TOWARDS AN APEC FOOD SYSTEM

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Revised October 1999

Draft of a report prepared for New Zealand's Ministry of Foreign Affairs and Trade, Wellington. Thanks are due to Robert Scollay and Anna Strutt for helpful discussions and

MFAT for financial support. The views expressed are entirely those of the author and not necessarily those of the New Zealand Government.

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ABAC	APEC Business Advisory Council
AFTA	ASEAN Free Trade Area
APEC	Asia Pacific Economic Cooperation
ASEAN	Association of South East Asian Nations
ASEAN-4	Indonesia, Malaysia, Philippines and Thailand
ATC	Agreement on Textiles and Clothing
EU	European Union
GATT	General Agreement on Tariffs and Trade
LAMIS	Labelling, quality assurance and market information services
MFA	Multi-fibre Arrangement
MFN	Most favoured nation
MTN	Multilateral trade negotiations
NAFTA	North American Free Trade Agreement
NGO	Non-government organization
NIEs	Chinese Taipei, Hong Kong, Singapore and South Korea
OECD	Organisation for Economic Cooperation and Development
PECC	Pacific Economic Cooperation Council
SOE	State-owned enterprise
SPS	Sanitary and phytosanitary
STE	State trading enterprises
TRQ	Tariff-rate quotas
VER	'Voluntary' export restraint
WTO	World Trade Organization

Executive summary

What is an APEC Food System?

Leaders of APEC's 21 member governments are committed to achieving free and open trade and investment and to better trade facilitation and greater economic and technical cooperation within the APEC region. Considerable progress has already been made towards those goals, but least so in the food sector. The latter needs to be addressed urgently, not only because of the wastefulness of current policies but also because the vast majority of the region's poor depend heavily on agriculture for their livelihood.

With this in mind, the APEC Business Advisory Council (ABAC) proposed in September 1998 that APEC leaders take joint action to develop a so-called APEC Food System to boost the food sector's contribution to the prosperity of APEC's economies. While not doubting the region's capacity to continue to meet its aggregate food needs, the question raised by ABAC is whether demand could be met in a more efficient and environmentally responsible way, and in such a way that people feel more food-secure and the poor are better off.

ABAC recognises the historical sensitivities associated with food, but nonetheless sees new high-pay-off opportunities emerging to do much better with respect to the food sector, as regional cooperation and economic interdependence with respect to other sectors progressively deepens. It sees the need for action in three interrelated areas:

- developing more extensive rural infrastructure, in terms of both physical and human capital;
- importing, adapting and adopting new farm and food technologies; and
- reducing impediments to international food trade and investment.

Why is now the time to focus on food?

There are strong reasons as to why initiatives should begin immediately to foster ABAC's concept of an APEC food system. They can be grouped under the headings of equity, economic efficiency, technological, environmental, and political perspectives.

In terms of **equity**, since the vast majority of the region's poor live in rural households and depend on food production for their livelihood, boosting their productive capacity is an essential component to any poverty reduction program. But reducing agricultural protectionism abroad also helps them, through raising the prices of their products in international markets. Cutting agricultural protection has equitable outcomes within the protectionist economies too: it helps poor consumers most because they spend the largest proportion of their household budget on food, and it often hurts small producers least because they usually have off-farm work.

In terms of **economic efficiency**, under-investment in rural physical infrastructure means there will be fewer resources employed in rural areas and more in urban areas than is optimal, thereby reducing national economic welfare. The same is true if there is under-investment in human capital in rural areas. These under-investments necessarily lower the level and growth of productivity and incomes of people in rural households, and encourage more of them to migrate to urban areas than would otherwise be the case. In the richer economies that are offering farmers protection from market forces, there is the opposite problem: too many resources are employed in agricultural production. Postponing reform is simply delaying the time when those greater economic gains can begin to be reaped.

In terms of **technology**, there is considerable under-investment in agricultural research in APEC developing economies. That degree of under-investment is escalating as new breakthroughs in bio-technology raise the rewards from agricultural research. The nature of those new technologies is such that, much more than in the past, there needs to be legal protection of the intellectual property involved. If developing economies cannot enforce plant variety rights, the technology is much less likely to develop or be transferred there. And even if it is imported for use in export industries, those economies then need to be aware of the restrictions being placed by other countries on imports of products produced in particular ways, such as genetically modified products.

The current pattern of distortions to agricultural incentives, which encourages farming in protected rich countries and discourages it in poor countries, is also bad for the **natural environment**. Artificially high food (and hence farmland) prices in rich economies encourage the use of output-expanding/land-saving inputs such as fertilizer and pesticides, which can have adverse environmental effects. Lowering food prices in these economies would encourage more export-oriented production in other economies where, because of their lower food prices and hence lower level of use of pollutive inputs, any extra environmental damage would be less than that saved in the high-price country. A boost to investment in rural infrastructure, together with higher real incomes of rural households from farm activities, will reduce the pull to urban areas and thereby slow the crowding and polluting of mega-cities in developing economies. Since environmental and social problems in those big cities are escalating, the sooner measures that can reduce them are in place the better.

Finally, now is an ideal time **politically** to commit to developing the APEC food system, and thereby contributing to meeting APEC's Bogor commitment to free trade by 2010/2020, for two key reasons. One is that four APEC members, all of great importance to APEC food trade, are in the midst of WTO accession negotiations (China, Chinese Taipei, Russia and Vietnam). Since these economies will have to reform their agricultural domestic and trade policies substantially over the next few years to satisfy WTO accession requirements, APEC can smooth the adjustments to those reforms by simultaneously developing its food system. The other political reason is because a new WTO round of multilateral farm trade negotiations is to be launched at the end of 1999. Making commitments in that Round to opening agricultural markets further will benefit food-importing economies in the sense that the quid pro quo will be greater access for their non-farm exports to the markets of other WTO members. Such commitments would be easier to adjust to if APEC's food system were being developed at the same time.

How would the system affect APEC economies?

In the absence of policy changes, agriculture is going to decline relatively in all APEC economies as they develop. What is also clear is that even massive increases in agricultural protection – as have been provided in Northeast Asia since the 1960s – have failed to prevent that relative decline, and have also failed to prevent food self-sufficiency from decreasing. It is therefore to be expected that if that protection growth were reversed, it too would not have a very large impact on the rate of relative decline of the sector being reformed.

Yet such reform would have major positive impacts at home and abroad. Globally, agricultural markets are the most distorted of any goods markets. Model simulation results suggest that almost one-third of the estimated global gains from goods trade liberalization would come from agricultural reform in advanced industrial economies -- even though farmers in those economies contribute only 4 per cent of global GDP and barely any more of global exports. Developing countries have almost as much to gain from that reform as they do from removing their own trade-distortionary policies.

At home in the reforming country, cutting farm protection would lower food costs for consumers and boost production in and exports from other sectors, raising overall economic welfare.

Abroad, it would enhance earnings for farm households elsewhere in APEC, the vast majority of which are homes to among the region's poorest people. If coupled with increased investments in rural infrastructure and technology transfers through greater technical cooperation, those developing economies could see their farm sectors making much closer to their optimal contribution to growth and development. That in turn could induce those economies to reduce their own anti-agricultural, anti-rural infrastructure, anti-trade policy biases. Growth in their farm production, incomes and exports would be accelerated, a by-product of which would be expanded opportunities for advanced industrial economies to export non-farm products to those poorer and more agrarian economies.

APEC trade promotion, as with most trade liberalizations, benefits mostly the economies undertaking the greatest reform. But because of relative proximity and cultural affinities, and because there are strong complementarities between APEC's resource-rich and resource-poor economies (about 70 per cent of both food and non-food trade of APEC economies is intra-regional), and because much of the remaining protectionism restricts the

exploitation of those complementarities, it turns out that the gains from APEC regional liberalization are heavily concentrated within the region. This is true even if APEC is assumed to liberalize its trade on a non-discriminatory MFN basis. Indeed in the case of agricultural reform, virtually all of the gains from APEC liberalization remain in the APEC region. That is, there is no significant 'free riding' by non-APEC economies in the case of unconditional MFN food trade reform in APEC.

A marketable surplus of food and the emergence of cash cropping in developing economies depend crucially on the provision of rural roads, radio, post and telecommunication infrastructure to lower the cost of transport, information and communication. Constructing and maintaining those infrastructures, and rural electrification, provide off-farm work for farm households; but, more importantly, those infrastructures spawn additional new service-sector jobs in rural areas and elsewhere for transporting, grading, processing, packing, and distributing the marketed farm products. The opening up or extending of rural roads and communications, and investments in irrigation, also expand the effective demand for purchased farm inputs such as improved seed varieties, chemical fertilizers, pesticides, farm machinery, and fuel, and make rural industrialization more profitable for unskilled labour-intensive industries not connected to primary sectors. Manufacturing activities that have the flexibility to close temporarily during peak seeding/transplanting and harvesting periods would be especially likely to be attracted to rural areas. The new jobs created by those off-farm activities have been shown to contribute substantially not only to economic growth but also to reducing absolute poverty and rural-income inequality in many modernising agrarian economies. Since they also slow the growth of urban pollution and congestion, all this suggests a high social rate of return to investments in rural infrastructure.

Despite very high social rates of return, real levels of public funding for agricultural research in developing economies has been virtually stagnant for more than a decade. Moreover, the extent of under-investment in this activity is growing because new breakthroughs in bio-technology are boosting returns from such research. However, the nature of those new technologies is such that there needs to be legal protection of the intellectual property involved. If developing economies cannot provide that, the technology is much less likely to be transferred there or to develop domestically. Technical cooperation may well be able to reduce the risk of the technology gap between rich and poor economies widening.

What about food security?

Sometimes it is presumed that food security is the same thing as food self-sufficiency. That is not so. Rather, food security refers to a country's capacity to ensure that everyone always has access to the minimum supply of basic food necessary for survival. A certain level of income per capita plus a well-functioning market for staple foods, including from abroad, can therefore ensure that a person, household or nation is food-secure.

However, if a society would feel too food-insecure under laissez faire, what needs to be determined is a sense of (a) its willingness to pay for more security by various means, and (b) the costs of those insurance measures. One such measure involves encouraging the holding of food stocks above those that would be commercially viable. Even if greater domestic production capability was considered by society to be one of the desirable means of boosting food security, there are far less costly ways of achieving that than farm product price supports and import protection. In particular, there are the first two components of the ABAC proposal for an APEC food system: boosting rural infrastructure and the use of new farm technologies. Technical cooperation and subsidies to agricultural research and extension are likely to be very high pay-off alternatives to propping up producer prices artificially. This is especially so if import restrictions rather than direct payments are the means by which prices are currently being supported (since import restrictions not only support producer prices but also raise consumer prices).

What actions are needed to develop the System?

Both food-exporting and food-importing APEC economies have reasons to actively support the launch of a new WTO round at the WTO Trade Ministerial at the end of 1999: the former to ensure agriculture is high on the agenda of that new negotiating round, the latter to ensure manufacturing as well as services are also on the agenda, so there are enough possibilities for inter-sectoral trades in market access. Given the high propensity of APEC economies to trade intra-regionally, the trade growth generated within the APEC region by such WTO negotiations will be similar to that which would result from regional negotiations.

But there are two additional advantages of doing this through the WTO process: it encourages non-APEC economies to reform as well, and it leads to legal bindings on reform commitments.

Both groups of economies would benefit if the accession negotiations for the four remaining APEC economies not yet members of the WTO were accelerated. This is especially true of China. Intensified pressure to speed China's remaining negotiations should be an immediate priority for all APEC members, not least to lock that economy in to low bound tariffs on food. The latter is crucial at this early stage of China's industrialization so as to prevent it following the costly path of agricultural protection growth that its neighbours have followed during recent decades.

For those food-importing economies having to forego the continued use of protection growth to slow the relative decline of their farm sectors and the fall in food self-sufficiency, other more-efficient policy options are available to meet the political pressures they confront. For example,

- much more effective than price supports for boosting farmers' incomes are targeted direct income supports, including re-training grants to boost farmers' prospects of securing a better-paying non-farm job;
- boosting food self-sufficiency through import protection is a very high-cost way of trying to achieve food security, compared with investing more in domestic agricultural research to boost farm productivity, encouraging more buffer stock-holding, and signing long-term contracts with a diversified group of food exporters to reduce the risk of supply cut-offs when some have a poor season; and
- food quality and safety can be secured just as much via imported products as via locally produced ones, for example through clear labelling requirements, and likewise for managing health risks to plants and animals.

1

What is an APEC Food System?

Leaders of APEC's 21 member governments are committed to achieving free and open trade and investment within the APEC region by 2010 for advanced economies and 2020 for developing economies. They are also strongly committed to better trade facilitation and greater economic and technical cooperation within the region. Much progress has been made towards those goals since the free-trade commitment was first made at Bogor in November 1994 and repeated at the two subsequent meetings of leaders.

However, reform progress has been slowest with respect to food, despite the fact that the vast majority of the region's poor depend heavily on agriculture for their livelihood. Food trade liberalization also has been slow in the WTO and in numerous sub-regional free trade areas, but that simply underlines the need for this sector to catch up.

With this in mind, a call was made at the Third Meeting of the APEC Business Advisory Council (ABAC), in Chinese Taipei in September 1998, for APEC Economic Leaders to take joint action. ABAC's proposal is to develop a so-called APEC Food System that better links farmers, food processors and consumers so as to boost the food sector's contribution to the prosperity of the APEC economies. More specifically, its objectives are to ensure the region's resources meet consumers' food needs more efficiently and securely than at present so that the food sector maximizes its contribution to national and regional growth and development. These goals are seen to require urgent action by government leaders of APEC economies, in collaboration with the private sector, to better facilitate:

- investment in rural infrastructure,
- transfer and dissemination of new technologies, and
- promotion of international trade and investment in food products.

Each of these activities will have a high social pay-off on their own so it is not necessary to wait on the first two before reducing trade barriers, for example. However, the interrelationships

between them are such that if they are pursued in parallel they will reinforce each other and provide an even bigger gain.

Few question the region's capacity to continue to meet its aggregate food needs. Rather, the question raised by ABAC is whether demand could be met in a more efficient and environmentally responsible way, and whether by doing so people would feel more food-secure and the poor in particular in APEC (who comprise one-third of the world's poor) would be better off.

ABAC recognises the historical sensitivities associated with food in the APEC region (as elsewhere), over issues such as food security and rural lifestyles. It acknowledges those as valid concerns, but also sees new opportunities emerging to do better with food as regional cooperation and economic interdependence with respect to other sectors progressively deepens.

Among the challenges facing the region that have stimulated this call for action are the variability in food quantities and prices in some economies, declines in area and quality of arable land (particularly in rapidly industrializing economies), and underinvestment in agricultural research, rural infrastructure and food distribution systems.

ABAC sees APEC as uniquely placed to address these and other pressing issues through cooperative action to build a more robust and interdependent food system in the region. More than that, it sees the development of such a food system as a necessary step towards achieving APEC's vision and goals for the region, and one which will have a very high pay-off for the region's economy, environment, and society generally.

Investment in rural infrastructure

The development of more extensive rural infrastructure is seen by ABAC as an essential and integral part of building a more efficient and robust regional food system. Investments in both physical and human capital are stressed.

Physical capital needs include electricity plus the various forms of transport and communication infrastructures required to improve the efficiency of:

- delivering agricultural inputs to farmers,
- getting farm outputs to storage and processing plants and to final markets, and
- keeping farmers and processors informed of changing market circumstances.

A more extensive, efficient and sophisticated distribution system is required as an increasingly urbanized population consumes a greater range of ever-higher quality and more processed food products, and as farmers demand more off-farm services. Those services needed to boost farm productivity include the supply of inputs, credit and transport, packaging, processing and marketing services. They can be provided by the private sector, thereby adding to the demand for labour in rural areas for off-farm jobs; but they will materialize only if sound macroeconomic policy and domestic regulatory environments are in place.

Furthermore, the increasing sophistication of food production, processing and marketing requires increasingly better-educated workers to emerge from farm households. All the empirical research shows that investments in basic education yield a huge return for farm households in two respects. First, for those members that stay on the farm, their decision-making will be closer to optimal the better educated they are. And second, for those that choose to seek off-farm work, they will find a job and adapt quicker and easier, as well as earn more, the greater their schooling. Basic rural health care investments yield a similarly high pay-off. And the payoffs are at least as high for females as for males.

With better physical infrastructure and a better-educated and healthier population, the scope for rural areas to attract industrial and service sector activities is enhanced. That in turn enhances the off-farm employment opportunities for farm households without the need for long-distance migration to large urban centres.

Transfer and dissemination of new technologies

The second area stressed in the ABAC proposal has to do with the adoption of new farm and food technologies. Historically, agricultural productivity growth has been even faster than productivity growth in manufacturing. As well, new technologies are capable of making food safer and raising its quality, and of reducing any harm to the environment caused by farming. These properties are valued more and more as people's incomes grow and as the natural environment comes under stress.

Such new technologies are not evenly spread across the APEC region, however. Rather, they tend to be confined to the few (often richer) economies where the innovations have arisen. This is not surprising, for two reasons. One is because the poorer economies spend a much smaller percentage of their agricultural value added on public agricultural research and hence on importing and adapting technologies developed abroad. The other is

because the private sector depends on sound property rights law being enacted and effectively enforced before it is willing to invest in producing or transferring many of the new technologies. Hence private agricultural research as a percentage of agricultural value added also is relatively low in poorer economies.

This suggests a great deal of scope for regional cooperation in the following areas:

- distributing information on more efficient and environmentally sound farm and food technologies,
- disseminating ways to enact and enforce legislation to better protect intellectual property rights, the environment, and consumers concerned with the safety of food so as to attract more private investment in technology transfer, and
- aiding governments in their support of those investments in farm technologies that are under-supplied by the private sector because the gains are too difficult for the innovator or disseminator to capture via the market.

Promotion of international trade and investment in food

The food sector of many APEC economies is much less integrated with international markets than other goods-producing sectors, because of major impediments to international food trade and investment. This has resulted in lower product prices for farmers and higher food prices for consumers than are necessary in many locations. In cases where prices are subsidized, there is also a burden on taxpayers. The limits on food trade and on foreign direct investment in agriculture and food processing are severely constraining agricultural and rural development in the APEC region, especially in developing economies.

Specifically, poor economies tend to discourage food production and exports while rich economies tend to discourage food import competition, either with trade taxes or various forms of non-tariff barriers to trade and investment flows across borders. These and related domestic policies such as producer price support programs in rich economies tend to have offsetting effects on international food prices, but they reinforce each other in reducing the volume and increasing the volatility of international food trade.

ABAC recognizes that food market interventions by governments arise in part because of such concerns as food security and farmer contributions to the rural environment. However, it sees scope for those and other national policy objectives being met in much more

efficient ways than at present. It also sees other impediments to food trade. Specifically, it calls for cooperative action by APEC members to:

- facilitate trade through harmonizing customs procedures and exchanging regulatory information to lower the cost of trading food products,
- provide technical assistance to better assess sanitary and phytosanitary procedures where they are unduly limiting trade in food products,
- share information on food safety and negotiate for the harmonization or mutual recognition of food safety standards adopted for the benefit of consumers, and
- consistent with but ahead of APEC trade reform commitments, encourage:
  - progressive reductions in tariffs,
  - phase-out of WTO-inconsistent non-tariff barriers,
  - eventual elimination of export subsidies, and
  - make domestic agricultural support programs transparent and WTO-consistent.

In its 1999 Report to APEC Economic Leaders, ABAC also recommended the region commit to abolishing export taxes and quantitative restrictions on exports.

Why is now the right time to focus on this ABAC proposal? What would be its effects? In particular, how would food security in the region be affected? What initiatives or actions are still required by governments, non-government organizations (NGOs), and the private sector to ensure its development, and what policy options are available for contributing and adjusting to it? These are the key questions addressed in the remainder of this report.

2

Why is now the time for APEC to focus on food?

There are strong reasons as to why initiatives should begin immediately to develop the ABAC concept of an APEC food system. They can be grouped under the headings of equity, economic efficiency and growth, technology transfer, environmental issues, and/or political/strategic considerations.

Equity reasons

An obvious reason for wanting to improve the food sector in APEC economies is because the vast majority of the region's poor live in rural households and depend on food production for their livelihood. As many as one-third of the world's poor -- about 450 million -- live in the rural areas of APEC's developing economies. Boosting their productive capacity is an essential component to any poverty reduction program. And reducing agricultural protectionism abroad also helps them, since it raises the prices of their products in international markets.

Another obvious equity aspect to consider is the distribution of rewards from agricultural support programs in the protectionist economies themselves. Raising domestic prices of food hurts all food consumers but it hurts poor households most, since they are the ones that spend the largest proportion of their household budget on food.

One might also assume that higher food prices help the largest farmers most, since higher prices assist in proportion to producers' output volume. The benefits to farmers, however, get capitalized into the value of land. Hence it is really only the owners of land at the time protection is introduced who benefit, as subsequent buyers pay a higher price for the land, and tenants see their rent go up commensurately. Those lucky original landowners benefit in proportion to the size and quality of their holding, which is hardly equitable. Removing

long-standing support programs by contrast, hurts current landowners, and they may not be the original gainers from the program. The longer the delay in removing such policies, the more likely it is that those whose wealth is reduced by the reform are not the same as those who gained in the first place from the programs -- yet another inequity, and one that worsens over time.

Economic efficiency and growth reasons

While there is under-investment in rural physical infrastructure such as roads, telephones and electricity, there will be fewer resources employed in rural areas and more in urban areas than is optimal, thereby reducing national economic welfare. The same is true if there is under-investment in human capital in rural areas (basic education and health, agricultural research and the dissemination of new technologies). These under-investments necessarily lower the level and growth of productivity and incomes of people in rural households, and encourage more of them to migrate to urban areas than would otherwise be the case.

In the richer economies offering farmers protection from market forces, there is the opposite problem: too many resources are employed in agricultural production. That too reduces national economic welfare. And because the producer benefits get capitalized into land values over time, there is pressure for ever-higher rates of protection to maintain farm incomes net of the rising opportunity cost of owning land (or of rent). This too is an argument for reforming support policies sooner rather than later.

Both types of distortion to incentives do more than reduce the efficiency of resource allocation at a point in time. In addition, especially if governments intervene sporadically or unpredictably, these distortions also lower the incentives to invest in general and reduce the likelihood of investments going to areas with the highest social pay-off. That is why we observe economies growing faster the less they are distorted. Postponing reform is simply delaying the time when those greater economic gains can begin to be reaped.

Technical innovation reasons

In the past, developing country efforts to invest in agricultural research had been supplemented to a considerable degree by private and official aid flows, including to the highly successful system of international agricultural research centres coordinated through the World Bank. Despite the very high measured rates of return to those investments, funding agencies decided from the late 1980s to put their proirities elsewhere -- perhaps because they interpreted the extremely low international food prices of the mid-1980s as a sign that world food problems had been solved. Real funding levels for this type of aid have remained low in the decade or so since, and national public funding for agricultural research in developing economies has not made up the shortfall. Hence there is even more under-investment in this activity now than there was prior to the 1990s.

Moreover, that degree of under-investment is escalating as new breakthroughs in bio-technology raise the rewards from agricultural research. Those breakthroughs have the potential to accelerate the pace of technological change in agriculture to the point of providing a rival to the 'green revolution' adoption of dwarf wheat and rice varieties in the 1960s. However, the nature of those new technologies is such that, much more than in the past, there needs to be legal protection of the intellectual property involved. In the case of genetically modified (GM) crops, for example, the further development of new seeds by the private sector will depend on seed companies being able to sell new seed to growers each year (rather than farmers simply withholding a part of this year's crop for next year's seed). If developing economies cannot enforce the property rights inherent in GM seeds, the technology is much less likely to develop or be transferred there.

As well, developed and other economies are rapidly introducing consumer legislation concerning GM products, especially labelling laws. This could well become a contentious area in trade negotiations, and is already showing up at the WTO. It will thus add complexity to exporting food to such economies, with outcomes ranging from the need for different labels for different destinations through to outright bans of imports from some sources.

Clearly there is an urgent need for technical cooperation in setting own-country standards, in meeting other economies' standards in cases involving exports, and in intellectual property law drafting and enforcing so as to facilitate investment in transferring, adapting and producing new farm technologies.

Environmental reasons

The above-mentioned distortions to agricultural incentives, that tend to encourage farming in protected rich economies and discourage it in poor economies, are generally bad for the natural environment. Artificially high food (and hence farmland) prices in rich economies encourage the use of output-expanding/land-saving inputs such as fertilizer, pesticides and irrigation for crops and intensive feedlots, veterinary products and growth hormones for livestock -- all of which can have adverse environmental effects. A fall in farm profitability in industrial economies as protection for their farmers is cut would encourage more labour and capital to be employed in non-farm sectors, most likely the dominant services sector which pollutes little. Lowering food prices in these economies would encourage more export-oriented production in other economies where, because of their lower food prices and hence lower level of use of pollutive inputs, any extra environmental damage would be less than that saved in the high-price country. This is especially so because typically high-price economies tend to be more densely populated than low-price economies, ensuring land prices are higher there and hence so too is the use of land-saving pollutive inputs.

By contrast, in poor agrarian economies where policies depress agricultural output, reform there would encourage more labour and capital to be employed in commercial agriculture. Those productive factors would come from other activities where they may well be contributing more environmental damage than they would in an expanded commercial agricultural sector. One possible source is from manufacturing, which in many newly industrializing economies can be quite pollutive until incomes rise sufficiently for people to demand stricter enforcement of environmental policies. Another possibility, particularly in less-advanced economies, is that underemployed labour will be attracted to commercial farming. Whether such workers come from the urban slums or from rural areas, they are likely to do less environmental damage in their new job. In the case of workers who would otherwise be eking out a subsistence income by squatting on marginal hillsides, less deforestation and soil degradation on those hillsides would result. As well, the increased value of rural labour would raise the opportunity cost of collecting and chopping wood for fuel. Cleaner fuels such as kerosene would then be used instead and forests would be depleted less as a result. This positive effect on the environment could be substantial, given that four-fifths of logs felled in developing economies are used as fuel.

A further environmental benefit of developing ABAC's proposed food system has to do with its rural infrastructure component. A boost to investment in rural infrastructure will enable rural areas to participate more in non-farm productive activities, instead of those activities being confined exclusively to urban areas. That, together with higher real incomes of rural households from farm activities, will reduce the pull to urban areas and thereby slow the crowding and polluting of mega-cities in developing economies (and APEC already has the majority of such cities with more than 12.5 million people, in Shanghai, Mexico City, Beijing, Jakarta, Seoul, Manila and Tianjin, the non-APEC ones being Sao Paulo, Bombay, Lagos, Buenos Aires and Calcutta). Since environmental and social problems in those mega-cities are escalating, the sooner measures that can reduce them are in place the better.

Political/strategic reasons

Now is an ideal time in a political sense to commit to developing the APEC food system, and thereby contributing to meeting APEC's Bogor goal of free trade by 2010/2020, for two key reasons. One is that four APEC members, all of great importance to APEC food trade, are in the midst of WTO accession negotiations. They are China, Russia, Chinese Taipei and Vietnam. A major focus of each of their accession negotiations is on import market access for agricultural products. Since these economies will have to reform their agricultural domestic and trade policies substantially over the next few years to satisfy WTO accession requirements, APEC can smooth those adjustments to those reforms by simultaneously developing its food system.

The second political reason for now being an ideal time to launch the ABAC proposal for an APEC food system is because a new WTO round of multilateral trade negotiations is to be launched at the end of 1999. Those new negotiations are required to include food and services, but may be more comprehensive. Making commitments in that Round to opening agricultural markets further will benefit food-importing economies in the sense that the quid pro quo will be greater access for their exports to the markets of other WTO members. Such commitments would be easier to adjust to if APEC's food system were being developed at the same time.

For both these reasons, the political cost of introducing reforms consistent with the development of APEC's food system will be less over the next few years than at a later period.

3

How would the system affect APEC economies?

In thinking about how the development of an APEC food system would impact on the region's economies, it is first necessary to think of what those economies would be like in a few years without that development. The Appendix to this report provides a more technical explanation of the changing role of agriculture as an economy develops. The first part of this section draws on that Appendix to present a reference scenario. The second part explains how that scenario could be altered with ABAC's proposed APEC food system.

APEC economies in 2005 without further development of APEC's food system

There is almost as much diversity among the 21 economies of APEC as there is in the world as a whole. They range from among the richest to among the poorest in the world, and from the most to the least densely populated. Equations (1) and (2) in the Appendix shows that agriculture's shares of GDP and employment are very significantly related, negatively, to GDP per capita. That is, agriculture declines in relative importance as an economy develops. Equation (3) shows the share of agriculture in national exports also is negatively related to GDP per capita, although much less strongly; and equally significant is the country's population density. That is, more-densely populated economies tend to become net food importers at an earlier stage of economic development, and lightly populated economies may retain a comparative advantage in agriculture through developing new labour-saving technologies as real wages rise. A country's comparative advantage in agriculture also is stronger: the more agreeable are climate, rainfall and soils for plant growth; the greater the extent to which land has been cleared of forests and is arable; and the fewer proven mineral reserves there are per capita.

Given all those determinants of comparative advantage, it is not surprising that when economies are ranked according to their revealed comparative advantage in food and agricultural products, the ranking is not even close to that by per capita GDP. Table 1 ranks APEC economies by their farm trade specialization index, defined as exports minus imports of food and agricultural products as a ratio of export plus imports of those goods. That index spans the range +1 to -1, suggesting a country has a stronger agricultural comparative advantage (or disadvantage) the closer its index value is to +1 (or -1). By and large, lightly populated economies appear near the top of that table, the exceptions being the mineral-rich tundra economies of Canada and Russia (and oil-rich and partly desertified Mexico), while the most densely populated economies appear at the bottom (Thailand being the main exception, because of its relative abundance of irrigable paddy land).

Grain self-sufficiency too varies widely across the region. It is true that most economies of East Asia have chosen policies to ensure they are each close to self-sufficient in rice but, with increasing demand for flour and livestock products as incomes and urbanization grow, their wheat and feedgrain imports have expanded considerably since the 1960s. This decline in self-sufficiency is reflected in the final two columns of Appendix Table A.2.

These trends, and the standard trade and development theory (as summarized in the Appendix) that explains them, suggest the comparative advantage of the more-densely populated economies of APEC, whether rich or poor, will continue to move away from agriculture as economic growth proceeds.

Whether those trends get reflected in actual food import growth depends heavily on developments in farm-support policies. In the past, Northeast Asian economies have curtailed food import growth by raising steadily their rates of agricultural protection. The Uruguay Round Agreement on Agriculture aimed at reversing that growth of agricultural protection, but in practice has barely stopped it. It remains to be seen whether the next WTO round of agricultural trade negotiations, due to start at the end of 1999, is able to bring down those rates of protection significantly.

The economies in the top one-third of Table 1 are among those likely to supply food import demand growth in the APEC region. These aggregate data hide the fact that there is a lot of intra-industry trade going on within the agriculture and food group, however. In particular, processed food trade is growing much faster than trade in raw agricultural products as economies specialize in production and as ever-richer consumers seek more variety and higher

quality rather than greater aggregate quantities of food. That intra-industry trade growth is likely to continue for the foreseeable future, particularly if excessive quarantine restrictions are gradually relaxed following the SPS Agreement under the GATT/WTO Uruguay Round.

Recent studies have attempted to model the effects of continued growth (including Uruguay Round liberalization) on the food trade and welfare of APEC economies. Results from one such study, projecting the changing importance of agriculture in production and trade of APEC economies over the period 1992 to 2005, are summarized in Tables 2 and 3.

Table 2 reports the projected changes in the composition of GDP in the APEC economies. (ASEAN-4 includes Indonesia, Malaysia, Philippines, and Thailand; NIEs include Hong Kong/Singapore, South Korea, and Chinese Taipei; and ROW includes all economies other than those shown.) Entries in each row refer to the percentage change in the relative importance of each sector in the real GDP of each region between 1992 and 2005; the base case assumes no Uruguay Round implementation, case E2 assumes full Uruguay Round implementation by current WTO members, and case E3 assumes that China and Chinese Taipei soon join the WTO and also participate in the Round's reforms. From the first column, for example, we see that the base case projection implies massive structural change in China over the coming decade. The relative volume contribution of agriculture to GDP is projected to decline by 42 per cent, in favour of growth in the relative importance of manufacturing and services. Similar declines in the relative importance of primary sectors are projected for the other East Asian economies. For the advanced economies of Canada/United States and Australia/New Zealand, the primary sectors are already relatively small and their GDP shares do not change much over the 13-year period.

The Uruguay Round is projected to do little to the structure of production in China if China stays out of the WTO, but that multilateral liberalization accelerates the move away from primary production elsewhere in East Asia (compare the first and second sets of rows in Table 2). In ASEAN-4, light manufacturing booms while in the NIEs and Japan the growth is concentrated in more capital-intensive manufactures. Uruguay Round reforms help the farm sectors of Australasia and North America while reducing agriculture's share of Western European economies, and in all three regions services and/or capital-intensive manufacturing grow faster because of the Round.

Allowing China and Chinese Taipei to join the WTO and thereby share greater access to OECD markets, especially for textiles and clothing, in return for liberalizing their own trade

regimes, would result in even faster relative decline for China's primary sectors (compare the third set of rows in Table 2). It would also ensure that resources released from agriculture to the non-primary sectors were concentrated more in light manufactures, where China has its strongest comparative advantage. That would mean, though, that fewer of the resources released from primary sectors in ASEAN-4 would go into textiles and clothing. It would also mean an even larger contraction in shares of the latter sectors in OECD economies.

Or to put is another way, if China is not soon admitted to the WTO and allowed to get rid of the restraints on its textile and clothing exports to the United States and European Union, it will grow and de-agriculturalize less rapidly and therefore be a smaller demander of food imports (see Box 1).

The impact on sectoral trade balances of economic growth and full implementation of the Round, including participation by China and Chinese Taipei, is summarized in Table 3. It shows for China, for example, that net exports of light manufactures would be almost $60 billion greater (in 1992 constant dollars) in 2005 than in 1992, whereas net imports of primary products and other manufactures would be $24 billion and $33 billion greater, respectively. Similar changes occur for ASEAN-4 and the NIEs. (Each country's trade balance is assumed to be held constant in these projections, which is why the column sums are all zero.) Japan and Western Europe increase their net imports of primary products while Australasia and North America do the opposite thanks to the agricultural reforms of the Round. For all the OECD country groups except Japan, net imports of light manufactures rise and the big gainers are net exports of other manufactures and services. Services export growth is especially large for North America and Western Europe. All these changes are what one would expect from the theory of changing comparative advantage and from past Asian growth experience, and together with Table 2 they suggest that the Uruguay Round is helping to reallocate global production towards its most efficient locations.

The economic crisis during the past two years in East Asia has set some economies back temporarily, not least because of the withdrawal of financial capital from the most troubled economies (Indonesia, Korea, Malaysia and Thailand). In the worst-hit case, Indonesia, this is resulting in a slight re-agriculturalization of the economy initially, such that Indonesia will have a stronger interest in access to food markets of other APEC economies in the next few years than it otherwise would have had (see Box 2).

By 2005, after the Uruguay Round is fully implemented and assuming China and Chinese Taipei have joined the WTO, what is the extent of remaining distortions to world trade in the various groups of products. A preliminary answer to that question is given in a new study, using the same GTAP model as described above. It is that remaining distortions will still be significant, but most especially in agricultural and processed food markets. Globally, that sector will have twice the import tariff average of textiles and clothing and nearly four times that for other manufactures (Table 4). The pattern of agricultural distortions will continue to differ between regions, with OECD economies subsidizing, and developing economies taxing, farm production and exports (see the numbers in parentheses in Table 4).

The economic significance of these projected distortions in the different sectors depends not only on the size of ad valorem price wedges but also on the value society places on the production and consumption distortions induced by them. Those quantity distortions depend largely on the size of each sector and the importance of its products in consumption (Table 5). Six alternative scenarios are compared with the base scenario of the GTAP model projection to 2005 post-Uruguay Round. All OECD economies are assumed to remove all price and trade distortions to (1) agriculture and processed food, (2) textiles and clothing, (3) other manufacturing, and (4) all goods combined. Two subsequent scenarios are (5) all developing economies remove all price and trade distortions to their goods markets, and (6) OECD and developing economies together remove all price and trade distortions to their goods markets.

If both OECD and developing economies were to liberalize all their goods markets in 2005, the model results suggest global economic welfare would be greater by US$260 billion per year (Table 6). It needs to be stressed that this is a gross underestimate of the *aggregate* gains from trade liberalization for several reasons: services and government procurement policies are excluded; no account is taken of the benefits of increasing the degree of competition and the scope for scale economies; a high degree of regional and product aggregation is employed; and the dynamic effects of reform are not captured. Those omissions may not affect greatly the *relative* gains from reforming the various markets for *goods*, however, which is the focus here.

Almost one-third (32 per cent) of the estimated global gains from goods trade liberalization would come from agricultural reform in OECD economies – even though farmers in those economies contribute only 4 per cent of global GDP and barely any more of global exports (Table 5). Textiles and clothing reforms appear to pale by comparison with farm

reform: their welfare contribution is only one-eleventh that of agriculture's.

This big difference reflects the fact that distortions to prices for agriculture are more than twice those for textiles and clothing (Table 4) and that the latter contributes only 1.5 per cent to the value of world production and 5 per cent to the value of world trade, half or less the shares for farm products (Table 5).

But two assumptions made above also contribute to this result. One is that it is assumed China and Chinese Taipei join the WTO before 2005 and enjoy the same accelerated access to OECD markets under the WTO's Agreement on Textiles and Clothing (ATC) as other developing economies that already are WTO members. The other crucial assumption is that OECD economies fully implement the ATC. The latter is far from certain to happen though, particularly if China were to join WTO soon and phase out its 'voluntary' export restraints (VERs) on textiles and clothing by 2005. Dropping either of those assumptions substantially reduces the estimated gains from UR implementation (Anderson et al. 1997b), and therefore increases the potential gains from textile and clothing reform in the next WTO round.

Even so, agricultural protection would remain hugely more costly to the world economy than barriers to textiles and clothing trade – and are more costly even than protection to other manufactures, despite the latter having much bigger shares in the value of world production and trade than farm products. WTO members were right, therefore, to insist that agricultural reform must continue into the new century without a pause.

In particular, developing economies have a major stake in that process continuing. According to these results, the farm policies of OECD countries contribute 44 per cent of the cost of global trade distortions to developing economies, nearly as much as the 58 per cent contribution of their own trade-distortionary policies. OECD textiles and clothing policies also harm them greatly, but only half as much as OECD farm policies (middle row of Table 6).

For the OECD economies themselves, despite the fact that agriculture and food represent only about 5 per cent of their GDP, abolishing their remaining agricultural protection in 2005 would contribute more than one-quarter of their welfare gains from liberalizing all goods trade globally—and more than two-fifths of the gains from liberalizing trade in all goods in the OECD alone.

Unfortunately the model results quoted above did not explicitly address the question of how much would reforming agriculture in APEC economies contribute to global gains from

farm trade reform. However, from the upper part of Table 4 it is clear that distortions to APEC food markets will be non-trivial even by 2005 if no further reforms are undertaken. They are non-trivial both absolutely and relative to distortions to APEC's markets for other goods.

The next question to address is: how much could be gained and what would be the production, trade and other consequences of developing ABAC's proposed APEC Food System, including freeing up food markets in the region.

APEC economies in 2005 with further development of APEC's Food System

The area that has been studied most deeply is the potential effects of trade reform in APEC, so those effects are considered first before adding the potential impacts of boosts to rural infrastructures and to technology transfers in APEC's developing economies. A recent paper surveying the main empirical studies of APEC liberalization in food and other merchandise trade finds that these results are not widely divergent despite the use of different models, time periods and assumptions (see Scollay and Gilbert 1999a, and also 1999b for their own simulations). Rather than duplicate that survey, results are presented below from one such study that is fairly representative of those available, and whose results also are directly comparable with a new study of the effects of *global* liberalization of food and other merchandise trade.

Potential trade and national welfare effects of APEC food trade liberalization

APEC Heads of Governments agreed in November 1994 at Bogor to eliminate, on a most-favoured-nation (MFN) basis, all trade barriers in the APEC region by 2010 in the case of advanced economies and by 2020 in the case of developing economies. The agreement was reaffirmed at the subsequent summits in Osaka and Subic Bay. If that reform were to be smoothly phased in, then by 2005 advanced economies would be two-thirds reformed and developing economies two-fifths there. Assuming a delayed start by the former, one might expect the region on average to be half way along by 2005. To examine the effects of reforms getting that far, the study reported in Tables 2 and 3 included a scenario which halved the tariff barriers to merchandise trade, and any goods production and export subsidies, that would otherwise have remained in APEC economies in 2005 after the Uruguay Round's

implementation. To see the importance of the agricultural distortions in particular, this scenario was run in two parts: first with agricultural policies exempted, and then with them liberalized as well.

Under both APEC liberalization scenarios, trade would be higher in non-farm primary products by 3 per cent, in light manufactures by 11 per cent, in other manufactures by 6 per cent, and in services by 3 per cent (Table 7). If agricultural policies are not reformed then trade in farm products only rises by 2 per cent, but if agricultural protection rates were to be halved also, farm trade would be 18 per cent greater in 2005 than without this additional APEC initiative.

Global trade in aggregate would be boosted between 5 and 6 per cent (with agriculture's inclusion making it one-fifth higher), but notice from Table 8 that most of that trade growth would be confined to the APEC region. Indeed the share of APEC economies' trade that is intra-APEC is 1.5 percentage points greater following APEC liberalization; and among just the East Asian economies their intra-East Asian trade would rise by 1.3 percentage points (Table 9). This concentration of the trade gains within APEC is not surprising, given that about 70 per cent of APEC food trade is intra-APEC (as is true also for non-food trade). It helps explain why most APEC governments are willing to liberalize on an MFN basis: the strong complementarities between trade patterns within the APEC region, and the bias toward intra-regional trade because of relative proximity and cultural affinities, ensure that most of the benefits from market opening go to other economies of the region even without the liberalization being preferential.

How do these APEC liberalization scenarios compare in terms of their estimated welfare effects? Table 10 summarizes those results. It needs to be recalled that these are very much lower-bound estimates, not least because imperfect competition, economies of scale, dynamic effects, and benefits from services trade reforms and the strengthening of the global trading system are not incorporated. That is less of a problem when attention is focused on the relative orders of magnitudes as between scenarios though. Globally, the gains from the Uruguay Round are estimated in this study to be $179 billion per year if China and Chinese Taipei are not admitted to the WTO soon. The global gain from the reforms likely to accompany the accession of China and Chinese Taipei to the WTO is estimated to be a further $50 billion (nearly half of it going to the new members themselves). The size of this additional gain should not be surprising given the huge contribution of the Agreement on Textiles and

Clothing to the overall welfare benefits of the Uruguay Round and of the weight of China and Chinese Taipei in global trade in those goods. The extra competition they create is estimated to reduce welfare of competitors in Southeast Asia, however.

Going an additional half way towards free trade in the APEC region would boost world welfare in 2005 by $81 billion per year. That is a very sizeable addition to the global gains from the Uruguay Round, especially since that does not include the $50 billion added by China (and Chinese Taipei's) reforms expected to accompany their accession to WTO. That APEC addition assumes agriculture is included in the regional reform, though. If farm trade reform were exempted, the estimated gain would be reduced by a hefty $32 billion per year. That is, APEC agricultural trade reform would add nearly as much to global welfare as the reform of all of APEC's other merchandise trade combined.

Of course the gains from liberalization are not spread evenly. APEC liberalization, as with most trade liberalizations, benefits mostly the economies undertaking the greatest reform. But because there are strong complementarities between APEC's resource-rich and resource-poor economies, and much of their remaining protectionism restricts the exploitation of those complementarities, it is not surprising that the gains from APEC regional liberalization are concentrated within the region. Indeed in the case of agricultural reform, virtually all of the gains from APEC liberalization remain in the APEC region. That is, there is no significant 'free riding' by non-APEC economies in the case of unconditional MFN food trade reform in APEC.

What may be surprising is that APEC liberalization is estimated to not benefit NAFTA (a slight loss is reported in Table 10 from non-food reform, although it is tiny if expressed as a proportion of NAFTA's GDP). The main reason is that NAFTA economies trade intensely with each other and will do so even more by 2005 because of their own continental free-trade agreement, so APEC liberalization adds little to that large component of their trade. Another reason for that result is that while NAFTA is estimated to gain about $18 billion from improved resource allocation following the APEC liberalization, it loses almost $22 billion from a decline in its terms of trade (mostly because of lower prices for its exports to East Asia). Had slightly higher elasticities of substitution between products of different national origins been assumed, the negative terms of trade effect would have been sufficiently smaller to ensure an estimated gain for North America. Recall, though, that services trade and investment liberalization has been omitted from the APEC liberalization experiment reported above, due to a lack of

quantitative information on policies affecting services and inadequate modeling of investment behaviour. Were they to be included, a definite gain for NAFTA would be expected, given NAFTA's strong comparative advantage in services and its active engagement in foreign investment.

These estimated welfare gains refer to APEC going half way by 2005 towards the Bogor goals of free trade by 2010/2020, so much more can be anticipated from full liberalization. Also, they refer only to reductions in import tariffs and in production and export subsidies affecting goods. We know, however, that there are many non-tariff barriers to imports as well. We also know there are restrictions on food exports in some APEC economies such as Vietnam which, if removed, would not only bring gains in terms of efficiency but also – and contrary to conventional wisdom -- in terms of equity (see Box 3). Should underpricing of farm products in such developing economies be reduced at the same time as import protection is reduced in richer economies, the effects on international food prices would be offsetting but the expansionary effects on the volume of food trade would be reinforcing. Furthermore, these estimates do not include the benefits that could flow from other trade facilitation measures, nor from the other two components of ABAC's proposed APEC Food System, to which attention now turns.

Potential effects of other APEC food trade facilitation measures

In addition to trade liberalization, the ABAC proposal for an APEC food system also stresses the need for trade promotion via cooperative action to reduce frictions to regional trade in the form of customs procedures and myriad other regulations. Examples of the types of initiatives that might be taken are greater transparency in and simplification of customs procedures, smoother electronic data interchange, and closer adoption of WTO procedures for valuing traded products and for pre-shipment inspection and classification of them. There is also great scope for technical assistance to better assess sanitary and phytosanitary procedures and other technical regulations where they are unduly limiting trade in food products, and to share information on food safety and to negotiate for the harmonization or mutual recognition of food safety standards.

On the last of those issues, APEC leaders have already recognised the importance of self-regulating labelling, quality assurance and market information services (LAMIS). Valuable

though they can be to consumers and industry, they none the less can impede trade when they differ across economies. Hence the desirability of a common nomenclature and consistent reporting format.

While the value of such initiatives is difficult to quantify, they are undoubtedly beneficial in lowering transaction costs of doing business in the region and thereby increasing interdependence among APEC's food markets without compromising consumer concerns about food quality and safety.

Potential effects of more investment in rural infrastructure

Improving rural infrastructure and human capital will have the effect of raising productivity in rural areas and thereby increasing those areas' capacity to retain resources that might otherwise migrate to cities. This will slow the decline in agriculture's relative importance in the economy, but it will do more than that. Improving transport and communications, and improving the skills and health of workers in rural areas, will attract investments in non-farm activities that will simultaneously make rural communities more vibrant and urban centres less crowded and polluted. Placing a value on all those benefits is not easy, but in so far as the social benefits exceed the private benefits, governments need to be pro-active to ensure the optimal extend of such investments occur.

More specifically, for poor agrarian economies the move from subsistence-only farm production to having a marketable surplus of food, and the emergence of cash cropping, depend crucially on the provision of rural roads, radio, post and telecommunication infrastructure to lower the cost of transport, information and communication. Constructing and maintaining those infrastructures, and rural electrification, provide off-farm work for farm households, but more importantly those infrastructures spawn additional new service-sector jobs in rural areas and elsewhere for transporting, grading, processing, packing, and distributing the marketed farm products. The opening up or extending of rural roads and communications, and investments in irrigation, also expand the effective demand for purchased farm inputs such as improved seed varieties, chemical fertilizers, pesticides, farm machinery, and fuel.

Rural roads, electricity and telecommunications also make rural industrialization more profitable for unskilled labour-intensive industries not connected to primary sectors. True,

those roads also make it easier for rural workers to drift to urban areas, which would close the urban-rural wage gap somewhat. But many workers will stay put because for much of the year they are fully occupied in seasonal farm work. Manufacturing activities that have the flexibility to close temporarily during peak seeding/transplanting and harvesting periods would be especially likely to be attracted to rural areas. The new jobs created by those off-farm activities have been shown to contribute substantially not only to economic growth but also to reducing absolute poverty and rural-income inequality in many modernising agrarian economies. Since they also slow the growth of urban pollution and congestion, all this suggests a high social rate of return to investments in rural infrastructure.

Those social returns would be higher the less government price and trade policies discriminate against primary and light manufacturing sectors. This is for two reasons. One is that being located near policy makers so as to lobby for special protectionist favours would then be less important. The other is that in the presence of protection, manufacturers sell mainly to domestic consumers and buy inputs from other domestic producers. Those linkages encourage a concentration of manufacturing in the cities. By contrast, in an open economy most sales of light manufactures are exports and many inputs are imported. That fact, together with higher property prices, congestion and pollution in cities, encourages rural industrialization and can thereby slow or reverse the growth of mega-cities.

Potential effects of enhanced food technology transfer and dissemination

As mentioned earlier, despite very high measured rates of return to investments in agricultural research, aid agencies decided from the late 1980s to reduce real funding levels for that activity, and national public funding for agricultural research in developing economies has not made up the shortfall. Moreover, that degree of under-investment in this activity is escalating because new breakthroughs in bio-technology are boosting returns from such research. However, the nature of those new technologies is such that, much more than in the past, there needs to be legal protection of the intellectual property involved. In the case of genetically modified (GM) crops, for example, the further development of new seeds by the private sector will depend on seed companies being able to sell new seed to growers each year (rather than farmers simply withholding a part of this year's crop for next year's seed). If developing economies cannot enforce the property rights inherent in GM seeds, the

technology is much less likely to be transferred there or to develop domestically. That, together with new labelling laws for GM products in many economies, is adding complexity to exporting food, with outcomes ranging from the need for different labels for different destinations through to outright bans of imports from some sources.

Technical cooperation could help developing economies in setting their own standards, in meeting other economies' standards in cases involving exports, in ensuring such standards are not excessively restrictive, and in intellectual property law drafting and enforcing so as to facilitate investment in transferring, adapting and producing new farm technologies. These developments will reduce the risk of the technology gap between rich and poor economies widening in a way that could impede developing economies' capacity to supply developed-country markets for food.

Potential food production, food consumption and equity effects of developing APEC's food system

Unfortunately the empirical study quoted above did not publish its estimates of effects of APEC food and other trade liberalization on changes *within* the various APEC economies. Nor did it examine the effects of lower transactions costs of doing business in rural areas or of faster farm productivity growth that would accompany enhanced investments in rural infrastructure and in technology production and transfer. And the GTAP model in its present state is unable to provide detailed insights into equity effects of reforms, because it treats each nation as one household. That does not prevent inferences being drawn from the general equilibrium thinking that underpins that economy-wide model, however.

What can be expected from the three-pronged development of the APEC food system is an expansion of food production in economies where farmers' rewards rise, for example because of:

- reduced non-agricultural protectionism,
- reduced taxation of farm exports,
- increased investment in producing or transferring appropriate new technology,
- increased investment in rural infrastructure, and/or
- reduced farm protectionism abroad.

The more of these that happen simultaneously, the greater the boost to agriculture and rural development in such economies.

Whether net buyers of food in those economies are better or worse off from the rise in farm producer prices depends also on what happens to the former's income. If most of their income comes from unskilled labour, there is a good chance that the improved incentives for farming – an activity intensive in the use of unskilled labour in developing economies – will raise their wages more than the increase in their cost of living because of the rise in farmers' rewards. This is true even if they do not work in agriculture. Such a wage rise would be especially likely in a developing country if it also reduced its import protection for capital-intensive manufacturing, and/or if industrial economies reduced their protection of textiles and clothing, This is because either of those reforms would raise the relative wage for unskilled labour in developing economies as industrialists shifted their investments to agriculture and/or unskilled labour-intensive manufacturing there and to more capital-intensive manufacturing in industrial economies.

What about in the farm-protectionist industrial economies themselves? Food consumers would of course be better off from being able to buy a greater variety of foods at lower prices. Poorer non-farm households would gain the most in percentage terms since they spend a relatively large share of their income on food, and there would be no significant fall in their wage income. Wages would hardly alter because, unlike in developing economies, only a small fraction of the workforce is employed in farming in industrial economies.

Incomes of some farmers, however, could be lowered by the fall in producer prices as protection barriers are dismantled. The extent to which that is harmful depends on the proportion of farm household income that comes from farming activities. For many farm households in Northeast Asia, most of their earnings are from non-farm sources (see final column of Appendix Table A.3), and more so the smaller the farming enterprise. The main impact would thus be a fall in the value of land, and that would be in proportion to farm size. Food production need not fall, however. Even if the reforms cause some farmers to sell, others will purchase and use their neighbour's land, gaining economies of size in the process. There may be some switching of enterprises though, to activities that become relatively more profitable as protection cuts take effect. Among the most likely enterprises to expand are horticultural activities, particularly fresh fruits and vegetables that are close to being non-tradable internationally because of their perishability. But if there are currently

under-investments in rural infrastructure and/or agricultural research in those advanced economies, correcting them could well offset significantly any adverse impact on farmers of a decline in farm product prices.

Conclusions

Clearly, in the absence of policy changes, agriculture is going to decline relatively in all APEC economies as they develop. What is also clear is that even massive increases in agricultural protection – as have been provided in Northeast Asia since the 1960s – have failed to prevent that relative decline, and have also failed to prevent food self-sufficiency from decreasing. It is therefore to be expected that if that protection growth were reversed, it too would not have a very large impact on the rate of relative decline of the sector. The above results also show that such reform would have major positive impacts at home and abroad. At home, it would lower food costs for consumers and boost production in and exports from other sectors, raising overall economic welfare. Abroad, it would enhance earnings for farm households elsewhere in APEC, the vast majority of which are homes to among the region's poorest people. If coupled with increased investments in rural infrastructure and technology transfers through greater technical cooperation, those developing economies could see their farm sectors making much closer to their optimal contribution to growth and development. That in turn could induce those economies to reduce their own anti-agricultural, anti-rural infrastructure, anti-trade policy bias, a by-product of which would be expanded opportunities for advanced industrial economies to export non-farm products to those poorer agrarian economies.

But how would such reforms affect food security in the APEC region? That is the topic to which attention turns next.

4

What about food security?

A major reason often given by net food-importing economies for not opening their market to import competition is their concern with food security. Within APEC, Japan has expressed this sentiment most strongly, but it has been echoed in other East Asian importing economies too. An assessment of the effects of ABAC's proposed APEC food system would therefore be incomplete without including some discussion of food security issues.

Access to food is the key issue

Sometimes it is presumed that food security is the same thing as food self-sufficiency. That is not so. Rather, food security refers to a country's capacity to ensure that everyone always has access to the minimum supply of basic food necessary for survival. A certain level of income per capita plus a well-functioning market for staple foods, including from abroad, can therefore ensure that a person, household or nation is food-secure.

The world has seen the daily supply of calories rise from 2,300 to 2,700 per capita between the 1960s and 1990s. The growth has been even more dramatic in just developing economies: from less than 2,000 to more than 2,500 (or 2,700 in the case of East Asia). This gain per person is particularly impressive given that it took place during a period in which the developing country group's population doubled. A considerable part of their gain in supplies is due to the growth of food imports from the developed economies, made affordable because of the rapid growth in real incomes in developing economies.

In advanced industrial economies, where well over 90 per cent of households are net buyers of food, agricultural price-support policies do not play a significant role in determining the *income* of non-farmers. They do, however, affect their capacity to *spend* that income --

and they do so negatively, by keeping the consumer prices of food well above what they would otherwise be, via import restrictions and export subsidies.

In poorer economies, where a high proportion of households are producers and net sellers of food, price-depressing policies harm rather than boost their food security. Of the net buyers of food, many are relatively affluent urban households who can well afford to pay market prices for food. That is, there is only a small proportion of households in developing economies that are net food buyers at risk of being food-insecure. Targeted programs to boost their earning capacity (eg basic education/training) are an efficient way to reduce their food insecurity. Where that fails, targeted subsidies to provide that core group with food staples are much less costly than general subsidies to all food consumers via price-depressing agricultural policies. Furthermore, poor rural infrastructure and poor access to new farm technologies reduce the food security of both net sellers and net buyers of food.

Instability of food prices and volumes also cause concern

What about the stability of food prices? Sometimes a dependence on food imports is considered undesirable because it could destabilize domestic food prices or quantities. With respect to prices, for example, when a country opens up to imports by moving to ad valorem tariffs or free trade, it will then transmit fluctuations in international food prices to the domestic market. Whether those fluctuations are greater than would otherwise prevail domestically depends on other economies' insulating policies: the larger the number of economies insulating their domestic markets, the greater are international price fluctuations. By so making the international market thinner and more volatile, such policies encourage other economies to follow suit, exacerbating the problem. The way to stop that cycle of begger-thy-neighbour policy making is to agree collectively to outlaw such protection and insulation policies -- which is one of the objectives of the proposed APEC food system.

With respect to quantity fluctuations, one concern seems to be that with seasonal fluctuations there might be shortfalls so that rice, for example, simply cannot be purchased internationally until the next harvest. Such situations are very rare in practice, and would be even rarer (a) if more importing economies relied on international markets on a regular basis instead of only when they have a domestic crop failure, and (b) exporters restrained from using the exceptions to GATT Article XI.1 which prohibits export restrictions other than taxes. One

exception is in GATT Article XI.2(a), which permits temporary quantitative export restrictions to relieve critical food shortages in an exporting country. But the WTO's Agreement on Agriculture's Article 12 has added some discipline to that provision. Specifically, it requires that due consideration be given to the effects of such a restriction on WTO members who are food importers, that such affected members be consulted, and that the WTO be notified of the nature and duration of the restriction. Even more discipline may be added in the next WTO round. For example, if it were shown that in the past longer-term customers were being served first and charged less in years of shortfall, perhaps agricultural-exporting economies could be required to provide non-discriminatory access to their supplies of basic foodstuffs. They would be more willing to comply the more protectionist economies were willing to lower their farm price supports.

What if imports are unavailable?

What about the risk that quantities of imported food available for consumption may fall dramatically because of war? (GATT Article XXI provides a national security exception to permit export embargoes in times of war or other emergencies in international relations.) Economies concerned about that risk can reduce it by choosing to have a diversified portfolio of foreign suppliers. The probability of *all* suppliers placing an embargo simultaneously, as in a world war, not only is very low but also is inversely related to the degree of openness. That is, the more economically interdependent nations become within (and between) regions, the higher the opportunity cost and hence the smaller the likelihood of them going to war. This is a major, if often understated, international public good provided by both APEC and the GATT/WTO, to which agricultural trade has much yet to contribute.

Even in the most catastrophic of cases where a country had to rely on just domestic suppliers for a period, there is substantial scope to survive in the richer economies at least, where most people consume far more calories and nutrients than are necessary for mere survival. Diets could be adjusted to avoid excessive calorific shortfalls, for example by preparing food differently (in particular, relying less on refined and processed food), by eating a greater proportion of each animal slaughtered, and by consuming grains and oilseeds directly rather than indirectly via animal products. Doing that for a short period of war would be far less

welfare-reducing than forcing consumers to pay higher prices for all the decades of peace that prevail these days between wars.

Isn't domestic production essential for food security in case of war?

Domestic farmers typically are the major suppliers of food in their country, so of course they contribute to food security in that sense. In a situation where a country had to rely on just domestic suppliers for a period, farmers would contribute even more, for example by transferring some of their resources from livestock to crop production. However, in an extreme embargo situation, fuel and chemical imports also would halt, so overall domestic food production could shrink significantly given the role of such products in providing energy, fertilizer and pesticide inputs for agriculture. Even the skills of the farmers, having used input-intensive techniques for decades, would be debased in such an input-deprived environment. This means that national food self-sufficiency in output terms is by no means synonymous with food security. On the contrary, in some cases it could be described more accurately as an illusion, offering a false or at least exaggerated sense of security.

How to achieve the optimal level of food security

How, then, might a country attain its optimal level of food security? If a society would feel too food-insecure under laissez faire, bearing in mind the above considerations, then what needs to be determined is a sense of (a) its willingness to pay for more security by various means, and (b) the costs of those insurance measures. One such measure involves encouraging the holding of food stocks above those that would be commercially viable -- a public good that is explicitly allowed for in Annex 2 of the WTO's Agreement on Agriculture. The optimal level of encouragement is that which boosts stocks so that the marginal social benefit in terms of food security equals the marginal social cost of that intervention. Costs are non-trivial, however: storage and interest costs and the costs of spoilage and quality deterioration can amount to more than 20 per cent a year. The cost part of the calculation also would need to include the risk of government failure if stocks were to be managed by an inefficient public agency.

If greater domestic production capability was considered by society to be one of the desirable means of boosting food security, there are far less costly ways of achieving that than farm product price supports and import protection. In particular, there are the first two components of the ABAC proposal for an APEC food system: boosting rural infrastructure and the use of new farm technologies. Technical cooperation and subsidies to agricultural research and extension are likely to be very high pay-off alternatives to propping up producer prices artificially. This is especially so if import restrictions rather than direct payments are the means by which prices are currently being supported (since import restrictions not only support producer prices but also raise consumer prices).

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What action is needed to develop the System?

Clearly, agriculture is dragging its heals in terms of contributing to the key goals of APEC: regional economic interdependence through trade and investment liberalization, trade facilitation, and economic and technical cooperation. The fact that the same is true globally simply underscores the political difficulties in the past of allowing this sector to adjust to changing market circumstances as economies develop.

As we move into the new millennium, however, the political economy of continuing with distortionary farm and food policies is changing rapidly, offering new opportunities for welfare-enhancing reforms. A key contributor is the WTO. Now that agriculture is at last being brought into the mainstream of the GATT rules-based trading system, and another round of multilateral trade negotiations (MTNs) is about to be launched, governments will be able to trade off past favours to their farmers with new favours to their non-agricultural exporters seeking greater access to markets in other, including agricultural-exporting, economies. The latter economies showed during the Uruguay Round that they are no longer willing to tolerate opening up their markets unless they see food markets in agricultural-protectionist economies also open up.

Another key contributor is APEC's own Bogor declaration to have free trade in the region by 2010/2020. With just a decade to go for advanced economies to reach that target, phased reductions in farm price supports will need to continue at a brisk pace. The next WTO round offers an opportunity for them to 'buy' some non-food market access in exchange for honouring their commitment to reform their farm policies.

This suggests both food-exporting and food-importing APEC economies have reasons to actively support the launch of a new WTO round at the WTO Trade Ministerial at the end of 1999: the former to ensure agriculture is high on the agenda of that new MTN, the latter to ensure manufacturing as well a services are also on the agenda, so there are enough

possibilities for inter-sectoral trades in market access. Given the high propensity of APEC economies to trade intra-regionally, the trade growth generated within the APEC region by such WTO negotiations will be similar to that which would result from regional negotiations. But there are two additional advantages of doing this through the WTO process: it encourages non-APEC economies to reform as well, and it leads to legal bindings on reform commitments.

Both groups of economies would benefit if the accession negotiations for the four remaining APEC economies not yet members of the WTO were accelerated. This is especially true of China, and especially if it can be done without unravelling the Uruguay Round Agreement on Textiles and Clothing. Hence intensified pressure to speed China's remaining negotiations should be an immediate priority for all APEC members, not least to lock that economy in to low bound tariffs on food. The latter is crucial at this early stage of China's industrialization so as to prevent it following the costly path of agricultural protection growth that its neighbours have followed during recent decades and now have to go through the process of reversing.

For those food-importing economies having to forego the continued use of protection growth to slow the relative decline of their farm sectors and the fall in food self-sufficiency, what other policy options are available to meet the political pressures they confront?

In terms of boosting farmers' incomes, import restrictions and related forms of price support are extremely inefficient and inequitable policy instruments. Much more effective are targeted direct income supports, including re-training grants to boost farmers' prospects of securing a better-paying non-farm job. Better still, reducing any areas of under-investment in agricultural research would support farmers' incomes in an even more cost-effective way.

In terms of food security, governments can make it clearer to their citizens that boosting food self-sufficiency through import protection is a very high-cost way of trying to achieve it. Lower-cost options include investing more in domestic agricultural research to boost farm productivity and in rural infrastructure to lower transactions costs, encouraging more buffer stock-holding, and signing long-term contracts with a diversified group of food exporters to reduce the risk of supply cut-offs when some have a poor season.

In terms of food quality and safety, there is ample opportunity to secure it just as much via imported products as via locally produced ones, for example through clear labelling requirements. Likewise, in the case of imported products that might carry disease, there is ample scope for managing health risks to plants and animals in ways that are consistent with the

WTO's SPS Agreement. For APEC's developing economies struggling to cope with such quarantine issues, technical cooperation is an obvious way to assist them.

And in terms of the rural environment, there are again far more efficient ways to preserve it than to provide product price supports such as via import protection -- indeed those policy measures are more likely to harm than help the environment. The 'green box' measures agreed to in the Uruguay Round provide a wide array of options that are WTO-approved.

Finally, for those developing economies still taxing farm exports, either to reduce the consumer price of food and/or to raise government revenue, there are again far cheaper and more equitable options available. Since there are very few poor households that would not be better off without an export tax on food (bearing in mind that such taxes lower the real wage for unskilled labour), targeted means of raising the income-earning capacity of such people would be a far more effective measure. As for revenue raising, while trade taxes may still be the revenue-raising instruments with the lowest collection costs in the poorest of economies, even so it would be much less distortionary and more equitable to have a uniform low tax on all exports or imports than a higher tax on a subset of exports such as staple foods.

Appendix:

The changing role of agriculture as an economy develops

One of the most striking features of economic development is the relative decline of the agricultural sector in growing economies. Also typical, particularly of densely populated economies, is a decline in their agricultural comparative advantage as industrialization proceeds. Whether that leads to declines in food self-sufficiency and the value of net imports of agricultural products are moot points: it depends in part on policy trends, which happen often to gradually change from disfavouring to favouring agriculture relative to other tradable sectors over the long term. This Appendix seeks to explain these trends, drawing in part on modern trade and development theory that is shown to be strongly supported by comparative evidence across economies and over time.

Why agriculture declines relatively as an economy grows

A primitive economy with few trading opportunities necessarily has to devote most of its resources to the provision of food. Agriculture's shares of national output and employment therefore start at high levels. As economic development proceeds, however, agriculture's shares of GDP and employment typically fall. This has commonly been attributed to two phenomena: the slow rise in the demand for food as compared with other goods and services as incomes rise (that is, relatively low price and income elasticities of food demand); and the more rapid development of new technologies for agriculture, relative to those for other sectors, which leads to expanding food supplies per hectare and per worker. Some of those new technologies can be imported by a late-developing economy from those more-advanced economies that were similarly endowed in earlier decades with a scarcity or abundance of land per worker, and then adapted relatively easily to local conditions. A third but less-commonly recognized phenomenon contributing to agriculture's relative decline is the rapid growth in modernizing economies in the use of intermediate inputs purchased from other sectors. This has been such that the farmers' value added share of output falls considerably faster than is the case for non-agricultural sectors.

The effects of the first two of these tendencies in a two-sector closed economy can be thought of as follows. Suppose productivity growth were to occur equally in the two sectors (agriculture and industry). The resulting increase in income would cause both sectors' demand

curves to shift to the right, but not to the same extent because of the lower price and income elasticities of demand for agricultural goods. Agriculture's share of national output is then lower after than before growth even at pre-growth prices, but more so at post-growth prices. And -- ironically -- it would be lower still if productivity growth had been faster in agriculture than nonagriculture (thanks to the lower price and income elasticities of demand for food).

The above could be used to describe the world as a whole, in which case it suggests we should expect a decline in agriculture's terms of trade in international markets, and more so the stronger is productivity growth in agriculture compared with other sectors.[1] In practise that decline is exacerbated by the gradual policy change, from taxing to subsidising agriculture, that so often accompanies the economic development of nations (Anderson 1994, 1995a). The weight of empirical evidence seems consistent with that expectation, in that agricultural prices appear to have declined considerably relative to industrial product prices during the past century, even after adjusting prices of (particularly non-farm) products for changes in quality (Grilli and Yang 1988).

But what about in an open agrarian economy that can trade all of its products internationally at those terms of trade? Suppose the domestic terms of trade in this agrarian economy, if it were closed to foreign trade, were below the international terms of trade for farmers. Then if the economy opened itself fully to international trade, the importance of agriculture would increase and the country would export agricultural produce and with the foreign exchange proceeds would import industrial products. If productivity growth and/or factor accumulation occurred in this open economy and the international terms of trade remained unchanged, agriculture's share of national product would rise or fall depending on whether that growth was biased toward farm or non-farm production. If that growth was sectorally unbiased, agriculture's share would remain unchanged. However, if growth also occurred in the rest of the world such that the international terms of trade deteriorated, the agricultural sector of the small open economy would decline unless the economy's own growth is biased towards agriculture sufficiently for the quantity changes to more than offset the adverse change in the terms of trade that result from global economic growth. This agricultural bias in productivity growth would have to be even stronger in a large open economy because its own contribution to world agricultural exports would depress the terms of trade even further.

The above assumes all products are tradable internationally. In reality, however, a large part of a developing economy involves the production and consumption of nontradable goods and services. These are items for which the costs of overcoming barriers to trading internationally -- especially transport costs -- are prohibitively expensive. The price of

[1] Farm productivity growth in the agricultural-exporting rich countries has been comparatively very rapid. In the United States, for example, total factor productivity growth since the late 1940s has been nearly four times as fast in farming as in the private non-farm sectors (Jorgenson and Gollop 1992), and similar performances have been found in Australia and Canada. This has been sufficient only to slow the decline in agriculture in these countries, however, not to prevent it or allow its relative importance to rise. See Martin and Mitra (1998) for a survey of these and other country studies.

nontradables is determined only by domestic demand and supply conditions because, unlike tradables, in equilibrium the quantity of nontradables demanded has to equal the quantity supplied domestically. Since the vast majority of nontradables are services,[2] and since the income elasticity of demand for services tends to be well above unity,[3] the demand for nontradables as a group is likely to be income elastic.

To see how taking into account the existence of nontradables alters the above conclusions, think of the two tradable sectors as comprising one super-sector of tradables and the rest of the economy as comprising nontradables whose demand is income elastic (which means the demand for tradables as a group must be income inelastic for their weighted average to sum to unity). Then if both sectors enjoyed equally rapid productivity growth, the demand conditions would ensure that the GDP share of tradables declines with economic growth. And if, for the reasons mentioned above, agriculture's importance is likely to decline *within* the tradables super-sector, it is even more likely to decline in relative importance in the total economy. Thus even for an open economy with an exceptionally dynamic farm sector, retaining resources in agriculture over the long term is unlikely; in fact, they will tend to be retained only in economies that are accumulating/importing non-farm resources relatively slowly and/or are suffering very slow productivity growth in their non-agricultural sectors, ceteris paribus (Anderson 1987).

The above reasoning is sufficient also for explaining the decline in agriculture's share of employment unless labour productivity is much slower in agriculture than in other sectors. Official data imply that agriculture's share of employment has not been declining as rapidly as the GDP share in growing economies.[4] The latter should not be seen as a sign of relative deterioration in labour productivity in the agricultural sector, however, as more care is needed in measuring farm labour input. Specifically, the proportion of farm household labour time spent in non-farm activities needs to be counted as agricultural only as much as the output is attributed to the agricultural sector. Typically in practice the recording of output is changed faster than the recording of employment and so the decline in agriculture's share of employment tends to be understated more in national accounts than the decline in the GDP share.

This decline in agriculture's GDP share results partly because post-farm gate activities, such as taking produce to market, get commercialized and taken over by specialists in the service sector. In such cases the farmers receive a lower price, in return for which their households spend less time going to market. Another contributing factor is that previous manual farm jobs such as spreading manure and weeding crops disappear as farm chemicals

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[2] Globally, sectoral exports in 1995 accounted for about 48 per cent of the agricultural sector's value added, about 51 per cent of manufacturing value added, but only about 7 per cent of services value added (World Bank 1997a; WTO 1997b).

[3] See Lluch, Powell and Williams (1977), Theil and Clements (1987) and Falvey and Gemmell (1994).

[4] For low-income countries the share of agriculture in GDP fell from 34 to 25 per cent between 1980 and 1995, while the share of the labour force in agriculture as measured declined only slightly (from 73 to 69 per cent between 1980 and 1990 – World Bank 1997a).

become more profitable, available and affordable with higher-yielding crop varieties, the seeds for which also have to be purchased in the case of hybrid varieties. As a result, value added by the farm household's own labour, land and capital, as a share of the gross value of agricultural output, falls over time as purchased intermediate inputs become more important. In fact, Anderson (1987, Table 2.1) provides evidence showing that the value-added share typically falls much more for agriculture than for the industrial sector. This increasing use of purchased intermediate inputs and off-farm services by farmers adds to the relative decline of the farm sector *per se* in overall GDP and employment (Timmer 1988, 1997; Pingali 1997).

One might also expect agriculture's share of exports to decline with economic growth, although with less certainty than for agriculture's shares of GDP and employment. To see this, consider again an open economy in a world in which the international price of agricultural relative to other goods is declining over time because of economic growth abroad. If this open economy is growing and if its output growth is insufficiently biased towards the non-farm sectors to match the non-farm bias in domestic demand growth, agriculture's share of exports may not decline: excess supply may grow more rapidly for farm than for non-farm products. But if this economy is not growing or its growth is concentrated in non-farm sectors, agriculture's share of its exports would decline, in part at least because of the decline in the relative price of farm products internationally.

Why agricultural self sufficiency may or may not decline with growth

What determines whether a country is a net agricultural exporter or importer at a point in time? And how will that position change over time? A nation's self sufficiency in farm products depends largely on its relative factor endowments compared with the rest of the world's (the key determinant of agricultural comparative advantage) as well as on government policies at home and abroad. Leaving the latter aside for the moment, how can we conceptualize the impact of the former on a country's trade composition?

The role of relative factor endowments

Perhaps the most appropriate simple model for explaining agricultural comparative advantage in a growth setting is that developed by Krueger (1977) and explored further by Deardorff (1984a). They consider two tradable sectors each using intersectorally mobile labour plus one specific factor (land or industrial capital). Assuming labour exhibits diminishing marginal product in each sector (and assuming for the moment that there are no other primary products, no services or nontradables, and no policy distortions), then at a given set of international prices the real wage is determined by the overall per worker endowment of land and industrial capital. The commodity composition of a country's trade -- that is, the extent to which a country is a net exporter of agricultural or industrial products -- is determined by its endowment of land relative to industrial capital compared with that ratio for the rest of the world.

Leamer (1987) suggested using a triangle as a way of summarizing the relative resource endowment ratios of different economies. The three factors of production are denoted N for arable land, L for labour time and C for produced capital. On the assumption that the stock of farm land is fixed (or changes at the same rate in all economies), rapid growth by one or more economies relative to others in their availability of produced capital per worker would cause those economies to strengthen their comparative advantage in non-farm products. The more significant those economies are in the world economy, the more their expanded stock of capital would boost the world average stock and thereby weaken the slower-expanding economies' comparative advantage in non-farm products, ceteris paribus.

There are several ways to make the above model more realistic. One is by adding other natural resources (minerals, forests). It follows that the more abundant a country's per worker endowment of other natural resources compared with arable land and industrial capital, the stronger will be its comparative advantage in primary products other than food crops. That more-realistic model also offers more scope for changes in comparative advantage over time. For example, a discovery of minerals or energy raw materials, or an increase in the international price of minerals or energy, would strengthen the country's comparative advantage in mining and weaken its comparative advantage in farm and other goods, ceteris paribus. Likewise, new investment in dams to build export-oriented hydro-electric power stations would have a similar de-agriculturalization effect. It would also encourage mobile resources to move into the production of nontradables as their demand strengthened and prices rose, further reducing farm and industrial production.[5] On the other hand, net deforestation simultaneously depletes the stock of trees and natural forest land and increases the potential area of land for plantation cash crops (assuming all the potentially arable land had already been cleared), thereby eventually strengthening the country's comparative advantage in agriculture as a whole, ceteris paribus, even though within the sector food crops may lose some of their competitive edge to plantation crops.

Domestic or foreign savings can be invested to enhance the stock and/or improve the quality not only of industrial capital but also of labour or natural resources, in addition to providing capital specific to the nontradables sector. 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 labour-saving techniques and the development and/or importation of new technologies that are less labour intensive. Which types of capital would expand fastest in a free-market setting depends on their expected rates of return. The more densely populated, natural resource-poor a country, the greater the likelihood that the highest pay-off would be in expanding its capital stocks for non-primary sectors. At early stages of development of such a country with a relatively small stock of natural resources per worker, wages would be very low

[5] (Corden 1984). Infact 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 export boom shows up in the trade statistics in the case where the exports are preceded b y FDI inflows for investments with a long lead time (Corden 1982).

and the country would have a comparative cost advantage in unskilled labour-intensive, standard-technology manufactures. Then as the stock of industrial capital grows, there would be a gradual move toward exporting more capital- and skill-intensive manufactures. Natural resource-abundant economies, on the other hand, would enter manufacturing at a later stage of development. Such economies are likely to have remained more than fully self sufficient in agricultural products for longer (although less so the greater their comparative advantage in minerals or other primary products, ceteris paribus), and their first industrial exports would be comparatively capital intensive. [6]

What determines the extent to which a country's agricultural exports will be unprocessed rather than processed products, low quality rather than high quality, and non-perishable rather than perishable? The capital intensity of production of the latter will play some part, but most of the explanation will have to do with the cost/speed of in-country transportation and communications, with packing, grading and storage facilities, with sea and air port facilities, and with the volume of domestic urban sales of processed, high-quality and perishable products. The latter sales volume is important because it provides the derived demands for processing and distribution services which, when sufficiently large, allow economies of scale to lower the price at which the more sophisticated products can be made available for export.

A final small point to keep in mind has to do with the way that food self sufficiency is measured. Typically, policy makers concerned about food security measure it as domestic production as a percentage of domestic consumption in volume terms (aggregated using constant prices) or, if they are especially conscious of the needs of the poorest people, in calorie terms. Simply focusing on whether the gross value of net food exports is positive could be misleading, however, because exports may be intensive in the use of imported intermediate inputs (farm chemicals and feedstuffs) and yet contribute very little value added.

The role of policies affecting agricultural incentives

The above expectations about agricultural self-sufficiency drawn from the theory of comparative advantage are based on the assumption of no interference in markets by governments. But in fact most economies intervene in markets and thereby alter incentives facing producers and consumers of food.

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[6] Notwithstanding its popular media coverage, the theory of 'competitive' advantage espoused by Porter (1990) does not supersede this theory of comparative advantage based on relative factor endowments. Warr (1994) explains why, noting that the confusion arises because while both are concerned with international competitiveness in a global context, the former applies to firms within an industry or sector (which focus on their private costs and benefits alone) whereas the latter is concerned with the competitiveness of industries and sectors from a national viewpoint, taking account of all (including social) costs and benefits. The theory of comparative advantage in its simplest form is based on numerous assumptions which, as critics never tire to point out, are unrealistic. However, the basic thrust of the theory survives when these assumptions are relaxed (Ethier 1984; Ruffin 1984) and the theory is made dynamic (Grossman and Helpman 1991), and strong empirical support from a wide range of countries can be found for the theory (Balassa 1979; Anderson 1983; Deardorff 1984b; Leamer 1984). Its relevance to developing countries is made clear in Krueger (1984).

From a national viewpoint, four levels of intervention can be distinguished. One is intervention abroad by the governments of other economies' that incidentally alters a country's terms of trade and, in so doing, introduces sectoral or geographic biases. Another is intervention at the national macro level to encourage savings and investment, which again could involve sectoral or geographic biases. Those macro interventions include the provision of price stability (i.e., low inflation), responsible fiscal policies, the optimal regulation of an open financial market, law and order including for the establishment and protection of property rights, the optimal provision and geographic distribution of public goods such as infrastructure, and optimal policies to offset externalities. The third level of intervention has to do with the biasing of domestic prices in favour of non-tradables via an overvalued currency (or, less commonly, in favour of tradables via undervaluing the nation's currency). And the fourth level of intervention has to do with altering output and input prices within the grouping of tradables sectors so that some tradables sectors enjoy more effective assistance from the government than others.[7]

The fact that sub-optimal market intervention by governments is rampant would make it difficult to qualify the above conclusions from comparative cost theory, were it not for the fact that governments intervene in a fairly consistent fashion. Five empirical features of intervention are worth mentioning. First, policies in high-income economies tend to overprice farm relative to nonfarm products while policies in lower-income economies tend to underprice them (Johnson 1991; Bautusta and Valdes 1993). Second, the degree of overpricing (underpricing) is highly positively correlated with the degree of agricultural comparative disadvantage (advantage) (Tyers and Anderson 1992, pp. 76-77). Third, over time economies tend to gradually change their policy induced distortion pattern away from negatively to positively assisting farmers and from effectively subsidizing to hurting food consumers (Anderson and Hayami 1986). Fourth, much of the disincentive to agriculture in developing economies comes not from *direct* underpricing but *indirectly* via manufacturing protection and overvaluation of the nation's currency (Krueger, Schiff and Valdes 1988). And fifth, most national governments have an urban bias in their provision of public infrastructure (electricity, transport, communications, etc.) and human capital (education, health, information production and dissemination, etc.) which decreases but rarely reverses with economic development, especially when the quality of those investments is properly accounted for (Schultz 1980). These transitions tend to occur at a faster rate the faster an economy is growing and, in the case of relative price distortions, to reach the point of intersectoral policy neutrality (before becoming supportive of agriculture) at an earlier stage of economic development the weaker a country's agricultural comparative advantage (for reasons suggested in Anderson 1995a).

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[7] As Corden (1994, Ch, 15) makes clear, these levels are useful in sorting out the different uses people make of the term "international competitiveness", which could apply to all sectors, to just the grouping of sectors producing tradables, or to just one or a subset of those tradables sectors.

According to one recent set of estimates, the net effect on international prices of temperate foods of their relative overpricing in rich economies was almost exactly offset by the underpricing of those products in poorer economies in the 1980s at least (Tyers and Anderson 1992, Ch. 6). But that is less likely to be the case for edible oils and natural fibres, and it would certainly not be the case for beverages and other tropical products not produced in high-income economies: in both of these latter cases, the underpricing domestically in developing economies dominates, causing international prices for these products to be higher than they would be under global free trade.

Three important consequences follow from these facts. One is that economies are trading less in farm products than would be the case without intervention: economies with a comparative advantage in farming tend to be exporting less, and those with a comparative disadvantage in farming tend to be importing less (and may even be depressing international prices further by using export subsidies to dispose of protection-induced surpluses, as in Western Europe). Another is that the relative price of agricultural products in international markets has been under even greater pressure to decline in the course of global economic growth than suggested in the discussion above, as more and more upper middle-income developing economies gradually move away from taxing to subsidizing farmers. And the third consequence of these facts is that it has left ample scope to reform policies affecting farmer and consumer incentives, the effects of which will depend heavily on the pace and nature of multilateral, regional and unilateral reforms in the various commodity markets. It is conceivable, for example, that an increase in net farm imports by high-income economies following the WTO's recent Uruguay Round and prospective Millennium Round could coincide with an increase in net exports of agricultural products from developing economies undertaking unilateral reforms, and have offsetting effects on international farm prices but reinforcing effects on quantities traded as both sets of economies better exploit their respective comparative advantages. And it is expected that the discipline placed by the Uruguay Round on developing and transition economies (including those subsequently acceding to the WTO) not to raise farm producer or export subsidies will, in the long run at least as bound agricultural tariffs are lowered, reduce the likelihood that agricultural disincentives are replaced by protectionist policies in the future.

The role of policies affecting light manufactures

The trade policy bias in favour of import-substituting industrialization, discussed above, has a similar effect on unskilled labour-intensive manufacturing in a newly industrializing economy as it does on agriculture. Limiting imports through protectionism reduces the demand for foreign currency and thereby causes the real exchange rate to appreciate. That effectively holds back the development of *all* industries otherwise able to export,[8] including those light

[8] For more on how protection against imports effectively taxes exports, see Clements and Sjaastad (1984).

ones in which a poor country's manufacturing comparative advantage will first emerge. They are the very industries most likely to benefit from relocating or establishing in rural areas to take advantage of lower wages and other costs of production there. Hence not only agriculture but also rural industrialization is hampered by all-too-common protectionist import-substituting industrial policies.

The role of rural infrastructure investments

Needless to say, the move from subsistence-only farm production to having a marketable surplus of food, and the emergence of cash cropping, depend on the provision of rural roads, radio, post and telecoms to lower the cost of transport, information and communication. Constructing and maintaining those infrastructures, and rural electrification, provide off-farm work for farm households, but more importantly those infrastructures spawn additional new service-sector jobs in rural areas and elsewhere for transporting, grading, processing, packing, and distributing the marketed farm products. The opening up or extending of rural roads and communications, and investments in irrigation, also expand the effective demand for purchased farm inputs such as improved seed varieties, chemical fertilizers, pesticides, farm machinery, and fuel.

Rural roads, electricity and telecommunications also make rural industrialization more profitable for unskilled labour-intensive industries not connected to primary sectors. True, those roads also make it easier for rural workers to drift to urban areas, which would close the urban-rural wage gap somewhat. But many workers will stay put because for much of the year they are fully occupied in seasonal farm work. Manufacturing activities that have the flexibility to close temporarily during peak rice transplanting and harvesting periods would be especially likely to be attracted to rural areas. The more that rural industrialization is successful, the more the country's comparative advantage would move away from the primary sectors.

The new jobs created by those off-farm activities have been shown to contribute substantially not only to economic growth but also to reducing absolute poverty and rural-income inequality in many modernising agrarian economies (Findlay, Watson and Wu 1994; Lipton and Ravellion 1995; Mellor 1995). They also slow the growth of urban pollution and congestion.

All of this suggests a high social rate of return to investments in rural infrastructure, and more so the less government price and trade policies discriminate against primary and light

manufacturing sectors. The returns would be higher the freer the economy is of government interventions in general for two reasons. One is that being located near policy makers so as to lobby for special protectionist favours would then not be an issue. And secondly, in the presence of protection, manufacturers sell mainly to domestic consumers and buy inputs from other domestic producers. Those linkages encourage a concentration of manufacturing in the cities. By contrast, in an open economy most sales are exports and many inputs are imported so, together with higher property prices, congestion and pollution in cities, those factors can eventually encourage rural industrialization (Krugman and Livas 1996; Krugman 1998). This new theory of economic geography suggests a government can slow or reverse the growth of large urban cities by freeing trade and boosting rural infrastructure.

Empirical evidence

Both global cross-sectional and Asian (and other) time series evidence provides strong empirical support for the comparative advantage theory outlined above, notwithstanding policy distortions. The negative relationship between agriculture's shares of gross domestic product (GDP), employment (EMP) and exports (EXP) on the one hand, and income per capita (YPC) on the other, are very significant statistically. These shares are also negatively associated with population density per unit of agricultural land (PDA) although significantly so only for the export share equation. The relationships are summarized in the following regression equations, from Anderson (1987), which are based on World Bank data for 70 countries with populations in excess of 1 million (t-values in parentheses):

(1) $GDP = 87 - 9.9\ln YPC, \qquad R^2 = 0.80$
$\qquad\qquad\quad (6.7)$

(2) $EMP = 179 - 18.5\ln YPC, \qquad R^2 = 0.80$
$\qquad\qquad\quad (16.6)$

(3) $EXP = 152 - 9.5\ln YPC - 8.5\ln PDA, \qquad R^2 = 0.45$
$\qquad\qquad\quad (5.1) \qquad (4.7)$

The time series evidence for Northeast Asia is even more striking. As Table A.1 shows, agriculture supplied two thirds of Japan's jobs and export earnings and one third of GDP in the late nineteenth century, while today those contributions by Japan's farmers are miniscule. In South Korea and Chinese Taipei, a similar contraction of agriculture has occurred

in the second half of this century -- twice as fast as in Japan. And China also has undergone a dramatic decline in the relative importance of its farm sector.

For Asia's less developed economies the changes began later, but the same tendencies are clear from the middle columns of Table A.2. The first four columns of that table summarize the relative resource endowments and economic growth rates of Asia's economies. Leaving aside the centrally planned economies of Indo-China and North Korea, three groups of developing economies are identifiable: the NIEs of South Korea and Chinese Taipei, the large ASEAN economies plus China, and the South Asian economies. The first are extremely densely populated, very rapidly growing and with high incomes; the second are moderately densely populated, rapidly growing (the Philippines only in the 1990s) and with moderate incomes; and the third are very densely populated, slowly growing prior to the 1990s and with low incomes. Theory would lead us to expect the first group to have a weak and rapidly declining comparative advantage in agriculture, the second to have a stronger agricultural comparative advantage at the same per capita income but one that is nonetheless declining, and the third to have an in-between and only slowly declining comparative advantage in farm products.

The final four columns of Table A.2 support that theory. They show the trends in two indicators of agricultural trade specialization. One is the so-called 'revealed' comparative advantage index, defined as agriculture's share of a country's merchandise exports relative to agriculture's share of global merchandise exports, following Balassa (1965). The other is agricultural exports minus imports as a ratio of agricultural exports plus imports. The latter therefore takes a value between minus and plus one, and is zero when a country is 100 per cent self sufficient in farm products.

Notwithstanding massive growth in agricultural protection in the three advanced economies of Northeast Asia (Anderson and Hayami 1986), and major structural adjustments within agriculture away from cereals and towards more valuable vegetables, fruits and livestock products (Table A.3), these economies have become increasingly dependent on imported farm products as their agricultural comparative disadvantage increases. This has happened least so for Chinese Taipei, however, where greater rural industrialization has allowed more efficient utilization of rural labour in both farm and factory work -- although as the final column of Table A.3 reveals, off-farm earnings have become increasingly important for farm households in the other Northeast Asian economies as well.

In the lower middle-income, less-densely populated economies of Southeast Asia and China where policy distortions against farmers have been reduced but still prevail (Anderson 1994), the index of 'revealed' comparative advantage in farm products has been high but has fallen considerably since the latter 1960s. And while the index of net agricultural export surplus is still positive in most cases, it has been falling also. Even China has followed this path, despite huge increases in producer prices (Sicular 1989).

While all the revealed comparative advantage indexes are above unity in most of the low-income, slow-growing economies of South Asia, they have been falling; and, apart from

India (where agricultural disincentives recently have been reduced considerably), the net export surplus in farm products has diminished and gone into deficit for these densely populated economies whose policies continue to discourage agriculture.

In short, the above theory of agriculture's changing role in a developing market economy is well supported by the experience of Asian and other developing economies.

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Table 1: Food and agricultural trade specialization index[a], grain self sufficiency, and population density, various APEC economies, 1997

	Food & agricultural trade specialization index (X-M)/(X+M)	Grain self-sufficiency (%, 1995)	Population density (per sq km)
New Zealand	0.75	85	10
Australia	0.73	401	2
Chile	0.52	71	20
Thailand	0.37	65	120
Peru	0.28	48	20
Malaysia	0.22	36	60
United States	0.21	151	30
Canada	0.19	170	3
Indonesia	0.10	na	110
Vietnam	0.08	100	230
Philippines	0.04	95	240
China + Hong Kong	-0.01	100	127
Mexico	-0.09	na	50
Singapore	-0.24	na	4990
Chinese Taipei	-0.37	22	550
Korea, Rep	-0.67	25	460
Russia	-0.73	na	9
Japan	-0.92	30	330

[a] Exports minus imports as a ratio of exports plus imports of agricultural and food products in value terms. Comparable data for Brunei and Papua New Guinea are not available.

Source: PECC (1999), FAO (1997) and World Bank (1998).

Table 2: Cumulative percentage change in composition of real GDP, by sector and by region, 1992-2005 (under different base cases)

	China	ASEAN-4	NIEs	Japan	Aus/NZ	NAFTA	WEurope	ROW
Agriculture								
E1: Base Case	-42	-21	-36	-11	-6	1	-12	-7
E2: E1 + UR	-42	-30	-39	-21	-0	6	-15	-9
E3: E2 + Ch	-46	-27	-39	-21	-2	7	-15	-8
Other Primary								
E1: Base Case	2	-13	-6	1	-6	-3	-6	1
E2: E1 + UR	1	-21	2	-2	-5	-2	-7	-4
E3: E2 + Ch	-11	-17	2	-2	-5	-2	-7	-3
Light Manufactures								
E1: Base Case	5	16	-5	-6	-9	-7	-10	0
E2: E1 + UR	8	68	0	-5	-20	-19	-19	9
E3: E2 + Ch	42	42	-0	-6	-23	-21	-21	5
Other Manufactures								
E1: Base Case	63	17	15	1	-4	1	2	-4
E2: E1 + UR	60	-12	9	2	-8	2	4	-10
E3: E2 + Ch	38	-4	9	2	-8	2	4	-9
Services								
E1: Base Case	15	6	1	1	2	0	1	3
E2: E1 + UR	14	-0	-0	0	2	0	2	2
E3: E2 + Ch	9	1	-0	0	2	1	2	2

Source: Anderson et al. (1997b).

Table 3: Change in trade balance resulting from economic growth and the Uruguay Round, by sector and by region, 1992 to 2005
($US 1992 billion)

	China	ASEAN-4	NIEs	Japan	Aus/NZ	NAFTA	WEurope
Agriculture	-13	-5	-8	-12	3	24	-7
Other Primary	-11	10	17	-13	2	4	-7
Light Manufactures	59	41	28	3	-4	-70	-80
Heavy Manufactures	-33	-38	-33	17	-3	15	44
Services	-2	-9	-3	6	2	27	50
Total[a]	0	0	0	0	0	0	0

Source: Anderson et al. (1997b).

[a] The simulation assumes the total trade balance is unchanged, hence the zeros in the final row.

Table 4: Post-Uruguay Round tariffs (and agricultural production and export subsidies)[b], by sector and by region, 2005 (per cent)

Region	*Agriculture and food processing*	*Mining*	*Textiles and clothing*	*Other manuf-actures*
NAFTA	15	0	18	7
Australia + New Zealand	3	0	25	9
Japan + Korea	57	3	9	4
China + Hong Kong + Chinese Taipei	22	1	2	2
Southeast Asia (ASEAN)	19	3	15	11
South Asia	19	8	55	29
North Africa + Middle East	24	19	38	24
Sub-Saharan Africa	13	10	18	9
Central and South America	12	6	27	18
Former SU + Central Europe	8	1	6	5
Western Europe	30	0	11	4
Rest of the World	50	23	60	28
All OECD economies (1-4)	***36 (1, 7)***	***1***	***14***	***6***
All developing economies (5-10)	***20 (-2, -2)***	***6***	***12***	***11***
ALL ECONOMIES[a] (1-12)	***29 (0, 3)***	***2***	***14***	***8***

[a] Includes 'Former Soviet Union and Central Europe' and 'Rest of the World' (made up mostly of small island economies plus Turkey and tiny European, Mediterranean and East Asian economies such as North Korea and Mongolia).

[b] Production and export subsidy rates for agriculture are shown in parentheses in column 1.

Source: Anderson, Hoekman and Strutt (1999).

Table 5: Shares of GDP post-Uruguay Round in 2005, of private household consumption in 1995, and of trade in 1997, by sector
(per cent)

	Agriculture and food processing	*Minerals and fuels*	*Textiles and clothing*	*Other Manufac-tures*	Services	**ALL PRODUCTS**
SECTORAL SHARES OF REGIONAL GDP:						
All OECD economies	5	3	0.8	19	72	100
All developing economies	19	9	4.4	16	52	100
ALL ECONOMIES[a]	8	4	1.5	18	68	100
REGIONAL & SECTORAL SHARES OF GLOBAL GDP:						
All OECD economies	4	2	0.6	15	58	80
All developing economies	3	1	0.7	3	8	16
ALL ECONOMIES[a]	8	4	1.5	18	68	100
SECTORAL SHARES OF REGIONAL HOUSEHOLD CONSUMPTION						
All OECD economies	11	0	[b]	18	71	100
All developing economies	30	1	[b]	24	45	100
SECTORAL SHARES OF WORLD TRADE:	**9**	**9**	**5**	**57**	**20**	**100**

[a] Includes 'Former Soviet Union and Central Europe' and 'Rest of the World', hence is not just the weighted sum of rows 1 and 2.
[b] Included with 'Other Manufactures'.

Source: Anderson, Hoekman and Strutt (1999).

Table 6: Impact on economic welfare (equivalent variation in income) of removing distortions post-Uruguay Round, by sector and by major region, 2005[b]

(per cent, and 1992 US$ billion p.a. difference from post-UR base case in 2005)

	Contribution from removing distortions in OECD economies' markets for:					
Region	*Agriculture and food processing* (per cent)	*Textiles and clothing* (per cent)	*Other Manufactures* (per cent)	**Contribution from removing distortions in all goods markets of OECD economies (sum of columns 1-3) (per cent)**	**Contribution from removing distortions in all goods markets of developing economies (per cent)**	**Net benefit from removing distortions in all goods markets of OECD and developing economies ($ billion p.a.)**
All OECD economies	29	-3	42	**68**	**32**	**217**
All developing economies	44	21	-23	**42**	**58**	**45**
ALL ECONOMIES[a]	32	3	27	**62**	**38**	**260**

[a] Includes 'Former Soviet Union and Central Europe' and 'Rest of the World', hence is not just the sum of OECD and developing economies.
Source: Anderson, Hoekman and Strutt (1999).

Table 7: Impact of APEC trade liberalization[a] on international prices and world trade volumes, by sector, 2005
(percentage changes)

	APEC without ag. Reform		APEC with ag. reform	
Commodity	Prices	Trade	Prices	Trade
Agriculture	0.2	2.1	-0.4	17.7
Other Primary	0.2	2.6	0.0	2.8
Light Manufactures	-0.1	10.6	-0.3	11.3
Other Manufactures	0.2	6.1	0.3	6.0
Services	0.2	2.7	0.4	3.3

[a] APEC economies by 2005 are assumed to be half way post-Uruguay Round towards meeting their commitment to free trade.

Source: Anderson et al. (1997b).

Table 8: Impact of APEC trade liberalization on export and import volumes, by region, 2005
(percentage change)

	APEC without ag. Reform		APEC with ag. Reform	
Region	Exports	Imports	Exports	Imports
China	15.2	21.1	16.5	24.4
ASEAN-4	10.1	11.6	12.0	13.7
NIEs	5.2	6.7	6.2	7.9
Japan	9.9	12.1	11.4	14.8
Australia/New Zealand	5.3	6.0	5.8	6.2
NAFTA	6.5	5.2	7.5	5.8
Western Europe	2.4	1.3	2.9	1.3
ROW	1.0	-0.1	1.5	0.1
WORLD	**5.4**	**5.4**	**6.3**	**6.3**

[a] APEC economies by 2005 are assumed to be half way post-Uruguay Round towards meeting their commitment to free trade.

Source: Anderson et al. (1997b).

Table 9: Impact of economic growth, Uruguay Round implementation, and APEC trade liberalizatio[n] on intra- and extra-regional shares of East Asian and APEC trade, 1992 to 2005

(per cent)

(a) Share of total trade that is intra-regional

	East Asia	**APEC**
1992	38.5	64.7
2005 (without UR)	46.1	67.8
2005 (with UR incl. China/Chinese Taipei)	46.5	67.5
2005 (also with APEC liberalization)	47.6	69.1

(b) Extra-regional (intra-regional) trade as a percentage of regional GDP

	East Asia	**APEC**
1992	11.1 (7.0)	5.0 (9.2)
2005 (without UR)	11.7 (10.0)	5.3 (11.2)
2005 (with UR incl. China/Chinese Taipei)	13.5 (11.7)	6.1 (12.6)
2005 (also with APEC liberalization)	14.5 (13.1)	6.3 (14.1)

[a] APEC economies by 2005 are assumed to be half way post-Uruguay Round towards meeting their commitment to free trade.

Source: Anderson et al. (1997b).

Table 10: Impact on economic welfare (equivalent variations in income) of Uruguay Round and APEC trade liberalization[a], by region, 2005

(US$ 1992 billion per year)

	Uruguay Round without China	**plus** China's WTO Accession	**plus** APEC non-agric. goods trade reform	**plus** APEC agricultural trade reform
China	1	25	4	2
ASEAN-4	37	-10	0	2
NIEs	16	7	10	6
Japan	19	9	33	21
Australia/New Zealand	2	0	0	1
NAFTA	34	8	-6	2
SUB-TOTAL, APEC	**109**	**31**	**41**	**34**
Western Europe	44	13	8	-2
ROW	26	-1	0	0
WORLD	**179**	**50**	**49**	**32**

[a] APEC economies by 2005 are assumed to be half way post-Uruguay Round towards meeting their commitment to free trade.

Source: Anderson et al. (1997b).

Table A.1: Changing importance of agriculture in Northeast Asia, 1880 to 1996

	Share of agriculture (%) in:		
	Employment	GDP	Exports
Japan			
1880	74	38	63
1900	60	29	30
1920	51	22	23
1939	42	15	18
1960	33	13	11
1980	11	4	2
1996	5[a]	2	1
South Korea			
1956	na	46	89
1960	66	40	56
1970	50	26	17
1980	34	15	10
1996	15[a]	6	3
Chinese Taipei			
1953	56	38	92
1960	50	33	68
1970	37	18	21
1980	20	9	9
1996	13[b]	3	4
China			
1952	84	51	55
1965	82	40	35
1972	79	33	37
1978	71	28	25
1987	60	28	18
1996	48	21	10

[a] 1994.

[b] 1993.

Source: Updated from Anderson (1990, Table 2.1) using World Bank (1998) and Asian Development Bank (1996).

Table A.2: Agriculture's shares of GDP and merchandise exports and trade specialization indexes, various Asian countries, 1965 to 1995

	Land & GNP/worker (1995, % of world av.)			**GNP/capita growth(% pa)**	**Share of GDP from agric. (%)**		**Agriculture's share of merchandise exports(%)**		**Agric. comparative advantage index[a]**		**Agric. net export index[b]**	
	Arable land	Total Land	GNP	1970-1995	1970	1995	1965-69	1993-95	1965-69	1993-95	1965-69	1993-95
Japan	12	12	750	3.2	6	2	2	1	0.08	0.05	-0.89	-0.74
South Korea	18	10	210	10.0	26	7	12	1	0.60	0.15	-0.67	-0.71
North Korea	32	21	<25	na	na	Na	11	7	0.58	0.77	-0.26	-0.70
Chinese Taipei	18	8	290	7.0	16	3	39	4	1.96	0.45	0.20	-0.30
Indonesia	65	43	22	4.7	45	17	53	11	2.69	1.28	0.54	0.16
Malaysia	180	87	106	4.0	29	13	46	11	2.35	1.24	0.34	0.33
Philippines	62	22	26	0.6	30	22	49	11	2.51	1.26	0.45	-0.10
Thailand	115	32	48	5.2	26	11	76	16	3.87	1.80	0.68	0.50
China	25	27	7	6.9	35	21	40	6	2.08	0.72	0.19	0.04
Cambodia	147	75	6	na	na	51	95	na	4.88	na	0.80	na
Laos	72	205	7	na	na	52	14	11	0.70	1.25	-0.95	-0.33[d]
Myanmar	79	59	<7	1.2	na	63	71	43	3.63	4.89	0.68	-0.01
Vietnam	36	19	5	na	na	28	20	27	1.06	2.99	-0.77	0.40
Bangladesh	29	4	5	1.5	55	31	45	5	2.29	0.53	0.13	-0.74
India	76	15	8	2.4	45	29	36	14	1.85	1.58	-0.22	0.37
Nepal	44	29	4	1.3	67	42	84[c]	17	5.53[c]	1.91	0.78	-0.44
Pakistan	88	35	8	2.9	37	26	74	12	3.75	1.32	0.08	-0.36
Sri Lanka	41	16	15	3.2	28	23	96	15	4.91	1.66	0.37	-0.02
WORLD	**100**	**100**	**100**	**1.4**	**8**	**5**	**20**	**9**	**1.00**	**1.00**	**0.00**	**0.00**

[a] Agriculture's share of the country's exports relative to agriculture's share of global merchandise exports, following Balassa (1965).

[b] Agricultural exports minus imports as a ratio of agricultural exports plus imports. [C] 1975-79. [D] 1995 only
Sources: World Bank (1997a) and FAO (1997).

Table A.3: Composition of farm household income in Northeast Asia, 1955 to 1995
(per cent)

	Share of gross value of farm output[a] from:				Shares of:	
	Grains	Livestock Products	Fruit and vegetables	Other farm Produce	Value added in gross value of farm output	non-farm income in farm household income[b]
Japan						
1955-59	58	12	17	13	na	na
1960-64	50	18	20	12	68	50
1965-69	46	20	21	13	67	56
1970-74	37	25	26	12	63	68
1975-79	38	26	26	10	60	71
1980-84	31	28	26	15	53	83
1985-86	32	26	26	16	53	85
1990-94	29	25	32	14	na	na
1995	30	24	32	14	na	na
South Korea						
1960-64	78	7	6	9	na	20
1965-69	60	13	13	14	na	21
1970-74	57	14	15	14	81	24
1975-79	53	16	22	11	78	28
1980-84	51	21	23	5	74	34
1985-89	55	22	17	6	63	40
1990-92	50	26	19	5	62	46
Chinese Taipei						
1955-59	56	20	7	17	66	na
1960-64	55	22	9	14	64	na
1965-69	46	26	13	15	63	34
1970-74	39	33	18	10	56	51
1975-79	34	36	20	10	54	60
1980-84	25	38	27	10	50	66
1985-87	21	40	28	11	49	64
China						
1975-79	na	na	na	na	73	na
1980-84	na	na	na	na	69	33
1985-87	na	na	na	na	68	47
1988-89	40	33	14	13	65	54
1990-92	39	32	15	14	64	58

[a] Valued at current domestic prices.

[b] For Japan the shares refer to the first year of each period; for Korea and Chinese Taipei the pre-1980 shares refer to 1962, 1966, 1970 and 1977; and for China the shares refer to the share of the output in rural areas derived from nonfarm activities.

Source: Updated from Anderson (1990, Tables 4.11) and from State Statistical Bureau, *Statistical Yearbook of China 1993*, Beijing, pp. 64, 333 and 337.

Box 1

Why China's access to OECD textile and clothing markets is so important for food trade

The extent to which China becomes a net importer of food in the coming decade depends heavily on what access the United States and the European Union provide for China's textile and clothing exporters.

Currently, while China remains outside the WTO, it is not enjoying the accelerated access to US and EU markets that was negotiated in the Uruguay Round's Agreement on Textiles and Clothing (ATC) for WTO members of the Multifibre Agreement (MFA). If the ATC is fully complied with, the latter countries' 'voluntary' export restraints (VERs) on textile products will be abolished at the end of 2004. China's VERs, by contrast, will expand less rapidly and still continue after 2004 unless a new agreement is reached.

China's negotiations on its accession to the WTO provide an opportunity to reach a new agreement. Should China be admitted to WTO and be allowed to abolish its VERs at the end of 2004 along with other WTO members, its economy would be able to better exploit its strong comparative advantage in light manufactures. This is demonstrated in a recent study using the global economy-wide simulation model known as GTAP. The model was first run to 2005 assuming the Uruguay Round was fully implemented but that China (and hence Chinese Taipei) remained outside WTO and was allowed only to slowly increase its restrictive VERs. That scenario was then compared with one in which China and Chinese Taipei join WTO and, in doing so, enjoy the same opportunity to remove their VERs by end-2004.

The differences between those two scenarios in the projected change in size of the agricultural sector in both China and APEC agricultural-exporting countries is dramatic. In the base case, the share of agriculture in China's GDP falls by 42 per cent between 1992 and 2005, whereas in the alternative scenario it falls by 46 per cent as more resources are attracted to light manufacturing. The opposite is true for ASEAN economies: agriculture's share of their GDP falls 30 per cent in the base case but only 27 per cent in the alternative scenario (see Table 2). These are understandable given that the international prices of food relative to clothing rise with China's accession to WTO and assumed greater access to OECD textile and clothing markets.

For the United States, there is a clear political trade-off: if it continues to protect its textile producers by not allowing China greater access to its market for those labour-intensive products, it sells not only less cotton to China's textile factories, but also less farm products generally because China's manufacturers have less incentive to attract resources from the countryside.

Source: Anderson et al. (1997b).

Box 2

Indonesia's temporary re-agriculturalization bolsters the sector's role as an engine of growth recovery

As the Appendix shows, a common feature of long-term economic growth and structural change as capital accumulates is the relative decline of the agriculture sector. The East Asian crisis of 1997-99, which involved capital flight and currency devaluation, tended to have the opposite impact on the worst-affected economies, namely that of *increasing* the relative importance of agriculture. Given that, to what extent could agriculture be an engine for recovery? The answer depends to a considerable extent on the policy responses of the government.

Consider the case of Indonesia, where the policy responses in turn depend in part on the degree of political stability and restoration of investor confidence following the 1999 elections. A recent study, using the global, economy-wide GTAP model, projects the Indonesian economy (and that of the rest of the world) to 2005 without and then with the East Asian crisis, and then shows how the economy would be affected by different Indonesian policy responses.

The projected decline in the share of agriculture and processed food in Indonesia's GDP slows considerably over the period to 2005 because of Indonesia's growth interruption in 1997-99. The estimated benefits to Indonesia from embracing further unilateral reform, as a way of catching up on those 'lost years', are contrasted with the growth-reducing strategy of reneging on Uruguay Round commitments to liberalize Indonesia's trade. Two growth-enhancing reforms are considered: an across-the-board unilateral trade reform, which hastens agriculture's relative decline, and an agriculture-specific policy reform that boosts farm productivity, which causes the farm sector to increase its contribution to GDP, employment and exports.

Such empirical studies demonstrate that there is indeed scope for agriculture to continue to play an important role even in newly industrializing economies, provided the policy environment removes impediments to farm productivity growth.

Source: Anderson and Strutt (1999).

Box 3

Food export taxes can harm food buyers as well as sellers: the cases of Thailand and Vietnam

For many years until recently, Thailand, like so many food-surplus developing countries, imposed a tax on rice exports. It did so partly to raise government revenue, but ostensibly also to lower the domestic price of rice for consumers to make this staple more affordable for poor households that are not surplus rice producers. In the process, of course, that tax lowered the producer price and so lowered the real incomes of those rice farmers who had (or would have had at the free-market price) a surplus to sell. Even though many such farmers were very poor, their plight was not enough to prevent the tax being imposed for decades.

However, a recent empirical study, using an economy-wide model, has shown that Thailand's rice export tax also worsened -- rather than improved -- the incomes of the urban poor in that country. This apparently paradoxical result comes about because the rice export barrier reduces the income-earning prospects of unskilled workers, and to a sufficient extent as to more than offset the help they receive directly in terms of lower food prices. Those workers' incomes are reduced because the trade tax lowers the aggregate demand for and hence wage of unskilled labour (the country's most abundant factor of production), not only on farms but also in non-farm activities.

This lesson from the Thai experience is even more relevant for Vietnam, where rice export restrictions remain severe. There 80 per cent of people still live in rural areas, and they are typically far poorer than the people in urban households. Certainly the majority of rural households would enjoy an income boost if rice trade restrictions were removed. But many of the other poor households in Vietnam also would benefit indirectly because, as in Thailand, the demand for and hence wages of unskilled labour would rise with that reform. The only people who might feel food would be less within reach of their budget are the net food buyers in urban areas who are relatively skilled workers or are capital owners -- and they are of course the most affluent households.

Removing restrictions on rice exports, especially when those restrictions vary from season to season in unpredictable ways, would also bestow a benefit outside Vietnam. Rice-importing countries such as Japan and Korea claim that the international rice market is unreliable and underpriced because of such export restraints. Reforming that policy, as Thailand has done, would reduce the weight that could be given to that argument for continuing rice protection in Northeast Asia.

Sources: Warr (1997), Minot and Goletti (1999), Anderson (1999).