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ABSTRACT

Asia's Growth, the Changing Geography of World Trade, and Food Security: Projections to 2030*

Rapid trade-led economic growth in emerging Asia has been shifting the global economic and industrial centres of gravity away from the north Atlantic, raising the importance of Asia in world trade but also altering the commodity composition of trade by Asia and other regions. What began with Japan in the 1950s and Korea and Taiwan from the late 1960s has spread to the much more populous ASEAN region, China and India. This paper examines how that growth and associated structural changes are altering agricultural markets in particular and thereby food security. It does so retrospectively and by projecting a model of the world economy which compares alternative growth strategies, trade policy scenarios and savings behaviours to 2030. Projected impacts on sectoral shares of GDP, 'openness' to trade and the composition and direction of trade are drawn out, followed by effects of the boom in non-farm sectors on agricultural self-sufficiency and real food consumption per capita in Asia and elsewhere. The paper concludes by drawing implications for policies that can address more efficiently Asia's concerns about food security and rural-urban income disparity than the trade policy measures used by earlier-industrializing Northeast Asia.

JEL Classification: D58, F13, F15, Q17
Keywords: Asian economic growth and structural change, booming sector economics, food security, global economy-wide model projections, South-South trade

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Asia's Growth, the Changing Geography of World Trade, and Food Security: Projections to 2030

1. Introduction

Asia's rapid economic growth is shifting the global economic and industrial centre of gravity away from the north Atlantic, and globalization is causing trade to grow much faster than output, especially in Asia. Together these forces are raising the importance of Asia's emerging economies in world output and trade. They are also altering food consumption patterns in Asia: consumers are switching from staples to more-expensive cereals, livestock and horticultural products as their incomes grow and as many of them migrate from rural to urban areas. That began with growth first in Japan in the 1950s and then in Korea and Taiwan from the late 1960s, but since then it has spread to the much more populous ASEAN region, China and India (hereafter referred also as the ACI countries). The former group represents just 3 percent of the world's population and so its rapid industrial growth was accommodated by the rest of the world without much difficulty, including in markets for food and other primary products. The ACI countries, by contrast, account for nearly half of humanity and so their rapid and persistent industrialization has far greater significance for primary product markets and thus for such things as food and energy security and greenhouse gas emissions regionally and globally. A boom in non-farm sectors also can exacerbate rural-urban income disparities in such fast-growing countries. How governments respond to these concerns will have non-trivial effects in both the emerging economies and those of their trading partners and competitor countries.

This paper focuses on agricultural market and food security consequences of this latest generation of Asian industrialization. There is a strong body of trade and development theory to suggest what to expect. There is also the historical experience of the two previous generations of Asia's industrializing economies and, since the 1980s, of the newest generation's first decades of rapid growth. And there are many new speculative studies about the future, from both academics (e.g., Rodrik 2011 and Spence 2011) and major consulting firms (e.g., Citi 2011 and PwC 2011). This paper briefly summarizes that theory and history, as a way of anticipating likely trends over the next two decades. Those expectations are then put to the test using a global economy-wide model for projecting the world economy to 2030. Results that emerge from a core business-as-usual projection are compared with those generated using alternative assumptions about sectoral productivity growth rates and trade policies, so as to be able to draw out implications for national food security of a range of scenarios.

The UN's Food and Agriculture Organization defines food security as the state "when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life" (FAO 2003). Since access to food for any poor household largely depends on its (and perhaps also its extended family's) income and assets, pro-poor economic growth is a key to reducing food insecurity. The vast majority of the poor are in rural areas and depend heavily on agriculture for their livelihood, so a boost to investment in staple food R&D is one option for enhancing food security: it would both boost the income of net sellers of food and raise the availability (and maybe lower the price) to net buyers of local food. It would also raise national income if there is currently under-investment in that R&D activity – and, incidentally, that would increase national food self-sufficiency. Import-restricting food policies also would raise national food self-sufficiency, but in the process would reduce

national income, raise food prices, and so lower the level of domestic food consumption. This would reduce the food security of all households that are net buyers of food, including those farm households specializing in producing products other than food staples. In countries where such households account for the majority of the poor, food import restrictions would add to poverty (Ivanic and Martin 2010).

The paper's core projection assumes agricultural and trade policies and the trade imbalances of the United States and China continue, and that endowment and productivity growth rates are sufficient to allow global export supplies of agricultural, mineral and manufactured products to expand to almost keep pace with import demands. This ensures the prices of primary products relative to manufactures in international markets increase only modestly above 2004 levels (and hence are lower than at their peaks in 2008-11).

That core projection is compared with two alternative growth scenarios to 2030. One involves slower productivity growth in primary sectors globally, in which case the relative price of primary products will be somewhat higher by 2030 – as forecast by some international agencies. The other growth scenario assumes faster grain productivity growth in China, India and ASEAN due to expanded domestic agricultural R&D aimed at slowing the rise in their foodgrain import dependence that is projected in the core scenario to otherwise occur.

The paper then explores alternative trade policy scenarios: one series in which regional goods markets are partly or fully opened up (to get a sense of how current Asian trade policies are affecting trade and food self-sufficiency in the region and elsewhere), and then one in which all developing countries' agricultural import tariffs are raised towards their legal limits according to current WTO commitments (to get a sense of how such a beggar-thy-neighbor counterfactual would impact on Asian food security). Finally, in the caveat section we show how the core projection would be altered if savings rates fell in China and

rose in the United States so as to largely remove the current trade imbalances of those two countries. The paper concludes by drawing out key policy implications from the results.

2. Theory and past experience

China and India, like Northeast Asia's earlier rapidly industrializing economies, are relatively natural resource-poor and densely populated. So too are some ASEAN countries. They are therefore highly complementary with relatively lightly populated and slower-growing economies well endowed with agricultural land and/or mineral resources in Australasia, Latin America, the Middle East and Sub-Saharan Africa (see Table 1 for crude indicators of relative factor endowments), according to the workhorse theory of comparative advantage developed in the 20th century. That theory blends the Heckscher-Ohlin-Samuelson model, which assumes all factors of production are mobile between sectors, with the Ricardo-Viner model which assumes some factors are sector-specific. Such a blend is provided by Krueger (1977) and explored further by Deardorff (1984). They consider two tradable sectors each using intersectorally mobile labour plus one sector-specific factor (natural-resource capital or produced capital). Assuming that labour exhibits diminishing marginal product in each sector, and that there are no services or nontradables and no policy distortions, then at a given set of international prices the real wage in each economy is determined by the aggregate per worker endowment of natural-resource and produced capital. The commodity composition of a country's trade – that is, the extent to which a country is a net exporter of primary or industrial products – is determined by its endowment of natural relative to industrial capital compared with that ratio for the rest of the world.

Leamer (1987) develops this model further and relates it to paths of economic development. If the stock of natural resources is unchanged, rapid growth by one or more economies relative to others in their availability of produced capital (physical plus human stills and technological knowledge) per unit of available labor time would tend to cause those economies to strengthen their comparative advantage in non-primary products. By contrast, a discovery of minerals or energy raw materials would strengthen that country's comparative advantage in mining and weaken its comparative advantage in agricultural and other tradable products, ceteris paribus. It would also boost national income and hence the demand for nontradables, which would cause mobile resources to move into the production of nontradable goods and services, further reducing farm and industrial production (Corden 1984).[1]

Domestic or foreign savings can be invested to enhance the stock and/or improve the quality not only of a country's produced capital but also of its economically exploitable stock of natural resources. Any such increase in the net stock of produced capital per worker will put upward pressure on real wages. That will encourage, in all sectors, the use of more labor-saving techniques and the development and/or importation of better technologies that are less labour intensive. Whether it boosts industrialization more than agriculture or other primary production will depend on the relative speed of sector-specific productivity growth that such R&D investments yield. Which types of investment would expand fastest in a free-market setting depends on their expected rates of return. The more densely populated, natural resource-poor an open economy is, the greater the likelihood that the highest payoff would be in expanding stocks of capital (including technological knowledge) for non-primary sectors.

[1] In fact the increased demand for nontradables (and other products) would begin as soon as expectations about future income prospects rose, which could be well before the mining export boom shows up in the trade statistics, especially in the case where the exports are preceded by FDI inflows for investments with a long lead time (Corden 1982).

At early stages of development of a country with a relatively small stock of natural resources per worker, wages would be low and the country would have a comparative cost advantage in unskilled labor-intensive, standard-technology manufactures. Then as the stock of industrial capital grows, there would be a gradual move toward exporting manufactures that are relatively intensive in their use of physical capital, skills and knowledge. Natural resource-abundant economies, however, would invest more in capital specific to primary production and so would not develop a comparative advantage in manufacturing until a later stage of development, at which time their industrial exports would be relatively capital intensive.

The above theory of changing comparative advantages – which can also be used to explain shocks to that pattern from discovery-driven mining booms or major terms of trade changes imposed from the rest of the world – has been used successfully to explain the evolving trade patterns of Asia's resource-poor first- and second-generation industrializing economies and their resource-rich trading partners (see, e.g., Anderson and Smith 1981). It has also explained the 20th century evolution, for early- and later-industrializing countries, of the flying geese pattern of comparative advantage and then disadvantage in unskilled labor-intensive manufactures as some rapidly growing economies expand their endowments of industrial capital per worker relative to the rest of the world – the classic example being clothing and textiles (Anderson 1992).

Useful though the above theory has been, it is less able to explain a more recent and rapidly expanding part of Asia's international trade within individual manufacturing industries, which is in intermediate inputs. This phenomenon has been driven by the lowering of trade costs thanks to the information and communication technology revolution and the opening up to foreign direct investment, both of which have facilitated networking abroad by firms (Kozo et al. 2008). It is increasing the scope to subdivide the processes of production

into ever-smaller parts that can be relocated anywhere in the world according to changes in comparative advantages over time (Jones and Kierzkowski 1997; Feenstra 1998; Arndt and Kierzkowski 2001). Its modes include sub-contracting, licensing, joint ventures, and vertical direct foreign investment by multinational corporations (Markusen et al. 1996).

The evolving pattern of a country's production and trade specialization depends on its changes not only in its comparative advantages but also in its sectoral and trade policies. If a developing economy that had been protecting its manufacturers from import competition chose to lower those barriers, there would be two sets of consequences. One is that the country would be better able to specialize in those manufacturing activities in which it had its strongest comparative advantages and to nimbly alter its product mix as those advantages evolved. The other is that its real exchange rate would depreciate, allowing other tradable sectors such as agriculture to expand production and net exports. If the economy had been taxing exports of primary products, a lowering of them also would allow production of those goods to grow. And if a dual or multiple exchange rate system was replaced by a market-driven system, that reform would effectively remove that implicit form of trade taxation (Dervis, de Melo and Robinson 1981) and thus amplify the above effects.

According to a recent multi-country empirical study, precisely those types of policy reforms have taken place in many developing countries over the past three decades. More specifically, policy-induced distortions to the domestic prices of agricultural goods relative to other tradable product prices had discriminated heavily against many developing country farmers prior to the 1980s, but they have since been greatly reduced (Anderson 2009a,b). According to Figure 1, this is particularly so in Asia.

That new evidence on Relative Rates of Assistance (RRAs, defined in note 1 of Figure 1) sheds light on something that has perplexed agricultural trade analysts for some time, namely, why self-sufficiency in farm products in China, India and some other densely

populated emerging Asian economies has fallen so little (see Table 2) despite very strong growth in production and exports of manufactures (and of certain tradable services in the case of India).[2] The fact that the RRA is now close to zero on average for the region raises the question: will it remain close to zero, rather than keep on rising as happened in more-affluent Asian countries? If yes, then will expectations from theory now be realized in the form of declining self-sufficiency in farm products as industrialization proceeds? If no, then to what extent might assistance to Asia's farmers rise by 2030, and how would that affect agricultural trade patterns and food security? We return to these questions toward the end of this paper.

3. Modeling methodology and database

Given the interdependence between sectors of growing economies, an economy-wide model of the world's national markets is needed to project future trends in agricultural trade and food security. In this study we employ the GTAP model (Hertel 1997) of the global economy and Version 7.1 of the GTAP database which is calibrated to 2004 levels of production, consumption, trade and protection (Narayanan and Walmsley 2008). The standard GTAP model is perhaps the most widely used CGE model for economy-wide global market analysis, in part due to its robust and explicit assumptions; and its base period of 2004 is ideal because it precedes the recent period of temporary spikes in food and fuel prices and the North Atlantic financial crisis and recession.

In its simplest form, the model assumes perfect competition and constant returns to scale in production. The functional forms are nested constant elasticities of substitution (CES) production functions. Land and other natural resources, labor (skilled and unskilled),

[2] Early examples of such expectations include articles by the senior author of this paper, in Anderson and Tyers (1987) and Anderson and Peng (1998).

and produced physical capital substitute for one another in a value added aggregate, and composite intermediate inputs substitute for value-added at the next CES level in fixed proportions. Land is specific to agriculture in the GTAP database, and is mobile amongst alternative agricultural uses over this projection period, according to a relatively high Constant Elasticity of Transformation (CET) which, through a revenue function, transforms land from one use to another. In the modified version of the GTAP model we use, natural resources, including coal, oil and gas, are specific to the sector in which they are mined. Aggregate national employment of each productive factor is fixed in the standard macro-economic closure, although we use exogenous projections to model changes in factor availability over time. Labor and produced capital are assumed to be mobile across all uses within a country, but immobile internationally, in the long-run model closure adopted.

On the demand side there is a national representative household whose expenditure is governed by a Cobb-Douglas aggregate utility function which allocates net national expenditures across private, government, and saving activities. The greatest advantage of this household representation is the unambiguous indicator of economic welfare dictated by the national utility function.[3] Government demand across composite goods is determined by a Cobb-Douglas assumption (fixed budget shares). Private household demand is represented by a Constant Difference of Elasticities (CDE) functional form, which has the virtue of capturing the non-homothetic nature of private household demands, calibrated to replicate a vector of own-price and income elasticities of demand (Hertel et al. 2008). In projecting to 2030 we modify these elasticities for developing country crops and animal products for rapidly

[3] Altering taxes in the GTAP model does not imply a reduction in government revenue and expenditure, as government expenditures are not tied to tax revenues. A tax reduction, for example, leads to a reduction in excess burden, so regional real income increases and real expenditure – including government expenditure – may also rise.

growing economies so they more closely match the income elasticities for these products in currently higher-income countries (following Yu et al. 2004).[4]

Bilateral international trade flows are handled through the Armington (1969) specification by which products are differentiated by country of origin. These Armington elasticities are the same across countries but are sector-specific, and the import-import elasticities have been estimated at the disaggregated GTAP commodity level (Hertel et al. 2007). For present purposes, where we are dealing with long-term changes, we follow the typical modelling practise of doubling the short-to-medium term Armington elasticities. The national balance of trade is determined by the relationship between national investment and savings and investment can be allocated either in response to rates of return, with capital markets kept in equilibrium, or in fixed shares across countries so that it moves in line with global savings. For present purposes we allow savings and investment to respond to changes in rates of return.

The GTAP version 7.1 database divides the world into 112 countries/country groups, and divides each economy into 57 sectors: 20 for agriculture, food, beverages and tobacco, 6 for other primary goods, 16 for manufactures and 15 for services. For most modelling tasks, including this one, it is necessary for the sake of both computational speed and digestion of model outputs to restrict the number of regions and sectors. In the present study we initially aggregate to 33 countries/country groups and to 26 sector/product groups, as shown in column 2 of Appendix Tables A.1 and A.2. We then further aggregate to 14 regions and just 4 sectors for many tables presented in this paper, as defined in column 1 of those Appendix Tables.

[4] This is but one of several differences between the present projection exercise and that reported in Anderson and Strutt (2011). Other refinements include updating the projections of GDP, population, unskilled labour, skilled labour and produced capital, as described in Section 4. We also now assume that land as well as other natural capital endowments change slightly over time, and we alter the macro closure to allow investment to respond to changes in rates of return. Furthermore, the initial database is augmented with estimates of distortions to agricultural prices in developing countries in 2004, based on Valenzuela and Anderson (2008).

The standard GTAP protection database reported in Narayanan and Walmsley (2008) contains little more than applied import tariffs for developing countries. It has therefore been altered to include a more-complete set of estimates of distortions to agricultural prices in developing countries in 2004, based on Valenzuela and Anderson (2008).[5] Those distortion estimates include some remaining export taxes, for example.

4. Core projection of the database to 2030

We project the GTAP database's 2004 baseline for the world economy to provide a new core baseline for 2030 by assuming the 2004 trade-related policies of each country do not change. However, over the 26-year period we assume that national real GDP, population, unskilled and skilled labor, capital, agricultural land, and extractable mineral resources (oil, gas, coal and other minerals) grow at exogenously set rates, summarized in Appendix Table A.3. The exogenous growth rates for GDP, investment and population are based on ADB projections over the next two decades, supplemented by World Bank data for real GDP and investment growth for the period to 2010, along with CEPII data for population growth to 2010 and for regional projections of GDP, investment and population not readily available in the ADB dataset (Fouré et al. 2010).[6] For projections of skilled and unskilled labour growth rates, we draw on Chappuis and Walmsley (2011). We estimate historical trends in agricultural land from FAOSTAT (summarized in Deininger and Byerlee 2011) and in mineral and energy raw material reserves from BP (2010) and the US Geological Survey (2010) and assume that past annual rates of change in fossil fuel reserves since 1990 continue for each country over the

[5] That distortions database is documented fully in Anderson and Valenzuela (2008) and is based on the methodology summarized in Anderson et al. (2008).
[6] World Bank and CEPII data are compiled from Chappuis and Walmsley (2011).

next two decades.[7] For other minerals, in the absence of country-specific data, the unweighed average of the annual rate of growth of global reserves for iron ore, copper, lead, nickel and zinc between 1995 and 2009 for all countries is used (from the US Geological Survey 2010). These rates of change in natural resources are summarized in the last five columns of Appendix Table A.3.

Given those exogenous growth rates,[8] the model is able to derive implied rates of total factor productivity and GDP per capita growth. For any one country the rate of total factor productivity growth is assumed to be the same in each of its non-primary sectors, and to be somewhat higher in its primary sectors. Higher productivity growth rates for primary activities were characteristic of the latter half of the 20th century (Martin and Mitra 2001), and are necessary in this projection if real international prices of primary products (relative to the aggregate change for all products) are to rise only modestly. We chose that calibration for our core simulation because it is consistent with the World Bank projections over the next four decades (see van der Mensbrugghe and Roson 2010). An alternative projection in which prices rise by even more is considered below. We do not consider one in which agricultural prices fall, as occurred in the latter half of the 20th century (Figure 2) and as projected in GTAP-based projection studies in the late 20th century (e.g., Anderson et al. 1997), because that seems too unlikely a scenario over the next two decades, given the slowdown in agricultural R&D investment since 1990 and its consequent delayed slowing of farm productivity growth (Alston, Babcock and Pardey 2010). It is even less likely for farm

[7] Past reserves data are from BP (2010). For coal, however, production data are used since reserves data are not available. The growth rates for Vietnam's oil and gas, along with Thailand's coal, provided implausibly high projections for the future, so they were modified downward.

[8] There is much uncertainty in macroeconomic projections over this kind of timeframe. See, for example Garnaut (2011) for some discussion on the uncertain nature of GDP, population and energy projections.

products if fossil fuel prices and biofuel mandates in the US, EU and elsewhere are maintained over the next decade.[9]

The implied TFP growth rates for all sectors are shown in the first column of Appendix Table A.4,[10] and the international price consequences for the core simulation are depicted in the first three columns of Appendix Table A.5.

It should be noted that the extent to which productivity growth rates are higher in each primary sector than in other sectors is the same for high-income and developing countries, and is the same for all crop and livestock industries within each country's farm sector. Since overall TFP growth is higher for developing than high-income countries in Appendix Table A.4, this means we are assuming agricultural TFP growth is higher for developing than high-income countries on average. That is consistent with recent (if not earlier) experience: Ludena et al. (2007, Table 2) estimate that agricultural TFP annual growth during 1981-2000 averaged 1.3 percent globally and only 0.9 percent for high-income countries (but during 1961-80 those rates were 0.6 and 1.4 percent, respectively).

4.1 Consequences for size and sectoral and regional compositions of GDP and trade

The differences across regions in rates of growth of factor endowments and total factor productivity, and the fact that sectors differ in their relative factor intensities and their share of GDP, ensure that the structures of production, consumption and trade across sectors within countries, and also between countries, is going to be different in 2030 than in 2004.

[9] Timilsina et al. (2010) project that by 2020 international prices will be higher in the presence versus the absence of those biofuel mandates for sugar (10 percent), corn (4 percent), oilseeds (3 percent), and wheat and coarse grains (2.2 percent), while petroleum product prices will be 1.4 percent lower.

[10] In the core baseline, these TFP estimates are endogenously determined. However, in the simulations modelling lower worldwide primary sector productivity and higher ACI grain productivity , it is the TFP estimates that are exogenous while GDP is endogenous.

In particular, the faster-growing developing economies (especially those of Asia) will account for considerably larger shares of the projected global economy over the next two decades. Their aggregate share of world GDP (measured in 2004 US$, not PPP dollars in which developing country shares are much larger) is projected to rise from 20 percent in 2004 to 41 percent in 2030, and for just Developing Asia from 11 to 28 percent. Western Europe's share, meanwhile, is projected to fall from one-third to less than one-quarter. Population shares change much less, with the developing countries' share rising from 80 to 83 percent but Developing Asia's component falling a little, from 55 to 53 percent between 2004 and 2030. Thus per capita incomes converge considerably, with the ratio of the high-income to developing country average more than halving, from 16 to 7 between 2004 and 2030. In particular, the per capita income of Developing Asia is projected to rise from 20 to 53 percent of the global average over the projection period (bottom rows of Appendix Table A.6).

When global value added is broken down by sector,[11] the changes are more striking. This is especially so for China: by 2030 it is projected to return to its supremacy as the world's top producing country not only of primary products but also of manufactures (Table 3). This is a ranking China has not held since the mid-19th century when first the UK and then (from 1895) the US was the top-ranked country for industrial production – see Allen (2011, Figure 2) and also Bairoch (1982) and Crafts and Venables (2003).

The Asian developing country share of global exports of all products nearly doubles, rising from 21 to 39 percent between 2004 and 2030 (Table 4). China's share alone grows from 6.7 to 18.4 percent. Note, however, that the growth of China's export share is entirely at the expense of high-income countries, as the export shares for all the other developing-

[11] Using producer expenditure on value added in each sector.

country regions in Table 4 also grow. The group's import share also rises, although not quite so dramatically: the increase for Developing Asia is from 18 to 34 percent (Table 5).[12]

The developing country share of primary products in world exports rises slightly and its share of manufactures in world exports rises dramatically over the projection period (almost doubling, as does its services share – Table 4). The developing country share of primary products in world imports rises substantially too (Table 5), almost all of which is due to Developing Asia's expected continuing rapid industrialization.[13] Developing Asia and other developing countries increase their share in total world imports by nearly half, and even by one-third in manufactures. The latter rise would be even larger if our model had been able to accommodate the on-going fragmentation of global production of manufactured goods, whereby the supply chain has many components whose production is footloose: we understate that phenomenon because of the high degree of aggregation of manufacturing industries in the version of the GTAP model we use here.

Given the political sensitivity of farm products, regional shares of global trade in just agricultural and food products are shown in Table 6. The developing country share of exports of those goods is projected to remain virtually unchanged. However, that country group's share of global imports of farm products rises dramatically (columns 6 and 7 of Table 6(a)). Hence its self-sufficiency ratio falls considerably. The source of that change is mainly China but also South Asia (columns 1 and 2 of Table 7). It is possible that these populous countries will seek to prevent such a growth in food import dependence in practice, by erecting protectionist barriers at least for food staples.

As for the sectoral shares of national trade, the consequences of continuing Asian industrialization are again evident: primary products are less important in developing country

[12] Capital flows explain the difference between each region's global export and import shares.
[13] Recall, though, that we are assuming no change in agricultural (or other) trade policies over the projection period in this baseline scenario. We also consider below an alternative scenario in which there is a rise in agricultural protection to slow the decline in food self sufficiency – as happened in the 20th century in the most-advanced Asian economies (see, e.g., Anderson 2009b).

exports and considerably more important in their imports, and conversely for non-primary products, with the changes being largest in Developing Asia. The opposite is true for high-income countries (Tables 8 and 9), which may seem surprising but recall that (a) what one part of the world imports the remaining part of the world must export to maintain global equilibrium and (b) we have not allowed for possible agricultural protection growth in this core scenario (but we do in an alternative scenario below). Note also from Table 8 that services exports are far more important for India than for China or ASEAN, and that difference is projected to increase substantially by 2030.

4.2 Consequences for intra-Asian and other bilateral trade

Turning now to bilateral trade patterns, the extent of South-South trade as a share of global trade is projected to more than double by 2030 in the core scenario, from (33 – 20 =) 13 to (57 – 27 =) 30 percent. The share of North-North trade in global trade, by contrast, is projected to fall from 51 to 27 percent (Table 10a and b, summarized in Figure 3). The importance of ASEAN's trade with both China and India grows dramatically, as does both China's and India's trade with other developing countries in Asia and elsewhere. The latter is not surprising, given that the share of Developing Asia's exports in world trade almost doubles over this projection period, thanks to not only its high GDP growth rate but also its high trade-to-GDP ratio (first two columns of Table 11).

More specifically, the share of intra-ACI trade in global trade is projected to more than double between 2004 and 2030, rising from 2.6 to 7.6 percent. The rise is somewhat less for farm products though: intra-ACI trade as a share of global trade in farm products in this core scenario rises from 2.7 to 6.0 percent. Most of that trade is from ASEAN to China and India (Table 12).

Trade indexes may be used to take into account changes in regional shares of global trade. One used by Anderson and Norheim (1993) is an intensity index. The export trade intensity index is defined in value terms as the share of country i's exports going to country j [x_{ij}/x_i] divided by the share of country j's imports (m_j) in world imports (m_w) net of country i's imports (m_i). That is,[14]

(1) $I_{ij} = [x_{ij}/x_i]/[m_j/(m_w - m_i)]$

The weighted average of I_{ij} across all j is unity; and the more I_{ij} is above unity, the more intense is the bilateral trade relationship between i and j.

Table 13 summarizes the trade intensity indexes. It suggests that, in the absence of trade policy changes, the intensity of intra-Developing Asia trade will decline between 2004 and 2030, as will the intensity of that region's exports to developing countries of other regions. This is a natural consequence of the dramatic growth in the shares of Asian developing countries in world trade, since this intensity indexes converge towards unity the larger the trading partner's share in world trade.

4.3 Consequences for food self-sufficiency and consumption of agricultural products

For India and the ASEAN countries the projected economic growth to 2030 leads to a small increase in self-sufficiency in crop products and a small decrease for meat, while China is projected to have a decline in its agricultural self-sufficiency for most farm products (Table 14).

[14] If the importer j is a country group and country i is part of country group j, it is necessary to subtract country i's imports from m_j (the numerator of the second expression in square brackets in equation (1)), since country i does not export to itself. If the exporter i is a country group, an approximation can be calculated by excluding only $1/n^{th}$ of i's imports from m_w in the denominator of the second expression in square brackets in equation (1), where n is the number of countries in the exporter group; and in the case where i=j, also multiply m_j (the numerator of the second expression in square brackets in equation (1)), by (n-1)/n.

Self sufficiency is a poor indicator of food security, however (Warr 2011). A more meaningful indicator is real per capita private consumption of agricultural and processed food products by households. Table 15 reports those results. It shows that between 2004 and 2030 real per capita food consumption would more than double for developing countries (a 139 percent rise). It would increase even more for China and India, by 226 and 177 percent respectively, and for ASEAN by 121 percent. These are dramatic improvements in food consumption such that, even if income distribution were to worsen over the next two decades, virtually all groups in those economies could expect to be much better fed by 2030 according to this baseline scenario.

5. Alternative TFP growth projections to 2030

The above core projection is but one of myriad possibilities, so in this section we explore others and compare their economic consequences with those just summarized for 2030. Specifically, the following two alternative growth scenarios are considered:

- ***Slower total factor productivity (TFP) growth in primary sectors in all countries***, so that real international prices for agricultural, mineral and energy products by 2030 are much more above 2004 levels than in the core projection and thus closer to 2011 prices, and more consistent with the projections of some international agencies that specialize in those markets instead of with the World Bank's projections; and
- ***Faster total factor productivity (TFP) growth in grain cropping in ASEAN, China and India,*** so grain output is higher in those Asian countries.

5.1 Slower TFP growth in primary sectors in all countries

The core projection sets higher TFP growth rates for some primary product sectors than for other sectors such that average real international prices for agricultural, mineral and energy products by 2030 are around one-ninth above 2004 levels (column 1 of Appendix Table A.5). As is clear from Figure 2, that is quite different from what was experienced in the 20th century, when real primary product prices traced a long-run downward trend (apart from the 1973 and 1979 OPEC cartel-induced jumps in the price of fossil fuels). In the past decade, however, those prices have been rising, and price projections of several international agencies suggest they will be well above 2004 levels in the next decade or two (FAO/OECD 2010, Nelson et al. 2010, IEA 2010). Hence in this alternative scenario we assume the additional TFP growth of 2.5 percentage points per year for forestry and fishing is reduced to 1 percentage point. For mining, agriculture and lightly processed food the productivity differential in the core projection is smaller, but it too is reduced by 1 percentage point. These amendments lead to real international prices for farm products in 2030 to be 25 instead of just 9 percent above those in 2004, and those for other primary products to be 101 instead of 25 percent above 2004 levels (see columns 1 and 2 of Appendix Table A.5 for details by product).

The higher prices more than compensate for lower farming and mining productivity such that the share of primary products in GDP is somewhat higher in this scenario than in the core projection. This does not lead to developing countries being more food self-sufficient though (Table 7), nor to much change in their share of global trade in farm products or in bilateral trade patterns (Tables 6(a) and 10(c)). It does, however, raise considerably the share of GDP that is traded by each region (Table 11), due largely to the higher prices of primary products.

5.2 Faster total factor productivity (TFP) growth in grain cropping in ACI countries

The core projection sets TFP growth rates for agricultural and lightly processed sectors at one percentage point per year higher than for non-primary sectors. In this next alternative scenario, the TFP growth rates for rice, wheat and coarse grains are set an extra 0.5 percent higher for just ASEAN, China and India. This could come about by boosting agricultural R&D in the region, marginal returns from which are likely to be so high as to not need to worry about modelling their up-front cost (Alston et al. 2000, 2009). Such a boost raises overall agricultural self-sufficiency rates by 3 percentage points for ASEAN countries and 1 point for India; but it brings down the international price of grains enough that China's food self-sufficiency falls slightly (Appendix Table A.5 and Tables 7 and 14). Even so, it increases slightly the extent of agricultural trade among ACI countries, and slightly raises instead of lowering (as in the core scenario) their exports of farm products to other Asian developing countries (Table 12).

6. Projections to 2030 under alternative policy and savings scenarios

The above scenarios all assume trade policies remain unchanged between the base period and 2030. This section examines how the above core scenario for 2030 would be altered if some trade policy reforms were to be undertaken over the projections period. Five trade liberalization scenarios are compared with the 2030 core baseline, including one in which agricultural protection rises in some developing countries, and they are followed by one in

which savings rates in the United States and China are altered. Specifically, the scenarios are as follows, the first three assuming membership of the ASEAN free trade area is extended to the six additional countries currently being considered (China, Japan, South Korea, India, Australia and New Zealand) to form ASEAN+6 (see Kawai and Wignaraja 2010):

- All merchandise trade *except for agricultural goods* is freed within the expanded ASEAN+6 bloc (that is, on a preferential basis, with no change to barriers to trade with other countries);
- All merchandise trade *including agricultural goods* is freed on a preferential basis within the expanded ASEAN+6 bloc;
- All merchandise trade including agricultural goods is freed by all countries in the expanded ASEAN+6 group and not on a preferential basis bloc but rather *also with the rest of the world* (that is, on an MFN basis);
- All merchandise trade including for agricultural goods is freed by all countries of the world (global MFN);
- All developing countries' agricultural import tariffs are raised towards their legal limits according to current WTO commitments (agricultural protection growth); and
- Savings rates in the United States and China alter so as to largely remove their respective trade imbalances by 2030.

6.1 Regional and global trade liberalization

If membership of the ASEAN free trade area were to be extended to the six additional countries currently being considered and their goods trade were to be liberalized fully, that could go a long way towards generating the benefits that could come from global goods trade liberalization. This is because the global shares of that expanded bloc of countries in 2004

would rise from 2 to 23 percent for GDP and from 6 to 21 percent for exports (Tables 3 and 4). But as with all such regional trading agreements, the potential benefits depend on the extent to which all trade is freed up. Hence we present results from the above-listed three versions of this initiative plus global goods trade reform.

The economic welfare effects of those reforms are summarized in Table 16. If the ASEAN+6 initiative was purely preferential and the reform excluded farm products, the global gains would be only $16 billion a year by 2030 (in 2004 US dollars). The gain to Developing Asia would be slightly higher at $26 billion, at the expense of $5 billion to other developing countries. Were agriculture *not* to be excluded from the deal, the global gains would be nearly four times greater but most of them would be enjoyed in the Western Pacific, and non-Asian developing countries as a group still would be slightly worse off. Were those reforms by ASEAN+6 to be on an MFN basis (that is, remove barriers for trade not only within the group but also with non-members), the global gains would nearly treble again, to $166 billion per year by 2030, while Developing Asia's gain would double to $52 billion. In that case non-Asian developing countries would be better off by $30 billion per year. For all three sets of countries those welfare benefits are less than half what they would be if all countries of the world were to remove their barriers to goods trade. Such an extreme reform would generate welfare gains of $384 billion per year globally by 2030, made up of $150 billion for high-income countries, $134 billion for Developing Asia, and $101 billion for other developing countries.

When expressed as a percent of real GDP (Table 16(b)), the gain to developing countries in 2030 from moving to global free trade is 1.5 percent, but it is 2.2 percent for ASEAN while only 0.5 and 1.4 percent for China and India, respectively.

What is particularly striking is the difference among ACI countries' welfare gains in the various trade reform scenarios. If ASEAN+6 were to unilaterally adopt free trade, the

gains to ASEAN and India are larger the more liberal is that reform, although in India's case it loses slightly in the first two (preferential) reforms. China, by contrast, gains little in the first two (preferential) reforms, loses in the unilateral MFN reform because it turns the terms of trade so much against itself, and gains substantially only when the whole world liberalizes.

The impact of expanding the ASEAN bloc by 6 members and freeing trade among the expanded membership but not in farm goods has little impact on ACI's share of global agricultural trade. If farm goods are *not* excluded in that preferential trade reform, however, ASEAN's agricultural exports increase dramatically and ACI's share of world agricultural exports (imports) in 2030 would be 17 instead of 12 percent (38 instead of 34 percent) – even though agricultural self-sufficiency of China, India and ASEAN would not change by much (Tables 6(b) and 7).

Each of these reform scenarios adds to globalization, as captured by the share of GDP traded. In the core simulation that is 61 percent globally, but it is 64 percent with ASEAN+6 preferential trade and 71 percent with global free trade: and for Developing Asia those numbers are 89, 100 and 109 percent, respectively (last two rows of Table 11).

6.2 Agricultural protection growth in developing countries

In the core scenario we assumed no change in trade restrictions between 2004 and 2030. That may be reasonable for manufacturing protectionism, now that most major countries have liberalized most of their markets for industrial products. Agricultural policies, however, have remained highly distortive – and they have been evolving in fairly systematic ways. In particular, emerging economies have tended to raise their agricultural protection rates if and when their agricultural comparative advantage declines rapidly in the course of their economic growth. How different might farm policies be in 2030 from those in 2004 in the

absense of a Doha agreement among WTO members to undertake multilateral farm policy reform?

Anderson and Nelgen (2011) address this issue by using political economy theory, past protection trends, and the projections from the present study of per capita GDP and agricltural trade specialization to project econometrically what rates of protection might be for key farm products by 2030 if unrestrained by new trade agreements (but ensuring they do not exceed current tariff bindings at the WTO). The impact this has on the overall sectoral rates of agricultural protection can be seen by comparing columns 1 and 4 of Appendix Table A.7.

When these alternative rates are adopted instead of the 2004 rates used in the core 2030 projection, international food prices are a little lower in that year (Appendix Table A.5). This is because ACI and other developing countries trade less and in particular import fewer farm products in this as compared with the core scenario (Tables 11 and 6(a)). Yet despite that making the ACI countries more agriculturally self-sufficient in 2030 than in the core scenario (Table 14(d)), their real food consumption is lower in this agricultural protection growth scenario (Table 15).

Also, the global welfare cost of trade policies would be somewhat higher with this protection growth. In particular, the welfare cost of developing countries' agricultural policies would be more than one-eighth higher, increasing the cost of their policies overall by one-ninth – and raising agriculture's contribution to the global cost of all goods trade distortions from 59 to 62 percent (Table 17). The final two columns of Table 16 disaggregate those results to reveal their effects on major economies. The differences in the two sets of effects are a combination of higher protection rates and thus also consumer prices for some farm products in some developing countries, substitution towards the production and away from the consumption of those more-protected products in those countries, and, as a

consequence of those adjustments, terms of trade changes for all countries. For most but not all of the countries/country groups shown in Table 16, their welfare would be lower (their gain from MFN liberalization greater) in the scenario in which agricultural protection was greater. Key exceptions are food-importing Japan, China and India, all of whom would have benefitted from the lower international prices associated with higher agricultural protection and thus would suffer a greater terms of trade deterioration with reform. Removing those higher protection rates from this alternative counterfactual would ensure real household consumption of farm products would rise by more in ACI countries too (Table 15).

6.3 Altered savings rates in the United States and China

In the core projection we did not constrain trade imbalances over time. However, even in the initial 2004 database, these are huge for the United States and China. Some argue that these imbalances are unlikely to be sustained over time (see Feldstein 2011 and Garnaut 2011, among others). Given that the large and rapidly growing Chinese economy is an important driver of some of the changes we model, we tested the sensitivity of key results to determine how they might change in an alternative scenario where China's trade surplus is constrained. In particular, we considered an extreme alternative scenario in which the trade surplus for China and the trade deficit for the United States are essentially eliminated over the next two decades.[15] Since we simply wished to test the robustness of our findings to this possibility, we did not modify other assumptions from the core baseline, including the GDP growth and capital accumulation rates, or trade balances in other regions.

[15] Changes in the trade balance are accomodated here by allowing saving rates to reduce in China and increase in the US, given the relationship S-I=X-M, consistent with the projections in Garnaut (2011). We note that the trade balance needs to be fixed relative to income to preserve homogeneity in the GTAP model, therefore it was necessary to iterate to drive the actual trade balances close to zero.

The importance of China in global exports will naturally reduce if it does not continue huge trade surpluses, while the importance of the United States in global exports will increase if it no longer runs large trade deficits: China's share goes down 2 percentage points, and the high-income countries' share goes up by 3 points (compare parts (b) and (i) of Table 10). Bilateral trade flows, particularly for the United States and China, will thus be impacted fairly significantly by this modified assumption. There will also be repercussions for trade flows with other regions, including somewhat lower trade between other Developing Asia and China, due to China's reduced need for intermediate imported components once its net export flows are constrained. Indeed, total intra-developing Asia trade reduces significantly, as a result of the importance of China in this region. Importantly for farmers, the share of China in global agricultural imports rises by 1 percentage point as the trade imbalances are phased out (compare parts (b) and (i) of Table 12). If global GDP growth rates are not impacted by the trade rebalancing, however, this modified trade balance assumption does not change the overall pattern of our other main findings.

7. Caveats

As with the results from all other economy-wide projections modelling, it is necessary to keep in mind numerous qualifications. One is that for the core projection we have assumed trade costs in the form of transport and communications costs do not change, even though they have been falling steadily during the current wave of globalization. Table 11 therefore understates the likely growth in the share of GDP traded.

A second assumption is that we have aggregated the model into just 26 sectors/product groups. This leads to gross underestimation not only of the gains from trade

reform, shown in Table 16, but also of the extent to which firms can take advantage of intra-industry trade through exploiting the increasing opportunities to lower costs through fragmenting the production process into ever-more pieces whose location is footloose.

Third, we have assumed constant returns to scale and perfect competition rather than allowing firms to enjoy increasing returns and some degree of monopoly power for their differentiated products. This too leads to underestimates of the welfare gains from trade reform (Krugman 2009). The fact that opening an economy exposes monopolistic firms to greater competition generates gains from trade reform that could be quite substantial in terms of reducing firm mark-ups, according to numerous country case studies (see, e.g., Krishna and Mitra (1998) on India).

Fourth, where consumers (including firms importing intermediate inputs) value a greater variety of goods, or a greater range of qualities, intra-industry trade can grow as a result of both economic growth and trade policy reform, but that too is not taken into account in the above analysis.

Fifth, in the trade reform scenarios we have not allowed domestic policies also to be reformed (apart from agricultural subsidies), even though it is typical for trade reforms – including in the context of signing regional trade agreements – to be part of a broader program of microeconomic policy reform. Recent studies show that when labor markets are freed up at the same time as trade, for example, they can have very different welfare and bilateral trade effects than if those factor markets remain inflexible (Helpman, Marin and Verdier 2008, Helpman and Itskhoki 2010). That is true also when financial market reforms are considered, not least because the inclusion of financial markets allows an additional set of influences on real exchange rates (see, e.g., McKibbin and Stegman 2005). Hoxha, Kalemli-Ozcan and Vollrath (2009) examine gains from financial integration and find that a move from autarky to full integration of financial markets globally could boost real consumption by

7.5 percent permanently, even assuming no accompanying productivity gains. National case studies of reform to services trade more generally also find gains several times those from goods trade reform (e.g., Dee, Hanslow and Pham 2003, Konan and Maskus 2006, Rutherford and Tarr 2008). However, estimating the extent of and effects of globally removing barriers to services and factor flows between countries is far less developed than methodologies applied to trade in goods (Francois and Hoekman 2010).

Sixth, the savings in bureaucratic costs of administering trade barriers, in traders' costs of circumventing barriers, and in lobbyists costs of rent-seeking to secure or maintain trade-distorting policies are all non-trivial but are not captured in the above modelling.

Seventh, our model has not included the new biofuel policies that have been put in place in many countries but mostly since our 2004 base year. The new biofuel mandates and subsidies have had a non-trivial effect of increasing both the mean and the variance of international food prices, and are expected to become even more important over the next decade as the mandates in the United States and EU in particular increase to 2020-21 (see Hertel and Beckman 2011, Hertel and Diffenbaugh 2011 and the references therein).

Finally, the standard GTAP model used here is comparative static. It therefore does not measure the additional dynamic gains from trade reform. Dynamic gains arise in numerous ways. One of the more important is through encouragement of the more-efficient firms to take over from the less efficient in each country (Melitz 2003, Bernard et al. 2007, Melitz and Ottaviano 2008). Another way is through multinational firms sharing technologies and knowledge across countries within the firm (Markusen 2002). Offshoring is yet another mechanism through which heterogeneous firms are affected by trade liberalization, including via re-locating from small to larger nations (Baldwin and Okuba 2011). The greater competition that accompanies trade reform also can stimulate more innovation (Aghion and

Griffith 2005), leading to higher rates of capital accumulation and productivity growth (Lumenga-Neso, Olarreaga and Schiff 2005).

In short, the aggregate welfare gains from freeing up trade are likely to be far bigger than the estimates reported above suggest, but their distribution, and the estimated bilateral patterns of global trade and relative GDPs of nations by 2030, also may be somewhat different if an empirical model with all of the above features had been available and used.[16] We also note that in the current modelling, we are not able to explicitly explore implications for poverty alleviation or environmental outcomes and their consequent impact on economies.

8. Policy implications and conclusions

Should relatively rapid economic growth in Asia and to a lesser extent in other developing countries characterize world economic development as suggested above, the ACI countries' share of global GDP and trade will continue to rise steeply over the next two decades. Their share of global agricultural GDP is projected to double also, but that is not fast enough to keep pace with their growing consumption of food. Table 18 shows that, by 2030, Asia is projected to consume half the world's grain and nearly half the world's fossil fuels (or even more if carbon taxes are introduced in high-income countries but not emerging economies). This is possible because their shares of the world's imports of farm products and of other primary products are projected to almost quadruple between 2004 and 2030 in the core scenario (Figure 4).

[16] For more on the challenges of enhancing standard global economy-wide models in these ways, see Francois and Martin (2010).

Since Asia in total accounts for around one-third of all agricultural and food output and consumption currently, and that global share will be one-half by 2030, its food security is likely to be greatest when markets for farm products are always open, and not only regionally but globally. This is because greater openness ensures international markets are 'thicker' and thus more stable and predictable, and hence are more likely to reduce poverty through encouraging investment and boosting employment prospects and economic growth.

This basic truth seems anathema to those governments who perceive food security as a production issue rather than a consumption issue, and who thus focus on food self-sufficiency rather than on the spending capability of the poor. Such a view is understandable, though, in a world where other countries protect and insulate their domestic producers. Throughout the post-World War II era many governments, in Asia as elsewhere, have been reluctant to open their agricultural markets. True, taxes on farm trade have fallen in many countries since the 1980s, but not in Northeast Asia where government assistance to farmers remains extremely high, having risen inexorable since the 1950s. That is partly why farm policies are still by far the most welfare-reducing of the restrictions to global merchandise trade.[17] Were China and India to follow those Northeast Asian countries in raising their assistance to farmers as their per capita incomes grew – as they have been doing already in recent decades (Figure 5) – the contribution of farm policies to the global cost of goods trade barriers would become even higher (as shown in Table 17).

The trade reform scenario results suggest developing countries need not wait for a multilateral trade agreement to benefit from freer trade: an agreement by members of the prospective ASEAN+6 bloc to free their trade on an MFN basis could generate for developing Asia two-fifths of the GDP gain that is estimated to flow if the whole world so

[17] Table 17(a) above and Anderson and Martin (2006, Ch. 12 and Anderson (2009a, Ch. 13). This reluctance on the part of governments to open food trade is worst when international prices spike up or down (Anderson and Nelgen 2012) – even though the net effect of many national governments so seeking to insulate their consumers or farmers from such fluctuations has been shown to be rather ineffective and to exacerbate the spike in international food prices (Martin and Anderson 2012).

liberalized. Since Doha is likely to generate only a tiny fraction of the global gains from full trade reform (Laborde, Martin and van der Mensbrugghe 2011), freeing up Developing Asian trade under a broad regional agreement has the potential to bring even higher gains than does a Doha agreement. Freer food trade within Asia would also reduce the volatility of international food prices, especially for rice which traditionally has been internationally traded so much less than wheat and coarse grains.

If concern with food import dependence is the main reason for reluctance in opening agricultural markets, the results in Table 14 reveal the extent to which greater farm productivity growth could alleviate that concern. Since further investments in agricultural R&D typically would have very high expected payoffs in developing countries (Alston et al. 2000), they are also growth-enhancing. Moreover, they have been shown to be very likely to reduce poverty as well (Ivanic and Martin 2010). Were developing countries willing to allow new transgenic crop varieties to be introduced, the gains would be even larger and would be generated faster. In the case of golden rice, for example, the gains would be especially high in Asia, where rice is the dominant staple (Anderson, Jackson and Nielsen 2005). With climate change adding to the demand for and return from further investment in agricultural R&D, and with the rapid advances in agricultural biotechnology over the past two decades, the potential rewards from accepting genetically modified organisms are rising steadily.

Finally, while nothing has been mentioned explicitly above about the food value chain, the on-going supermarket revolution globally offers further scope for market openness to benefit both net sellers and buyers of food. Foreign direct investment (FDI) liberalization in this area could complement trade reform. Developing countries so far have been only minor players as hosts of FDI in processed food: in 2007 their inflow was less than $3 billion, compared with an inflow of $46 billion into high-income countries. Flows of FDI into the primary agricultural sector were even less, such that FDI accounted for less than 0.3 percent

of capital formation in developing country agriculture compared with 13 percent for the overall economy of that country group (UNCTAD 2009, Chapter 3). Nonetheless, Reardon and Timmer (2007) argue that FDI has greatly facilitated the transformation of food value chains over the past two decades, in particular via the expansion and merger/takeover activity in supermarket retailing which is having dramatic effects further up the value chain. First-stage processors, food and beverage manufacturers, and distributors are also becoming more concentrated so as to better match the bargaining power of supermarkets, although typically in narrowly focused industries rather than across-the-board as in supermarket retailing. Their actions are constrained too by the supermarkets' capacity to develop their own brands and even their own processing and distribution. In turn these developments are altering dramatically the way farmers are expected to supply those markets, with the emphasis on timely delivery of uniformly high-quality products with very specific attributes (Reardon and Timmer 2007, Swinnen 2007, Reardon *et al.* 2009). According to Swinnen and Vandeplas (2009), though, consumers and possibly even farmers in developing countries are benefitting from the trade and investment liberalization and the ICT revolution that have stimulated these changes, because of the fierce competition that still remains along the food value chain.

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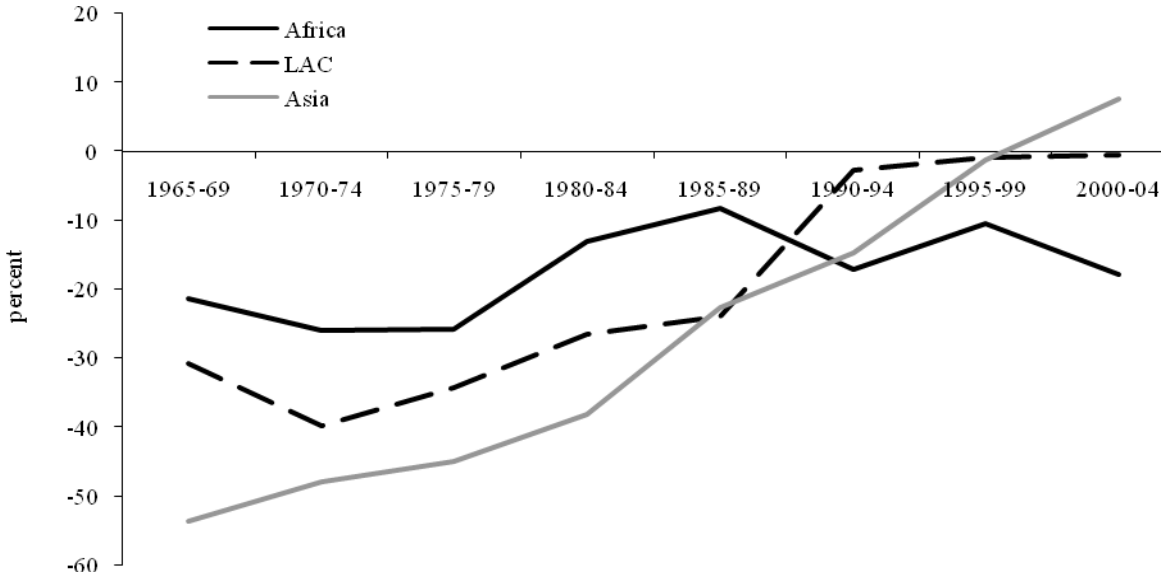
Figure 1: Relative rates of assistance to agriculture,[a] Asian, African and Latin American developing countries, 1965 to 2004[b]

(percent)



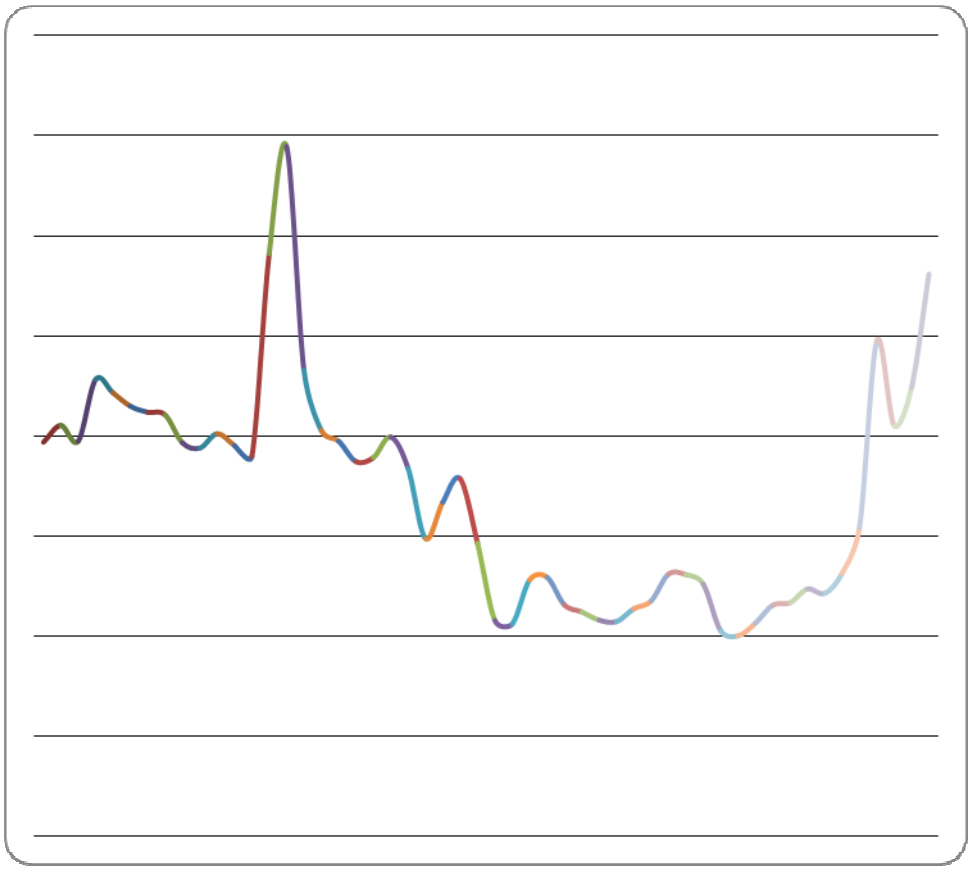
[a] The RRA is defined as 100*[(100+NRAag^t)/(100+NRAnonag^t)-1], where NRAag^t and NRAnonag^t are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively. The 5-year weighted averages are estimated using value of production at undistorted prices as weights.

[b] Estimates for China pre-1981 are based on the assumption that the nominal rates of assistance to agriculture and other tradables in those years were the same as the average for China for 1981-84.

Source: Calculated from Anderson and Valenzuela (2008).

Figure 2: Real international food prices, 1960 to (July) 2011

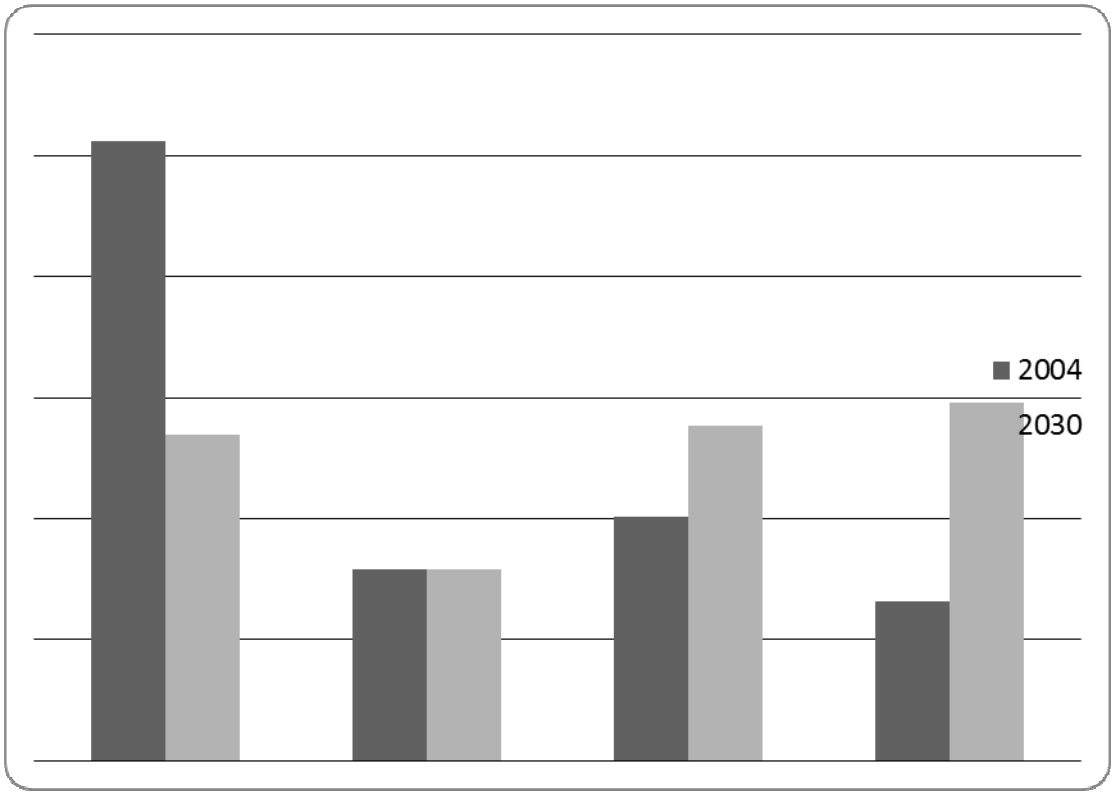
(2000 = 100)



Source: Updated from Grilli and Yang (1988) by the World Bank.

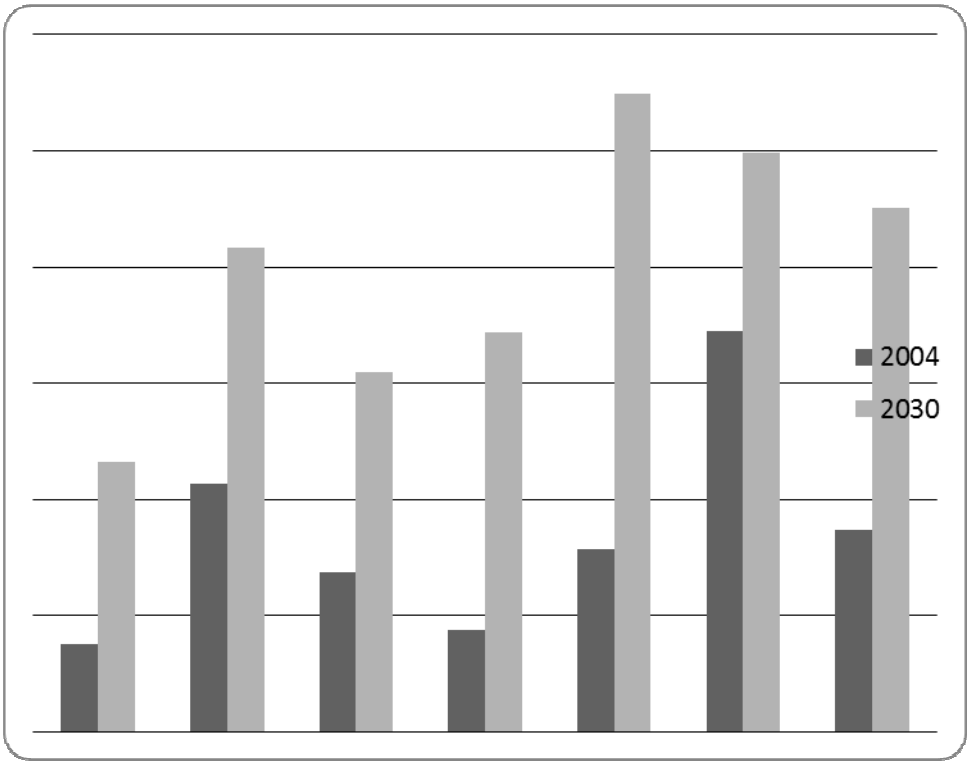
Figure 3: Shares of world trade in all products by high-income ('North') and developing ('South') countries, 2004 and 2030 core

(percent)



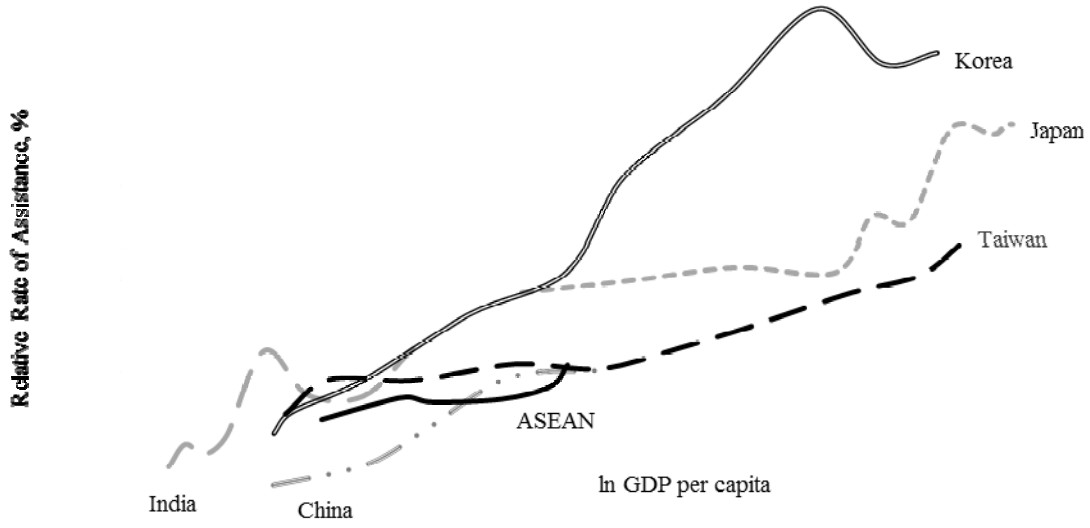
Source: See Table 10

Figure 4: Shares of China, India and ASEAN in selected global markets, 2004 and 2030 core (percent)



Source: See Tables 3, 4, 5 and 18.

Figure 5: Relative rates of assistance to agriculture[a] and log of real per capita GDP, India and Northeast Asian economies, 1955 to 2005



[a] The RRA is defined as $100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$, where $NRAag^t$ and $NRAnonag^t$ are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.

Source: Adapted from Anderson (2009b).

Table 1: Indicators of relative factor endowments in 2000-04

(national relative to world, world=100)

	Per capita stocks of:		
	Produced capital[a]	**Agric. land[b]**	**Mineral reserves[c]**
W. Europe	454	46	44
E. Europe &CA	48	178	241
US & Canada	636	186	274
Australia & NZ	405	2454	1615
Japan	610	5	14
DevelopingAsia	20	34	25
NEAsian NIEs	*254*	*8*	*4*
ASEAN 5	*28*	*37*	*28*
China	*21*	*35*	*54*
India	*9*	*5*	*8*
Africa	14	148	144
Latin America	64	171	181
Total	**100**	**100**	**100**

[a] Proxied by GDP per capita.
[b] Arable land and permanent crops.
[c] Proxied crudely by total land per capita.

Source: Sandri, Valenzuela and Anderson (2007), compiled mainly from the World Bank's *World Development Indicators.*

Table 2: Self-sufficiency in primary agricultural production,[a] Asian developing economies, 1961 to 2004

(percent at undistorted prices)

	1961-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04
China	99	101	100	99	98	101	101	99	98
India	98	97	99	99	99	99	100	100	100
Indonesia	na	na	106	105	104	106	104	103	102
Malaysia	293	265	215	167	152	150	122	110	104
Philippines	115	112	116	108	106	101	101	99	99
Thailand	na	na	115	125	131	135	133	130	137
Vietnam	na	na	na	na	na	103	104	110	112
Asian dev. economies[b]	**100**	**100**	**100**	**99**	**97**	**94**	**88**	**87**	**85**

[a] Agricultural production, valued at undistorted prices, as a percentage of production plus imports minus exports.

[b] Includes also Bangladesh, Pakistan, Sri Lanka, South Korea and Taiwan, China.

Source: Calculated by authors based on data in Anderson and Valenzuela (2008).

Table 3: Regional shares of global value added by sector, 2004 and 2030 core
(percent)

(a) 2004 Base

	Agric. & Food	Other Primary	Manufactures	Services	Total
W. Europe	27.0	13.0	33.8	33.0	32.1
E. Europe	4.6	8.0	2.0	2.2	2.5
US & Canada	17.1	14.0	26.5	35.2	32.0
ANZ	2.0	2.6	1.3	1.9	1.8
Japan	6.9	1.4	11.5	12.6	11.7
China	9.4	8.9	8.8	2.8	4.4
ASEAN	4.3	6.1	3.0	1.3	1.9
Pacific Islands	0.0	0.1	0.0	0.0	0.0
Rest E. Asia	1.8	1.0	4.1	2.7	2.9
India	7.6	2.6	1.2	1.1	1.6
Rest S. Asia	1.8	0.6	0.3	0.4	0.5
Central Asia	0.4	1.2	0.1	0.1	0.2
Latin America	9.1	7.3	5.0	3.7	4.4
M.E. & Africa	8.0	33.2	2.3	2.8	4.0
High-income	**57.6**	**39.0**	**75.1**	**84.8**	**80.1**
Developing	**42.4**	**61.0**	**24.9**	**15.2**	**19.9**
of which Asia:	25.3	20.5	17.6	8.6	11.5
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

(b) 2030 core

	Agric. & Food	Other Primary	Manufactures	Services	Total
W. Europe	15.7	7.5	22.9	25.3	22.9
E. Europe	3.4	7.8	2.1	2.6	3.0
US & Canada	12.4	7.5	19.9	32.1	26.8
ANZ	1.7	2.0	1.0	2.2	1.9
Japan	3.4	0.3	6.3	9.5	7.9
China	24.8	22.6	25.3	8.5	13.6
ASEAN	5.2	6.9	4.8	2.2	3.2
Pacific Islands	0.0	0.1	0.0	0.1	0.1
Rest E. Asia	1.4	0.7	4.5	3.4	3.2
India	11.7	4.7	3.2	3.7	4.3
Rest S. Asia	2.7	1.4	0.6	1.0	1.1
Central Asia	0.5	1.2	0.1	0.2	0.3
Latin America	7.8	9.1	5.8	4.9	5.6
M.E. & Africa	9.3	28.1	3.5	4.3	6.2
High-income	**36.5**	**25.1**	**52.1**	**71.8**	**62.5**
Developing	**63.5**	**74.9**	**47.9**	**28.2**	**37.5**
of which Asia:	46.3	37.7	38.5	19.1	25.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Derived from the authors' GTAP Model results

Table 4: Regional sectoral shares of global exports of all products, 2004 and 2030 core
(percent)

(a) 2004

	Agric. & Food	Other Primary	Manufactures	Services	Total
W. Europe	2.9	1.0	29.4	9.1	42.3
E. Europe	0.2	0.9	1.9	0.5	3.6
US & Canada	0.9	0.4	9.4	3.0	13.7
ANZ	0.3	0.2	0.5	0.3	1.3
Japan	0.0	0.0	5.5	0.6	6.1
China	0.2	0.1	6.0	0.5	6.7
ASEAN	0.4	0.4	4.4	0.7	6.0
Pacific Islands	0.0	0.0	0.0	0.0	0.1
Rest E. Asia	0.1	0.0	4.9	1.3	6.3
India	0.1	0.0	0.7	0.2	1.0
Rest S. Asia	0.0	0.0	0.3	0.1	0.4
Central Asia	0.0	0.2	0.1	0.0	0.4
Latin America	0.9	0.8	3.0	0.6	5.4
M.E. & Africa	0.4	3.3	2.2	0.9	6.8
High-income	**4.4**	**2.6**	**46.6**	**13.5**	**67.0**
Developing	**2.2**	**4.8**	**21.6**	**4.3**	**33.0**
of which Asia:	0.9	0.8	16.4	2.8	20.8
Total	**6.6**	**7.4**	**68.2**	**17.8**	**100.0**

(b) 2030 core

	Agric. & Food	Other Primary	Manufactures	Services	Total
W. Europe	2.3	1.7	16.2	5.0	25.2
E. Europe	0.2	2.1	1.6	0.5	4.4
US & Canada	1.3	1.1	5.6	1.6	9.5
ANZ	0.3	0.5	0.2	0.1	1.2
Japan	0.0	0.0	2.1	0.2	2.4
China	0.0	0.0	16.4	1.9	18.4
ASEAN	0.6	1.0	6.8	1.0	9.4
Pacific Islands	0.0	0.0	0.0	0.0	0.1
Rest E. Asia	0.1	0.1	4.9	1.0	6.0
India	0.2	0.2	1.9	0.8	3.1
Rest S. Asia	0.1	0.0	0.8	0.3	1.2
Central Asia	0.1	0.4	0.0	0.0	0.5
Latin America	1.2	1.8	4.1	0.7	7.8
M.E. & Africa	0.5	5.0	3.1	2.2	10.9
High-income	**4.2**	**5.4**	**25.6**	**7.4**	**42.7**
Developing	**2.8**	**8.5**	**38.0**	**8.1**	**57.3**
of which Asia:	1.0	1.7	30.8	5.2	38.7
Total	**6.9**	**14.0**	**63.6**	**15.5**	**100.0**

Source: Derived from the authors' GTAP Model results

Table 5: Regional sectoral shares of global imports of all products, 2004 and 2030
(percent)

(a) 2004

	Agric. & Food	Other Primary	Manufactures	Services	Total
W. Europe	3.1	2.5	28.2	8.6	42.5
E. Europe	0.3	0.4	2.1	0.5	3.2
US & Canada	0.9	1.6	13.7	2.7	18.8
ANZ	0.1	0.1	1.0	0.3	1.4
Japan	0.5	0.8	2.8	1.0	5.1
China	0.2	0.5	4.4	0.6	5.7
ASEAN	0.3	0.4	3.7	0.8	5.2
Pacific Islands	0.0	0.0	0.1	0.0	0.1
Rest E. Asia	0.3	0.6	3.6	0.8	5.3
India	0.1	0.3	0.6	0.2	1.2
Rest S. Asia	0.1	0.0	0.3	0.1	0.5
Central Asia	0.0	0.0	0.3	0.1	0.4
Latin America	0.4	0.2	3.5	0.7	4.7
M.E. & Africa	0.7	0.2	3.9	1.0	5.8
High-income	**4.8**	**5.3**	**47.9**	**13.0**	**71.1**
Developing	**2.0**	**2.3**	**20.5**	**4.2**	**28.9**
of which Asia:	1.0	1.8	13.0	2.5	18.4
Total	**6.9**	**7.6**	**68.3**	**17.2**	**100.0**

(b) 2030 core

	Agric. & Food	Other Primary	Manufactures	Services	Total
W. Europe	1.8	1.8	18.4	6.1	28.1
E. Europe	0.3	0.5	2.1	0.6	3.5
US & Canada	0.6	1.6	12.0	2.4	16.6
ANZ	0.1	0.0	1.2	0.3	1.6
Japan	0.3	0.5	2.8	0.9	4.5
China	1.8	5.2	7.7	0.8	15.5
ASEAN	0.5	0.7	5.3	0.8	7.4
Pacific Islands	0.0	0.0	0.1	0.0	0.1
Rest E. Asia	0.2	0.8	3.7	0.8	5.6
India	0.1	1.9	1.3	0.3	3.6
Rest S. Asia	0.2	0.3	0.6	0.1	1.2
Central Asia	0.0	0.0	0.3	0.1	0.5
Latin America	0.3	0.4	3.4	0.7	4.8
M.E. & Africa	0.9	0.4	4.8	0.9	6.9
High-income	**3.0**	**4.5**	**36.5**	**10.3**	**54.3**
Developing	**4.2**	**9.7**	**27.3**	**4.5**	**45.7**
of which Asia:	3.0	8.9	19.2	2.9	34.0
Total	**7.2**	**14.2**	**63.8**	**14.8**	**100.0**

Source: Derived from the authors' GTAP Model results

Table 6: Regional shares of world trade in agricultural and food products, 2004 base, 2030 core and 2030 alternative growth scenarios, and trade reform scenarios

(percent)

(a) Baseline scenarios

	Exports					Imports				
	2004	**2030 core**	**2030 Slower prim TFP**	**2030 Faster ACI grain TFP**	**2030 incr. agric prot.**	**2004**	**2030 core**	**2030 Slower prim TFP**	**2030 Faster ACI grain TFP**	**2030 incr. agric prot.**
W. Europe	43.6	32.6	30.3	32.5	35.3	45.6	24.8	23.9	25.0	27.2
E. Europe	3.2	3.6	4.0	3.6	3.7	4.3	3.7	4.2	3.7	4.0
US & Canada	14.3	18.5	19.2	18.3	18.7	12.4	8.5	8.4	8.6	9.1
ANZ	4.7	4.9	4.1	4.8	4.7	1.0	1.0	0.9	1.0	1.0
Japan	0.4	0.6	0.6	0.6	0.7	7.2	3.8	3.8	3.8	4.2
China	3.6	0.5	0.2	0.5	0.5	3.6	25.5	25.1	25.1	25.0
ASEAN	6.7	8.8	10.3	9.0	9.1	4.4	7.3	8.2	7.2	7.3
Pacific Islands	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Rest E. Asia	0.9	1.4	1.6	1.4	1.3	3.9	3.4	3.3	3.4	3.4
India	1.4	2.3	2.7	2.6	2.0	0.8	1.6	1.6	1.6	1.2
Rest S. Asia	0.6	0.8	0.9	0.7	0.6	1.1	3.2	2.3	3.2	3.3
Central Asia	0.5	0.8	0.7	0.7	0.7	0.4	0.5	0.5	0.5	0.4
Latin America	13.6	17.2	17.3	17.2	16.8	5.5	4.5	4.4	4.5	3.5
M.E. & Africa	6.3	7.9	7.9	7.9	5.9	9.6	12.3	13.1	12.4	10.3
High-income	**66.2**	**60.2**	**58.3**	**59.7**	**63.1**	**70.5**	**41.8**	**41.3**	**42.1**	**45.4**
Developing	**33.8**	**39.8**	**41.7**	**40.3**	**36.9**	**29.5**	**58.2**	**58.7**	**57.9**	**54.6**
of which Asia:	13.9	14.7	16.6	15.2	14.3	14.3	41.5	41.2	41.0	40.8
and ACI:	11.7	11.6	13.3	12.2	11.5	8.8	34.3	34.9	33.8	33.5
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table 6 (continued): Regional shares of world trade in agricultural and food products, 2004 base, 2030 core and 2030 alternative growth scenarios, and trade reform scenarios

(percent)

(b) Trade reform scenarios

	Exports					Imports				
	ASEAN +6, no agric.	ASEAN +6 with agric	ASEAN +6, MFN	Full glob lib'n	Full lib'n from higher ag prot	ASEAN +6, no agric.	ASEAN+ 6 with agric	ASEA N+6, MFN	Full global lib'n	Full lib'n from higher ag prot
W. Europe	32.8	28.5	29.7	26.8	26.8	24.6	22.2	21.8	24.1	24.1
E. Europe	3.6	3.1	4.4	4.8	4.8	3.7	3.3	3.5	4.3	4.3
US & Canada	18.8	15.7	17.8	17.1	17.1	8.4	7.5	7.5	8.4	8.4
ANZ	4.8	7.4	5.0	4.9	4.9	1.0	1.2	1.0	0.9	0.9
Japan	0.5	1.9	1.2	1.1	1.1	4.0	5.4	5.6	4.6	4.6
China	0.5	1.2	0.8	0.8	0.8	25.7	25.2	25.8	22.4	22.4
ASEAN	7.9	12.8	12.1	10.8	10.8	7.5	9.5	9.2	7.9	7.9
Pacific Islands	0.2	0.1	0.2	0.6	0.6	0.2	0.2	0.2	0.3	0.3
Rest E. Asia	1.4	2.8	2.9	3.0	3.0	3.4	4.2	4.1	3.9	3.9
India	2.4	3.1	2.1	2.0	2.0	1.5	3.2	3.8	3.2	3.2
Rest S. Asia	0.8	0.7	0.7	0.9	0.9	3.0	2.7	2.6	2.9	2.9
Central Asia	0.7	0.7	0.6	0.8	0.8	0.4	0.4	0.4	0.5	0.5
LatinAmerica	17.5	15.1	15.9	18.4	18.4	4.4	4.0	3.8	4.4	4.4
M.E.& Africa	8.0	6.9	6.6	8.2	8.2	12.1	11.0	10.6	12.1	12.1
High-income	**60.6**	**56.6**	**58.2**	**54.6**	**54.6**	**41.7**	**39.6**	**39.5**	**42.3**	**42.3**
Developing	**39.4**	**43.4**	**41.8**	**45.4**	**45.4**	**58.3**	**60.4**	**60.5**	**57.7**	**57.7**
of which Asia:	13.9	21.4	19.4	18.8	18.8	41.8	45.4	46.1	41.1	41.1
and ACI:	10.8	17.1	15.0	13.5	13.5	34.7	37.9	38.8	33.5	33.5
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Derived from the authors' GTAP Model results

Table 7: Agricultural self-sufficiency ratio,[a] 2004 base, 2030 core and 2030 alternative growth scenarios, and trade reform scenarios

(percent)

	Baseline scenarios					Trade reform scenarios				
	2004	2030 core	2030 Slower prim TFP	2030 Faster ACI grain TFP	Incr. agric prot'n	ASEA N+6, no agric	ASEA N+6, with agric	ASEA N+6 MFN	Full Lib.	Full lib'n from higher ag prot
W. Europe	0.94	1.05	1.01	1.05	1.04	1.06	1.04	1.07	1.01	1.01
E. Europe	0.94	0.95	0.94	0.95	0.94	0.95	0.95	0.94	0.91	0.91
US & Canada	1.04	1.20	1.19	1.19	1.17	1.20	1.19	1.23	1.24	1.24
ANZ	1.45	1.64	1.56	1.63	1.57	1.63	1.82	1.68	1.75	1.75
Japan	0.81	0.83	0.82	0.83	0.83	0.82	0.75	0.65	0.65	0.65
China	0.97	0.83	0.84	0.83	0.85	0.82	0.82	0.80	0.79	0.79
ASEAN	0.97	0.85	0.83	0.86	0.86	0.84	0.87	0.86	0.86	0.86
Pacific Islands	0.92	0.90	0.88	0.90	0.88	0.91	0.91	0.92	2.05	2.05
Rest E. Asia	0.77	0.79	0.76	0.79	0.79	0.78	0.84	0.81	0.77	0.77
India	1.01	1.00	1.00	1.01	1.00	1.00	1.02	0.99	1.00	1.00
Rest S. Asia	0.96	0.85	0.90	0.85	0.86	0.86	0.86	0.87	0.85	0.85
Central Asia	1.04	1.09	1.05	1.09	1.08	1.09	1.08	1.08	1.10	1.10
Latin America	1.10	1.23	1.29	1.22	1.20	1.23	1.23	1.26	1.40	1.40
M.E. & Africa	0.93	0.92	0.93	0.92	0.93	0.92	0.92	0.92	0.91	0.91
High-income	**0.97**	**1.09**	**1.06**	**1.09**	**1.07**	**1.09**	**1.09**	**1.11**	**1.09**	**1.09**
Developing	**0.98**	**0.91**	**0.93**	**0.92**	**0.92**	**0.91**	**0.92**	**0.91**	**0.93**	**0.93**
of which Asia:	0.96	0.87	0.87	0.87	0.88	0.87	0.87	0.85	0.85	0.85
Total	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**

[a]Agricultural self-sufficiency ratio excludes 'other (processed) food products'

Source: Derived from the authors' GTAP Model results

Table 8: Sectoral shares of national exports, 2004 and 2030 core
(percent)

(a) 2004

	Agric. & Food	Other Primary	Manufactures	Services	Total
W. Europe	6.8	2.3	69.4	21.5	100.0
E. Europe	5.8	26.6	52.7	14.8	100.0
US & Canada	6.9	3.1	68.4	21.7	100.0
ANZ	23.3	18.1	35.4	23.3	100.0
Japan	0.5	0.1	90.1	9.3	100.0
China	3.5	1.2	88.6	6.7	100.0
ASEAN	7.4	6.2	74.3	12.2	100.0
Pacific Islands	17.1	25.2	31.9	25.7	100.0
Rest E. Asia	1.0	0.2	78.4	20.4	100.0
India	9.4	4.8	67.6	18.3	100.0
Rest S. Asia	10.2	1.7	70.7	17.3	100.0
Central Asia	8.4	53.1	26.7	11.8	100.0
Latin America	16.6	15.1	56.5	11.8	100.0
M.E. & Africa	6.1	48.0	32.5	13.5	100.0
High-income	6.5	3.9	69.5	20.1	100.0
Developing	6.7	14.6	65.6	13.1	100.0
of which Asia:	4.4	3.6	78.7	13.3	100.0
Total	6.6	7.4	68.2	17.8	100.0

(b) 2030 core

	Agric. & Food	Other Primary	Manufactures	Services	Total
W. Europe	9.0	6.8	64.3	20.0	100.0
E. Europe	5.7	47.5	35.9	11.0	100.0
US & Canada	13.5	11.6	58.2	16.7	100.0
ANZ	29.4	45.1	16.0	9.4	100.0
Japan	1.7	1.7	88.6	7.9	100.0
China	0.2	0.1	89.3	10.5	100.0
ASEAN	6.5	10.4	72.1	11.0	100.0
Pacific Islands	13.0	36.4	34.7	15.9	100.0
Rest E. Asia	1.6	0.8	80.5	17.1	100.0
India	5.3	6.8	61.1	26.9	100.0
Rest S. Asia	4.5	0.7	66.3	28.5	100.0
Central Asia	9.7	77.4	8.4	4.5	100.0
Latin America	15.4	23.2	52.3	9.1	100.0
M.E. & Africa	5.0	46.3	28.5	20.1	100.0
High-income	**9.8**	**12.8**	**60.1**	**17.4**	**100.0**
Developing	**4.8**	**14.9**	**66.2**	**14.1**	**100.0**
of which Asia:	2.6	4.4	79.5	13.4	100.0
Total	**6.9**	**14.0**	**63.6**	**15.5**	**100.0**

Source: Derived from the authors' GTAP Model results

Table 9: Sectoral shares of national imports, 2004 and 2030
(percent)

(a) 2004

	Agric. & Food	Other Primary	Manufactures	Services	Total
W. Europe	7.4	5.9	66.4	20.3	100.0
E. Europe	9.0	11.0	64.9	15.1	100.0
US & Canada	4.5	8.5	72.8	14.1	100.0
ANZ	4.9	3.9	73.2	18.0	100.0
Japan	9.6	16.3	55.0	19.1	100.0
China	4.4	8.5	77.1	10.0	100.0
ASEAN	5.8	6.8	72.7	14.7	100.0
Pacific Islands	11.8	0.8	69.0	18.4	100.0
Rest E. Asia	5.1	11.5	68.3	15.1	100.0
India	4.5	28.5	52.0	15.0	100.0
Rest S. Asia	13.5	6.9	64.2	15.5	100.0
Central Asia	7.7	5.5	63.4	23.5	100.0
Latin America	7.9	4.6	73.4	14.0	100.0
M.E. & Africa	11.4	3.5	67.9	17.2	100.0
High-income	**6.8**	**7.5**	**67.4**	**18.3**	**100.0**
Developing	**7.0**	**7.9**	**70.7**	**14.4**	**100.0**
of which Asia:	5.4	10.1	71.0	13.6	100.0
Total	**6.9**	**7.6**	**68.3**	**17.2**	**100.0**

(b) 2030 core

	Agric. & Food	Other Primary	Manufactures	Services	Total
W. Europe	6.4	6.6	65.4	21.6	100.0
E. Europe	7.6	14.1	61.2	17.0	100.0
US & Canada	3.7	9.6	72.0	14.7	100.0
ANZ	4.2	2.7	72.2	20.8	100.0
Japan	6.1	10.9	63.3	19.7	100.0
China	11.8	33.4	49.8	4.9	100.0
ASEAN	7.1	9.6	72.1	11.1	100.0
Pacific Islands	10.5	2.6	67.4	19.6	100.0
Rest E. Asia	4.4	15.0	66.4	14.2	100.0
India	3.1	52.9	36.8	7.2	100.0
Rest S. Asia	18.6	21.8	51.6	8.0	100.0
Central Asia	6.4	4.9	63.8	24.9	100.0
Latin America	6.7	8.4	70.5	14.4	100.0
M.E. & Africa	12.8	5.5	68.8	13.0	100.0
High-income	**5.5**	**8.2**	**67.2**	**19.0**	**100.0**
Developing	**9.2**	**21.3**	**59.7**	**9.8**	**100.0**
of which Asia:	8.8	26.3	56.4	8.5	100.0
Total	**7.2**	**14.2**	**63.8**	**14.8**	**100.0**

Source: Derived from the authors' GTAP Model results

Table 10: Shares of bilateral trade in global trade in all goods and services, 2004 base, 2030 core and 2030 alternative growth scenarios, and trade reform scenarios

(percent)

(a) 2004 base

Importer: / *Exporter:*	High-income	China	India	ASEAN	Rest of DevAsia	Rest of developing	Total
High Income	**51.2**	**2.7**	**0.6**	**2.4**	**3.4**	**6.7**	**67.0**
Developing	**20.2**	**3.0**	**0.6**	**2.7**	**2.8**	**3.7**	**33.0**
China	4.8	0.0	0.1	0.5	0.8	0.6	**6.7**
India	0.6	0.1	0.0	0.1	0.1	0.2	**1.0**
ASEAN	3.1	0.7	0.1	1.1	0.6	0.4	**6.0**
RDevAsia	3.7	1.7	0.1	0.6	0.5	0.6	**7.1**
RDeveloping	8.0	0.5	0.4	0.5	0.8	2.0	**12.2**
Total	**71.4**	**5.6**	**1.2**	**5.1**	**6.2**	**10.4**	**100.0**

(b) 2030 core baseline

Importer: / *Exporter:*	High Income	China	India	ASEAN	Rest of DevAsia	Rest of Developing	Total
High Income	**26.9**	**5.9**	**0.9**	**1.7**	**2.3**	**4.9**	**42.7**
Developing	**27.7**	**9.4**	**2.7**	**5.7**	**5.1**	**6.7**	**57.3**
China	12.0	0.0	0.4	2.1	2.1	1.7	18.4
India	1.5	0.4	0.0	0.3	0.3	0.6	3.1
ASEAN	3.3	2.8	0.2	1.8	0.8	0.5	9.4
RDevAsia	2.6	3.3	0.2	0.7	0.5	0.6	7.8
RDeveloping	8.3	2.9	1.9	0.8	1.4	3.2	18.6
Total	**54.7**	**15.3**	**3.6**	**7.4**	**7.4**	**11.6**	**100.0**

(c) 2030 baseline: Slower primary TFP growth

Importer: / *Exporter:*	High Income	China	India	ASEAN	Rest of DevAsia	Rest of Developing	Total
High Income	**25.4**	**6.3**	**0.9**	**1.3**	**2.0**	**4.4**	**40.2**
Developing	**32.2**	**9.8**	**2.4**	**4.7**	**4.9**	**5.8**	**59.8**
China	13.8	0.0	0.4	2.0	2.1	1.7	20.1
India	2.2	0.4	0.0	0.2	0.2	0.4	3.4
ASEAN	3.7	2.9	0.2	1.4	0.7	0.5	9.4
RDevAsia	2.9	2.9	0.1	0.5	0.4	0.6	7.4
RDeveloping	9.5	3.6	1.6	0.6	1.5	2.6	19.5
Total	**57.6**	**16.1**	**3.2**	**6.0**	**6.9**	**10.2**	**100.0**

Table 10 (continued): Shares of bilateral trade in global trade in all goods and services, 2004 base, 2030 core and 2030 alternative growth scenarios, and trade reform scenarios

(percent)

(d) 2030 baseline: Higher grain TFP growth in China, India and ASEAN

Importer: / *Exporter:*	High Income	China	India	ASEAN	Rest of DevAsia	Rest of Developing	Total
High Income	**27.0**	**5.9**	**0.9**	**1.7**	**2.3**	**4.9**	**42.7**
Developing	**27.7**	**9.4**	**2.7**	**5.7**	**5.1**	**6.7**	**57.3**
China	12.0	0.0	0.4	2.1	2.1	1.7	18.3
India	1.5	0.4	0.0	0.3	0.3	0.6	3.1
ASEAN	3.3	2.8	0.2	1.8	0.8	0.5	9.4
RDevAsia	2.6	3.3	0.2	0.7	0.5	0.6	7.9
RDeveloping	8.3	2.9	1.9	0.8	1.4	3.2	18.6
Total	**54.7**	**15.3**	**3.6**	**7.4**	**7.4**	**11.6**	**100.0**

(e) 2030 with trade reform of ASEAN+6 without agriculture

Importer: / *Exporter:*	High-income	China	India	ASEAN	Rest of DevAsia	Rest of developing	Total
High Income	**25.9**	**5.9**	**0.8**	**1.7**	**2.2**	**4.7**	**41.2**
Developing	**26.7**	**10.6**	**3.3**	**6.6**	**5.3**	**6.3**	**58.8**
China	11.5	0.0	1.1	3.2	2.4	1.5	19.6
India	1.6	0.6	0.0	0.3	0.3	0.7	3.5
ASEAN	3.0	3.7	0.4	1.5	0.8	0.4	9.8
RDevAsia	2.5	3.6	0.2	0.7	0.4	0.6	7.9
RDeveloping	8.1	2.8	1.7	0.8	1.4	3.1	17.9
Total	**52.6**	**16.6**	**4.1**	**8.3**	**7.5**	**11.0**	**100.0**

(f) 2030 with trade reform of ASEAN+6 with agriculture

Importer: / *Exporter:*	High Income	China	India	ASEAN	Rest of DevAsia	Rest of Developing	Total
High Income	**25.8**	**6.0**	**0.7**	**1.7**	**2.2**	**4.7**	**41.1**
Developing	**26.6**	**10.6**	**3.4**	**6.6**	**5.3**	**6.3**	**58.9**
China	11.4	0.0	1.1	3.2	2.4	1.5	19.6
India	1.7	0.6	0.0	0.4	0.3	0.7	3.7
ASEAN	3.0	3.7	0.6	1.6	0.8	0.4	9.9
RDevAsia	2.5	3.6	0.2	0.7	0.4	0.6	7.9
RDeveloping	8.1	2.7	1.6	0.8	1.4	3.1	17.8
Total	**52.5**	**16.6**	**4.2**	**8.4**	**7.5**	**10.9**	**100.0**

Table 10 (continued): Shares of bilateral trade in global trade in all goods and services, 2004 base, 2030 core and 2030 alternative growth scenarios, and trade reform scenarios
(percent)

(g) 2030 with trade reform of ASEAN+6 MFN

Importer: ***Exporter:***	**High Income**	**China**	**India**	**ASEAN**	**Rest of DevAsia**	**Rest of Developing**	**Total**
High Income	**24.6**	**6.7**	**1.1**	**1.9**	**2.3**	**4.3**	**41.0**
Developing	**27.1**	**10.5**	**3.5**	**6.2**	**5.3**	**6.4**	**59.0**
China	12.2	0.0	0.7	2.9	2.4	1.7	19.9
India	1.9	0.6	0.0	0.4	0.4	0.9	4.0
ASEAN	3.1	3.3	0.4	1.4	0.8	0.5	9.5
RDevAsia	2.2	3.9	0.2	0.7	0.4	0.5	8.0
RDeveloping	7.6	2.8	2.3	0.8	1.4	2.8	17.6
Total	**51.7**	**17.2**	**4.6**	**8.1**	**7.6**	**10.8**	**100.0**

(h) 2030 with of full global trade liberalization

Importer: ***Exporter:***	**High Income**	**China**	**India**	**ASEAN**	**Rest of DevAsia**	**Rest of Developing**	**Total**
High Income	**23.5**	**6.8**	**1.1**	**2.0**	**2.4**	**5.0**	**40.8**
Developing	**26.8**	**10.2**	**3.3**	**5.8**	**5.4**	**7.7**	**59.2**
China	11.8	0.0	0.6	2.6	2.3	2.5	19.8
India	1.7	0.6	0.0	0.4	0.4	0.9	3.9
ASEAN	2.9	3.1	0.4	1.3	0.8	0.6	9.1
RDevAsia	2.3	3.7	0.2	0.7	0.5	0.8	8.2
RDeveloping	8.1	2.7	2.2	0.8	1.4	2.9	18.2
Total	**50.3**	**17.0**	**4.4**	**7.7**	**7.9**	**12.6**	**100.0**

(i) 2030 core baseline, with the trade surplus for China and the trade deficit for the US forced to <1% of initial imbalance

Importer: ***Exporter:***	**High Income**	**China**	**India**	**ASEAN**	**Rest of DevAsia**	**Rest of Developing**	**Total**
High Income	**28.1**	**6.4**	**1.0**	**2.0**	**2.6**	**5.8**	**45.8**
Developing	**25.5**	**9.2**	**2.7**	**5.5**	**4.9**	**6.3**	**54.2**
China	10.4	0.0	0.4	2.0	2.0	1.6	16.3
India	1.4	0.4	0.0	0.3	0.3	0.6	2.9
ASEAN	3.2	2.7	0.2	1.8	0.8	0.5	9.2
RDevAsia	2.5	3.2	0.2	0.7	0.5	0.6	7.7
RDeveloping	8.1	2.9	1.9	0.8	1.4	3.0	18.1
Total	**53.7**	**15.6**	**3.7**	**7.4**	**7.5**	**12.1**	**100.0**

Source: Derived from the authors' GTAP Model results

Table 11: Exports plus imports of goods and services as a proportion of GDP, 2004 base, 2030 core and 2030 alternative growth scenarios, and trade reform scenarios

	Baseline scenarios					Trade reform scenarios				
	2004	2030 core	2030 Slower primary TFP	2030 Faster ACI Grain TFP	2030 incr. agric prot	ASEAN+6 No Ag.	ASEAN+6	ASEAN+6 MFN	Full trade lib.	Full trade lib'n from higher agric. prot.
W. Europe	0.66	0.70	0.79	0.70	0.70	0.70	0.70	0.71	0.75	0.75
E. Europe	0.69	0.78	0.90	0.78	0.78	0.77	0.78	0.79	0.89	0.89
US & Canada	0.27	0.31	0.35	0.31	0.31	0.31	0.31	0.31	0.33	0.33
ANZ	0.39	0.44	0.49	0.44	0.43	0.47	0.49	0.48	0.49	0.49
Japan	0.26	0.29	0.33	0.29	0.29	0.32	0.33	0.32	0.33	0.33
China	0.77	0.82	1.29	0.82	0.81	0.91	0.92	0.99	1.02	1.02
ASEAN	1.48	1.59	1.84	1.59	1.57	1.75	1.77	1.79	1.80	1.80
Pacific Islands	0.96	0.96	1.05	0.96	0.95	0.95	0.95	0.97	1.29	1.29
Rest E. Asia	1.05	1.10	1.28	1.10	1.10	1.15	1.17	1.21	1.26	1.26
India	0.37	0.46	0.62	0.46	0.45	0.55	0.58	0.66	0.67	0.67
Rest S. Asia	0.51	0.66	0.83	0.66	0.65	0.65	0.65	0.66	0.86	0.86
Central Asia	0.99	1.02	1.13	1.02	1.00	1.02	1.02	1.03	1.12	1.12
Latin America	0.49	0.58	0.70	0.58	0.58	0.59	0.59	0.59	0.67	0.67
M.E. & Africa	0.80	0.87	0.94	0.87	0.84	0.86	0.86	0.87	1.03	1.03
High-income	**0.44**	**0.48**	**0.55**	**0.48**	**0.48**	**0.49**	**0.49**	**0.50**	**0.52**	**0.52**
Developing	**0.77**	**0.83**	1.07	**0.83**	**0.82**	**0.89**	**0.90**	**0.94**	**1.01**	**1.01**
of which Asia:	0.90	0.89	1.22	0.89	0.88	0.98	1.00	1.05	1.09	1.09
Total	**0.51**	**0.61**	**0.73**	**0.61**	**0.61**	**0.64**	**0.64**	**0.66**	**0.71**	**0.71**

Source: Derived from the authors' GTAP Model results

Table 12: Shares of bilateral trade in global trade in agricultural and food products, 2004 base, 2030 core and 2030 scenario with faster grain TFP growth in ACI countries, and trade reform scenarios

(percent)

(a) 2004 base

Importer: / *Exporter:*	High Income	China	India	ASEAN	Rest DevAsia	Rest Developing	Total
High Income	**51.9**	**1.8**	**0.2**	**1.8**	**2.9**	**7.6**	**66.2**
Developing	**19.4**	**1.6**	**0.6**	**2.5**	**2.5**	**7.2**	**33.8**
China	2.4	0.0	0.0	0.4	0.5	0.2	3.6
India	0.6	0.0	0.0	0.2	0.2	0.4	1.4
ASEAN	3.0	0.6	0.3	1.2	0.7	0.9	6.7
RDevAsia	1.3	0.1	0.0	0.2	0.3	0.2	2.2
RDeveloping	12.0	0.8	0.3	0.6	0.7	5.4	19.8
Total	**71.3**	**3.4**	**0.8**	**4.3**	**5.4**	**14.8**	**100.0**

(b) 2030 core baseline

Importer: / *Exporter:*	High Income	China	India	ASEAN	Rest DevAsia	Rest Developing	Total
High Income	**30.3**	**15.1**	**0.5**	**3.2**	**3.6**	**7.4**	**60.2**
Developing	**12.2**	**10.1**	**1.0**	**4.0**	**3.5**	**9.0**	**39.8**
China	0.3	0.0	0.0	0.1	0.1	0.0	0.5
India	0.6	0.2	0.0	0.5	0.4	0.7	2.3
ASEAN	1.8	3.3	0.3	1.6	0.8	0.9	8.8
RDevAsia	0.9	1.0	0.1	0.3	0.6	0.3	3.1
RDeveloping	8.6	5.6	0.6	1.4	1.8	7.1	25.1
Total	**42.6**	**25.2**	**1.6**	**7.2**	**7.1**	**16.4**	**100.0**

(c) 2030 baseline with lower primary productivity growth

Importer: / *Exporter:*	High Income	China	India	ASEAN	Rest DevAsia	Rest Developing	Total
High Income	**29.7**	**13.4**	**0.6**	**3.4**	**3.3**	**7.8**	**58.3**
Developing	**12.2**	**11.5**	**1.0**	**4.7**	**3.0**	**9.4**	**41.7**
China	0.1	0.0	0.0	0.1	0.0	0.0	0.2
India	0.6	0.2	0.0	0.7	0.4	0.9	2.7
ASEAN	1.3	4.9	0.3	1.9	0.7	1.1	10.3
RDevAsia	0.8	1.2	0.2	0.4	0.5	0.3	3.3
RDeveloping	9.3	5.2	0.6	1.6	1.4	7.1	25.2
Total	**41.9**	**24.9**	**1.6**	**8.1**	**6.3**	**17.2**	**100.0**

Table 12 (continued): Shares of bilateral trade in global trade in agricultural and food products, 2004 base, 2030 core and 2030 scenario with faster grain TFP growth in ACI countries, and trade reform scenarios

(percent)

(d) 2030 baseline with higher grain TFP growth in China, India and ASEAN

Importer: / *Exporter:*	High Income	China	India	ASEAN	Rest DevAsia	Rest Developing	Total
High Income	**30.5**	**14.8**	**0.5**	**3.1**	**3.6**	**7.3**	**59.7**
Developing	**12.4**	**10.0**	**1.0**	**4.0**	**3.6**	**9.2**	**40.3**
China	0.3	0.0	0.0	0.1	0.1	0.0	0.5
India	0.6	0.2	0.0	0.6	0.4	0.8	2.6
ASEAN	1.9	3.4	0.3	1.6	0.8	1.0	9.0
RDevAsia	0.9	1.0	0.1	0.3	0.6	0.2	3.0
RDeveloping	8.7	5.5	0.6	1.4	1.8	7.1	25.1
Total	**42.9**	**24.8**	**1.6**	**7.0**	**7.2**	**16.5**	**100.0**

(e) 2030 with trade reform of ASEAN+6 without agriculture

Importer: / *Exporter:*	High Income	China	India	ASEAN	Rest DevAsia	Rest Developing	Total
High Income	**30.4**	**15.5**	**0.5**	**3.3**	**3.6**	**7.3**	**60.6**
Developing	**12.1**	**10.0**	**1.0**	**4.0**	**3.4**	**8.9**	**39.4**
China	0.3	0.0	0.0	0.1	0.1	0.0	0.5
India	0.6	0.2	0.0	0.6	0.4	0.7	2.4
ASEAN	1.6	3.0	0.3	1.5	0.7	0.8	7.9
RDevAsia	0.9	1.0	0.1	0.3	0.5	0.3	3.1
RDeveloping	8.7	5.8	0.6	1.5	1.7	7.1	25.4
Total	**42.5**	**25.5**	**1.5**	**7.4**	**7.0**	**16.2**	**100.0**

(f) 2030 with trade reform of ASEAN+6 with agriculture

Importer: / *Exporter:*	High Income	China	India	ASEAN	Rest DevAsia	Rest Developing	Total
High Income	**27.6**	**14.6**	**0.7**	**3.4**	**3.8**	**6.6**	**56.6**
Developing	**12.8**	**10.4**	**2.5**	**6.0**	**3.7**	**8.1**	**43.4**
China	0.7	0.0	0.0	0.2	0.3	0.0	1.2
India	0.7	0.3	0.0	0.9	0.5	0.6	3.1
ASEAN	2.4	3.7	2.1	3.0	1.0	0.7	12.8
RDevAsia	1.1	1.7	0.1	0.6	0.5	0.3	4.3
RDeveloping	7.9	4.7	0.3	1.2	1.5	6.5	22.0
Total	**40.4**	**25.0**	**3.2**	**9.3**	**7.5**	**14.7**	**100.0**

Table 12 (continued): Shares of bilateral trade in global trade in agricultural and food products, 2004 base, 2030 core and 2030 scenario with faster grain TFP growth in ACI countries, and trade reform scenarios

(percent)

(g) 2030 with trade reform of ASEAN+6 MFN

Importer: / *Exporter:*	High Income	China	India	ASEAN	Rest DevAsia	Rest Developing	Total
High Income	**27.3**	**15.3**	**0.5**	**5.0**	**3.9**	**6.1**	**58.2**
Developing	**12.9**	**10.3**	**3.2**	**4.1**	**3.3**	**8.0**	**41.8**
China	0.6	0.0	0.0	0.1	0.1	0.0	0.8
India	0.7	0.2	0.0	0.3	0.3	0.6	2.1
ASEAN	2.9	3.6	1.7	1.8	0.9	1.2	12.1
RDevAsia	1.1	1.6	0.1	0.9	0.6	0.3	4.4
RDeveloping	7.6	5.0	1.5	1.1	1.4	5.9	22.4
Total	**40.2**	**25.6**	**3.8**	**9.1**	**7.2**	**14.1**	**100.0**

(h) 2030 with full global trade liberalization

Importer: / *Exporter:*	High Income	China	India	ASEAN	Rest DevAsia	Rest Developing	Total
High Income	**23.2**	**14.5**	**0.4**	**4.4**	**3.7**	**8.4**	**54.6**
Developing	**19.8**	**7.8**	**2.7**	**3.5**	**3.8**	**7.8**	**45.4**
China	0.6	0.0	0.0	0.1	0.1	0.0	0.8
India	0.9	0.2	0.0	0.2	0.3	0.4	2.0
ASEAN	2.7	2.9	1.5	1.5	1.1	1.2	10.8
RDevAsia	1.7	1.5	0.1	0.8	0.7	0.6	5.3
RDeveloping	14.0	3.2	1.1	0.9	1.6	5.7	26.6
Total	**42.9**	**22.3**	**3.1**	**7.8**	**7.5**	**16.3**	**100.0**

(i) 2030 core baseline, with the trade surplus for China and the trade deficit for the US forced to <1% of initial imbalance

Importer: / *Exporter:*	High Income	China	India	ASEAN	Rest DevAsia	Rest Developing	Total
High Income	**29.9**	**16.4**	**0.5**	**3.3**	**3.7**	**7.9**	**61.7**
Developing	**11.4**	**9.7**	**1.0**	**3.8**	**3.4**	**8.8**	**38.3**
China	0.3	0.0	0.0	0.1	0.1	0.0	0.5
India	0.6	0.2	0.0	0.5	0.4	0.7	2.3
ASEAN	1.7	3.4	0.3	1.6	0.8	0.9	8.7
RDevAsia	0.8	0.9	0.1	0.3	0.5	0.3	3.0
RDeveloping	8.1	5.2	0.6	1.4	1.7	6.9	23.9
Total	**41.3**	**26.2**	**1.5**	**7.2**	**7.2**	**16.7**	**100.0**

Source: Derived from the authors' GTAP Model results

Table 13: Intra-and extra-regional trade intensity indexes[a] for Developing Asian countries, other developing countries and high-income countries, 2004 base, 2030 core and 2030 alternative growth scenarios

(a) 2004

	High Income	China	India	ASEAN	Rest Dev. Asia	Rest developing
HighIncome	1.08	0.68	0.67	0.69	0.80	0.94
China	0.95	0.00	0.78	1.36	1.71	0.74
India	0.81	0.98	0.00	1.40	1.42	1.85
ASEAN	0.73	2.04	1.35	3.87	1.56	0.58
RDevAsia	0.72	4.23	0.88	1.56	1.20	0.74
Rdeveloping	0.92	0.72	2.69	0.72	1.09	1.55

(b) 2030 core

	High Income	China	India	ASEAN	Rest Dev. Asia	Rest developing
HighIncome	1.17	0.88	0.56	0.54	0.71	0.97
China	1.02	0.00	0.52	1.32	1.33	0.66
India	0.88	0.78	0.00	1.17	1.15	1.65
ASEAN	0.64	1.91	0.68	2.82	1.13	0.45
RDevAsia	0.61	2.70	0.57	1.13	0.84	0.69
Rdeveloping	0.82	1.00	2.84	0.58	1.04	1.49

(c) 2030 Slower primary TFP growth

	High Income	China	India	ASEAN	Rest Dev. Asia	Rest developing
HighIncome	1.11	0.95	0.65	0.52	0.70	1.04
China	1.01	0.00	0.58	1.38	1.27	0.69
India	1.09	0.70	0.00	0.93	0.83	1.13
ASEAN	0.69	1.90	0.69	2.69	1.06	0.47
RDevAsia	0.68	2.39	0.61	1.12	0.80	0.78
Rdeveloping	0.85	1.13	2.49	0.53	1.13	1.32

(d) 2030 Higher grain TFP growth in China, India and ASEAN

	High Income	China	India	ASEAN	Rest Dev. Asia	Rest developing
HighIncome	1.17	0.88	0.56	0.54	0.71	0.97
China	1.02	0.00	0.52	1.33	1.33	0.66
India	0.87	0.78	0.00	1.18	1.15	1.67
ASEAN	0.64	1.92	0.68	2.82	1.14	0.45
RDevAsia	0.61	2.71	0.57	1.13	0.84	0.69
Rdeveloping	0.82	1.00	2.83	0.58	1.04	1.49

[a] For definitions of the intensity indexes, see text in section 3.2

Source: Derived from the authors' GTAP Model results.

Table 14: Self-sufficiency ratio in agricultural products, 2004 base, 2030 core and 2030 scenario with faster grain TFP growth in ACI countries

(a) 2004 base

	High Income	China	India	ASEAN	RDevAsia	RDeveloping
Rice	0.95	1.00	1.04	1.08	0.97	0.75
Wheat	1.22	0.84	1.03	0.11	0.74	0.67
Coarse Grains	1.04	1.01	1.03	0.92	0.39	0.88
Fruit & Veg	0.86	1.01	0.99	1.05	0.90	1.17
Oilseeds	0.95	0.47	1.01	0.79	0.31	1.17
Sugar	0.91	0.95	0.98	1.01	0.89	1.04
Cotton	1.15	0.64	1.00	0.17	0.87	1.15
Other Crops	0.88	1.80	1.04	1.07	0.92	1.33
Beef & Sheep	0.99	0.89	1.03	0.87	0.89	0.99
Pork & Chicken	0.98	1.01	1.00	1.00	0.85	1.02
Dairy	1.01	0.97	1.00	0.65	0.94	0.94
Other Food	0.97	1.03	0.97	1.17	0.84	1.01

(b) 2030 core sim

	High Income	China	India	ASEAN	RDevAsia	RDeveloping
Rice	1.02	0.98	1.09	1.00	1.00	0.72
Wheat	1.69	0.60	1.13	0.04	0.61	0.65
Coarse Grains	1.13	0.96	1.07	0.89	0.36	0.88
Fruit & Veg	1.01	0.92	0.97	1.02	0.96	1.13
Oilseeds	1.32	0.19	1.00	0.65	0.33	1.32
Sugar	0.91	0.84	0.95	0.95	0.94	1.07
Cotton	2.31	0.48	0.91	0.09	0.64	1.51
Other Crops	1.00	0.34	0.99	0.76	0.74	1.13
Beef & Sheep	1.03	0.63	0.99	0.77	0.91	1.05
Pork & Chicken	1.19	0.79	0.97	0.91	0.86	1.13
Dairy	1.02	0.93	1.02	0.69	0.95	0.94
Other Food	0.98	0.92	1.02	1.23	0.86	1.01

(c) 2030 Higher grain TFP growth in China, India and ASEAN

	High Income	China	India	ASEAN	RDevAsia	RDeveloping
Rice	0.99	0.98	1.11	1.04	0.98	0.69
Wheat	1.62	0.65	1.22	0.05	0.60	0.64
Coarse Grains	1.12	0.96	1.08	0.90	0.36	0.88
Fruit & Veg	1.01	0.92	0.97	1.03	0.96	1.13
Oilseeds	1.32	0.19	1.00	0.66	0.33	1.32
Sugar	0.91	0.85	0.95	0.95	0.94	1.07
Cotton	2.31	0.48	0.91	0.10	0.64	1.51
Other Crops	1.00	0.34	0.99	0.76	0.74	1.12
Beef & Sheep	1.03	0.64	0.99	0.78	0.91	1.05
Pork & Chicken	1.19	0.79	0.97	0.92	0.86	1.13
Dairy	1.02	0.93	1.02	0.70	0.95	0.94
Other Food	0.97	0.92	1.02	1.24	0.86	1.01

Table 14 (continued): Self-sufficiency ratio in agricultural products, 2004 base, 2030 core and 2030 scenario with faster grain TFP growth in ACI countries

(d) 2030 with higher developing country agricultural protection

	High Income	China	India	ASEAN	RDevAsia	RDeveloping
Rice	0.98	0.99	1.02	1.02	0.98	0.84
Wheat	1.53	0.71	1.08	0.03	0.67	0.72
Coarse Grains	1.08	0.97	1.06	0.88	0.38	0.89
Fruit & Veg	1.00	0.93	0.97	0.98	0.96	1.10
Oilseeds	1.30	0.18	1.00	0.69	0.34	1.28
Sugar	0.89	0.99	0.98	0.93	0.94	1.05
Cotton	2.38	0.50	0.93	0.09	0.61	1.38
Other Crops	0.99	0.34	1.00	0.73	0.75	1.10
Beef & Sheep	1.00	0.71	1.00	0.82	0.92	1.07
Pork & Chicken	1.18	0.81	0.98	0.92	0.89	1.09
Dairy	1.01	0.94	1.02	0.69	0.97	0.96
Other Food	0.98	0.91	1.02	1.23	0.84	1.00

Source: Derived from the authors' GTAP Model results

Table 15: Changes in real household consumption per capita of agricultural and food products from 2004 base, core and alternative growth scenarios in 2030, and variations from that core base due to trade reforms

(percent)

	Baseline scenarios				Trade reform scenarios				
	Core Baseline	Lower primary TFP	Higher AIC grain prod.	Increased agric prot	ASEAN+6, not agric	ASEAN+6, with agric	ASEAN+6 MFN	Full trade lib'n	Full trade lib'n from higher ag protection
W. Europe	34	25	34	34	-0.1	0.0	0.1	4.5	4.4
E. Europe	87	77	88	88	0.0	0.1	0.0	2.3	2.2
US & Canada	41	29	41	41	-0.1	0.0	0.0	0.6	0.5
ANZ	67	62	67	67	-0.1	0.3	0.1	0.2	0.2
Japan	36	29	36	36	0.6	3.6	5.5	5.7	5.5
China	226	160	228	226	0.0	0.2	0.9	1.3	2.1
ASEAN	121	88	123	120	0.9	1.7	3.4	3.6	4.4
Pacific Islands	68	76	69	68	-0.3	-0.8	0.2	6.4	7.0
Rest E. Asia	68	49	68	67	0.5	3.8	5.5	7.9	8.6
India	177	130	178	177	-0.3	0.4	1.3	1.3	1.4
Rest S. Asia	176	123	176	176	-0.4	-0.4	-0.1	1.2	1.5
Central Asia	99	109	100	99	0.0	0.2	0.6	2.0	2.7
Latin America	76	64	76	76	-0.1	0.1	0.0	0.0	0.6
M.E. & Africa	103	81	104	102	0.0	0.1	0.6	2.2	3.3
High-income	**43**	**34**	**43**	**43**	**0.0**	**0.5**	**0.8**	**3.1**	**3.0**
Developing	**139**	**105**	**140**	**138**	**0.0**	**0.5**	**1.1**	**1.9**	**2.6**
of which Asia:	167	121	168	166	0.0	0.7	1.6	2.2	2.7
Total	**66**	**47**	**66**	**65**	**0.0**	**0.5**	**1.0**	**2.5**	**2.8**

Source: Derived from the authors' GTAP Model results

Table 16: Effects on welfare and GDP of liberalizing trade in Asia and globally, 2030

(a) Change in welfare (equivalent variation in income in 2004US$ billion per year)

	ASEAN+ no ag	ASEAN+ with ag	ASEAN+ MFN	Global MFN	Global MFN from higher ag prot sim
W. Europe	-16.0	-14.8	26.4	76.3	78.4
E. Europe	-0.3	0.3	8.8	24.2	26.1
US & Canada	-11.2	-14.9	16.4	12.2	20.2
ANZ	1.4	12.1	1.0	3.9	6.7
Japan	21.8	39.4	31.6	33.0	31.8
China	2.0	-2.4	-22.0	19.9	16.0
ASEAN	31.1	40.8	42.5	50.1	51.0
Pacific Islands	-0.1	-0.3	0.1	1.2	1.2
Rest E. Asia	9.1	15.2	28.9	41.8	41.4
India	-13.2	-8.1	2.1	13.2	11.7
R. South Asia	-3.1	-3.4	-0.6	4.6	4.2
Central Asia	0.0	0.2	1.3	3.2	4.2
Latin America	-2.2	-3.4	1.5	28.9	39.1
M.E. & Africa	-3.0	-0.9	28.6	71.7	82.1
High-income	**-4.2**	**22.1**	**84.1**	**149.6**	**163.2**
Developing	**20.6**	**37.8**	**82.3**	**234.5**	**250.8**
of which: Asia	25.8	42.0	52.2	133.9	129.6
Other	-5.3	-4.3	30.1	100.6	121.3
Total	**16.3**	**59.8**	**166.4**	**384.0**	**414.0**

(b) Change in real GDP (%)

	ASEAN+ no ag	ASEAN+ with ag	ASEAN+ MFN	Global MFN	Global MFN from higher ag prot sim
W. Europe	-0.04	-0.02	0.03	0.60	0.59
E. Europe	-0.01	0.00	0.12	0.98	1.00
US & Canada	-0.01	-0.01	0.02	0.14	0.13
ANZ	0.10	0.12	0.17	0.16	0.16
Japan	0.06	0.47	0.58	0.58	0.56
China	0.13	0.13	0.45	0.53	0.63
ASEAN	0.77	0.94	2.04	2.21	2.34
Pacific Islands	-0.07	-0.24	0.09	2.68	2.86
Rest E. Asia	0.20	0.61	0.86	1.18	1.23
India	-0.13	0.21	1.28	1.37	1.38
R. South Asia	-0.15	-0.15	0.01	1.38	1.51
Central Asia	-0.03	-0.01	-0.03	0.59	0.90
Latin America	-0.06	-0.07	-0.05	0.44	0.65
M.E. & Africa	-0.09	-0.09	-0.01	1.13	1.37
High-income	**-0.01**	**0.05**	**0.10**	**0.41**	**0.40**
Developing	**0.13**	**0.28**	**0.83**	**1.52**	**1.74**
of which Asia	0.28	0.53	1.38	1.72	1.86
Other	-0.03	-0.03	-0.01	0.29	0.37
World	**0.02**	**0.09**	**0.24**	**0.59**	**0.63**

Source: Derived from the authors' GTAP Model results.

Table 17: Regional and sectoral sources of welfare gains from full global trade liberalization, 2030, core and agricultural protection growth simulations

(a) Core simulation

	Regional gain (2004$USbillion)			Regional gain (%)		
	Developing countries	High-income countries	All countries	Developing countries	High-income countries	All countries
Developing countries liberalize						
Agric and food	61	29	90	26	19	24
Other products	117	23	140	51	15	36
All products	178	52	230	77	34	60
High-income countries liberalize						
Agric and food	23	114	137	10	75	36
Other products	31	-14	17	13	-9	4
All products	53	100	154	23	66	40
All countries liberalize						
Agric and food	84	143	227	36	94	59
Other products	148	9	157	64	6	41
All products	**231**	**153**	**384**	**100**	**100**	**100**

(b) Assuming agricultural protection growth in developing countries

	Regional gain (2004$USbillion)			Regional gain (%)		
	Developing countries	High-income countries	All countries	Developing countries	High-income countries	All countries
Developing countries liberalize						
Agric and food	74	45	119	30	27	29
Other products	117	23	140	48	14	34
All products	192	68	260	78	41	63
High-income countries liberalize						
Agric and food	23	113	136	9	68	33
Other products	32	-14	18	13	-8	4
All products	55	99	154	22	59	37
All countries liberalize						
Agric and food	97	158	255	40	94	62
Other products	149	9	159	60	6	38
All products	**247**	**167**	**414**	**100**	**100**	**100**

Source: Derived from the authors' GTAP Model results

Table 18: Regional shares of global consumption of grains and fossil fuels, 2004 and 2030 core

(percent)

	2004		2030	
	Grains	Fuel	Grains	Fuel
W. Europe	11.3	19.8	6.6	10.3
E. Europe	4.9	8.4	4.0	5.9
US & Canada	5.4	24.6	4.0	14.2
ANZ	0.2	1.2	0.2	0.6
Japan	11.7	5.7	5.0	2.4
China	12.0	9.3	27.1	28.3
ASEAN	9.3	4.5	10.5	5.5
Pacific Islands	0.0	0.0	0.0	0.0
Rest E. Asia	4.6	4.7	3.3	4.5
India	13.2	3.6	12.2	11.3
Rest S. Asia	5.3	0.5	4.8	1.5
Central Asia	0.6	1.1	0.5	0.8
Latin America	8.4	6.9	6.9	6.9
M.E. & Africa	12.9	9.7	15.0	7.8
High-income	**33.6**	**59.7**	**19.7**	**33.4**
Developing	**66.4**	**40.3**	**80.3**	**66.6**
of which Asia:	45.0	23.7	58.4	52.0
Total	**100.0**	**100.0**	**100.0**	**100.0**

Source: Derived from the authors' GTAP Model results

Appendix Table A.1: Aggregations of regions in the GTAP Model[a]

Aggregations of regions	Modelled regions	Description	Original GTAP regions
W. Europe	WesternEurope	EU27 and EFTA	AUT BEL CYP CZE DNK EST FIN FRA DEU GRC HUN IRL ITA LVA LTU LUX MLT NLD POL PRT SVK SVN ESP SWE GBR CHE NOR XEF BGR ROU
E. Europe	Russia	Russia	RUS
	RestEEurope	Other Europe	ALB BLR HRV UKR XEE XER TUR
US & Canada	USA	USA	USA
	Canada	Canada	CAN
Australia&NZ	Australia	Australia	AUS
	NewZealand	New Zealand	NZL
Japan	Japan	Japan	JPN
China	China	China	CHN
ASEAN	Singapore	Singapore	SGP
	Indonesia	Indonesia	IDN
	Malaysia	Malaysia	MYS
	Philippines	Philippines	PHL
	Thailand	Thailand	THA
	Vietnam	Vietnam	VNM
	RestSEAsia	Cambodia, Laos, Brunei, Myanmar, Timor Leste	KHM LAO XSE
Pacific Islands	PacificIslands	Pacific Countries	XOC
Rest E. Asia	HongKong	Hong Kong	HKG
	SouthKorea	South Korea	KOR
	Taipei,China	Taipei,China	TWN
	RestNEAsia	North Korea, Macau, Mongolia	XEA
India	India	India	IND
R. South Asia	Pakistan	Pakistan	PAK
	Bangladesh	Bangladesh	BGD
	RestSAsia	Afghanistan Bhutan Maldives, Nepal, Sri Lanka	LKA XSA
Central Asia	CentralAsia	Arm Azeb Geo Kaz Kyr Taj Tkm Uzbek	KAZ KGZ XSU ARM AZE GEO
Latin America	Mexico	Mexico	MEX
	Argentina	Argentina	ARG
	Brazil	Brazil	BRA
	RestLatAmer	Other Latin America	XNA BOL CHL COL ECU PRY PER URY VEN XSM CRI GTM NIC PAN XCA XCB
ME & Africa	ME_NAfrica	Middle East and North Africa	IRN XWS EGY MAR TUN XNF
	SthAfrica	South Africa	ZAF
	RestSSAfrica	Sub-Saharan Africa	NGA SEN XWF XCF XAC ETH MDG MWI MUS MOZ TZA UGA ZMB ZWE XEC BWA XSC

[a] High-income countries (the 'North') are defined as the first five country groups in the table (i.e. the regions of W Europe, E Europe, US&Canada, Australia&NZ, and Japan). The rest are defined as developing countries (the 'South'), of which China, ASEAN, Pacific Islands, Rest E. Asia, India, Rest S. Asia, and Central Asia make up 'Developing Asia'.

Source: Authors' compilation from www.gtap.org

Appendix Table A.2: Aggregations of sectors in the GTAP Model

Aggregations of commodities	Modelled commodities	Description	Original GTAP sectors
Agric. & Food	Rice	Paddy and processed rice	pdr pcr
	Wheat	Wheat	wht
	Fruit_Veg	Vegetables, fruit, nuts	v_f
	Oilseeds	Oil seeds	osd
	Sugar	Raw and processed sugar	c_b sgr
	Cotton	Plant-based fibres	pfb
	Grains	Other cereal grains	gro
	OtherCrops	Other crops	ocr
	Beef_Sheep	Beef & sheep	ctl wol cmt
	Pork_Chicken	Pork & chicken	oap omt
	Dairy	Dairy products	rmk mil
	OtherFood	Other processed food	vol ofd b_t
Other Primary	Fish_Forest	Forestry and fishing	frs fsh
	Coal	Coal	coa
	Oil	Oil	oil
	Gas	Gas	gas
	OthMinerals	Other minerals	omn
Manufactures	Text_App_Lea	Textiles, apparel & leather	tex wap lea
	MotorVehicle	Motor vehicles & parts	mvh
	Electronics	Electronic equipment	ele
	OtherLtMan	Other light manufacturing	lum ppp fmp otn omf
	HeavyManuf	Heavy manufacturing	p_c crp nmm i_s nfm ome
Services	Utiliti_Cons	Utilities and construction	wtr cns
	Elect_Gas	Electricity & gas distribution	ely gdt
	Trade_transp	Trade & transport	trd otp wtp atp
	OthServices	Other Services	cmn ofi isr obs ros osg dwe

Source: Authors' compilation from www.gtap.org

Appendix Table A.3: Average annual GDP and endowment growth rates, 2004 to 2030

	GDP growth	Population growth	Unskilled labor	Skilled labor	Produced capital	Agric. land	Oil	Gas	Coal	Other minerals
W. Europe	1.48	0.14	-1.09	1.50	1.60	-0.28	2.81	0.77	-2.51	2.07
E. Europe	3.51	0.02	-0.57	1.49	4.03	-0.23	2.64	0.12	-1.86	2.07
US & Canada	2.09	0.82	0.17	1.59	1.75	-0.20	1.00	-0.14	0.19	2.07
Australia & NZ	2.78	1.07	0.31	1.89	1.59	-0.56	1.49	6.10	3.55	2.07
Japan	0.92	-0.21	-1.45	0.98	0.40	-1.14	0.00	0.00	-9.34	2.07
China	8.05	0.29	0.03	2.88	7.62	-0.36	-0.40	4.85	5.62	2.07
ASEAN	5.25	0.97	0.45	3.67	5.95	0.17	1.31	1.48	11.71	2.07
Pacific Islands	3.66	1.72	2.30	1.88	3.86	0.19	1.54	1.21	0.15	2.07
Rest E. Asia	3.47	0.31	-0.45	2.20	3.11	-0.87	0.00	0.00	-1.59	2.07
India	7.88	1.18	1.37	4.03	7.27	-0.04	0.24	0.00	4.93	2.07
Rest S. Asia	7.23	1.36	1.99	4.93	8.14	-0.10	0.27	-2.18	2.26	2.07
Central Asia	4.09	-0.46	-0.67	1.07	4.38	-0.29	2.81	0.77	-2.51	2.07
Latin America	3.81	0.92	0.78	3.32	4.85	0.22	3.29	-0.34	5.15	2.07
ME & Africa	4.55	1.92	1.04	4.16	5.46	0.05	1.27	3.64	1.89	2.07
High-income	**1.73**	**0.27**	**-0.55**	**1.49**	**1.56**	**-0.33**	**2.07**	**0.40**	**-0.26**	**2.07**
Developing	**5.28**	**1.03**	**0.52**	**3.28**	**5.81**	**-0.09**	**1.48**	**2.24**	**5.57**	**2.07**
of which Asia:	6.24	0.78	0.26	2.93	6.26	-0.16	0.72	0.93	5.93	2.07
Total	**2.45**	**0.88**	**-0.37**	**1.68**	**2.65**	**-0.17**	**1.67**	**1.23**	**2.50**	**2.07**

Source: Authors' assumptions (see text for details)

Appendix Table A.4: Implied annual growth in total factor productivity for the various sectors,[a] 2004 to 2030

(percent, using 2004 national GDP values as weights)

	2030 core			2030 Slower primary TFP				2030 Higher ACI grain productivity			
	A	**B**	**C**	**A**	**B**	**C**	**D**	**A**	**B**	**C**	**E**
W Europe	0.7	1.7	3.2	0.7	0.7	1.7	-0.3	0.7	1.7	3.2	1.7
E Europe	1.2	2.2	3.8	1.2	1.2	2.2	0.3	1.2	2.2	3.8	2.2
US & Canada	1.0	2.0	3.5	1.0	1.0	2.0	0.0	1.0	2.0	3.5	2.0
Australia & NZ	1.4	2.4	4.0	1.4	1.4	2.4	0.5	1.4	2.4	4.0	2.4
Japan	1.0	2.0	3.5	1.0	1.0	2.0	0.0	1.0	2.0	3.5	2.0
China	2.9	3.9	5.5	2.9	2.9	3.9	2.3	2.9	3.9	5.5	4.4
ASEAN	1.3	2.4	3.9	1.3	1.3	2.4	0.4	1.3	2.4	3.9	2.9
Pacific Islands	0.6	1.6	3.1	0.6	0.6	1.6	-0.5	0.6	1.6	3.1	1.6
Rest E. Asia	1.7	2.7	4.2	1.7	1.7	2.7	0.9	1.7	2.7	4.2	2.7
India	3.1	4.2	5.7	3.1	3.1	4.2	2.6	3.1	4.2	5.7	4.6
Rest S. Asia	2.2	3.2	4.7	2.2	2.2	3.2	1.4	2.2	3.2	4.7	3.2
Central Asia	1.8	2.8	4.4	1.8	1.8	2.8	1.0	1.8	2.8	4.4	2.8
Latin America	0.7	1.7	3.2	0.7	0.7	1.7	-0.4	0.7	1.7	3.2	1.7
ME & Africa	0.8	1.8	3.4	0.8	0.8	1.8	-0.2	0.8	1.8	3.4	1.8
High Income	0.9	1.9	3.4	0.9	0.9	1.9	-0.1	0.9	1.9	3.4	1.9
Total Developing	1.7	2.7	4.3	1.7	1.7	2.7	0.9	1.7	2.7	4.3	2.9
Developing Asia	2.4	3.4	4.9	2.4	2.4	3.4	1.7	2.4	3.4	4.9	3.7
Total World	**1.1**	**2.1**	**3.6**	**1.1**	**1.1**	**2.1**	**0.1**	**1.1**	**2.1**	**3.6**	**2.1**

[a] The above TFP growth rates are those implied for the non-primary sectors by the GDP and factor growth rates in Appendix Table A.3, based on the following assumptions about primary sector TFP growth. Primary sector TFP rates were exogenously set higher than those for the non-primary sectors to the following extent in the core projection for all countries, with the aim of ensuring only modest growth in international relative prices for those products (shown in Appendix Table A.5): 1% for agriculture, lightly processed food and other minerals, 0% for fossil fuels, and 2.5% for the forestry and fishing sector (N.B. the actual sectoral TFP increase implemented is a little higher than this, due to interactions with economywide TFP). In the slower primary TFP growth scenario, the increment for all primary sectors is assumed to be 1 percentage point lower than in non-primary sectors. For the higher ACI grain productivity scenario, the increment is increased in rice, wheat and coarse grains by a further 0.5% for China, ASEAN and India. For the trade reform scenarios, the core projection's TFP growth assumptions are maintained.

Column heading letters refer to:

A: non-primary sectors
B: agriculture, lightly processed food and other minerals
C: forestry and fishing
D: fossil fuel sectors (coal, oil and gas)
E: rice, wheat and other coarse grains in the higher ACI productivity growth scenario

Source: Derived from the GTAP Model, based on authors' assumptions (see text for details)

Appendix Table A.5: Cumulative changes in international prices, 2004 to 2030
(price relative to global average output price change across all sectors, percent)

	Baseline (compared with 2004)			Trade reform (compared with 2030 core)				
	2030 core	2030 slower Prim. TFP	2030 higher ACI grain TFP	ASEAN +6 no agric.	ASEAN +6 with agric	ASEAN +6 MFN	Full global lib'n	Full global lib'n from higher ag protn
Rice	9.7	22.1	4.0	0.5	-0.8	-3.2	-2.1	-4.5
Wheat	14.6	48.4	11.5	-0.4	-1.1	5.7	5.0	3.0
CoarseGrains	22.0	61.3	17.7	-0.1	-0.6	1.5	3.4	1.3
Fruit_Veg	40.8	85.8	38.6	0.2	-0.9	-4.5	-3.5	-6.8
Oilseeds	21.4	63.9	20.4	-0.3	-2.1	-2.4	2.1	1.5
Sugar	-2.0	5.3	-2.2	-0.3	-1.2	-3.5	-2.8	-4.6
Cotton	30.5	67.6	29.2	-1.3	-2.0	-2.3	5.3	4.1
OtherCrops	12.8	48.9	11.9	-0.2	-1.2	-2.0	-1.6	-1.8
Beef_Sheep	1.7	13.3	1.4	-0.3	-0.4	-0.5	-0.2	-1.0
Pork_Chicken	12.7	24.6	11.5	0.0	-0.7	-2.5	-3.0	-4.8
Dairy	-2.1	8.0	-2.2	-0.3	-0.8	-0.3	1.1	0.2
OtherFood	4.3	12.4	4.0	0.1	-0.7	-1.8	-1.9	-2.9
Forest_Fish	22.2	198.3	23.6	-0.5	-0.4	-0.8	-1.2	-0.7
Coal	-12.3	-9.6	-12.3	0.2	0.6	-0.4	0.5	0.7
Oil	35.5	102.3	35.4	0.2	0.5	2.6	0.6	1.1
Gas	10.8	54.5	10.7	-0.8	-0.3	-0.2	-1.2	-0.9
OthMinerals	23.8	91.7	23.2	0.6	0.9	-1.2	-0.6	-0.2
Text_App_Lea	-3.8	-8.1	-3.8	-0.6	-0.8	-2.0	-1.9	-2.9
MotorVehicle	0.0	-3.8	0.0	-0.2	-0.1	-0.4	-1.0	-0.9
Electronics	-5.2	-13.6	-5.1	-0.1	0.1	-0.4	0.3	0.4
OtherLtMan	-0.9	-1.2	-0.8	-0.2	-0.1	-0.4	-0.4	-0.3
HeavyManuf	1.6	6.9	1.7	0.0	0.1	-0.2	-0.3	-0.2
Utiliti_Cons	1.0	-1.1	1.0	0.1	0.2	0.2	0.1	0.2
Elect_Gas	-5.7	-7.1	-5.6	-0.1	0.0	0.2	0.2	0.4
Trade_transp	-1.5	-6.8	-1.4	0.1	0.1	0.4	0.3	0.4
OthServices	-2.3	-8.2	-2.3	0.0	0.1	0.4	0.5	0.6
Aggregate Prices:								
Agriculture_Food	8.9	24.5	8.0	0.0	-0.8	-1.7	-1.3	-2.6
OtherPrimary	24.7	100.6	24.7	0.1	0.3	0.9	-0.1	0.4
Manufactures	-0.2	0.9	-0.1	-0.1	0.0	-0.4	-0.5	-0.4
Services	-1.8	-7.0	-1.8	0.0	0.1	0.4	0.4	0.5

Source: Derived from the authors' GTAP Model results

Appendix Table A.6: Regional shares of world real GDP and population, and GDP per capita relative to world average, 2004 and the core projection for 2030[a]

	World GDP share		World population share		GDP per capita relative to world average	
	2004	**2030**	**2004**	**2030**	**2004**	**2030**
W. Europe	33.0	22.7	7.8	6.4	422.7	357.9
Russia	1.4	1.7	2.2	1.6	61.9	101.2
Rest E. Europe	1.1	1.3	2.4	2.1	47.3	61.5
USA	28.5	22.9	4.6	4.5	617.7	512.0
Canada	2.4	2.0	0.5	0.5	478.9	410.3
Australia	1.6	1.5	0.3	0.3	500.0	460.3
New Zealand	0.2	0.2	0.1	0.1	377.9	358.3
Japan	11.4	6.8	2.0	1.5	569.3	457.8
China	4.1	14.4	20.4	17.3	20.0	83.3
Singapore	0.3	0.3	0.1	0.1	391.0	426.7
Indonesia	0.6	1.2	3.4	3.4	18.1	36.0
Malaysia	0.3	0.5	0.4	0.4	72.2	113.4
Philippines	0.2	0.5	1.3	1.5	16.2	33.1
Thailand	0.4	0.6	1.0	0.9	39.7	68.8
Vietnam	0.1	0.3	1.3	1.3	8.1	24.4
Rest SE Asia	0.1	0.1	1.1	1.1	4.6	7.6
Pacific Islands	0.1	0.1	0.1	0.2	38.2	37.4
Hong Kong	0.4	0.4	0.1	0.1	366.1	393.4
South Korea	1.7	1.8	0.7	0.6	222.0	296.3
Taipei,China	0.7	0.9	0.4	0.3	209.7	315.5
Rest NE Asia	0.1	0.1	0.4	0.3	15.8	26.6
India	1.6	5.3	17.0	18.1	9.2	29.3
Pakistan	0.2	0.7	2.4	2.9	9.6	24.6
Bangladesh	0.1	0.4	2.2	2.3	6.3	18.0
Rest South Asia	0.1	0.2	1.2	1.3	6.9	14.4
Central Asia	0.2	0.3	1.1	0.8	17.8	34.0
Mexico	1.7	1.7	1.7	1.6	101.0	100.8
Argentina	0.4	0.7	0.6	0.6	61.3	117.1
Brazil	1.5	2.3	2.9	2.7	52.4	83.9
Rest L. America	1.7	2.1	3.5	3.7	49.6	56.9
M.E. & N Africa	2.7	3.7	5.3	6.0	51.5	61.7
South Africa	0.5	0.6	0.7	0.7	70.8	92.1
Rest SS Africa	0.8	1.8	10.7	15.0	7.1	12.3
High-income	79.6	59.0	20.0	16.9	398.7	349.9
Developing	**20.4**	**41.0**	**80.0**	**83.1**	**25.5**	**49.3**
of which Asia:	11.1	28.1	54.6	52.8	20.4	53.2
World	**100**	**100**	**100**	**100**	**100**	**100**

[a] 2004 prices.

Source: Derived from the authors' GTAP Model results

Appendix Table A.7: Average import-weighted tariff protection rates, 2030

(percent)

	2030 core rates (same as 2004)			*2030 agric rates, assuming higher developing country agric protection*
	Agric & food	**Other Primary**	**Manufactures**	
W. Europe	6.7	0.0	1.1	6.6
E. Europe	13.8	0.5	6.1	13.8
US & Canada	5.6	0.2	2.0	5.8
ANZ	2.2	0.0	4.2	2.2
Japan	23.1	0.1	1.0	23.5
China	10.5	0.6	6.4	19.2
ASEAN	12.5	0.9	4.9	18.3
Pacific Islands	22.8	0.9	8.5	32.8
Rest E. Asia	24.3	4.4	3.5	33.6
India	31.3	10.7	13.4	45.8
Rest S. Asia	12.3	5.8	14.9	17.2
Central Asia	11.7	0.1	5.5	22.3
Latin America	7.6	1.5	6.7	19.3
M.E. & Africa	13.0	3.3	9.8	27.1
High-income	**8.5**	**0.1**	**1.8**	**8.5**
Developing	**12.6**	**3.2**	**6.9**	**22.0**
of which Asia:	13.0	3.3	6.2	21.0
Total	**10.9**	**2.2**	**4.0**	**15.9**

Source: Derived from the authors' GTAP Model results