Macroeconomic and Global Growth Influences on U.S. Agricultural Trade

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Abstract: In recent years, U.S. agricultural import growth has far outpaced export growth, raising questions about how the future pattern of U.S. trade will evolve. Analysis of two key factors affecting agricultural trade suggests that this may be a temporary phenomenon. Due to differences in global economic growth rates and consumption levels, U.S. trade is undergoing a major shift in the direction of exports, with the share of exports going to faster growing emerging markets beginning to offset slow growth in large high income markets. As per-capita incomes and population rises in these faster growing markets, overall U.S. exports may accelerate in the future. In addition, the large and growing U.S. current account deficit could place downward pressure on the U.S dollar at some point. If foreign capital inflows subside, dollar depreciation and other macroeconomic effects would spur U.S. export growth and dampen imports. Results are supported by preliminary analysis conducted with dynamic U.S. computable general equilibrium and static global trade models.

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The recent rapid growth of U.S. agricultural imports—and the coinciding slow growth of exports—has sparked renewed interest in the subject of U.S. agricultural trade competitiveness. Although agricultural exports are expected to reach a record $67 billion in 2006, imports have grown much faster than exports, nearly doubling in the past decade. As a result, the gap between exports and imports fell from an all-time high of $27.3 billion in 1996 to an expected $2 billion in 2006—the lowest level since 1972. The U.S. Department of Agriculture (USDA) now projects that agricultural imports may match exports within the next decade (USDA Baseline, 2006). These developments naturally raise questions about the causes and timing of these changes. This paper addresses these issues by investigating the role and future implications of two broad factors affecting U.S. agricultural trade:

- First, we examine **global structural changes** associated with national population and income growth differences, and their influence on the overall level and destination of U.S. agricultural exports.
- Second, we investigate broader **macroeconomic developments** associated with U.S. current account deficits, and potential ramifications for exchange rates and agricultural trade.

Much recent discussion on agricultural trade has focused on such factors as market barriers, domestic support policies, and foreign exchange rate policies, but agricultural trade patterns also reflects fundamental changes in global population shifts, GDP growth, and underlying macroeconomic conditions. Import growth, for example, has largely been driven by robust household spending—and low savings rates—in recent years, which has lifted consumer-good imports across the board. On the export side, slow population and income growth in traditionally important markets has simultaneously dampened U.S. export growth.[1]

[1] Import growth has been driven mainly by the rapid growth of horticulture products such as fruits, vegetables, and wine, as well as by animal products such as red meat and dairy. Exports

Using two applied general equilibrium models (a single-country and global model), we separately capture the influences of differences in global economic growth and cyclical macroeconomic developments on U.S. agricultural trade. To evaluate the impacts of GDP and population growth differences on U.S. bilateral exports—both historical and projected—we perform a growth simulation with the GTAP (Global Trade Analysis Project) modeling framework. Macroeconomic influences are simulated using a second model, known as USAGE (U.S. Applied General Equilibrium). Macroeconomic shocks in capital markets that drive exchange rate movements are used to simulate deviations around a 10-year projected baseline for U.S agricultural trade.

The fact that countries grow at different rates and are at different levels of economic development has major consequences for how trade patterns evolve. Despite the fact that overall foreign food demand continues to grow steadily, for example, U.S. agricultural export growth has slowed in the past decade partly due to sluggish food demand and income and population growth in its traditionally important markets such as Japan and Western Europe.

Cyclical macroeconomic factors affecting consumption, savings, interest rates, and exchange rates also affect global trade patterns, including agricultural trade. Declining trade balances in all sectors of the U.S. economy—including in other traditional surplus categories such as Services and Capital Goods—indicate that changes in U.S. agricultural trade are part of an economy-wide phenomenon. In particular, strong U.S. consumption growth—accompanied by low U.S. and high foreign savings rates—are often cited as causes of sharply rising imports

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of high-valued products, which make up about two-thirds of total U.S. agricultural export value, have been fairly flat in the past decade, while bulk commodity exports have been more volatile.

during the past decade. Although differences in national savings and investment rates can allow countries to be net importers, and borrowers, over prolonged periods, eventually trade imbalances are expected to readjust through interest rate, exchange rate, and other changes so that net importers "repay" their borrowing with net exports in a subsequent time period. One possibility is that a reduced flow of foreign lending to the U.S. could induce further dollar depreciation, higher interest rates, lower consumption growth, and increased net exports.

In the following sections, we provide an overview of how U.S. agricultural exports have evolved over time, and the potential impacts of global GDP and population growth rate differences on future export flows. We then explore the broader macroeconomic context with a discussion of the U.S. current account imbalance and some of the implications for exchange rates, interest rates, and other variables affecting both agricultural imports and exports. This is followed by a description of methods and an outline of key results. Our analysis indicates that the recent pattern of rising imports and slow export growth is unlikely to continue due to the prospect of increased export demand from faster-growing emerging markets, and depreciation of the dollar bringing about slower U.S. household spending growth and improved export competitiveness.

Global growth, structural shifts, and implications for U.S. agricultural exports

Among economic drivers of global trade, world food consumption changes based on income and population trends is usually one of the most stable and predictable indicators. However, despite the generally steady growth of world food consumption, U.S. export growth has slowed in the past decade (figure 1). U.S. agricultural exports have also been quite volatile over time, since

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For historical information on the value, composition, destination, and source of U.S. agricultural

exports have been concentrated on a succession of markets where import demand was driven largely by factors unrelated to income or population growth.[2] This situation is now changing as U.S. agricultural exports are becoming more tightly linked to markets experiencing faster income and food consumption growth.

A historical view of U.S agricultural trade

Compared with the steady growth of agricultural imports, U.S. export growth has been volatile, with periods of intermittently strong growth occurring in a succession of developed-country markets: first the European Union, then Japan, then Canada. Because export growth to these markets was driven largely by policy related factors—rather than income or population growth associated with increased food consumption—growth was not sustained.

For example, while the European Union (EU) was the leading market for the United States for more than three decades (figure 2), weakening domestic demand—combined with the emergence of the EU's Common Agricultural Policy—contributed to sharply reduced demand for U.S. agricultural products by the mid-1980s. U.S. exports to the EU are now at the same nominal value as they were in 1974 ($7 billion), and much smaller in real terms. By the late 1980s, the EU's position as the leading market for U.S. exports was supplanted by Japan, but its import demand for U.S. products eventually declined as well. Trade liberalization boosted U.S. exports to Japan in the early 1990's, but trade to Japan has been declining since 1996. As with the EU, overall food demand in Japan stagnated due to slowing population growth and the

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trade, see: http://www.ers.usda.gov/Briefing/AgTrade/

[2] Agricultural trade flows, as with trade for other products, are of course influenced by other factors—including exchange rate fluctuations, changing consumer preferences, trade policies, the pace of technology adoption, and infrastructure development.

lackluster economic conditions. By 2006, the combined share of U.S. exports to the EU and Japan fell to 22 percent--down from 50 percent three decades earlier.

In 2002, Japan was replaced by Canada as the largest single country market for U.S. agricultural exports. Export growth to Canada, although remaining strong and steady, is not likely to continue at the same pace as in the past 15 years, when the impacts of the 1989 CAFTA and 1994 NAFTA trade liberalization process unfolded. This is because Canada, like other high-income but relatively slow growth markets, is not a consumption-led food market where import growth is tied to population or per-capita income growth. Instead, trade between U.S. and Canada has been largely driven by market integration and the ongoing rationalization and increased efficiency in their food processing and distribution sectors (see Mattson and Koo, 2005, for a detailed description of changes in U.S. agricultural exports and imports by region and category).

Global demand-side factors and their influence on trade patterns

Given the past U.S. dependence on slower growing export markets such as the EU and Japan, future export growth potential appears limited, especially since these economies are experiencing slow population growth and—even with rising incomes—the share of total expenditures devoted to food tends to decline in high income markets (Seale J., A. Regmi, and J. Bernstein 2003). In contrast to wealthier countries, per-capita income growth in lower income markets has a larger marginal impact on food consumption and imports since food purchases represent a much larger share of new expenditures. France, Japan, and the United States all have a marginal propensity to consume food of less than 10 cents for every additional dollar of income, whereas countries such as Egypt, the Philippines, Indonesia, and Vietnam, among others have a propensity to

consume more than 25 cents of every additional dollar of income on food (USDA, 2002). Mattson and Koo (2005) find that foreign income has a positive and statistically significant impact on U.S. exports of all three broad categories (bulk, intermediate, and consumer-oriented) of agricultural trade.

As a result, continued income and population gains in emerging markets such as Asia (excluding Japan) and Latin America have transformed these regions into increasingly significant destinations for U.S. exports. For example, while Canada's per-capita imports from the United States are currently more than double ($330 per person) that of Mexico's, Mexico has greater potential as a growth market for the United States due to population growth twice the rate of Canada's, and faster expected GDP growth.

Income and population gains in other, mostly emerging, markets are also expected to stimulate faster overall export growth in the coming decade (figures 3 and 4). Based on per capita income growth differences, China, South East Asia, Mexico, Central America, and to some extent India, should continue to increase their share of U.S. and global food trade. The development of a broader set of markets with stronger income and population growth prospects would mark a significant structural shift in the pattern of U.S. agricultural trade. Already in 2006, combined exports to China and Mexico exceeded for the first time combined exports to the European Union and Japan (figure 5). With the faster growing economies representing a larger share of foreign demand, the increasing prominence of emerging economies in global trade will be a key development affecting the U.S. agricultural sector.[3]

[3] Another dimension of global agriculture is the ongoing change in the composition trade. In the past two decades, imports of processed products by high-income countries have been growing faster than global trade in bulk commodities, so the composition of global agricultural trade has shifted from bulk towards high value products. Thus, while the U.S. has maintained its global market share in bulk commodities, its total share of global agricultural trade has drifted

Macroeconomic Influences on the U.S. Trade Balance

While global population and income growth differences shape trade patterns over the longer term, cyclical macroeconomic factors affecting consumption, interest rates, and exchange rates also clearly influence shorter term fluctuations in trade. Underlying these variables are differences in national consumption, savings, and investment behaviors which ultimately determine whether a country runs aggregate trade (and current account) surpluses or deficits. In the U.S., low levels of domestic savings relative to investment—and large inflows of foreign capital—have led to progressively larger current account deficits. In 2005, the U.S. current account deficit amounted to a record $816 billion (6.5 percent of GDP), which has been associated with declining trade balances in every sector of the economy (figure 6).[4]

Although strong consumption and the inflow of foreign financial capital indicate confidence in the U.S. economy, many economists regard large current account deficits supported by inflows of low cost foreign savings to the U.S. as unsustainable. At some point, foreigners may become less willing to save or invest in the U.S. due to the perception of increased risk in U.S. holdings, or due to improved investment opportunities elsewhere. Demand for a higher rate of return on U.S. investments would imply an eventual further depreciation of the dollar, reduced U.S. consumption, and lower overall deficits—which would have

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downward as the composition has shifted to high value products. U.S. high-value product exports are also notably more concentrated in far fewer markets (such as Canada, Japan, and the EU) than bulk exports, so limited export growth was also associated with the lack of representation in faster-growing markets.

[4] Note that the Department of Commerce "Food, Feeds, and Beverages" category and the USDA definition of agriculture are not directly comparable. BEA, 2004 data from "latest news release" 7/13/2005, tables, Exhibit 13. http://www.bea.gov/bea/di/home/trade.htm
1997 data from: http://www.census.gov/foreign-trade/Press-Release/97_press_releases/Final_Revisions_1997/exh12.txt

implications for U.S. agricultural trade. In this section, we explore some of the factors underlying the U.S. current account deficit and provide some perspectives on the sustainability and implications of these imbalances for agriculture. Scenarios reflecting foreign demand for different rates of return on U.S. assets and borrowings are traced out in the results section.

Macroeconomic imbalances and the growth of U.S. trade and current account deficits

As noted above, a country's current account balance (the extent to which a country borrows from or lends to other countries) reflects a gap between domestic savings and investment.[5] In the U.S. case, the current account deficit reflects a strong rate of investment compared to domestic savings, with the U.S. financing part of its aggregate demand for consumption and investment by borrowing from abroad.

Many economists point to the low U.S. savings rates as a primary cause of rising current account deficits, a view that is supported by the fact that U.S. savings rates are low both by historical standards and relative to many other economies (figure 7). While the U.S. gross national savings rate averaged 17.9 percent of GDP during the 1980s, and 16.9 percent during the 1990s, the savings rate has been under 14 percent since 2002.[6] This reflects both low public savings (budget deficits) and low household savings rates, which fell from 7 percent of

[5] The trade balance and current account balance are overlapping, but somewhat different terms. The U.S. current account balance mostly reflects trade in services and goods (capital and consumer goods, including agricultural products), but it also includes net investment earnings to and from the rest of the world. These investment earning flows include rents, interest, profits, and dividends, and net transfer payments (such as pension funds and worker remittances) to and from the rest of the world during a specific period. Consequently, the current account is a more accurate measure of a nation's annual monetary inflows (borrowing) and outflows (lending) than the trade deficit alone.

[6] Rising investment (as a percentage of GDP) from 1991 to 2001 was also associated with generally increasing current account deficits, but a fall in investment following the 2001

disposable household income in 1990 to less than 1 percent since 2004.[7] Recent data indicate that household savings rates in the U.S. have turned negative.

Despite the evident trend towards lower savings in the U.S., there is some disagreement about whether less saving in the U.S is the only, or even the primary cause of the increased current account deficits. Some argue that the growing current account deficit is partly rooted in changing savings and investment behavior in other countries which—largely due to a series of financial crises abroad and recent oil price hikes—have created a "glut" of global savings that has been channeled to the U.S. in search of higher or more secure investment returns.[8]

According to this viewpoint, instead of a case of under-savings (over-consumption) in the U.S., the current account deficit reflects what Cotis and de Mello (2004) termed "a flexible and welfare-enhancing adaptation to a foreign-saving shock motivated by higher expected returns in the U.S…."[9] Some observers point in particular to the substantial shift among a group of mostly emerging economies from being international net borrowers to becoming net lenders beginning in the mid-1990s—a time when the U.S. current account deficit began its recent expansion

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recession was accompanied by even larger declines in savings, which led to continued growth of the current account deficits.

[7] The other major component of gross national savings is business savings. Note that figure 7 refers to net, rather than gross, U.S. savings.

[8] Financial crises in Mexico (1994), East Asia (1997), Russia (1998), Brazil (1999), and Argentina (2002) dampened investment demand in these countries and led to an increased flow of savings to external investment opportunities. Following the 1997/98 Asian financial crisis, for example, the region (excluding Japan, Australia, and New Zealand), moved from a small current account deficit to consistent surpluses—largely reflecting a decline in investment rather than a change in savings. Domestic investment 7 East Asian economies fell from a 1996 average of 35 percent of GDP to less than 24 percent during 1998-2002 (Lee, Mckibben, and Park, 2004). Increased earnings from oil-exporting countries also found their way into global financial markets due to limited domestic investment opportunities. Although the "oil exporting" countries had current account surpluses throughout most of the 1995-2005 period, their collective surpluses grew rapidly in recent years, averaging $212 billion during 2003-05 compared to $52 billion annually during 1995-2002.

[9] p. 4.

(Bernanke, 2005). Due to lower capital-to-labor ratios, less-advanced economies would typically offer higher (but riskier) rates of return on investment, and would therefore normally attract, or borrow, financial capital rather than lending as the current account surpluses indicate (figure 8). According to Bernanke (2005), for example:

> We see that many of the major industrial countries--particularly Japan and some countries in Western Europe--have both strong reasons to save (to help support future retirees) and increasingly limited investment opportunities at home (because workforces are shrinking and capital-labor ratios are already high). In contrast, most developing countries have younger and more-rapidly growing workforces, as well as relatively low ratios of capital to labor, conditions that imply that the returns to capital in those countries may potentially be quite high. Basic economic logic thus suggests that, in the longer term, the industrial countries as a group should be running current account surpluses and lending on net to the developing world, not the other way around. If financial capital were to flow in this "natural" direction, savers in the industrial countries would potentially earn higher returns and enjoy increased diversification, and borrowers in the developing world would have the funds to make the capital investments needed to promote growth and higher living standards. (pp. 10-11).

Longer term implications of current account deficits

Changes in the U.S. current account balance have been associated with changes in U.S. savings behavior, but have also been affected very importantly by foreign savings and investment behavior—and the resulting financial flows to the U.S. from non-industrial countries. In the past decade, one reflection of the attractiveness of secure but relatively low return U.S. investments has been the increase in foreign central bank reserves held as U.S. government treasury notes. By the end of 2005, foreigners owned over one-quarter of all U.S. treasuries, and more than half (about $2.2 trillion) of privately held treasuries (TD Economics, 2006). According to Obstfeld and Rogoff (2004), the amount of privately held U.S. Treasuries were roughly the same as foreign central bank reserves, which are mostly dollar denominated reserves held by Asian

countries.[10] The high level of the U.S. current account deficit—and the importance of these financial flows from abroad—has raised widespread debate about the sustainability of such deficits and the type of adjustments that may be required. A particular question is how a change in foreign savings behavior—such as a reduced willingness to hold U.S. assets due to a desire for currency diversification or improved investment prospects elsewhere—would influence interest and exchange rates, and by extension, agricultural trade.

At the end of the 1990s, at the early stages of U.S. current account deficit growth (beginning a continuous string exceeding 3 percent of GDP), Mann (1999) suggested that because of the U.S.'s dollar's special position in international financial markets, the current account situation was not at the time unsustainable. However, she noted that as long as the U.S. continued to grow faster than the rest of the world, foreign investors would continue to choose U.S. dollar denominated assets, keeping the dollar high and ultimately raising the chances of a more profound shift in investor sentiment leading to dollar depreciation.[11]

More recently, with current account deficits having continued to rise, and now exceeding 6 percent of GDP, the OECD's U.S. Economic Survey (2004) suggested that an adjustment in the U.S. current account may eventually be precipitated by a change in U.S. and global demand for U.S. dollar assets, since "at some stage, these assets may come to occupy too large a share of foreign portfolios, even though their relative returns remain favorable."[12]

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[10] Specifically, Obstfeld and Rogoff (October 2004) note that "Netting out the Treasuries by the US Social Security Trust administration and by the Federal Reserve system, the remaining Treasuries held privately are of roughly the same order of magnitude as foreign central bank reserves. These reserves are held mostly by Asia (though Russia, Mexico, and Brazil are also significant), and held mostly in dollars. Indeed, during late 2003 and early 2004, foreign central bank acquisition of Treasuries nearly equaled the entire US current account deficit." P. 7

[11] Mann (1999), p. 9.

[12] According to the OECD (Economic Survey of United States, 2004), stabilizing the U.S. current account deficit "cannot rely exclusively on dollar depreciation. Faster domestic demand

Recent evidence (Edwards, 2005) indicates that while, globally and historically, sudden current account deficit "reversals"[13] are atypical, there are very few cases of countries able to maintain "persistent" and "high" current account deficits similar to the level currently experienced by the U.S. Edwards (2006) suggests that the likelihood of large current account reversals is low for advanced countries with flexible exchange rates, but the probability has increased significantly for the U.S. since 1999.[14] While the timing and magnitude of a U.S. current account "adjustment" is unclear, and perhaps not inevitable, it is certainly plausible. There is also a general consensus that a current account adjustment would involve real exchange rate depreciation and higher interest rates that could be precipitated by a reduced willingness of foreigners to invest in the U.S. Corden (2006) outlines a number of scenarios—involving reduced foreign savings or increased investment abroad—that could lead to dollar depreciation. A potential change in demand for U.S. dollar assets is explored in the next section as an exercise to evaluate the implications for the U.S. dollar exchange rate and the impact on U.S. agricultural trade.[15]

Methodology

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growth abroad will be required, as will an increase in US national savings and some long-lasting competitiveness gains independent of exchange rate changes." (p. 3)

[13] Defined by Edwards (2005) as either a reduction in the current account deficit of at least 4 percent of GDP in a one year period (and an accumulated reduction of at least 5 percent over 3 years), or a 2 percent of GDP in one year (and an accumulated reduction of at least 5 percent over 3 years).

[14] Specifically, he estimates that the probability of a U.S. current account reversal has grown from 1.7% in 1999 to 14.9% in 2006.

[15] For more information on the impacts of reduced U.S. dependence on foreign savings and the key market mechanisms (exchange rates, interest rates, and economic activity) reducing the excess of domestic investment over savings and net imports, see Marris (1987), particularly chapter 4.

Projecting and explaining historical shifts for U.S. and global trade is a complex task because of the multiple factors influencing trade. While both long-term factors such as global economic growth and shorter-term cyclical factors affect trade, there are few models that can capture both types of influences. However, recent developments in global economic models have yielded frameworks which are increasingly useful for examining causes and consequences of global change.

Two major streams of global macroeconomic: multi-country applied general equilibrium (AGE) models, and macro-econometric models are widely used. General equilibrium models are derived from microeconomic optimization theory, with attention to firm and household behavior, whereas macro-econometric models are based on aggregate behavior with reliance placed heavily on correlations found in time series of aggregate data. Applied general equilibrium models have expanded in detail making them more useful for projecting macroeconomic variables such as exchange rates, interest rates, international trade flows by sector, as well as detailed production, investment, consumption, and the rate of return on assets within sectors for developed and developing countries. International databases and advancements in numerical algorithms have accelerated the development and use of multi-country models.

When models have transparent and well documented inter-relationships, they offer a way of thinking about many complex interdependencies in a coherent manner. Applied general equilibrium models consist of two broad classes of equations. Some equations are identities that hold independently of assumptions about behavior. For example, the sum of all countries' trade balances is zero while global savings and investment are equated. Projecting a deteriorating trade balance for the United States and in the rest of the world violates a basic identity. Private household income from returns to land, labor and capital is used for expenditures on goods and

services, or is saved or taxed by the government. Basic relations such as these are imposed in such modeling frameworks but often ignored in ad hoc forecasting models. One of the strengths of the general equilibrium framework is the ability to capture interactions between agricultural and non-agricultural sectors, and their impact on agricultural trade.[16] Finally, there are important links with financial markets that govern exchange rates and returns on assets.

Modeling global structural change

There are a number of global modeling approaches to examine the effects of structural shifts in population and demographics, their implications for consumption and savings responses, and how these responses impact trade, capital flows, and asset markets (see McKibben, 2006; and Shi and Tyers, 2005). It is now more common to use an independent sub-model for generating exogenous growth and demographic information as inputs for global general equilibrium models. For example, Shi and Tyers introduce a global demographic sub model having rich information on changes for population size, age distributions and gender compositions. To capture the economic consequences of the projected demographic change, they adopt a standard long-term dynamic model of the world economy, namely GTAP-Dynamic (Ianchovichina and McDougall, 2000).

We opted for a two-part modeling approach (figure 9) where we address global economic growth and macroeconomic influences on U.S. trade using separate models. To assess the influence of global economic growth on U.S. agricultural trade we adopt the approach employed

[16] For example, China's demand for U.S. cotton is driven by its rapidly growing export-driven apparel industry. How much cotton will be demanded by China depends on export demand for China's cotton apparel in the rest of world. The effect of growing per capita incomes and its implications for trade is important, and will depend on how consumers allocate income for expenditures on food, nonfood, and services as well as to savings for future investment.

by Coyle, Gehlhar, Hertel, Wang, and Yu (1998), and Gehlhar and Coyle (2001) using the GTAP modeling framework. We use the model to retrospectively examine, as well as forecast, U.S. and global trade. This general approach, termed "backcasting" or backward forecasting takes as exogenous variables that project GDP change over time. To make global projections, we use projected growth in real GDP, capital, labor (skilled and unskilled) and population. Capital stock projections are estimated consistently with projected gross domestic investment. We adopted the capital stock and labor estimates for individual countries from estimates prepared by the Center for Global Trade Analysis as a baseline scenario for Dynamic GTAP model. We adopt a closure rule that allows us to endogenously determine economy-wide total factor productivity growth to attain projected real GDP targets in each country. One shortcoming is the inability to project productivity growth by individual sector. This is most critical for agricultural productivity growth.[17]

A number of improvements have since been made to the early version of standard GTAP modeling (Hertel 1997). These improvements all have some bearing on the ability of the model to reproduce historical trade patterns. Some of the most critical features with implications for agricultural trade are demand side specification and trade elasticities in the model. Modifications of the demand include calibrating to own price and income elasticity targets of nine consumption goods which are derived from estimated parameters of Seale, Regmi, and Bernstein (2003). In doing so, expenditure and price responsiveness can vary considerably from high income countries to low income countries for different goods.

[17] A methodology has been developed recently by Ludena and Hertel (2005) by taking into account greater country and commodity-specific productivity rates in primary agriculture by region. Ideally this method could be used to generate productivity projections for specific agricultural sectors. In the future, we hope to expand projections to include productivity shocks to agriculture.

Trade pattern shifts simulated from global trade models are governed heavily by the trade elasticities. Previous parameters in the standard GTAP model were based on outdated estimates from highly aggregate estimates which restrict the ability to reproduce historical trade shifts. As a result, price changes for home and foreign goods are prone to diverge by unrealistic magnitudes. Better methodologies for generating estimates based on Hummels (1999) have become available for the elasticity of substitution among imports from competing sources. The estimates based on this study provide more variation for most food and farm products. Other estimates, including those by Harrigan (1993) and Trefler and Lai (1999) also support higher elasticities of substitution parameters.

Measuring macroeconomic influences

Approaches to examining the influence of macroeconomic variables on agricultural trade often focus on exchange rate movements and their long and short-term effects (see Carter and Pick, 1989; Mattson and Koo, 2005). However, macroeconomic influences can involve a multitude of factors beyond exchange rate effects which shift in supply and demands in the U.S. and rest of world. In our analysis, we examine the broader question of how U.S. agricultural trade might be affected by macroeconomic factors as a result of shifting foreign demand for U.S. assets. The framework we employ is a dynamic computable general equilibrium model of the United States known as MONASH-USA, developed by Dixon and Rimmer (2002). This type of model has been widely applied in forecasting, policy analysis, estimation of technology trends, and analysis of historical events for the Australian economy. The USAGE model has many special features including the explicit treatment of international financial flows. Although the model can be run with 500 industries, the dynamic version of the model used here is aggregated to 40 sectors. One

advantage of an aggregated version is the ability to run year to year simulations in order to capture the dynamic effects of macroeconomic adjustment.

In this version of the paper our primary interest is obtaining initial estimates of the impact of macroeconomic influences on U.S. trade, which does not require full industry detail. The aggregated version retains the main theoretical features of full scale Monash-style models. The dynamic aspects of the model described in Dixon and Rimmer (2002) include: physical capital accumulation and rate-of-return-sensitive investment; foreign debt accumulation and the balance of payments; public debt accumulation and the public sector deficit; and dynamic adjustment of wage rates in response to gaps between the demand for and supply of labor. The model has explicit treatment of net foreign liabilities where the current account deficit includes payments for servicing foreign owned assets and payments on foreign debt where all foreign liabilities are assumed to be debt repayable in U.S. currency.

The model can be run with 4 basic closures: historical closure, decomposition closure, forecast closure, and policy closures.[18] The model is capable of producing estimates of changes in technological change and consumer preferences, explanations of historical developments, forecasts for industries, and projections of the deviations from forecast paths that would be caused by the implementation of proposed policies and by other shocks such as macroeconomic shocks.

Macroeconomic Scenarios

We analyze the macroeconomic influences by conducting basic scenarios around one type of macroeconomic shock, that being changes in foreign investor demand ("confidence") in U.S.

[18] Closures refer to splits between alternative variables that are endogenous and exogenous in the model.

assets. Changes in demand are represented by a change in the required rate of return by foreign investors. A gain of confidence lowers the required rate of return by foreign investors while reduced confidence raises the required rate of return. We simulate over a time path a gain of confidence, reduced confidence, and a combination scenario with both a gain and reversal in confidence. In the last case, the required rate of return reverts at a later time to the identical rate of returned required before the gain in confidence. Thus the three hypothetical scenarios to measure the influence of macroeconomic influenced are:

Scenario 1 - a gain of confidence beginning the year 2002. It is used to capture historical influences that have lingering effects in future years. Although the year 2002 is chosen because the first year in the base year of the model, it is meant to simulate the macroeconomic developments that led to dollar appreciation beginning in the mid-1990s.

Scenario 2 - a future shock capturing reduced confidence. This second scenario—requiring increased returns on U.S. assets—is a decline of confidence in a future year (2008) independent of the effects of a historical gain in confidence (scenario 1).

Scenario 3 - the third scenario is the combination of both the first and the second where the accumulated effects of scenario 1 are incorporated in the second scenario. The macroeconomic shocks are implemented in a single year while the model adjusts to the shock over a time path.

Results

Global Growth Simulation

Results from global growth effects using the GTAP model broadly conform to what took place historically in U.S. trade, with an ongoing shift in the direction of U.S. exports (figure 10). Based on the simulation, the U.S. share of agricultural exports going to high income markets fell

from 51 percent to 44 percent between 1990 and 2001. Even though the share of total exports to high-income markets falls, total export growth continues to grow but at a slowing pace due to weaker population and GDP growth. The primary drivers of demand, such as per capita income and population growth accounted for an annual increase of 1.7 percent in U.S. exports to high income markets in contrast to the 3.7 percent annual export growth to fast growing economies. Even as per capita income increases, the share of income spent on foods declines in mature high income countries. This is a feature of the model's demand specification which is supported by econometric evidence. Another important reason for slowing growth is simply that population growth diminishes in high-income markets. The simulated historical trade pattern suggests that slowing U.S. agricultural exports was consistent with ongoing structural shifts taking place in the world.

Although GDP and population growth are projected to slow in most countries, faster growth in U.S. agricultural exports in the future is plausible due to structural shifts brought about by the relative changes in the size and rates of growth of different countries. From 1990 to 2001, U.S. exports grew by 2.8 percent per year, but are projected to grow faster (4 percent) annually in the next decade. Why is this? By the year 2010, lower-income but faster growing economies will account for a larger share of U.S. exports than the traditionally important high income countries. Thus, even if world economic and population growth slows in the next decade,[19] the rate of U.S. agricultural export growth actually accelerates because of the shift in the direction of U.S. trade. As exports shift to foreign markets with large populations and low per capita income, but higher expected GDP growth rates, U.S. agricultural exports grow faster. Faster growing economies, which accounted for 37 percent of total U.S. agricultural exports in 2001, could

[19] Projections are based on USDA's GDP growth estimates.

account for 56 percent of exports in 2016.[20] The share of U.S. exports going to high income markets drops from 46 percent in 2001 to 29 percent in 2016. This simulated shift in trade is consistent with actual shifts in recent years, as shown previously by the succession of lead markets for U.S. agricultural goods.

Model-based growth effects on U.S. imports fall far short of the actual historical import growth. Model results indicate U.S. agricultural imports would have grown less than 2 percent annually over the last decade, far below actual import growth rate for the United States. In fact, U.S. agricultural imports have grown at an unprecedented 12 percent per year since 2001. This suggests other factors not represented in the model are behind the rapid rise in U.S. agricultural imports, such as the macroeconomic effects discussed next. In addition to macroeconomic effects, import growth was likely the result of a combination of shifts in consumer preferences, technological change reducing transactions cost of trade, and ongoing market integration fueling intra-industry trade in the greater North American market. These are all factors driving that that must be addressed outside the GTAP modeling framework.

Macroeconomic scenario results

We now turn to the question of how macroeconomic influences affect the U.S. economy and trade. The USAGE model confirms that the ability to attract foreign capital to the U.S. economy has fueled growth in U.S. consumption at the expense of export competitiveness. Similar to what unfolded beginning in the mid-1990s, scenario 1 models a hypothetical fall in the required rate of return on U.S. assets for the year 2002, triggering an initial dollar appreciation of

[20] High income countries include Japan, Western Europe, Canada, and Oceania. Faster growing economies include other East Asian countries, South East Asia, South Asia, Mexico and other Central American countries.

30 percent, cutting total (agricultural and non-agricultural) U.S. exports by at least 10 percent, and increasing real household expenditures by 7 percent (figure 11). The continued attractiveness of the U.S. market for foreign investors depicted in scenario 1 thus drags down U.S. exports, even as trade and domestic markets adjust over time restoring the exchange rate closer to the original level. The change in U.S. total foreign liabilities is permanently altered since the level of foreign capital in the U.S. has increased and must be serviced. As long the U.S. economy continues to grow and has the ability to service foreign debt, this remains sustainable situation.

In the second hypothetical scenario, we model a sudden decline of confidence by foreign investors in the year 2008, assuming no previous macroeconomic shock as in scenario 1. This has the opposite effect of the enhanced confidence scenario (scenario 1), with the U.S. dollar depreciating and total U.S. export volume increasing by nearly 15 percent (figure 12). However, the U.S. suffers a terms of trade loss raising the price of goods facing U.S. households. This has the effect of reducing real household consumption by about 3-4 percent.

The results from the third scenario likely depict a more realistic macroeconomic outcome affecting trade and other economic variables in the current decade. In this scenario the lingering effects of a previous shock are depicted as an increase in confidence followed by a reversal which sets the required rate of return back to its original rate in the year 2008. These combined effects not surprisingly yield a more complex picture, with U.S. export volume continually growing over the entire decade (figure 13). However, the export volume does not grow as much (less than 10 percent above baseline) as in the previous scenario. This is because of the previous accumulated effects of the gain in confidence. Similarly the negative terms of trade and household consumption changes are not as large as in scenario 2.

The impacts of scenario 2 are used to estimate the likely effects on U.S. agricultural exports alone (figure 14). The depreciation of the U.S. dollar, in conjunction with other macroeconomic influences, causes exports to rise to about 10 percent above their projected baseline levels by the year 2015. A rise in import prices would also be expected to bring about some substitution between foreign and domestic products. Because of this and the growth in exports, the U.S. agricultural surplus widens by $10-15 billion compared with baseline projections. If there is no reversal in investor confidence over the coming decade, macroeconomic influences could continue to place downward pressure on the U.S. agricultural trade balance, changing the surplus to a deficit by 2007 (figure 15). However, the effects diminish over time making the U.S. trade position as a net exporter or net importer unclear. The trade balance would likely fluctuate between surplus and deficit over the decade.

Conclusion

The slowing of U.S. agricultural exports in the past decade has raised the question of whether the U.S. will experience a fundamental slowdown in foreign demand and in global agricultural trade for the coming decade. With slower population growth and GPD in major foreign markets, reduced U.S. export growth in the next decade is a plausible. However, we find that while U.S. export growth slowed, there was a major shift in the direction of trade towards emerging markets. Because of wide differences in per capita income between wealthier and emerging markets, the direction of trade will continue to shift towards developing countries. As a result, U.S. and world agricultural trade growth will likely be stronger in the next decade than the previous decade.

In the past, wide fluctuations in U.S. agricultural trade were primarily the result of the unsteadiness in import demand from larger maturing markets due to slow income-related consumption growth. Another important source of instability in trade is macroeconomic influences. In the absence of a change in foreign preferences for U.S. assets, it is possible that the U.S. agricultural trade surplus will continue to fluctuate near zero, and may even become temporarily negative within the next several years. However, if the U.S. dollar depreciates, it is less likely that the U.S will become a persistent net importer of agriculture over the next decade. Although our results suggest some plausible outcomes for U.S. agricultural trade, we view the type of modeling tools employed in this paper mainly as a contribution to the projection process, rather than as projections in and of themselves.

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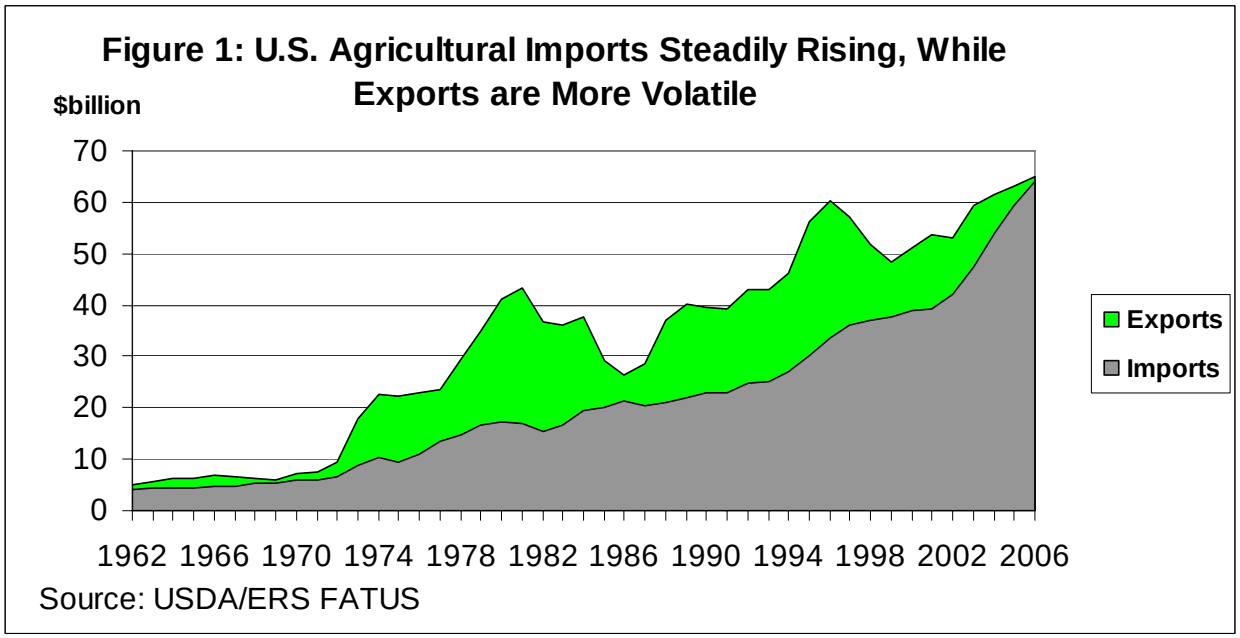
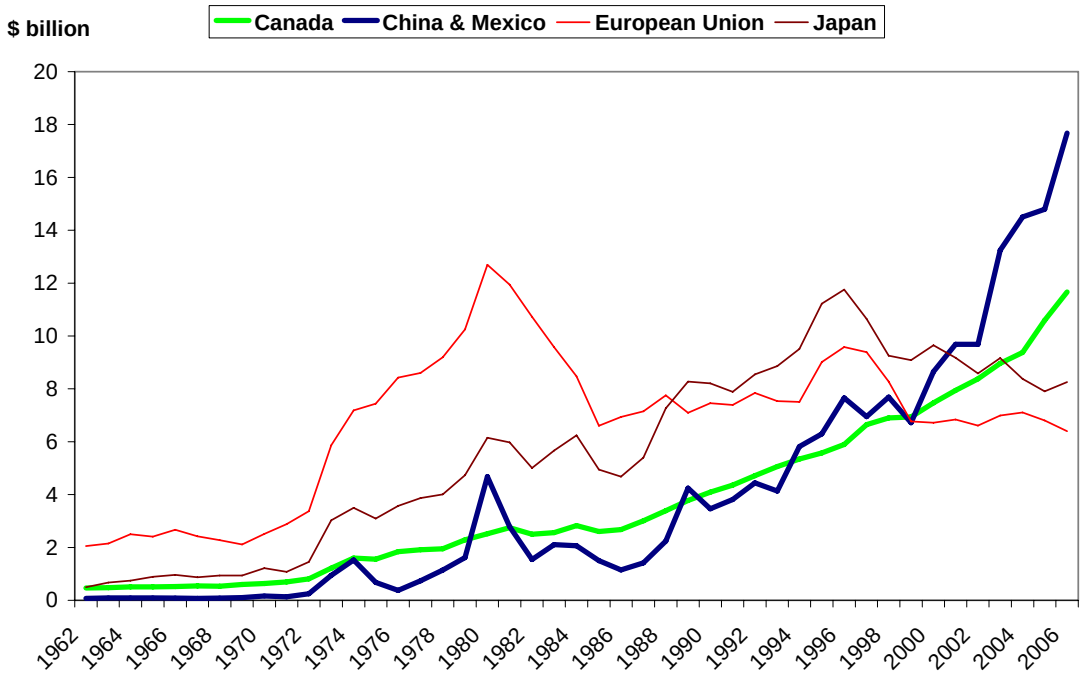
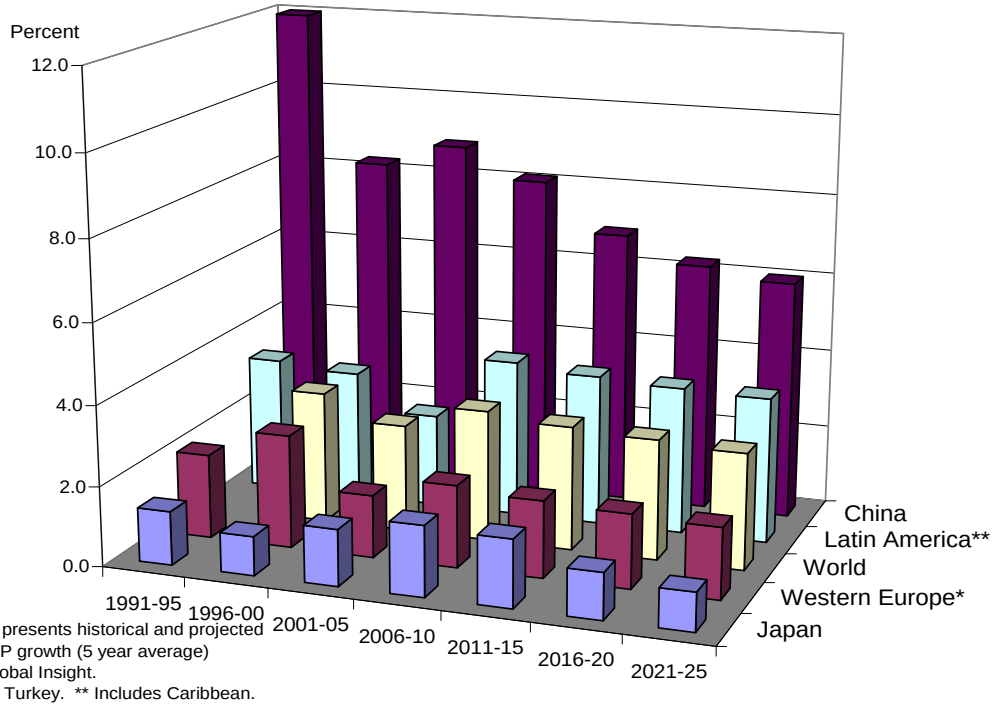


Figure 2: U.S. agricultural exports flow to succession of top new markets



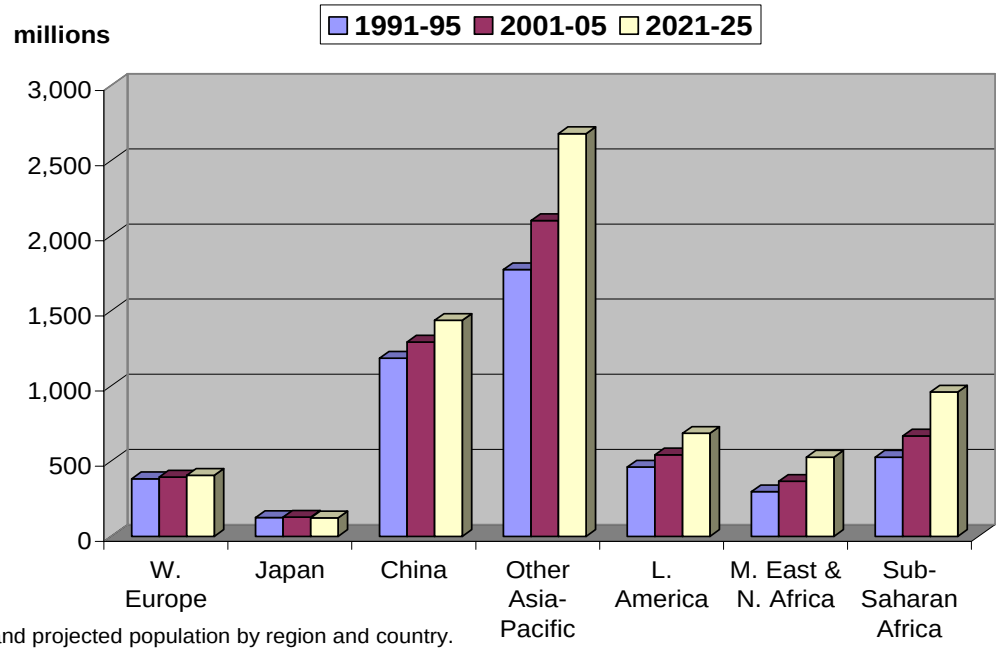
Source: USDA/ERS (FATUS)

Figure 3: GDP growth in mature markets lags



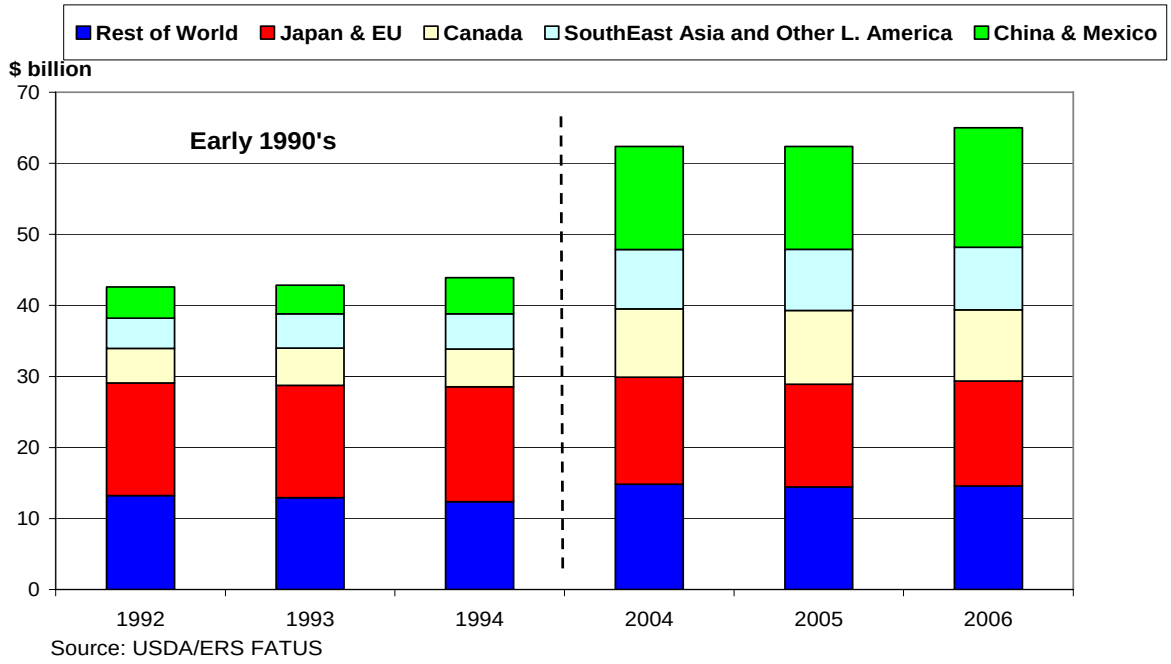
Note: data presents historical and projected annual GDP growth (5 year average)
Source: Global Insight.
* Excludes Turkey. ** Includes Caribbean.

Figure 4: Population growth strongest in Asia, L. America



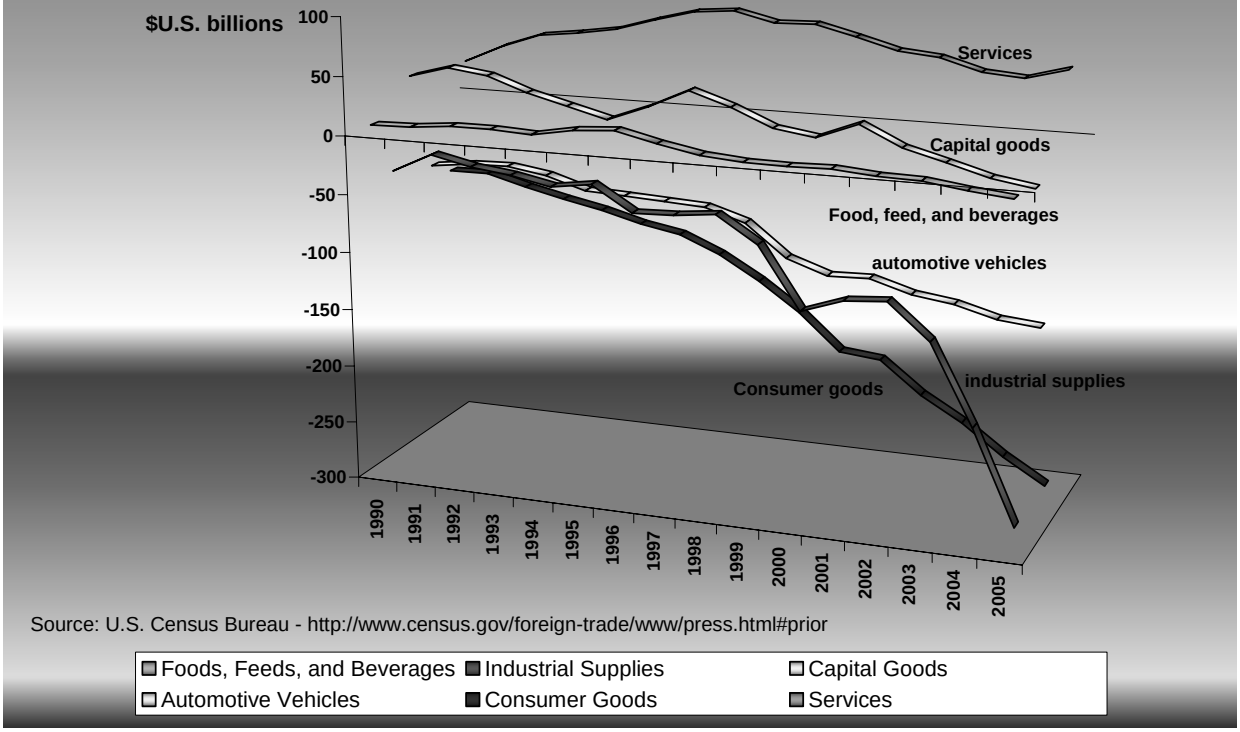
Historical and projected population by region and country.
Source: Global Insight.

Figure 5: U.S. agricultural exports shifting towards emerging markets



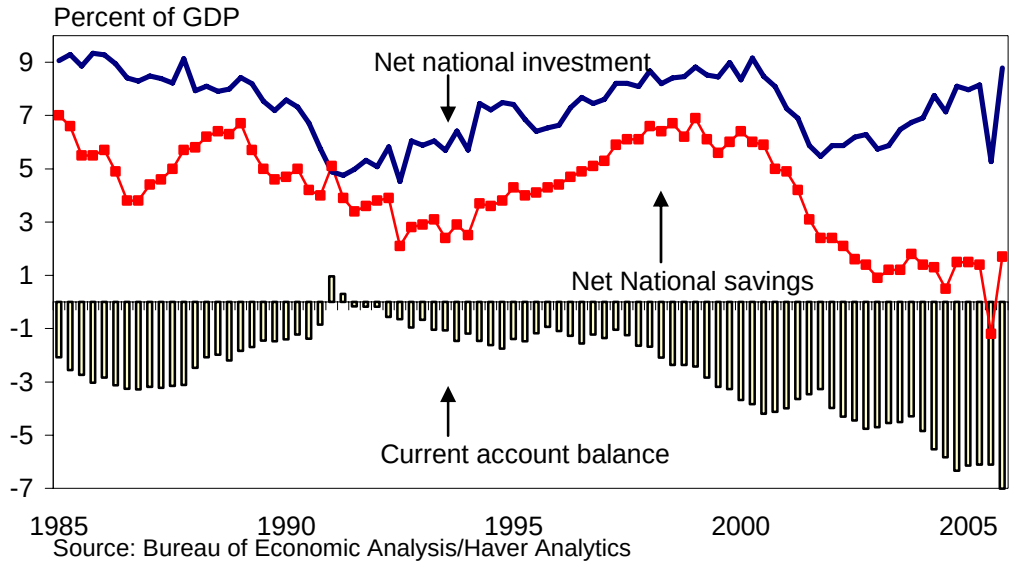
Source: USDA/ERS FATUS

Figure 6: U.S. Trade balance declines in all categories



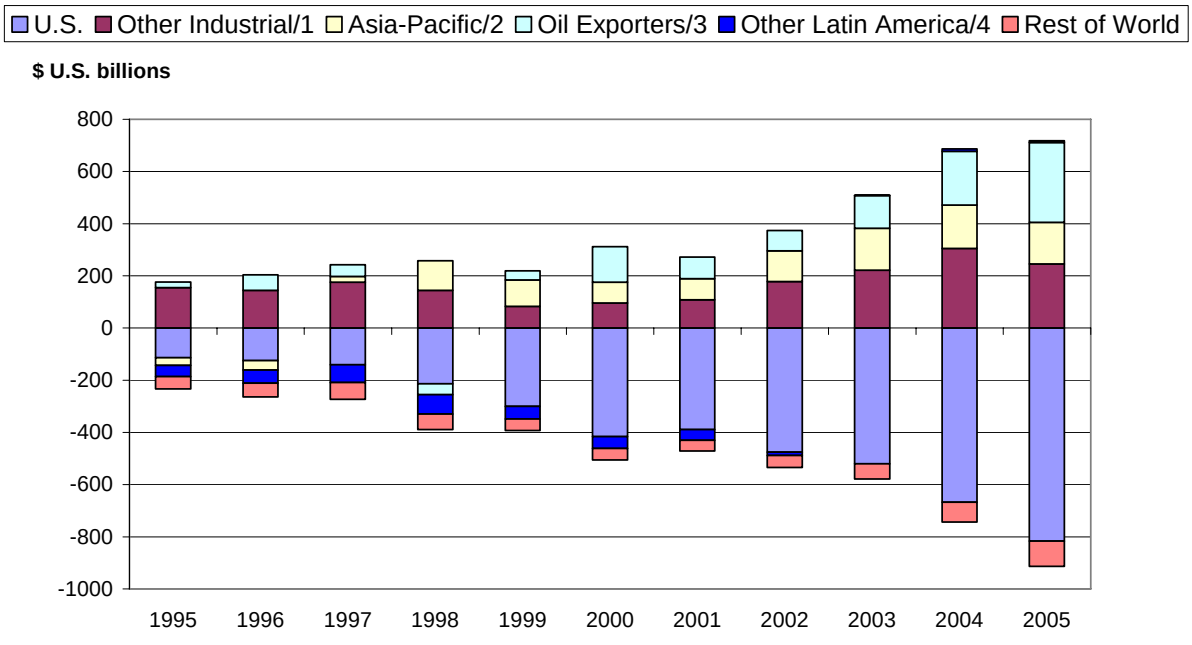
Source: U.S. Census Bureau - http://www.census.gov/foreign-trade/www/press.html#prior

Figure 7: Savings, investments, and the Current Account Balance



Source: Bureau of Economic Analysis/Haver Analytics

Figure 8: U.S. current account deficits financed largely by emerging markets



1/ Canada, W. Europe, Japan, Australia, N. Zealand. 2/ "Asia Pacific" minus Japan, Australia, N. Zealand. 3/ Top 10 oil exporters (2004).

Figure 9: Schematic of Modeling Approach

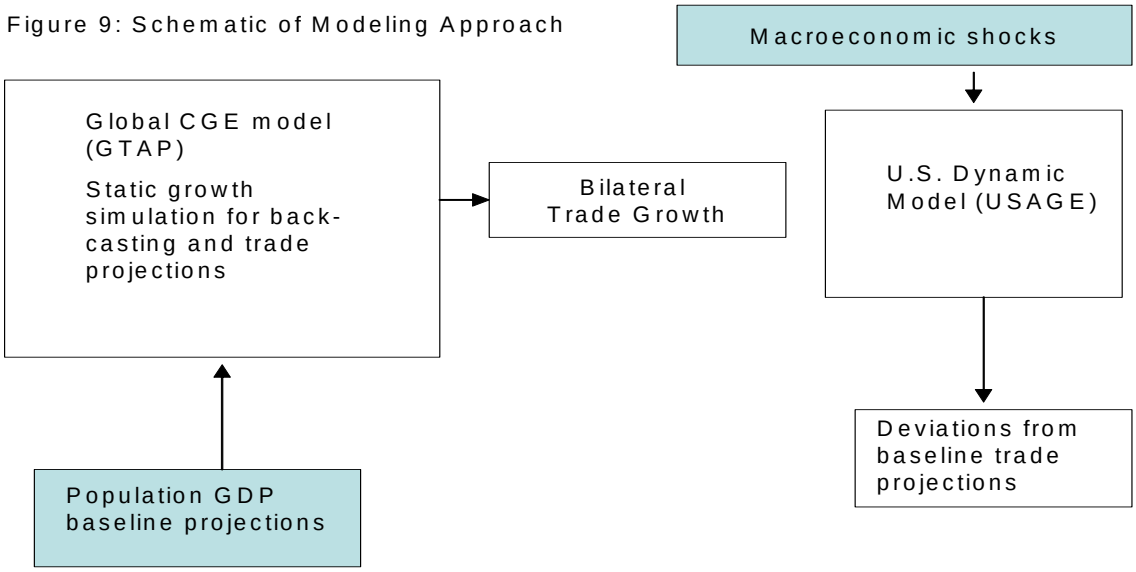
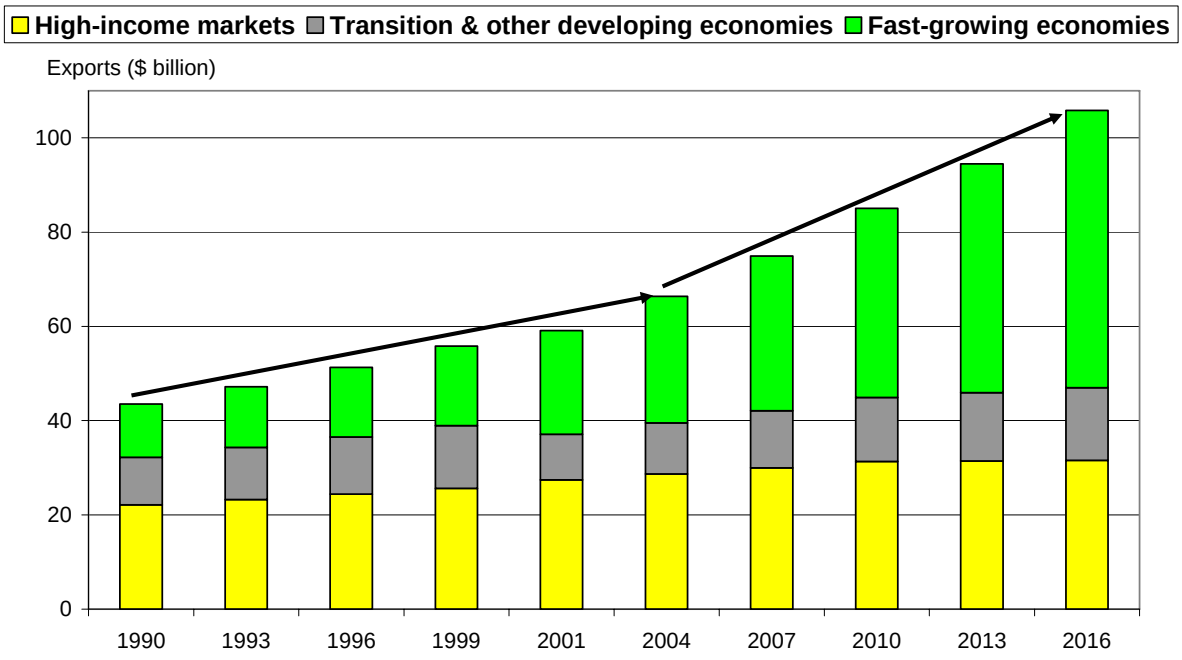
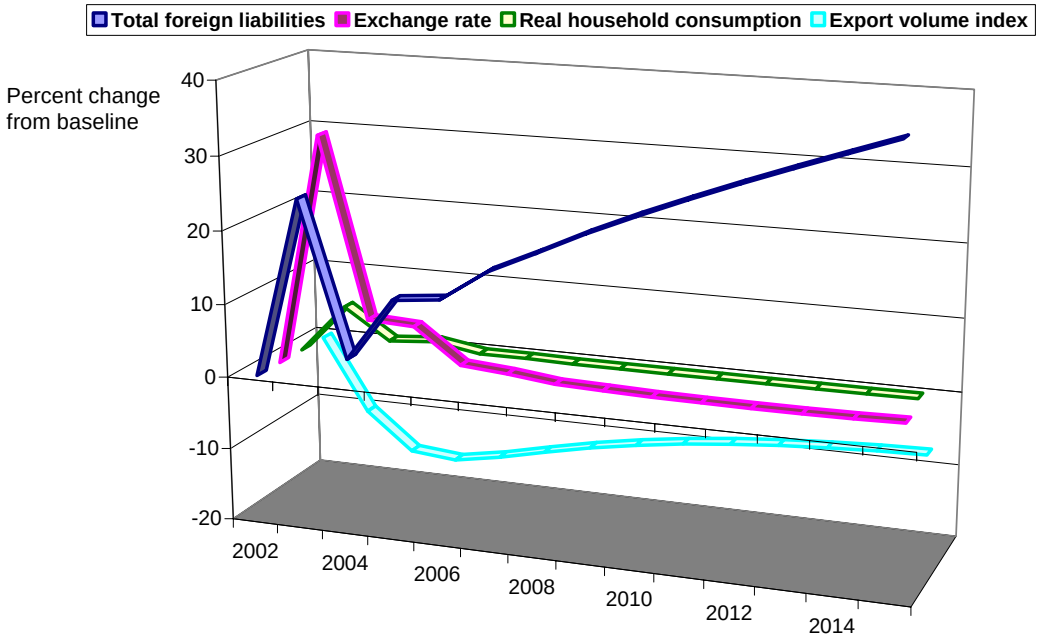


Figure 10: Simulated Structural Shifts in U.S. Agricultural Exports from Global Economic Growth



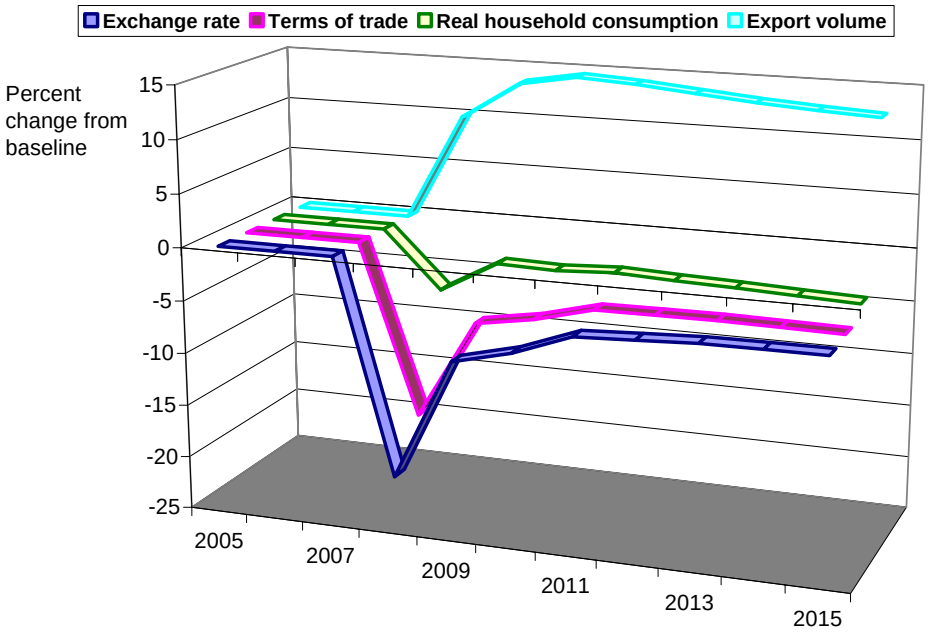
Source: GTAP model simulations, version 6.2 database, ERS-USDA. High income countries include Japan, Western Europe, Canada, and Oceania. Faster growing economies include other East Asian countries, Southeast Asia, South Asia, Mexico, and Central America.

Figure 11: Macroeconomic effects of a simulated increase of confidence in the U.S. economy in 2002



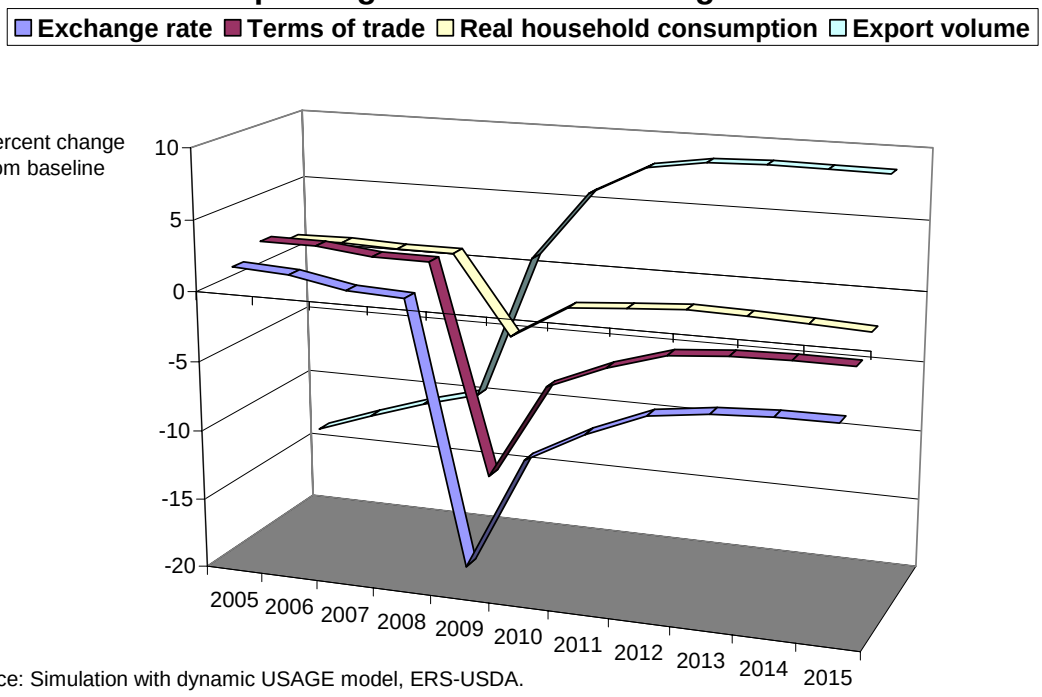
Source: Simulated from dynamic USAGE model, ERS-USDA.

Figure 12: Macroeconomic effects on U.S. economy of a simulated decline of foreign confidence in 2008



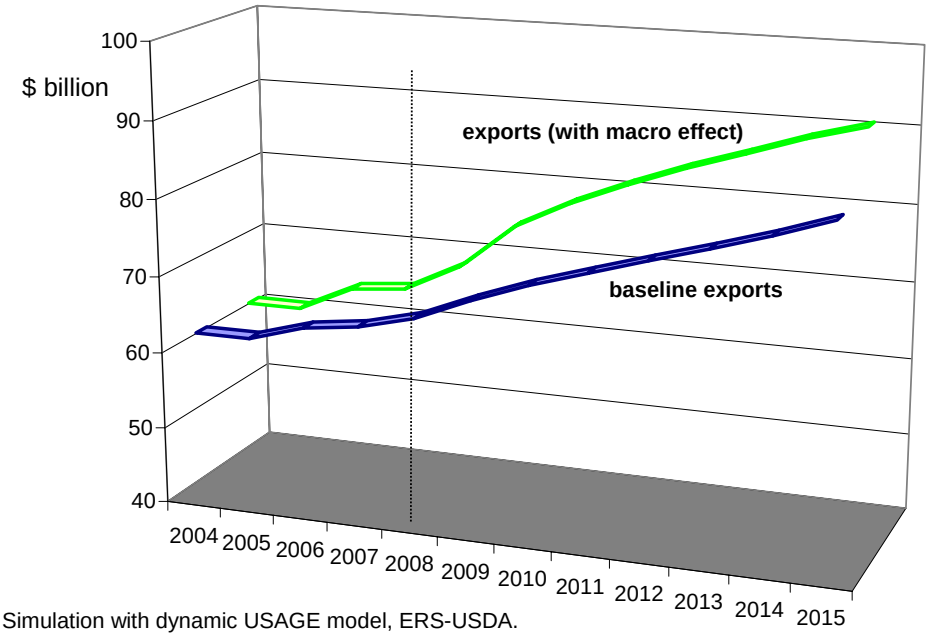
Source: Simulation with dynamic USAGE model, ERS-USDA.

Figure 13: Macroeconomic effects on U.S. economy of prolonged confidence ending in 2008



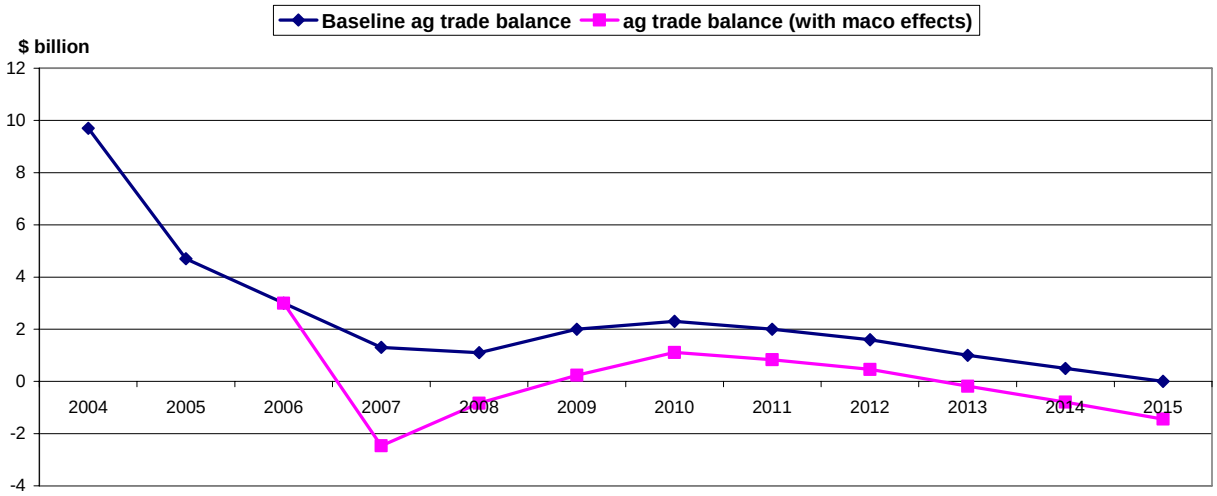
Source: Simulation with dynamic USAGE model, ERS-USDA.

Figure 14: Macroeconomic effects on U.S. agricultural exports of simulated increase in U.S. risk premium (2008)



Source: Simulation with dynamic USAGE model, ERS-USDA.

Figure 15: Macroeconomic effects on U.S. agricultural trade with continued foreign investor confidence



Source: Simulation with dynamic USAGE model, ERS-USDA.