price elasticity of demand for domestic country exports (foreign country imports), and η_{Dm} is the domestic country price elasticity of demand for imports. These elasticities are very difficult to determine and most likely differ between the short run and the long run, so the time frame of observation will also play a key role in analysis. If the M-L condition does not hold, the trade balance will deteriorate with depreciation, and the countercyclicality may not be observed, depending upon the size of the effects of the change in income and depreciation. If there are long and pronounced variations from purchasing power parity (PPP) or exchange rates and prices are extremely volatile, the overall effects of these changes could reinforce the suggested outcomes of Sachs' model or be counter to it. Therefore, if the M-L condition holds and the income decline is solely focused or mainly focused on the domestic economy, the Sachs model should hold. If the income decline is worldwide, the RBC model is more likely to be true. Otherwise, failure for the M-L condition to hold or extreme volatility in prices and exchange rates could lead to outcomes described by neither hypothesis.

Transitory shocks originating from aggregate demand, such as expansionary fiscal or monetary policy, may also not fall directly under the Sachs or RBC models. An expansionary policy will lead to a decrease in the trade balance if the shock is unexpected, income rises, and purchasing power parity holds. If the shock is expected, it is predicted that there will not be transitory effects on income due to the policy ineffectiveness proposition (Lucas). If there are effects from exchange rates and prices of exports, the effect on the trade balance is determined by the size of the change in income (if any) and the viability of the M-L condition. If the M-L condition holds, depreciation will lead to the opposite effect on the trade balance compared to the effect of the increase in income. The direction the trade balance moves depends upon the size of these two effects. If the M-L condition does not hold, the effects will reinforce each other, and the trade balance will be countercyclical. Again, if there is volatility in the exchange rate and prices and purchasing power parity do not hold, these effects could lead to different results based on the size of these changes. In general, if the policy is unanticipated and the M-L condition does not hold, or the absolute value of the effect from the income change is larger than the effect from the depreciation if the M-L condition holds, the Sachs hypothesis should be supported. RBC models do not need demand shocks to explain the movement of the trade balance. This is true if the policy is anticipated, but demand shocks can have an impact on the trade balance if the above conditions for the Sachs model hold, or if movements in prices and exchange rates lead to positive or negative impacts for the trade balance.

Permanent supply shocks, such as technological improvements, may lead to the countercyclical nature of the trade balance, but again this does not have to be the case in the instance of every shock. If the technological shock is instantaneous and equally distributed to all trading partners, Sachs' theory based on the permanent income hypothesis should hold, as consumption and income will increase by the same amounts in all countries. If the shock is local, however, domestic consumption will rise permanently, and the trade balance will worsen as more imports are purchased. Exchange rate and relative price effects continue to remain a factor in the same manner as the other shocks discussed previously. Timing may also play a role as spillover effects of technology can cause foreign incomes to rise after the technology is discovered by the domestic country. The extent of the spillover coupled with the length of time it takes to spread will determine what percentage of the effect is transitory or permanent on the trade balance. Thus, the explanation for the countercyclicality, whether it can be explained solely by permanent productivity shocks, as in the RBC models, or not, is dependent upon the worldwide effect of the shock.

In summary, the effect on the trade balance depends upon the sources of the shock, its effect on income, prices, the exchange rate,

and the impact on the rest of the world. Within this framework, the trade balance of a country can be consistent with Sachs' hypothesis, the RBC models, both, or neither. A way to examine the shocks more closely is to look at areas or sectors of the economy that are prone to certain types of shocks. During the time frame examined for the United States, much of GDP growth is driven by the services sector. The technological advances in the computer industry and others have had a major impact on the growth of income in this sector and on trade. Agriculture, on the other hand, is heavily characterized by government supply-side programs. Some of these programs are highly transitory, such as the export-enhancement programs and subsidies, while others last many years and could appear in the data to be permanent, such as addition or removal of trade barriers or some government agricultural programs. One such plan is the Conservation Resources Program, which is designed to be more of a long-term program in which 10% of agricultural land is set aside for at least ten years, which lowers output for an extended period. The manufacturing sector seems to have elements of all types of shocks, including technological improvements, removal of trade barriers, input price shocks, etc. All sectors are influenced by demand-side shocks, but the extent depends upon the type of demand shock and the relative sizes of the sectors in the economy. Using these sectors to examine such shocks may provide more insight into the true nature of the trade balance and how much of its changes can be attributed to the theories of the Sachs and RBC models.

One important point in relation to using these sectors of the economy in an empirical analysis is that the Sachs model suggests that permanent increases in real income will not change the aggregate trade balance because income and consumption change by the same amount. Therefore, the trade balance in any individual sector may change under the Sachs model, but it would be perfectly offset by some combination of trade balance adjustment in other sectors. This study is an empirical analysis of the effects of permanent and transitory shocks on real income and the trade balance by sector. We use the existing RBC models and the Sachs model to help to explain the results that are discovered through this sectoral approach.

Methodology

In order to investigate the role of permanent and transitory changes in income in the determination of the trade balance of the agricultural, manufacturing, and services sectors, we followed a procedure proposed by Blanchard and Quah for distinguishing temporary from permanent shocks to a pair of time-series variables. The method has also been described by Enders and applied with some variations to open-economy models by Bayoumi and Eichengreen; Clarida and Gali; Enders and Lee; Kim (1994, 1996); Lastrapes; and Miljkovic, Paul, and Garcia.

The two variables in this model are real income, y_t, and the trade balance, b_t. The log of GDP is used for real income, while the trade balance is measured by real net exports. The quarterly data for all sectors under consideration were obtained from *National Income and Product Accounts* from 1980:IV through 2003:IV. These data sets were selected for availability and to avoid possible structural breaks due to the oil shocks in the 1970s. Tests for unit roots and time trends were performed on the variables. The variables should be appropriately transformed so that the resulting sequences are both $I(0)$. In our sample, the hypothesis of a unit root cannot be rejected at conventional significance levels for both real income and the trade balance variables. We thus assume that they are both $I(1)$. Full unit root test results are presented in Appendix I.

The model then can be stated as follows:

$$(1) \qquad Z_t = \alpha + \sum_{k=0}^{\infty} A_k U_{t-k},$$

where $Z_t = (\Delta y_t, \Delta b_t)'$ and $U_t = \left(u_t^p, u_t^t\right)'$, α is a vector of deterministic components, and A_k represents matrices of coefficients. To distinguish between permanent and transitory

changes in real income and effects of changes on the trade balance, it is essential to decompose reduced-form shocks into structural shocks. Thus, the two types of structural disturbances considered are u_t^t and u_t^p, the innovations that generate transitory and permanent changes in income, respectively. A transitory shock does not have a long-run effect on real income. This restriction can be described as the sum of the (1, 2) element of A_k is equal to zero. These restrictions do not exist for permanent shocks. The effects for permanent and transitory shocks on the trade balance are captured by $A_k^{2,1}$ and $A_k^{2,2}$, respectively.

Following the Blanchard and Quah decomposition procedure, we estimate a VAR (vector autoregressions) model that consists of Δy_t and Δb_t. The VAR model and its moving average representation are

$$(2) \quad Z_t = \beta + \sum_{k=1}^{p} B_k Z_{t-k} + V_t,$$

$$(3) \quad Z_t = \alpha + \sum_{k=0}^{\infty} C_k V_{t-k},$$

where $\alpha = \left(I - \sum_{k=1}^{p} B_k\right)^{-1}\beta$ is a matrix of coefficients. The impulse responses are represented by the B_k and C_k matrices of coefficients.

Reduced-form innovations, V_t, from the VAR equations are converted into the structural innovations of U_t. Each structural innovation is standardized to have unit variance and is assumed to be uncorrelated with each other, i.e., Var $(U_t) = I$. This yields the contemporaneous structural decomposition matrix A_0, such that $\Omega = A_0 A_0'$, where $\Omega = \text{Var}(V_t)$ is the covariance matrix of the reduced-form innovations (V_t) estimated with Equation (2) and $\sum_{k=0}^{\infty} A_k^{1,2} = 0$. The dynamic multipliers A_k are obtained by transforming the impulse responses of reduced-form innovations, i.e., $A_k = C_k A_0$, $k = 1,2, \ldots$. The effects of structural innovations on the level of income and the trade balance are then obtained from

$$(4) \quad X_t = \alpha + \sum_{k=0}^{\infty} D_k U_{t-k},$$

where $X_t = (y_t, b_t)'$, $D_k^{2,j} = A_k^{2,j}, j = 1, 2$, and $D_k^{1,j} = \sum_{i=0}^{k} A_k^{1,j}, j = 1, 2$. The empirical results follow this representation.

Results and Implications

In order to allow dynamics and eliminate serial correlation in the model, we lag the variables using the general-to-specific method suggested by Hall and determine that four lags in the VAR model bring about satisfactory results. To check the robustness of the results, the same model is estimated with different lag lengths using methods such as Akaike's Information Criterion. Very little difference in results is obtained (Figures 1–4).

The results from the variance decomposition of real income and trade balances in the U.S. economy and its three sectors are shown in Figures 1 through 4. We define the k-quarter-ahead forecast error in real income as the difference between the actual value of real income and its forecast from Equation (4) as of k quarters earlier. This forecast error is due to both unanticipated transitory and permanent disturbances in the last k quarters. The numbers for real income at horizon k ($k = 1, \ldots, 20$) give the percentage of variance of the k-quarter-ahead forecast error due to transitory and permanent disturbances respectively (the line in the middle). The asymmetric one-standard-deviation bands, derived based on Blanchard and Quah, surround the point estimates. A similar interpretation holds for the numbers for the trade balances.

The variance in real income is explained mostly (98%) by permanent shocks in the economy as a whole and in each of the sectors except agriculture at the end of the horizon of five years. However, while the variance in real income in the manufacturing sector is explained over 90% by permanent shocks in the first quarter and 95% at the end of the first year, the variance in real income in the services sector is explained close to 55% in the first quarter and less than 85% at the end of the first year. Some of this transitory variation can be attributed to technological spillovers that increase the income of trading partners at

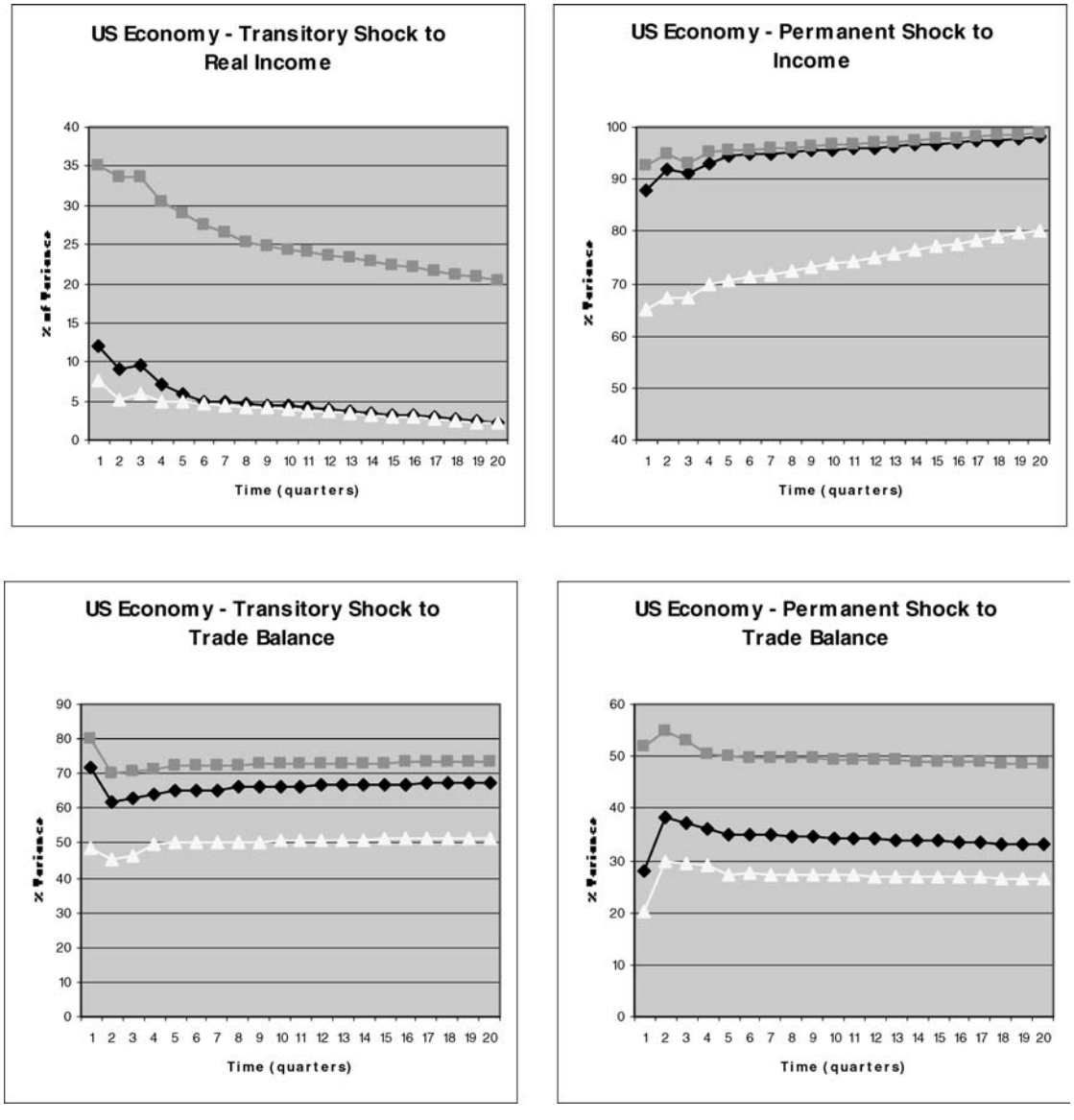

Figure 1. Variance Decomposition (U.S. Economy)

some lag over time to the domestic economy. The agricultural sector presents a very different picture. While 60% of the variance in real income is due to the permanent shocks in the first quarter, that percentage drops to close to 50% in the next period and reaches 60% only after three years. At the end of the fifth year, less than 70% of the variance in real income is due to permanent shocks. Much of this can be attributed to the many supply-side programs introduced into the agricultural sector by the government.

There are several important conclusions that can be inferred from the empirical results. First, permanent shocks explain the variance in real income in the U.S. economy to a greater extent in this study than in Kim (1996). The differences in the results in this study compared to those found in Kim (1996) likely stem from the intentional avoidance of the oil shocks of the 1970s in our sample. In the sample of 1957–1993 in Kim (1996), the inclusion of the large oil shocks likely contributed to lower percentages of the income

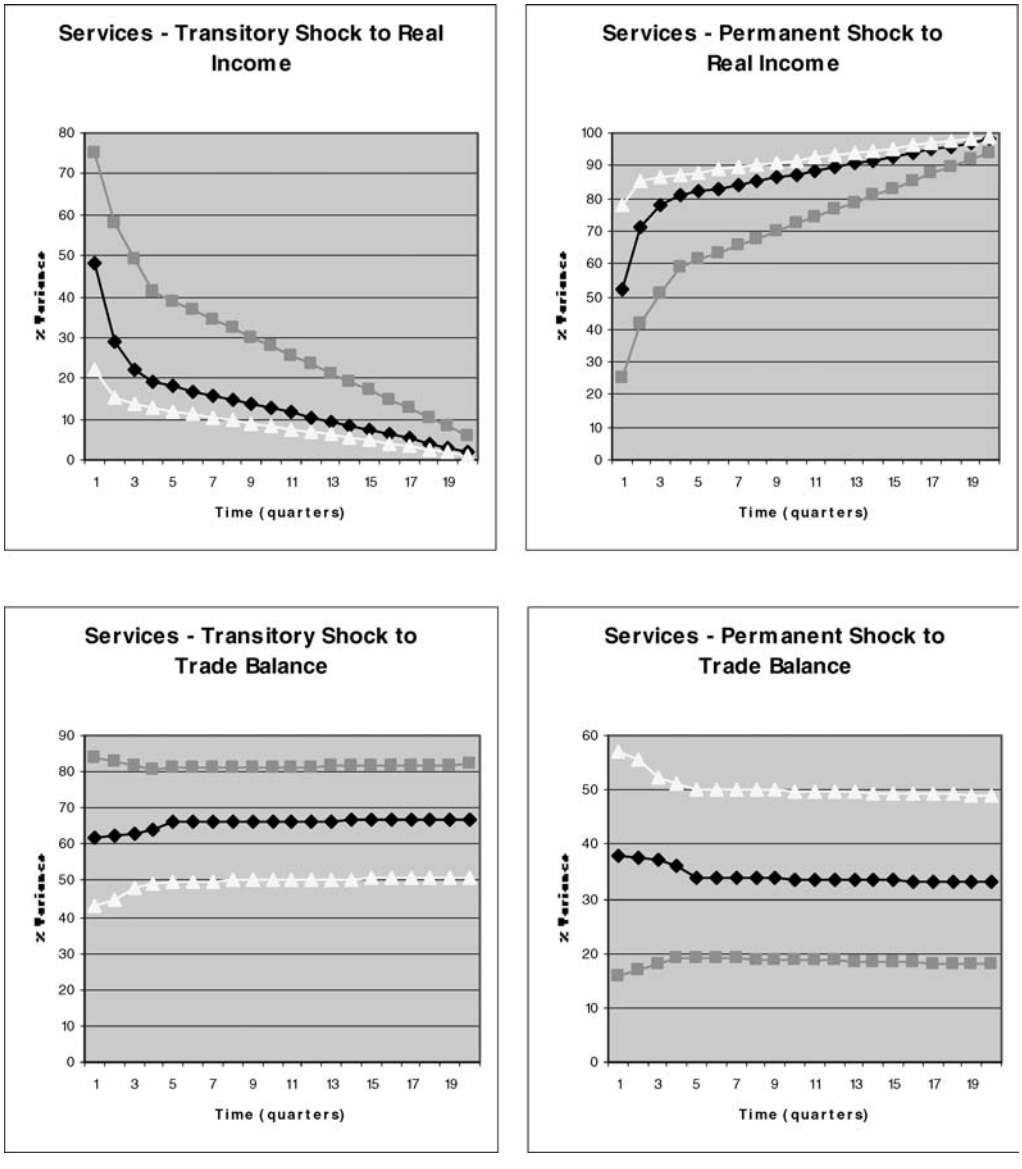

Figure 2. Variance Decomposition (Services)

variance being explained by permanent shocks and a higher percentage of the trade balance variance being explained by transitory shocks. The oil shocks likely led to transitory shocks playing a much larger role in the variance of income and the trade balance. Second, results for the manufacturing and service sectors almost completely drive the results for the economy as a whole. This is primarily due to the size of these sectors relative to the agricultural sector. Third, due to the nature of the production processes in the manufacturing sector, supply-side shocks such as an oil shock or technological change have an instant and strong effect on real income. Fourth, the services sector underwent dramatic changes, primarily due to advancements in the computer and software industries. This is consistent with findings of Jorgenson and Stiroh, and Stiroh. Thus, the impact of supply-side shocks was dominant in this sample. Fifth, real income in the agricultural sector is very sensitive to transitory disturbances such as weather or natural disasters (e.g., drought, flooding, and hail). Also, the agricultural sector is exposed to more frequent policy

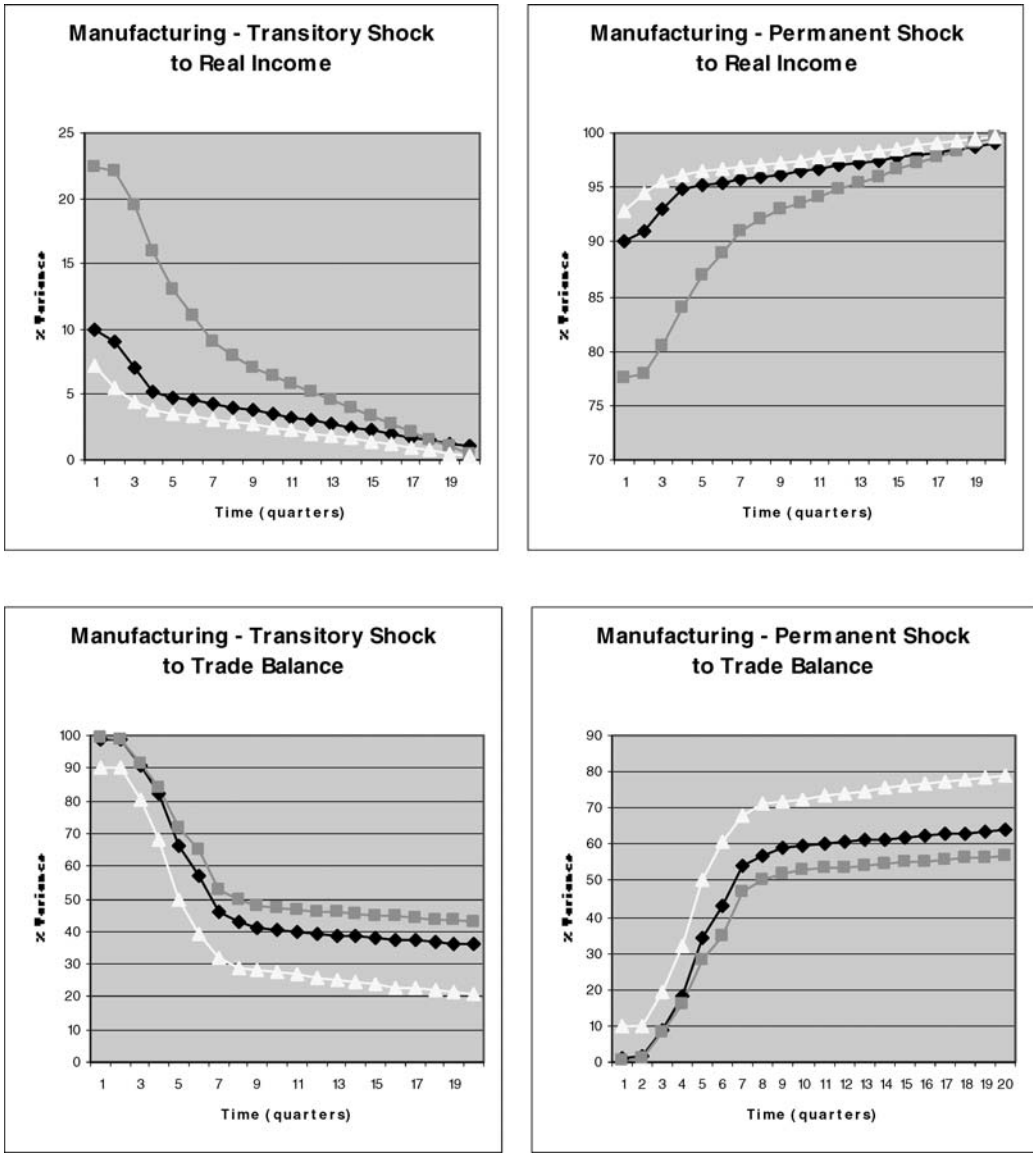

Figure 3. Variance Decomposition (Manufacturing)

regulation and government intervention because of the very nature and importance of agricultural products (Baek and Koo). Therefore, this leads to a strengthening of the effect of transitory shocks on real income. Notice that the result for the agricultural sector may slightly change if the period under consideration includes major technological advances in agriculture such as the development of high-yield varieties of grains (green revolution during the 1960s and 1970s).

A steady 67% portion of the variance in the trade balance for the U.S. economy as a whole is explained by transitory changes in income from the second through the fifth year. The first year is more volatile, i.e., the transitory changes in income explain 72% of the variance in the trade balance in the first quarter, dropping to 62% in the following quarter, and then rising to 67% by the end of the first year. This result seems to support Sachs' hypothesis, although not strongly.

The response of the variance within the sectors differs significantly. Services, being the largest sector among the three sectors studied here, drive the results for the entire economy.

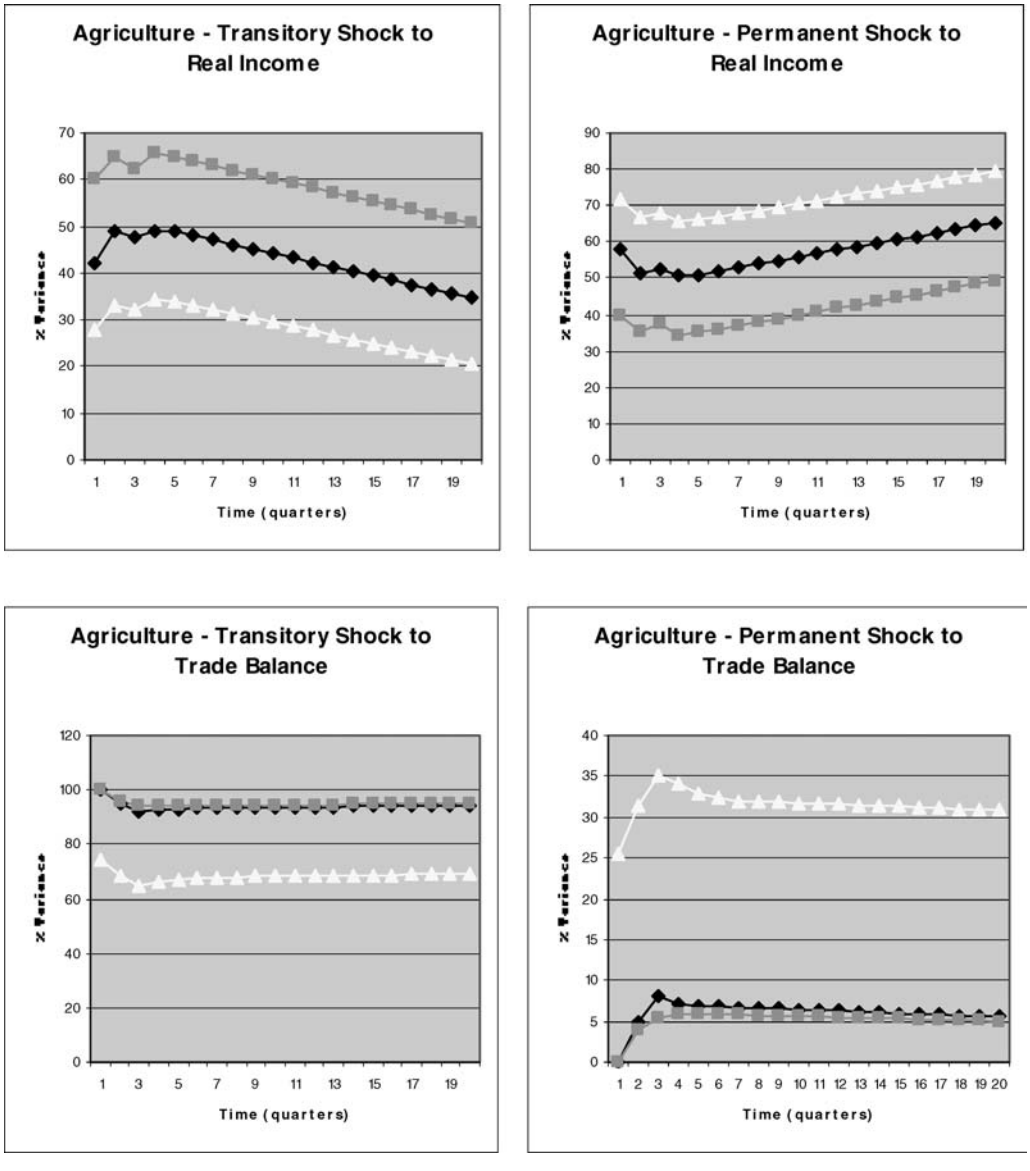

Figure 4. Variance Decomposition (Agriculture)

A 63% to 67% portion of the variance in the trade balance of the services sector is explained by transitory changes in income. This could represent changes in aggregate demand policies or transitory supply-side effects such as input price changes as in Sachs' work. Additionally, the spillover effects of the technological advances more than likely make some of the permanent effects on real income in the U.S. have transitory components in the trade balance as the incomes of other nations rise in the future, which would follow the logic of the RBC models.

The variance in the trade balance of the manufacturing sector can be explained almost completely by transitory changes in income during the first two quarters. However, by the end of the horizon of five years, the portion of the trade balance variance explained by transitory changes in real income drops to below 40%. Finally, the portion of the variance explained by transitory changes in income in the case of the agricultural sector stabilizes between 85% and 90% at the end of the first year, after the initial drop from close to 100%. Transitory supply-side shocks due to

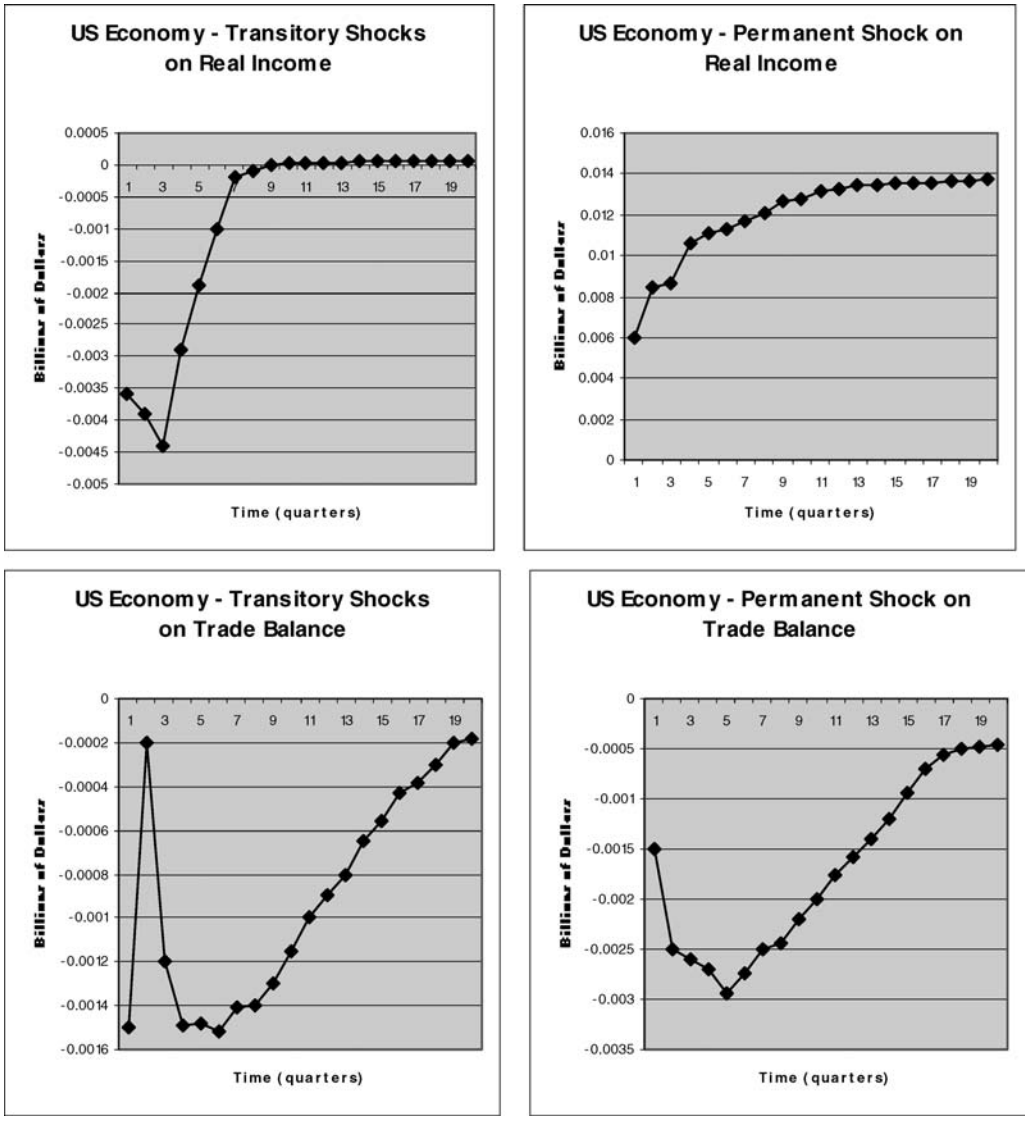

Figure 5. Impulse Responses (U.S. Economy)

the policies of the governments and various supply-side shocks lead to changes in the trade balance, which is consistent with the theory of Sachs.

Dynamic responses are plotted in Figures 5 through 8. Four impulse responses are presented for each sector and the country as a whole. The top two panels are the responses of income, in billions of dollars, to a transitory shock (left) and a permanent shock (right), while the bottom panels represent corresponding responses in the trade balance (also in billions of dollars).

Income increases permanently due to a permanent shock in the entire economy and each of its sectors. The effect of a permanent shock on real income increases over time in all sectors except agriculture. The agricultural sector income increases due to a permanent shock, but that effect dampens rapidly during the first year and slowly and steadily thereafter. These are expected results because the supply-side shocks such as technological improvements have a long-term positive effect on income. In agriculture, however, they are coupled with some long-term supply-side

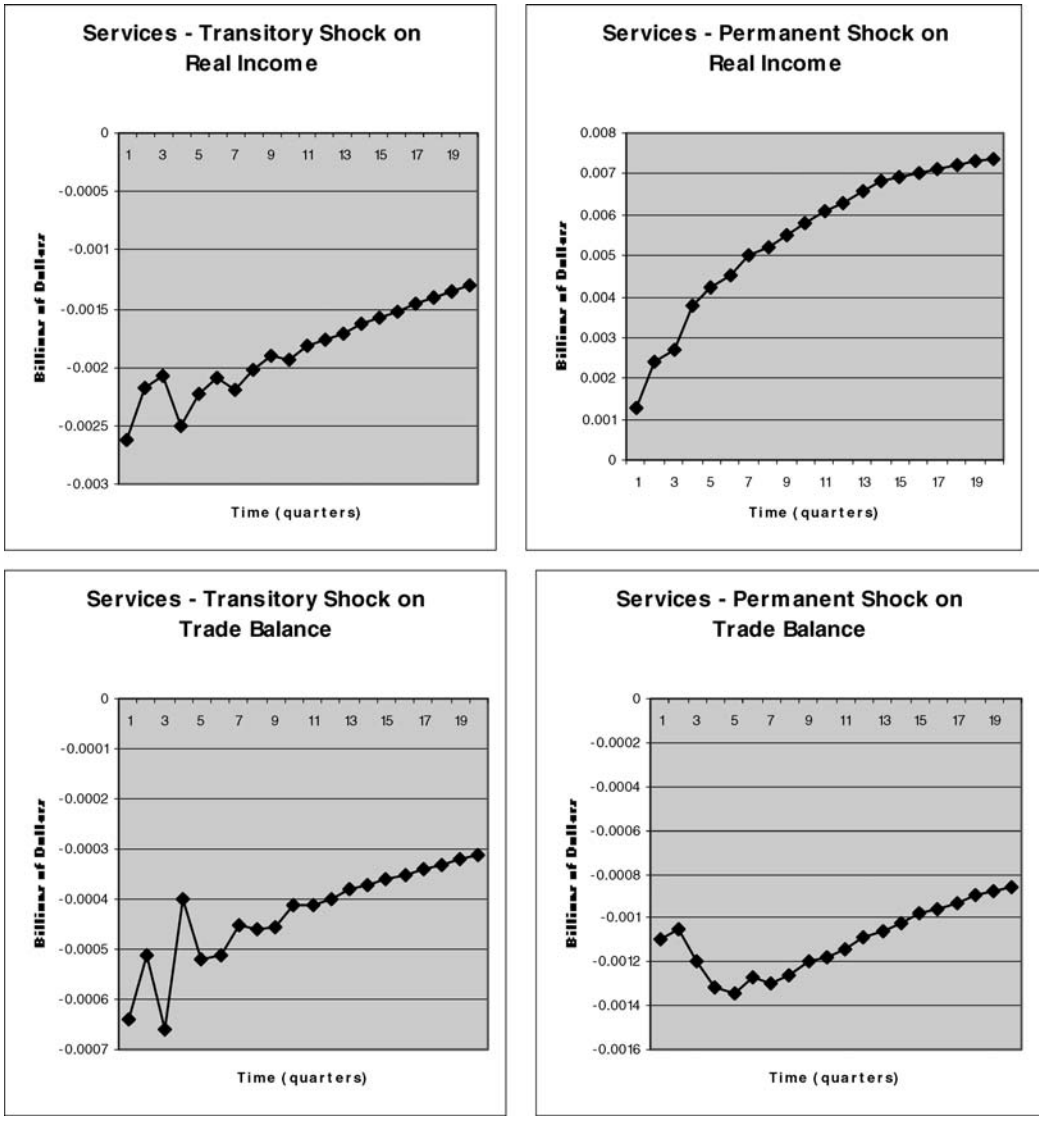

Figure 6. Impulse Responses (Services)

policies such as the aforementioned Conservation Resources Program, which drove some farmers out of production or significantly decreased the level of operations of many others.

Transitory shocks generate temporary and negative effects on income in the services and manufacturing sectors and larger positive effects in agriculture. The effect of transitory shocks on income at the level of the entire economy is short-lasting. It decreases during the first two years and is positive, but virtually nonexistent afterward. It seems that the short-term agricultural policies such as various export-enhancement programs or crop insurance programs have a significant and positive effect on income in the agricultural sector. Also, government transfers to farmers at times of weather disasters seem to offset the negative effect they could have had on agricultural income. On the other hand, the transitory disturbances in terms of policy changes or autonomous changes in consumption seem to have a negative, but almost negligible effect on income in the manufacturing and services sectors. Various aggregate supply and aggre-

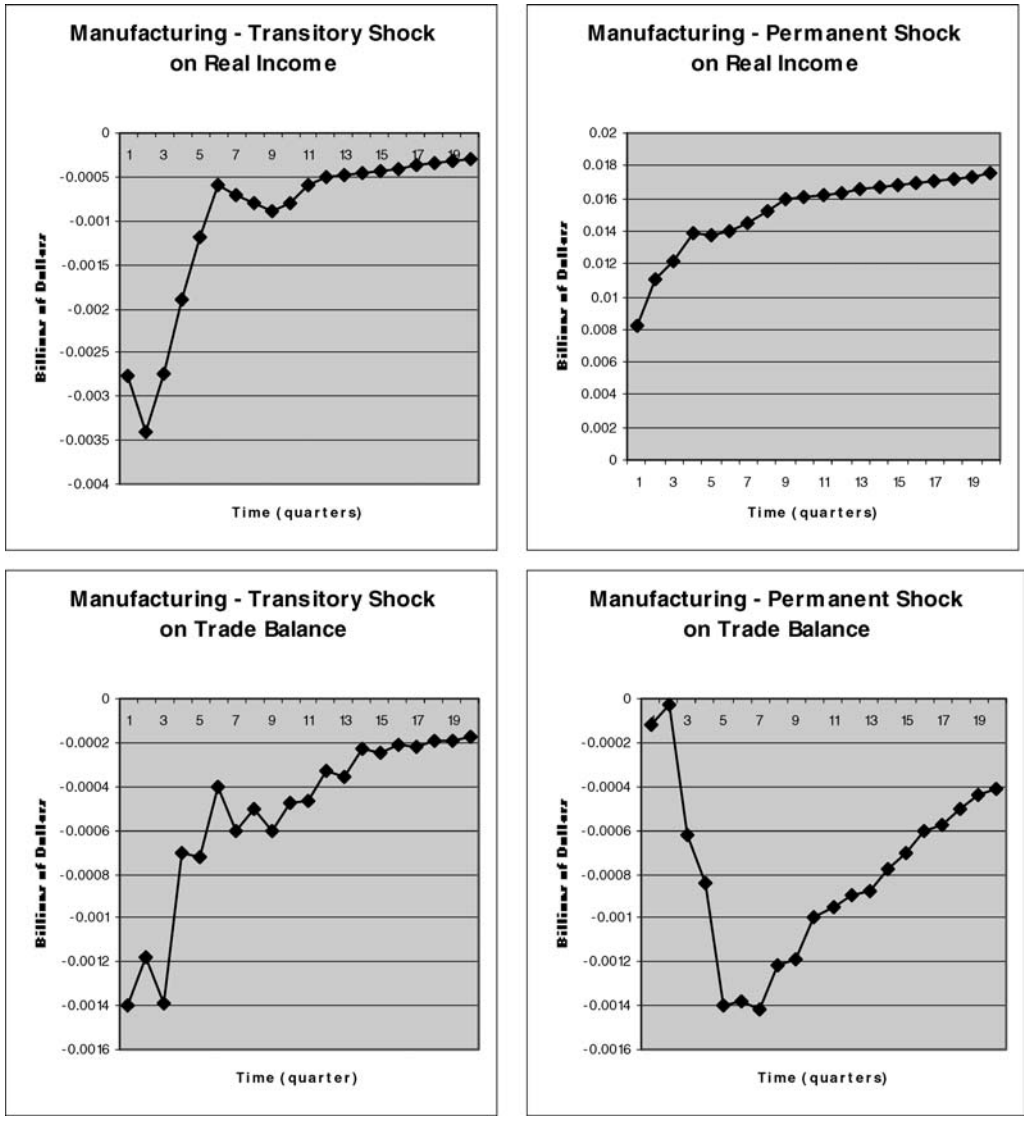

Figure 7. Impulse Responses (Manufacturing)

gate demand disturbances occurring simultaneously cause the income response for the entire economy, as described previously. These results may also represent an argument in favor of the policy ineffectiveness proposition (Lucas), which states that anticipated policy cannot change real GDP in a regular or predictable way.

Transitory shocks reduce the trade balance in all sectors and the economy overall. That effect is most obvious in the agricultural sector. The explanation for this is the dependence of agricultural production on weather and the effect that weather-related disasters may have on the export of agricultural products. While the result for services and the economy overall can be explained with Sachs' argument to an extent, the RBC model including spillover effects from technology can be supported as permanent shocks reduce the trade balance first, but then improve over time.

The manufacturing sector can be explained with Sachs' argument only partially because of the relatively low importance of transitory shocks on the variations of its trade balance.

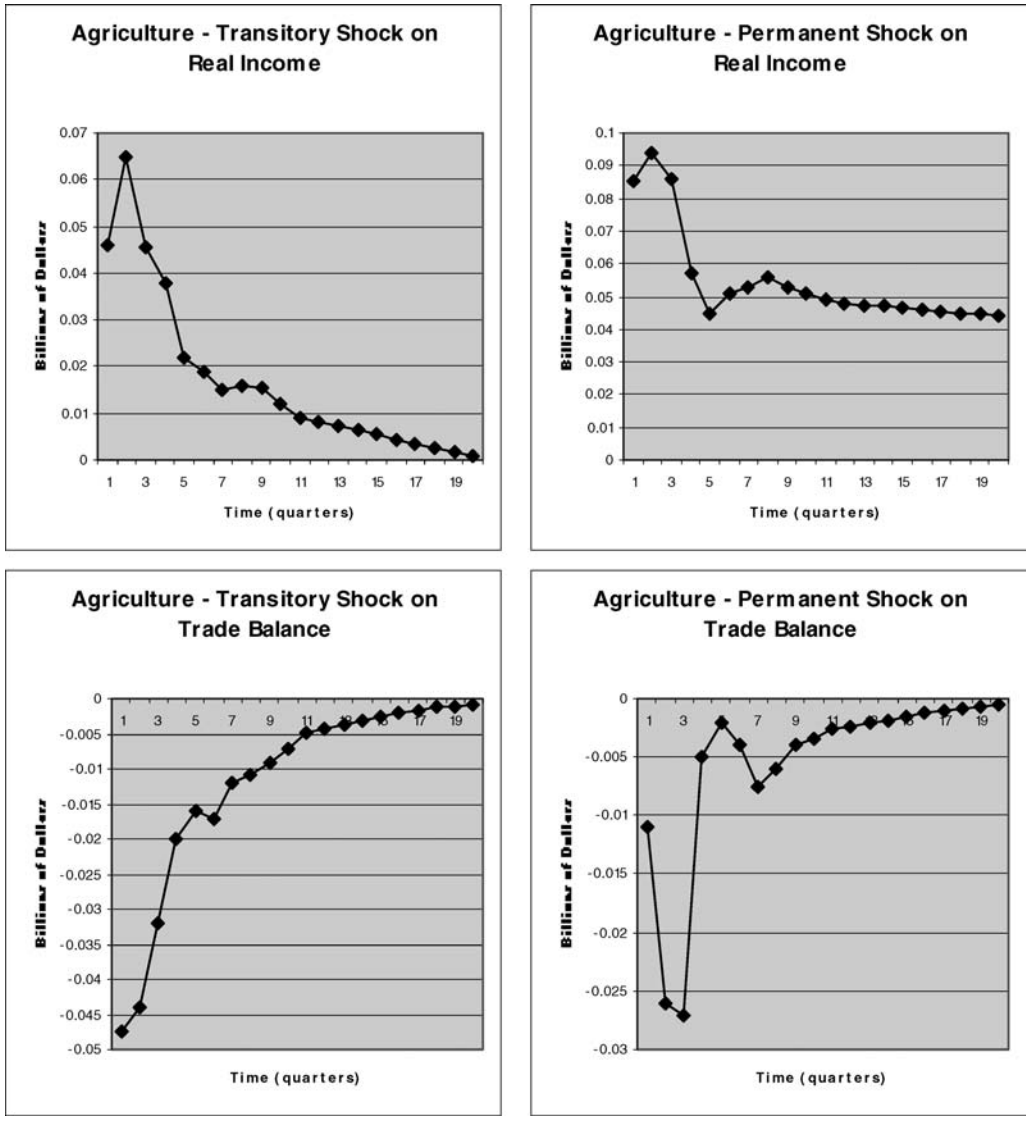

Figure 8. Impulse Responses (Agriculture)

A larger part of the variance of the manufacturing sector trade balance may be explained by permanent shocks. A discussion of this point is detailed at the conclusion of this section.

The trade balance in agriculture is heavily influenced by shocks such as weather, export-enhancement programs, and demand shocks. It is not surprising that transitory shocks explain nearly 95% of the variation in the agricultural sector trade balance. The source of the shock, the change in domestic and foreign incomes, and the viability of the M-L condition determine the effect of these changes on the trade balance. Together, these findings illustrate how results could be consistent with both the Sachs model and the RBC models based upon the source and nature of the shocks.

Permanent shocks also reduce the trade balance in all sectors and the economy overall. Some of that effect can be attributed to global and regional trade liberalization processes such as GATT, CUSTA, or NAFTA agreements. The relative consumption of imported goods in the United States increased signifi-

cantly during the 1980s and 1990s relative to the consumption in previous periods. Remember, however, that the effect of permanent shocks on trade balances in all sectors except manufacturing is very small. A permanent shock that may have had a larger negative impact on the manufacturing sector trade balance is a domestic economy distortion in the form of the wage differential between manufacturing and other sectors. Many high-wage jobs are found in manufacturing. Labor unions are a potential reason for this wage differential. The remedy for this problem is the elimination of this wage differential between manufacturing and other sectors (Bhagwati; Krugman). Also, there may be substitution between services exported and manufacturing, which may lead to the decline in the trade balance for this sector. It then appears that the RBC model better explains the trade balance variation of the manufacturing sector than the Sachs model.

Concluding Remarks

The United States economy and each of its sectors (services, manufacturing, and agriculture) were studied for the time frame of 1980–2003 to examine the causes of the countercyclicality of the trade balance. Results are found for each sector individually and for the economy as a whole. The variance decomposition of real income and the trade balance reveals that permanent shocks explain most of the variance in real income in the U.S. economy as a whole and in the services and manufacturing sectors. The variance in real income in the agricultural sector is mainly due to transitory shocks. Transitory changes in income explain over two thirds of the variance in the trade balance for the overall U.S. economy, giving slight support to the hypothesis of Sachs over the competing RBC models. In the individual sectors, transitory shocks to income explain most of the variation in the trade balance in the services and agricultural sectors, while the manufacturing sector is explained by transitory shocks in the short run, but permanent shocks play a more significant role at the end of the time horizon of five years.

The impulse responses reveal that permanent shocks increase real income permanently for the U.S. economy and each individual sector. Transitory shocks lead to temporary decreases in real income in the services and manufacturing sectors, but they lead to temporary increases in real income in the agricultural sector. Both permanent and transitory shocks decrease the trade balance for the economy as a whole and for each sector.

Implications of the results of this study are threefold. First, it is difficult to isolate and generalize the effects of any transitory shocks in the form of different policies aiming at different goals. An examination of individual sectors of the economy provides greater insight into a world that can have results that are consistent with Sachs, RBC models, both, or neither due to the most typical shocks that occur in these sectors. The services sector was mainly influenced by technological improvements, which cause permanent shocks to be dominant, with positive and lasting effects on real income, and negative shocks to the trade balance, which improve over time, possibly from technological spillovers. All of the government programs in agriculture have led to a much higher percentage of the variance being caused by transitory shocks than the other sectors. The positive effects of these shocks on the trade balance show the impact of export-enhancement programs and subsidies. There is a greater percentage of variance explained by permanent shocks on the trade balance for manufacturing, which may be due to the high-wage aspects of many of the jobs in this sector and the possible substitution of service activities for manufacturing, which would have led to the decrease in the trade balance.

The second major implication of the findings of this study is that different sectors respond differently to various shocks. At the aggregate (macro) level, the results will depend on the relative size of different sectors in the economy. Therefore, policy makers should be very careful when designing and implementing any macroscopic or individual sector policies because their effects may adversely affect some

(especially small) sectors and still have a positive overall effect on the economy.

The third implication is that globalization of the U.S. economy during the 1980s and 1990s has led to an increase in the share of both imports and exports in GDP. It is difficult, however, to explicitly pinpoint the sources of this increased trade share. It is unlikely that a fall in transportation costs and/or an improvement in terms of trade are the sources of the increased trade share in GDP. A more likely cause is the reduction of invisible transactions costs in international trade due to improvements in communication and information processing (Krugman). The driving force behind the emergence of a dramatic trade deficit in manufacturing may be trade liberalization, to some extent, as well as the domestic distortion in the form of relatively high manufacturing wages.

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Appendix I. Unit Root Tests

Variable	Test	Number of Lags	Test Statistic
GDP	ADF^{A}	4	−2.681102
GDP	PP^{A}	4	−2.369244
TB	ADF^{A}	4	−3.086270
TB	PP^{A}	4	−2.395961
Agriculture GDP	ADF^{A}	3	−4.578020***
Agriculture GDP	PP^{A}	3	−3.619127**
Agriculture TB	ADF^{B}	3	−2.786503*
Agriculture TB	PP^{B}	3	−2.777192*
Manufacturing GDP	ADF^{A}	3	−2.354515
Manufacturing GDP	PP^{A}	3	−2.545449
Manufacturing TB	ADF^{B}	3	−2.120523
Manufacturing TB	PP^{B}	3	−2.397254
Services GDP	ADF^{A}	4	−1.639946
Services GDP	PP^{A}	4	−1.370084
Services TB	ADF^{B}	4	−2.226807
Services TB	PP^{B}	4	−2.215816

Note: Superscripts on the tests represent the use of constants and trends. A represents use of both, while B represents use of just a constant. PP stands for Philips-Perron test, and ADF stands for augmented Dickey-Fuller test. The lag values were determined by the use of the Newsy-West test.

* Denotes rejection of the null hypothesis of a unit root at 10% level.

** Denotes rejection of the null hypothesis of a unit root at 5% level.

*** Denotes rejection of the null hypothesis of a unit root at 1% level.