

# Distorted Agricultural Incentives and Economic Development: Asia's Experience

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**Abstract**

Earnings from farming in many low-income countries have been depressed by a pro-urban bias in own-country policies, as well as by governments of richer countries favoring their farmers with import barriers and subsidies. Both sets of policies reduce national and global economic welfare. The rapid development of many Asian emerging economies has been accompanied by a gradual reduction in their anti-agricultural policies, but many distortions remain and some countries have moved from negative to positive assistance for farmers, following the earlier examples of first Japan and then Korea and Taiwan. Drawing on results from a new multi-country research project, this paper examines the extent of these changes relative to those of other developing countries over the past five decades. It concludes by pointing to prospects for further policy reform in Asia.

**Keywords:** Distorted incentives, agricultural and trade policy reforms, Asian agricultural development

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# **Distorted Agricultural Incentives and Economic Development: Asia's Experience**

*Kym Anderson*

## **1. INTRODUCTION**

A study two decades ago showed that developing countries had been taxing heavily their agricultural sectors, both directly and indirectly via protecting manufacturing from import competition (Krueger, Schiff and Valdes 1988, 1991). The main exceptions seemed to be South Korea and Taiwan which, like Japan some decades earlier, had switched from taxing to assisting their farmers and were steadily raising that assistance as their per capita income and agricultural comparative disadvantage rose in the course of their rapid economic growth (Anderson, Hayami and Others 1986). But since the mid-1980s, great progress has been made by many developing countries in reducing their earlier anti-farm policy bias, and indeed these changes have been transformational in China and to a lesser extent in India. Yet many trade-reducing price distortions remain between sectors, as well as within the agricultural sector of low- and middle-income countries, including in Asia. This matters for the majority of households in the world, because 45 percent of the global workforce is employed in agriculture and 75 percent of the world's poorest households depend directly or indirectly on farming for their livelihoods. It matters even more in Asia's developing economies where 60 percent of the workforce and 81 percent of the poor (625 million people earning less than \$1/day) are engaged in agriculture (World Bank 2007, Chen and Ravallion 2007).

To better understand the nature and extent of this reform process, a new World Bank research project is revisiting this issue, extending those earlier estimates of distortions to the present decade and expanding the sample to examine similar trends in other parts of Asia as well as in Africa, the Americas and Europe. In all, estimates are being provided for more than 70 countries, comprising 90 percent of global agriculture, and for as many years as possible over the past five decades. The sample of 13 Asian economies reviewed in this paper accounts for more than 95 percent of

the agricultural value added, farm households, total population and total gross domestic product of Asia.<sup>1</sup>

This study is timely for at least four reasons. First, the World Trade Organization (WTO) is in the midst of the Doha round of multilateral trade negotiations, and agricultural policy reform is one of the most contentious issues in those talks. Second, countries are seeking to position themselves favorably also in various preferential trade negotiations, and in the wake of other forces of globalization such as the information, communication, agricultural-biotechnology and supermarket revolutions. Third, poorer countries and their development partners are striving to achieve their United Nations–encouraged Millennium Development Goals by 2015, the prime ones being the alleviation of hunger and poverty. And fourth, the outputs of the study can be used by governments as they grapple with how to respond to the spike in food prices in 2008.

This paper summarizes the research project’s preliminary findings on the changing extent of policy induced price distortions in Asia relative to those of other developing countries.<sup>2</sup> What emerges from the new results is that the tendency observed in Northeast Asia, for governments to move gradually from taxing to assisting agriculture relative to manufacturing in the course of economic development, is also showing up in later-industrializing countries of Asia and elsewhere. In particular, when mapped against per capita income it appears that China and India in particular are on similar policy trajectories to those traveled by Northeast Asia’s policy makers. The concluding section reflects on the scope and prospects for further policy reform in Asia, including via trade negotiations among members of the World Trade Organization where WTO commitments on agricultural tariffs and subsidies could limit the scope for further growth in agricultural protection – but only after the large gaps between earlier WTO legally bound and actual applied tariff and subsidy rates on farm products are removed.

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<sup>1</sup> A more-limited study for a smaller sample of four key developing economies of Asia was recently also undertaken by IFPRI (Orden et al. 2007).

<sup>2</sup> The regional studies are forthcoming in Anderson and Martin (2009), Anderson and Masters (2009), Anderson and Swinnen (2008), and Anderson and Valdés (2008). Together with comparable studies of high-income countries (including Japan), they form the basis for a global overview volume (Anderson 2009a).

## 2. BACKGROUND

When Japan switched from being a small net exporter of food to becoming dependent on rice imports in the early years of the 20<sup>th</sup> century, farmers and their supporters called for rice import controls. Their calls were matched by equally vigorous calls from manufacturing and commercial groups for unrestricted food trade, since the price of rice at that time was a major determinant of real wages in the non-farm sector. These heated debates were not unlike those that led to the repeal of the Corn Laws in Britain six decades earlier. In Japan, however, the forces of protection triumphed, and a tariff was imposed on rice imports from 1904. That tariff then gradually rose over time, raising the domestic price of rice to more than 30 per cent above the import price during World War I. When there were food riots because of shortages and high rice prices just after that war, the Japanese government's response was not to reduce protection but instead to extend it to its colonies and to shift from a national to an imperial rice self-sufficiency policy. That involved accelerated investments in agricultural development in the colonies of Korea and Taiwan behind an ever-higher external tariff wall that, by the latter 1930s, had driven imperial rice prices to more than 60 per cent above those in international markets (Anderson and Tyers 1992).

After post-war reconstruction, Japan continued to raise its agricultural protection, just as had been happening in Western Europe, but to even higher levels. Domestic prices exceeded international market prices for grains and livestock products by around 40 per cent in the 1950s in both Japan and the European Community. By the 1980s the difference was 90 per cent for Japan, and since the 1990s has been above 120 per cent. Meanwhile, in South Korea and Taiwan, an import-substituting industrialization strategy was adopted in the 1950s. It harmed farmers for a few years, but was replaced in the early 1960s with a more-neutral trade policy, which stimulated very rapid export-oriented industrialization in those densely populated economies. That development strategy imposed competitive pressure on the farm sector which, just as in Japan in earlier decades, prompted farmers to lobby (successfully, as it happened) for ever-higher levels of agricultural protection from import protection in those newly industrialized economies.

The Asian developing economies in the present sample accounted in 2000-04 for only 10 percent of worldwide GDP but 37 percent of agricultural value added, 51

percent of the global population and 73 percent of the world's farmers. Table 1 reveals the considerable diversity across countries within Asia in terms of stages of development, relative resource endowments, and comparative advantages, hence these economies provide a rich sample for comparative study.

In terms of endowments of agricultural land per capita, Korea and Taiwan are exceptional in having – like Japan – only one-twentieth of the global average endowment ratio. Bangladesh has only a little more, followed by Sri Lanka and the Philippines. Even Indonesia, India and Pakistan have only about one-quarter of the global average endowment, while Malaysia and Thailand have about two-fifths and China one-half.<sup>3</sup> That is, none of these Asian economies are relatively well endowed with crop or pasture land, and on a per capita basis the region has only one-third the global average. This might suggest Asian economies would have a low comparative advantage in agricultural goods, were it not for two facts: these economies are at varying stages of industrial development, and the quality of and institutional arrangements/entitlement to their land and water vary greatly. As a result, so too do their strengths in terms of agricultural competitiveness. Those differences are reflected in the indexes of revealed comparative advantage (RCA) shown in Table 1. A majority of the economies have an RCA index well above 100, indicating the extent to which the share of agricultural and food products in the country's merchandise trade exceeds the global average share, but for Korea and Taiwan – again like Japan – that index is below 30 and for China and the Philippines it is around 60.

The most striking economic characteristic of Asia's developing economies, and especially those in East Asia, is their rates of economic growth and industrial development over the past three decades (and even longer for Korea and Taiwan, again copying Japan before them). The recent report of the Commission on Growth and Development (Spence 2008) noted that 13 of the world's economies have had sustained growth of real per capita income of more than 7 percent for at least 25 consecutive years since World War II, and nine of those are East Asian.<sup>4</sup> Between 1980 and 2004, East Asia's per capita GDP (excluding Japan) grew at 6.3 percent per year and South Asia's at 3.4 percent, which contrasts with the global average of just 1.4 percent. Developing Asia's industrial growth in that period was 8.6 percent per

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<sup>3</sup> In terms of overall (as distinct from just crop and pasture) land endowment per capita, China is only one-third of the global average.

<sup>4</sup> The nine are Japan, Korea, Taiwan, China, Indonesia, Malaysia, Thailand, Hong Kong and Singapore. Brazil is the only other large economy in the set, the other three being Botswana, Malta and Oman.

year compared with the world's 2.5 percent; and even agricultural growth in developing Asia was more than half as high again as in the world as a whole (3.1 compared with 2.0 percent per year – see Table 2).

A key driver of the rapid growth and industrialization of Asia has been the decision by many countries of the region to become more open and switch away from an import-substituting development strategy to one that is export oriented. That change occurred at different times in our focus countries, beginning early on with Japan and then with Taiwan and then Korea in the 1960s. China joined the group from the late 1970s, Vietnam in the mid-1980s, and India haltingly in the early 1980s but more concertedly from 1991. As a result, export volumes grew at double-digit rates (last column of Table 2), such that the share of exports in GDP rose steadily for the region (more than doubling in the 30 years to 2004) and the developing East Asian region's share of global exports of non-food manufactures has quadrupled since 1990, thanks especially to China's industrialization.<sup>5</sup>

With that export-led growth has come dramatic restructuring of Asia's economies away from agriculture and towards not only manufacturing but also service activities. In East Asia the farm sector's share of GDP is now less than 30 percent of what it was in the latter 1960s, and even in slower-growing South Asia it has less than halved over that period. The biggest changes are in China and Indonesia, where agriculture's shares of GDP have dropped from more than 40 and 50 percent, respectively, in the 1960s to 13 percent by 2005. Bangladesh also has transformed remarkably: agriculture's share was 54 percent in 1965-69 when all other non-service industries accounted for just 9 percent, and now industry's share is well above agriculture's (27 versus 20 percent in 2005). Pakistan, Sri Lanka and the Philippines, being the slowest-growing of the focus economies, have been the slowest to move away from agriculture since the 1960s. At the other extreme are Korea and Taiwan, which now have only 2 or 3 percent of their GDP coming from farming (closing in on Japan's 1 percent). For developing Asia as a whole, agriculture is now less than one-eighth of GDP (down from more than one-third in the late 1960s), industry has risen from 27 to 38 percent, and services from 35 to 49 percent (Table 3).

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<sup>5</sup> By contrast, developing Asia's share of global exports of agricultural and food products has grown very little (from 11.0 to 13.5 percent between 1990 and 2006).

The apparent decline in agricultural comparative advantage in developing Asia is evident in the self-sufficiency data for primary farm products. Until 30 years ago the region was almost exactly 100 percent self-sufficient in farm products, but since then that indicator has declined to less than 85 percent (Table 4). The share of farm production exported has not changed much, averaging in the 4-6 percent range (although there have been substantial changes in individual countries, with declines in Malaysia, the Philippines, Sri Lanka and Taiwan offset by increases in countries such as Vietnam, Thailand and China). By contrast, since the latter 1970s the share of imports in domestic consumption of farm products has quadrupled, to around 20 percent.

As will become clear below, the increasing dependence on imports of farm products in Asia has occurred despite reductions in the taxation of agricultural exports and increases in incentives provided to farmers via government policy reforms. Before presenting those results, it is necessary to briefly summarize the methodology used to generate these new indicators of distortions (details of which are available in Anderson et al. 2008).

### **3. METHODOLOGY FOR MEASURING PRICE DISTORTIONS**

The nominal rate of assistance (NRA) is defined as the percentage by which government policies have raised gross returns to farmers above what they would be without the government's intervention (or lowered them, if  $NRA < 0$ ). If a trade measure is the sole source of government intervention, then the measured NRA will also be the consumer tax equivalent (CTE) rate at that same point in the value chain. But where there are also domestic producer or consumer taxes or subsidies, the NRA and CTE will no longer be equal and at least one of them will be different from the price distortion at the border due to trade measures. Both are expressed as a percentage of the undistorted price (unlike the producer and consumer support estimates (PSEs and CSEs) computed by OECD (2007) which are expressed as a percentage of the distorted price).

In most countries distortions to farm inputs are very small compared with distortions to farm output prices. But where there are significant product-specific distortions to input costs, they are captured by estimating their equivalence in terms of a higher output price and including that in the NRA for individual agricultural industries wherever data allow.

Each industry is classified either as import-competing, or a producer of exportables, or as producing a nontradable (with its status sometimes changing over the years), so as to generate for each year the weighted average NRAs for the two different groups of tradables. Any non-product-specific distortions, including distortions to farm input prices, are also added into the estimate for the overall sectoral NRA for agriculture as a whole.

The coverage of products for NRA estimates averages around between two-thirds and three-quarters of the gross value of Asian farm production at undistorted prices. Authors of the country case studies also provide 'guesstimates' of the NRAs for non-covered farm products. Weighted averages for all agricultural products are then generated, using the gross values of production at unassisted prices as weights. For countries that also provide non-product-specific agricultural subsidies or taxes (assumed to be shared on a pro-rata basis between tradables and nontradables), such net assistance is then added to product-specific assistance to get a NRA for total agriculture (and also for tradable agriculture for use in generating the Relative Rate of Assistance, defined below).

In addition to the mean, a measure of the dispersion or variability of the NRA estimates across the covered products also is generated for each economy. The cost of government policy distortions to incentives in terms of resource misallocation tend to be greater the greater the degree of substitution in production (Lloyd 1974). In the case of agriculture which involves the use of farm land that is sector-specific but transferable among farm activities, the greater the variation of *NRA*s across industries within the sector then the higher will be the welfare cost of those market interventions. A simple indicator of dispersion is the standard deviation of the covered industries' *NRA*s .

Farmers are affected not just by prices of their own outputs but also by the incentives nonagricultural producers face. That is, it is *relative* prices and hence *relative* rates of government assistance that affect producer incentives. More than seventy years ago Lerner (1936) provided his Symmetry Theorem that proved that in

a two-sector economy, an import tax has the same effect as an export tax. This carries over to a model that also includes a third sector producing only nontradables, to a model with imperfect competition, and regardless of the economy's size (Vousden 1990, pp. 46-47). If one assumes that there are no distortions in the markets for nontradables and that the value shares of agricultural and non-agricultural nontradable products remain constant, then the economy-wide effect of distortions to agricultural incentives can be captured by the extent to which the tradable parts of agricultural production are assisted or taxed relative to producers of non-farm tradables. By generating estimates of the average NRA for non-agricultural tradables, it is then possible to calculate a Relative Rate of Assistance, RRA, defined in percentage terms as:

$$(1) \quad RRA = 100[(1+NRA_{ag}^t/100)/(1+NRA_{nonag}^t/100) - 1]$$

where  $NRA_{ag}^t$  and  $NRA_{nonag}^t$  are the weighted average percentage NRAs for the tradable parts of the agricultural and non-agricultural sectors, respectively. Since the NRA cannot be less than -100 percent if producers are to earn anything, neither can the RRA (assuming  $NRA_{nonag}^t$  is positive). And if both of those sectors are equally assisted, the RRA is zero. This measure is useful in that if it is below (above) zero, it provides an internationally comparable indication of the extent to which a country's policy regime has an anti- (pro-)agricultural bias.

In calculating the NRA for producers of agricultural and non-agricultural tradables, the methodology sought to include distortions generated by dual or multiple exchange rates. Such direct interventions in the market for foreign currency were common in some Asian countries in the 1970s and 1980s, including China. However, authors of some of the focus country studies had difficulty finding an appropriate estimate of the extent of that distortion, so the impact of that on NRAs has not been included for all. Its exclusion for some countries (e.g., India) means their estimated (typically) positive NRAs for importables and (typically) negative NRAs for exportables are smaller than they should be. In cases where the NRA for importables dominates that for exportables, this omission would lead to an underestimate of the average (positive) NRA for such tradables sectors, and conversely.

To obtain dollar values of farmer assistance and consumer taxation, the country authors' estimates of *NRA* are multiplied by the gross value of production at undistorted prices to obtain an estimate in current US dollars of the direct gross subsidy equivalent of assistance to farmers (*GSE*). This is then added up across

products for a country and across countries for any or all products to get regional aggregate transfer estimates for the studied economies. These *GSE* values are converted to constant (2000) US dollars, and are also expressed on per-farm-worker basis. Comparable dollar value estimates of the consumer transfer also are provided.

### 3. ESTIMATED RATES OF ASSISTANCE

We begin with estimates of the nominal rates of assistance to agriculture, then compare them with the nominal rates for non-agricultural tradables in Asia and with similar rates for other regions.

#### *a. Nominal rates of assistance to agriculture*

From the mid-1950s to the early 1980s, agricultural price and trade policies reduced earnings of farmers in developing Asia, on average by more than 20 percent; but that implicit taxation declined from the early 1980s and, from the mid-1990s, the NRA switched sign and became increasingly positive. That average hides considerable diversity within the region, however. Nominal assistance to farmers in Korea and Taiwan was positive from the early 1960s (although very small initially when compared with the 40+ percent in Japan), Indonesia had some years in the 1970s and 1980s when its NRA was a little above zero (as did Pakistan prior to Bangladesh becoming an independent country in 1971), and India's and the Philippines' average NRAs became positive from the 1980s (Table 5).<sup>6</sup>

This trend is present for the vast majority of the commodity NRAs for the region too, with meat and milk the only products to have seen their assistance rates cut over that period. As is true for other regions of the world, assistance is among the highest for the 'rice pudding' products of sugar, milk and rice (Table 6). But even for those three products there is a great diversity across countries in their NRAs, with 5-

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<sup>6</sup> Note that in Tables 5 to 8, and Figures 1 and 2, it has been assumed that NRA estimates for China pre-1981 and India pre-1965 are the same as the average NRA estimates for those economies for 1981-84 and 1965-69, respectively, and that the gross value of production in those missing years is that which gives the same average share of value of production in total world production in 1981-84 and 1965-69, respectively. This NRA assumption is conservative in the sense that for both countries the average NRA was probably even lower (more negative) in earlier years.

year averages ranging from almost zero to as much as 400 percent for rice and 140 percent for milk in Korea, and to 230 percent for sugar in Bangladesh. There is a great deal of NRA diversity also across commodities within each Asian economy's farm sector, and the extent (as measured by the standard deviation) has grown rather than diminished over the past five decades, from a regional average of less than 40 percent in the early years under study to more than 55 percent in recent years (see bottom row of Table 5). This suggests there is still much that could be gained from improved resource reallocation both between Asian economies and within the agricultural sector of individual Asian economies, were differences in rates of assistance to be reduced.

A striking feature of the distortion pattern within the farm sector is its strong anti-trade bias. This is evident in Figure 1, which depicts the average NRAs for agriculture's import-competing and export sub-sectors for the region: the former average is always positive and its trend is upward-sloping, whereas the NRA average for exportables is negative and did not diminish until the 1980s, after which it gradually approached zero. While the gap between the NRAs for those two sub-sectors has diminished little since the 1960s for the region as a whole, that hides the fact that there are several countries (Malaysia, Thailand, Pakistan, Sri Lanka) for which that gap has narrowed somewhat.

The US dollar value equivalent of the positive or negative assistance to farmers due to agricultural price and trade policies has been non-trivial. The anti-agricultural bias peaked for the region in the latter 1970s at nearly \$130 billion per year in constant dollar terms (expressed in 2000 US dollars – see bottom row of Table 7(a)). That is equivalent to a gross tax of around \$170 for each person engaged in agriculture. Most of that \$130 billion was due to China's anti-agricultural policies, with India the second biggest contributor in the 1960s and 1970s. Thanks to the reforms of the past two decades, such taxation has gradually disappeared in all our focus countries. But the reform does not mean there is no intervention now. Rather, the former negative influence has been replaced by positive assistance to farmers in most countries, totalling nearly \$60 billion per year, with China, India and Korea each contributing about one-quarter of that total. In recent years the total has averaged around \$60 per farm worker in Asia. That \$60 is not small compared with per capita income for the region, but it is very unevenly distributed: it ranges from between \$6900 and \$5300 for farmers in Korea and Taiwan (more than one-third of those economies' per capita income) to around \$150 in the Philippines, \$90 in Indonesia,

\$60 in Malaysia, India and Vietnam, and virtually zero in Thailand, Bangladesh and Pakistan (Table 7(b)). The negative contribution comes mainly from policies directly affecting the exportable parts of Asian agriculture, while most of the positive contribution comes from protecting import-competing producers. Rice, milk and sugar again are the most assisted industries in terms of aggregate gross subsidy equivalent today – but back in the early 1980s, when China was still heavily taxing its farmers, the net contribution of rice was negative and large. At that time policies affecting pigmeat, and fruits and vegetables, were equally large contributors to the effective taxation of Asian farmers, again almost entirely because of China's influence.

*b. Assistance to non-farm sectors and relative rates of assistance*

The anti-agricultural policy biases of the past were due not just to agricultural policies. Also important to changes in incentives affecting inter-sectorally mobile resources have been the significant reductions in border protection to the manufacturing sector (which has been the dominant intervention in the tradables part of non-agricultural sectors). That reduction in assistance to producers of non-farm tradables has been even more responsible for the improvement in farmer incentives than the reduction in direct taxation of agricultural industries.

It has not been possible to quantifying the distortions to non-farm tradable sectors as carefully as for agriculture. Authors of the country case studies typically relied on applied trade taxes (for exports as well as imports) rather than being able to undertake price comparisons, and hence they usually do not capture the quantitative restrictions on trade which were important in earlier decades but decreasingly so through recent times. Nor do they capture distortions in the services sectors, some of which now produce tradables (or would do in the absence of interventions preventing their emergence). As a result the estimated NRAs for non-farm importables are smaller and decline less rapidly than in fact was the case – and likewise for non-farm exportables, except their NRAs in some cases would have been negative. Of those two elements of under-estimation, the former bias certainly dominates, so the authors' estimate of the overall NRA for non-agricultural tradables should be considered a

lower-bound estimate, and more so in the past so that its decline is less rapid than it should be.<sup>7</sup>

Despite that likely underestimation, the NRA estimates for non-farm tradables are very sizeable prior to the 1990s. For Asia as a whole, the average NRA value has steadily declined throughout the past four or five decades as policy reforms have spread. This has therefore contributed to a decline in the estimated negative relative rate of assistance for farmers: the weighted average RRA was worse than -50 percent up to the early 1970s but improved to an average of -32 percent in the 1980s, -9 percent in the 1990s and is now positive, averaging 7 percent in 2000-04. The five-decade trends in RRAs and their two component NRAs for each economy are reported in Table 8. It is even clearer from Figure 2 that the falling positive NRAs for non-farm producers has contributed even more to the rise of the RRA in Asia than has the gradual reduction in the negative NRAs for farmers due to agricultural policy reforms.

Has the international location of production of farm products within Asia become more or less efficient as a result of policy changes over the past five decades? A global computable general equilibrium model with a time series of databases is needed to answer that question well. But one very crude way of addressing the question is to examine the standard deviation of RRAs across the economies of the region over time. That indicator suggests distortions have become more dispersed across countries over time: it averaged 35 percent during 1960-74, 50 percent during 1975-89 and 55 percent during 1990-2004 (final row of Table 8).

Of the striking changes in RRAs shown for individual economies over the past two decades, it is the move from negative to positive RRAs for China and India that matter most for the region – and indeed for the world. The extent of the decline in the non-agricultural NRA since the early 1980s is very similar for those two key countries, but the agricultural NRA has differed: in China the 5-year averages have risen steadily from -45 percent to 6 percent, whereas in India it has been close to zero except for a spike upward when international food prices collapsed in the mid-1980s, and for a rise in the present decade (Figure 3).

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<sup>7</sup> This bias is accentuated in those cases where distortions to exchange rates are not included, as noted above in the methodology section. Exchange rate distortions were included in the studies for China, Malaysia, Vietnam, Pakistan and Sri Lanka. Their impact was greatest in China, where it made the RRA more negative to the extent of about 2 percentage points in the 1970s, 6 percentage points in the 1980s and 3 points in the 1990s (see Huang et al. 2007).

This dramatic rise in the RRA for the world's two most populous countries is of great significance to the current analyses of the causes of the international food price rises of the present decade. One of the contributors is said to be the growing appetite for food imports by these two countries as they industrialize and their per capita incomes rise. Yet as Table 4 shows, both countries have remained very close to self sufficient in agricultural products over the past four decades. Undoubtedly the steady rise in their RRAs has contributed to that outcome. It may also have helped ensure that the trend in China's ratio of urban to rural mean incomes (adjusted for cost of living differences) has been flat since 1980 (Ravallion and Chen 2006, Figure 3), and that the Gini coefficient for India has hardly changed between 1984 and 2004 (World Bank 2008). A major question, to which we return at the end of the paper, is: will their RRAs remain at their current neutral level of close to zero, or will they continue to rise in the same way as observed in Korea and Taiwan and, before them, in Japan and Western Europe?

### *c. Comparisons with other regions*

The regional upward shift in agricultural NRAs and the RRAs towards zero, and even the move to positive agricultural NRAs and RRAs recently, are not unique to Asia. Figure 4 shows that similar trends, albeit less steep, have resulted from policy reforms in other developing country regions over the past four decades, suggesting that similar political economy trends might be at work as economies develop. In the past it has been found that agricultural NRAs and RRAs are positively correlated with per capita income and agricultural comparative disadvantage (Anderson 1994, 1995). A glance at previous tables suggests that Asian economies have been – and continue to be – contributors to that trend. This is confirmed statistically in the multiple regressions with country and time fixed effects shown in Table 9.

### *d. Consumer tax equivalents of agricultural policies*

The extent to which farm policies impact on the retail consumer price of food and on the price of livestock feedstuffs depends on a wide range of things including the degree of processing undertaken and the extent of competition along the value chain. We, like the OECD (2007), therefore attempt only to ask how much impact policies

have on the buyer's price at the point on the value chain where the farm product is first traded internationally and hence where comparisons are made between domestic and international prices (e.g., as milled rice, or raw sugar, or beef).

If there were no farm input distortions and no domestic output price distortions so that the NRA was entirely the result of border measures such as an import or export tax or restriction, and there were no domestic consumption taxes or subsidies in place, then the CTE would equal the NRA for each covered product. But such domestic distortions are present in several Asian economies. In Korea, for example, producer prices have been well above consumer prices for several important crop products, while in China the opposite was true at least until the early 1990s: producers of food staples were taxed more than consumers were subsidized, even taking into account the 'iron rice bowl' in-kind partial wage payment received by many urban workers. Also, because of international trade, the weights used to aggregate product distortion rates on the consumption side differ from those on the production side of the market. Hence the aggregate CTE differs somewhat from the aggregate NRA for each economy.

In dollar terms the CTEs are largest in China and India, but are also large in Indonesia, Korea and Taiwan (Table 10). In the present decade the transfer on average from consumers to producers in the region amounts to around \$35 billion per year. In the early 1980s, by contrast, the transfer was from producers to consumers, and amounted to \$50 billion per year at the producer level for products covered in this project. Among the covered products, the biggest transfers are again for milk, rice and sugar.

*e. The role of agricultural policies in stabilizing domestic prices*

An often-stated objective of food policies in Asia (and elsewhere) is to reduce fluctuations in domestic food prices and in the quantities available for consumption. Nowhere is that more obvious than in rice, for which fluctuations in trade barriers are frequently used as a buffer against domestic or international shocks, rather than using trade as a source of cheaper imports or an opportunity for export earnings. Since Asia produces and consumes four-fifths of the world's rice (compared with about one-third of the world's wheat and maize), this market-insulating behavior of Asian policy makers means that even by 2000-04 only 6.9 percent of global rice production was

traded internationally<sup>8</sup> (compared with 14 and 24 percent for maize and wheat), and so international prices are much more volatile for rice than for those other grains. This in turn means that nominal rates of protection for rice would be above trend in years of low international prices and conversely in years when international prices for rice are high.

Figure 5 reveals that this indeed is the case. Even when averaging over all our focus countries in Southeast or South Asia, the negative correlation between the rice NRAs and the international rice price is very high, at -0.59 for Southeast Asia and -0.75 for South Asia.

#### *f. Summary of findings*

One of the most salient features of price and trade policies in the Asian region since the 1960s is the spate of major economic reforms, including significant trade liberalization. Overall levels of non-agricultural protection have declined considerably, which has improved the competitiveness of the agricultural sector in many economies but especially in China and India. Two other salient features have been the gradual policy movement away from taxing agricultural exportables, and at the same time – and in contrast to non-agriculture – a rise in agricultural import protection.

More specifically, the following features of the Asian experience of the past five decades are worth highlighting by way of summarizing the key findings of this regional study.

*Since the 1950s the region has seen a gradual movement away from taxing farmers relative to non-agricultural producers and the emergence during the most recent decade of positive assistance on average for Asian farmers.* The gradual fall in the estimated (negative) RRA for the region, from more than -50 percent up to the early 1970s to small positive rates in the past decade, has been not dissimilar to but is more dramatic than the trends in Africa and Latin America. Instead of being effectively taxed more than \$130 billion per year as in the late 1970s/early 1980s (or \$170 per person working in agriculture), Asian farmers in the region now enjoy

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<sup>8</sup> This was up from the pre-1990s half-decade global shares which are all less than 4.5 percent (e.g., 4.1 percent in 1985-89), and is greater than the Asian share of just 5.7 percent in 2000-04, according to the project's database (Anderson and Valenzuela 2008).

support worth more than \$60 billion per year or nearly \$60 per person employed on farms.

*The dispersion across Asian economies in nominal and relative rates of assistance to farmers has increased rather than diminished despite the reforms in the region.* This result means there is still lots of scope for reducing distortions in the region's use of resources in agriculture though more international re-location of production, especially in rice. That finding also suggests there are political economy forces at work in each country that do not change greatly relative to other countries over time. In particular, the econometric results reported above suggest that both NRA for agriculture and the RRA tend to rise with per capita income and to be higher the lower a country's agricultural comparative advantage.

*The dispersion in nominal rates of assistance to farmers also has increased rather than diminished within each studied Asian economy.* This result means there is still scope for reducing distortions in resource use within agriculture even in countries with an average NRA for agriculture and an RRA close to zero. As in other regions, the products in Asia with the highest rates of distortion and gross subsidy equivalent values are rice, sugar and milk.

*In particular, the strong anti-trade bias in assistance rates within the farm sector remains in place.* The NRA for import-competing farm industries has increased over the decades studied, while the negative NRA for agricultural exportables has been phased down. The fact that the average NRAs for import-competing and exportable agricultural industries have risen almost in parallel means that the anti-trade bias has not fallen much from the high levels it rose to by the 1980s. This may be understandable from a political economy viewpoint, but it nonetheless means that resources continue to be allocated inefficiently within the farm sector and, since openness tends to promote economic growth, that total factor productivity growth in agriculture is slower than it would be if remaining interventions were removed.

*The most important instruments of farm assistance/taxation continue to be trade-restrictive measures.* Domestic taxes and subsidies on farm inputs and outputs, and non-product-specific assistance, have made only minor contributions to the estimates of NRAs for Asia as a whole. True, input subsidies have played a significant role in India and, occasionally, in some other parts of the region. But, as in other regions such as Latin America (Lopez and Gallinato 2006), there has been comparatively little assistance provided via public investments in rural infrastructure

and agricultural R&D<sup>9</sup> even though social rates of return from further such investments remain very high (Fan and Hazell 2001, Fan 2008).

*Movements in the consumer tax equivalent closely replicate changes in farm support/taxation, because agricultural taxation or assistance is mostly due to trade measures.* This means that before the reforms food prices were kept artificially low but, in recent years, they have been above international levels on average in Asia. It also means there is considerable variation in consumer tax equivalents across products and across countries in the region. The current level of taxation of food consumers for the region as a whole is rising, and in 2000-04 it amounted to \$11 per capita per year (compared with a subsidy of \$22 in 1980-84).

*The decline in negative relative rates of assistance has been due as much to cuts in protection for non-agricultural sectors as to reforms of agricultural policies.* This underscores the fact that the reductions in distortions to agricultural incentives in the region have been part of a series of economy-wide reform programs and not just due to farm policy reforms.

*Food policies in continue to seek to reduce fluctuations in domestic food prices and in the quantities available for consumption via fluctuations in barriers to trade.* This beggar-thy-neighbor dimension of each economy's food policy reduces hugely the international public good role that trade between nations can play in bringing stability to the world's food markets. This is especially the case for rice, because it is the main staple in Asia and because Asia accounts for five-sixths of the global market for rice. The more some countries insulate their domestic markets, the more they export their volatility to the international market, and the greater the resulting volatility in that marketplace. This, in turn, creates a perceived need for other countries to do likewise. In most cases, volatility is exported through changes in import tariffs; but export taxes and export controls are sometimes also used by exporting countries. When NRAs in enough countries are adjusted in this way to changes in international prices, this exacerbates those change in world prices so that even larger changes in NRAs are desired—a classic collective action problem.

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<sup>9</sup> Data in Pardey et al. (2006) suggest that public R&D expenditure in Asia since the late 1970s has averaged less than 0.5 percent of the gross value of production at undistorted prices, which is trivial compared with the NRA via price-distorting measures for Asia of 25 to 40 times that (12 percent in 2000-04 and below -20 percent prior to the mid-1980s).

#### 4. PROSPECTS FOR FURTHER REFORM

The expectation is that, provided they remain open and continue to free up domestic markets and practice good macroeconomic governance, Asia's developing economies will keep growing rapidly in the foreseeable future, and the growth there will be more rapid in manufacturing and service activities than in agriculture. In the more densely populated economies of the region that growth will be accompanied by rapid increases in per capita incomes of low-skilled workers where labor-intensive exports boom. Agricultural comparative advantage is thus likely to decline in such economies. Whether these economies become more dependent on imports of farm products depends, however, on what happens to the RRA. The first wave of Asian industrializers (Japan, and then Korea and Taiwan) chose to slow the growth of food import dependence by raising their NRA for agriculture even as they were bringing down their NRA for non-farm tradables, such that their RRA became increasingly above the neutral zero level. A key question is: will later industrializers follow suit, given the past close association of RRAs with rising per capita income and falling agricultural comparative advantage?

When the RRAs for Japan, Korea and Taiwan are mapped against real per capita income, it is possible to superimpose on that same graph the RRAs for lower-income economies to see how they are tracking relative to the first industrializers. Figure 6 does that for China and India, and shows that their RRA trends of the past three decades are on the same trajectory as the richer Northeast Asians. That provides reason to expect the governments of later industrializing economies to follow suit if other things were equal.

Might one expect different government behavior now, given that the earlier industrializers were not bound under GATT to keep down their agricultural protection? Had there been strict discipline on farm trade measures at the time Japan and Korea joined GATT in 1955 and 1967, respectively, their NRAs may have been halted at less than 20 percent (Figure 7). At the time of China's accession to WTO in December 2001, its NRA was less than 5 percent according to this present study, or 7.3 percent for just import-competing agriculture. Its average bound import tariff commitment was about twice that (16 percent in 2005), but what matters most is China's out-of-quota bindings on the items whose imports are restricted by tariff rate

quotas (Anderson, Martin and Valenzuela 2008). The latter tariff bindings as of 2005 were 65 percent for grains, 50 percent for sugar and 40 percent for cotton (WTO, ITC and UNCTAD 2007, p. 60). China also has bindings on farm product-specific domestic supports of 8.5 percent, and can provide another 8.5 percent as non-product specific assistance if it so wishes – a total 17 percent NRA from domestic support measures alone, in addition to what is available through out-of-quota tariff protection. Clearly the legal commitments China made on acceding to WTO are a long way from current levels of domestic and border support for its farmers, and so are unlikely to constrain the government very much in the next decade or so.

The legal constraints on Asia's developing countries that joined the WTO earlier (except for Korea) are even less constraining. For India, Pakistan and Bangladesh, for example, their estimated NRAs for agricultural importables in 2000-04 are 34, 4 and 6 percent, respectively, whereas the average bound tariffs on their agricultural imports are 114, 96 and 189 percent, respectively (WTO, ITC and UNCTAD 2007). Also, like other developing countries, they have high bindings on product-specific domestic supports of 10 percent and another 10 percent for non-product specific assistance, a total of 20 more percentage points of NRA that legally could come from domestic support measures – compared with currently 10 percent in India and less than 3 percent in the rest of South Asia.

One can only hope that the China and South and Southeast Asia will not make use of the legal wiggle room they have allowed themselves in their WTO bindings and thereby follow Japan, Korea and Taiwan into high agricultural protection. A much more efficient and equitable strategy would be to instead treat agriculture in the same way they have been treating non-farm tradable sectors. That would involve opening the sector to international competition, and relying on more-efficient domestic policy measures for raising government revenue (e.g., income and consumption or value-added taxes) and to assist farm families (e.g., public investment in rural education and health, rural infrastructure, and agricultural research).<sup>10</sup>

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<sup>10</sup> As implied by the estimates reported in the previous footnote, even if just one-twentieth of the current NRA provided to Asian farmers via farm price-support policies was replaced by agricultural R&D expenditure, that would more than double current public spending on such R&D – and the latter would increase regional economic welfare whereas price-distortionary policies reduce it. Such a boost to Asian R&D could well be able to generate another green revolution of the order of magnitude of the first one that began in the 1960s, especially if it took full advantage of the new developments in biotechnology (as shown for rice, for example, in Anderson, Jackson and Nielsen 2005).

What do the above lessons and implications suggest developing country policymakers should do when confronted, as in recent years, with a sharp upward movement in international food prices? In the past, as illustrated for rice in Figure 5, many governments have simply either increased their export restrictions or lowered their import restrictions on food staples for the duration of the spike. But what if this recent rise in international prices is much more prolonged than the short-lived spikes of recent decades? This year's outlook projections by international agencies are suggesting prices could remain high for the foreseeable future, and that growth in net food imports by rapidly industrializing economies of Asia is one of the significant contributors.<sup>11</sup> Yet as we saw in Figure 3 above, China and India have steadily raised their RRAs, and that has been sufficient to keep both countries very close to self sufficient in primary agricultural products over the previous four decades. In terms of all agricultural and processed food trade though, in 2000-04 China for the first time became a net importer while in South Asia, India's net exports were less than Pakistan and Bangladesh's net imports for the first time since the latter 1960s (Sandri, Valenzuela and Anderson 2007). Should these countries choose to keep their RRAs at current (close to zero) levels, their import dependence in agriculture could well increase over time. If so, other developing countries might do well to re-consider their current position in the WTO's Doha round of trade negotiations: by agreeing to lower substantially their bound tariffs and subsidies on agricultural products, they could extract greater 'concessions' from high-income countries without having to reduce their actual applied rates for the foreseeable future.

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<sup>11</sup> The World Bank's commodity forecast as of May 2008 for grain prices is that by 2020 in real terms they will still be 10 percent above 2006 levels, which in turn were 20 percent above the average for 2001-05. IFPRI (von Braun 2007) and the OECD and FAO (2008) similarly expect food prices to remain high well into next decade and beyond.

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Table 1: Key economic and trade indicators, Asian focus economies, 2000–04

	Share (%) of world:				National rel. to world (world=100)		
	Pop'n	Total GDP <sup>b</sup>	Agric GDP <sup>b</sup>	Agric workers	GDP per capita	Ag land per capita	RCA <sup>a</sup> ag & food
<b>East Asia</b>	<b>29.09</b>	<b>8.38</b>	<b>24.76</b>	<b>47.1</b>	<b>29</b>	<b>45</b>	<b>75</b>
China	20.60	4.33	16.62	38.4	21	54	58
Indonesia	3.41	0.59	2.62	3.8	17	27	173
Korea, Rep.	0.77	1.62	1.69	0.2	212	5	26
Malaysia	0.39	0.28	0.73	0.1	74	41	107
Philippines	1.27	0.22	0.91	1.0	18	19	67
Taiwan	0.36	0.84	0.45	0.1	232	5	28
Thailand	1.01	0.38	1.05	1.5	38	39	204
Vietnam	1.29	0.11	0.69	2.1	8	14	301
<b>South Asia</b>	<b>21.67</b>	<b>1.99</b>	<b>11.90</b>	<b>25.3</b>	<b>9</b>	<b>20</b>	<b>145</b>
Bangladesh	2.16	0.14	0.90	2.9	7	8	93
India	16.87	1.57	9.32	20.2	9	22	143
Pakistan	2.33	0.23	1.43	1.9	10	23	137
Sri Lanka	0.31	0.05	0.24	0.3	16	15	254
<b>Asian DCs</b>	<b>50.76</b>	<b>10.37</b>	<b>36.65</b>	<b>72.5</b>	<b>20</b>	<b>34</b>	<b>80</b>
Japan	2.05	12.51	4.94	0.2	6.10	5	12

<sup>a</sup> Revealed comparative advantage index is the share of agriculture and processed food in national exports as a ratio of that sector's share of global exports.

<sup>b</sup> At distorted prices.

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

Table 2: Growth of real GDP and exports, Asian focus economies, 1980 to 2004

(at constant 2000 prices, percent per year, trend-based)

	Agriculture	Industry	Services	Total GDP	GDP per capita	Export volume <sup>a</sup>
<b>East Asia</b>	<b>3.1</b>	<b>9.0</b>	<b>7.9</b>	<b>7.6</b>	<b>6.3</b>	<b>13.7</b>
China	4.4	12.1	11.3	9.9	8.6	15.1
Indonesia	2.9	6.6	5.3	5.4	3.7	10.4
Korea, Rep.	1.3	8.2	7.2	7.1	6.1	10.6
Malaysia	1.7	7.8	6.9	6.6	3.9	10.3
Philippines	1.7	2.0	3.5	2.7	0.4	12.8
Taiwan	0.5	5.3	8.3	6.7	5.6	17.0
Thailand	2.4	8.5	5.8	6.3	4.9	17.3
Vietnam	3.9	9.7	7.5	7.0	5.1	<b>n.a.</b>
<b>South Asia</b>	<b>3.0</b>	<b>6.2</b>	<b>6.4</b>	<b>5.4</b>	<b>3.4</b>	n.a.
Bangladesh	2.7	6.6	4.4	4.4	2.1	13.4
India	3.0	6.3	7.0	5.7	3.7	n.a.
Pakistan	4.0	5.5	4.8	4.7	2.1	9.8
Sri Lanka	1.8	5.6	5.1	4.5	3.3	6.3
<b>Asian developing economies</b>	<b>3.1</b>	<b>8.6</b>	<b>7.5</b>	<b>7.1</b>	<b>5.5</b>	<b>n.a.</b>
Japan	-1.7	2.0	3.0	2.5	2.1	4.0
<b>WORLD</b>	<b>2.0</b>	<b>2.5</b>	<b>3.2</b>	<b>3.0</b>	<b>1.4</b>	<b>n.a.</b>

<sup>a</sup> 1985-95, from World Bank's *World Development Indicators 2008*, Table 6.2.

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

Table 3: Sectoral shares of GDP, Asian focus economies, 1965 to 2004

(percent)

	Agriculture				Industry				Services			
	1965 -69	1975 -79	1985 -89	2000 -04	1965 -69	1975 -79	1985 -89	2000 -04	1965 -69	1975 -79	1985 -89	2000 -04
<b>East Asia<sup>a</sup></b>	<b>34</b>	<b>26</b>	<b>19</b>	<b>10</b>	<b>29</b>	<b>40</b>	<b>40</b>	<b>42</b>	<b>34</b>	<b>32</b>	<b>41</b>	<b>48</b>
China	39	31	27	14	35	47	44	46	26	22	30	41
Indonesia	49	29	23	16	16	35	36	45	35	36	41	40
Korea, Rep.	30	21	10	4	22	30	37	35	48	49	53	61
Malaysia	29	26	20	9	27	37	39	49	44	37	42	42
Philippines	27	29	24	14	27	36	35	32	46	35	42	53
Taiwan	20	10	5	2	34	44	45	31	47	46	50	67
Thailand	30	25	16	10	24	29	34	43	46	46	50	48
Vietnam	na	na	41	23	na	na	27	39	na	na	32	38
<b>South Asia</b>	<b>43</b>	<b>36</b>	<b>29</b>	<b>21</b>	<b>18</b>	<b>21</b>	<b>23</b>	<b>24</b>	<b>39</b>	<b>42</b>	<b>48</b>	<b>55</b>
Bangladesh	54	55	31	22	9	14	21	25	36	31	48	52
India	44	36	29	21	19	22	24	24	38	43	47	55
Pakistan	35	29	24	22	19	21	21	22	46	50	55	56
Sri Lanka	29	28	24	17	21	26	24	24	51	46	51	59
<b>Asian dev. economies<sup>a</sup></b>	<b>36</b>	<b>28</b>	<b>22</b>	<b>12</b>	<b>27</b>	<b>36</b>	<b>35</b>	<b>38</b>	<b>35</b>	<b>34</b>	<b>43</b>	<b>49</b>
Japan	8	5	3	1	43	41	39	31	49	54	58	68

<sup>a</sup> Ignores Vietnam in the periods 1965-69 and 1975-79, whose weight in Asian GDP was less than 1 percent.

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

Table 4: Self-sufficiency in primary agricultural production,<sup>a</sup> Asian developing economies, 1961 to 2004

(percent at undistorted prices)

	1961-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04
Korea	96	95	88	92	89	91	90	91	87
Taiwan	80	73	51	40	27	21	15	11	7
China	99	101	100	99	98	101	101	99	98
Indonesia	-	-	106	105	104	106	104	103	102
Malaysia	293	265	215	167	152	150	122	110	104
Philippines	115	112	116	108	106	101	101	99	99
Thailand	-	-	115	125	131	135	133	130	137
Vietnam	-	-	-	-	-	103	104	110	112
Bangladesh	-	-	98	99	99	98	99	98	96
India	98	97	99	99	99	99	100	100	100
Pakistan	101	100	102	97	103	104	99	96	97
Sri Lanka	297	298	194	221	155	144	131	142	157
<b>Asian dev. economies<sup>c</sup></b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>99</b>	<b>97</b>	<b>94</b>	<b>88</b>	<b>87</b>	<b>85</b>

<sup>a</sup> Agricultural production, valued at undistorted prices, as a percentage of production plus imports minus exports.

Source: Calculated from Anderson and Valenzuela (2008)

Table 5: Nominal rates of assistance to agriculture,<sup>a</sup> Asian focus economies, 1955 to 2004<sup>c</sup>  
(percent)

	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04
Japan	38.8	45.8	50.4	46.9	65.9	68.3	116.6	115.8	118.6	119.8
<b>Northeast Asia</b>	-42.8	-42.6	-41.7	-41.2	-39.5	-38.2	-25.7	-1.7	14.4	11.9
Korea	-3.2	4.0	13.4	35.7	56.3	89.4	126.1	152.8	129.8	137.3
Taiwan	-12.0	3.6	3.0	9.3	7.1	14.9	27.1	38.1	46.4	61.3
China <sup>b</sup>	-45.2	-45.2	-45.2	-45.2	-45.2	-45.2	-35.5	-14.3	6.6	5.9
<b>Southeast Asia</b>	<b>na</b>	<b>-6.8</b>	<b>5.9</b>	<b>-8.8</b>	<b>0.0</b>	<b>4.6</b>	<b>-0.4</b>	<b>-4.2</b>	<b>0.0</b>	<b>11.1</b>
Indonesia	na	na	na	-2.6	9.3	9.2	-1.7	-6.6	-8.6	12.0
Malaysia	na	-7.2	-7.5	-9.0	-13.0	-4.6	1.3	2.3	-0.2	1.2
Philippines	na	-5.3	14.4	-5.1	-7.1	-1.0	18.7	18.5	32.9	22.0
Thailand	na	na	na	-20.3	-14.0	-2.0	-6.2	-5.7	1.7	-0.2
Vietnam	na	na	na	na	na	na	-13.9	-25.4	0.6	21.2
<b>South Asia</b>	<b>0.0</b>	<b>-0.5</b>	<b>0.6</b>	<b>0.4</b>	<b>-5.5</b>	<b>0.6</b>	<b>20.9</b>	<b>0.7</b>	<b>0.2</b>	<b>13.6</b>
Bangladesh	na	na	na	-16.0	1.4	-3.3	11.7	-1.5	-5.2	2.7
India <sup>b</sup>	0.1	0.1	0.1	0.2	-5.6	1.9	24.9	1.8	0.7	15.8
Pakistan	na	-0.7	15.3	6.8	-8.5	-6.4	-4.0	-6.9	-1.6	1.2
Sri Lanka	-2.3	-22.8	-24.5	-16.3	-25.5	-13.5	-9.9	-1.2	12.2	9.5
<b>Asian dev economies<sup>a</sup></b>	<b>-27.3</b>	<b>-26.7</b>	<b>-25.1</b>	<b>-25.3</b>	<b>-23.8</b>	<b>-20.6</b>	<b>-9.0</b>	<b>-2.0</b>	<b>7.5</b>	<b>12.0</b>
Av. dispersion <sup>c</sup>	39	37	56	42	48	51	67	56	56	64

<sup>a</sup> Weighted average includes product-specific input distortions and non-product specific assistance as well as authors' guesstimates for non-covered farm products, with weights based on gross value of agricultural production at undistorted prices.

<sup>b</sup> Estimates for China pre-1981 and India pre-1965 assume the nominal rates of assistance to agriculture in those years were the same as the average NRA estimates for those economies for 1981-84 and 1965-69, respectively, and that the gross value of production in those missing years is that which gives the same average share of value of production in total world production in 1981-84 and 1965-69, respectively. This set of assumptions is conservative in the sense that for both countries the average NRA was probably even lower (more negative) in earlier years.

<sup>c</sup> Simple average across countries of the standard deviation of product NRAs around the weighted mean for each country each year.

<sup>f</sup> Weighted average share of gross value of total agricultural production at undistorted prices accounted for by covered products.

Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Martin (2008).

Table 6: NRAs for Asian developing country farmers, by product, 1955 to 2004

(percent, at primary product level)

	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04
Barley	41	84	72	120	101	166	357	524	543	563
Beef	38	25	34	44	95	101	94	145	106	85
Cassava	na	na	na	-23	-1	-9	-17	-11	-14	-10
Chickpea	na	50	24	1	0	8	12	9	15	19
Cocoa	na	na	-2	-3	-2	-2	-1	-2	-2	0
Coconut	-29	-29	-24	-8	-3	-11	-19	-34	-22	-8
Coffee	na	na	na	-7	-4	-9	-5	-5	-1	-2
Cotton	na	-19	12	63	7	-12	-2	-3	0	5
Egg	-25	-21	19	0	-6	10	22	27	23	51
Fruits & vegetables	na	0	0	0	0	-8	-3	-11	-6	-4
Jute	na	na	na	-30	-37	-29	-35	-38	-6	-39
Maize	na	-10	50	19	8	-20	-6	-15	8	13
Milk	na	na	71	122	139	108	124	40	23	32
Oilseeds	na	24	31	11	-5	22	35	21	22	22
Palmoil	na	-11	-11	-15	-14	-1	-2	2	-9	-3
Pigmeat	-10	16	59	51	47	-41	-39	-3	7	4
Poultry	-25	0	69	18	58	48	-2	20	17	12
Rice	-10	-6	-25	-17	-13	-27	-6	-9	2	18
Rubber	-16	-16	-14	-8	-19	-19	-14	-16	5	4
Sorghum	na	82	42	55	12	7	36	7	21	16
Sugar	na	96	163	13	2	37	39	13	20	43
Tea	-22	-39	-39	-28	-22	-18	-19	-10	-8	-7
Wheat	-33	-12	24	15	-3	-3	12	4	18	11
<b>Asian dev. economies<sup>c</sup>:</b>	<b>-11.1</b>	<b>-2.7</b>	<b>2.6</b>	<b>0.3</b>	<b>-0.4</b>	<b>-21.6</b>	<b>-15.2</b>	<b>-4.8</b>	<b>6.0</b>	<b>10.2</b>

<sup>a</sup> For covered products only, hence less than the totals in Table 5. Weights are production valued at undistorted prices.

Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Martin (2008).

Table 7: Gross subsidy equivalents of assistance to farmers, total and per farm worker, Asian developing economies, 1955 to 2004

## (a) Total (constant 2000 US\$ million using the US GDP deflator)

	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04
Korea	-154	107	854	1672	6943	9335	13306	18594	17536	15289
Taiwan	-394	133	132	439	605	1342	2500	3849	4170	3725
China <sup>a</sup>	-52857	-69648	-70671	-98931	-124086	-118224	-75780	-28381	15667	15644
Indonesia	na	na	na	-848	3783	4131	-785	-2729	-4101	4286
Malaysia	na	-250	-246	-547	-1097	-456	75	156	3	100
Philippines	na	-225	735	-1082	-903	-299	1399	1850	3832	1951
Thailand	na	na	na	-2434	-2148	-324	-645	-719	260	-14
Vietnam	na	na	na	na	na	na	-726	-1815	-18	1602
Bangladesh	na	na	na	na	583	-672	882	-103	-448	189
India <sup>a</sup>	46	61	-993	-7803	-8653	-49	21607	1600	281	15433
Pakistan	na	-91	1089	-34	-815	-787	-380	-755	-260	95
Sri Lanka	-68	-461	-455	-396	-571	-344	-194	-27	245	154
<b>Asian dev. economies</b>	<b>-53426</b>	<b>-70373</b>	<b>-69554</b>	<b>-109965</b>	<b>-126359</b>	<b>-106348</b>	<b>-38740</b>	<b>-8481</b>	<b>37169</b>	<b>58455</b>

## (b) Per person engaged in agriculture (constant 2000 US\$ using the US GDP deflator)

	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04
Korea	20	155	293	1196	1716	3041	5618	6445	6899
Taiwan	76	76	261	390	1045	2077	3699	4795	5329
China <sup>a</sup>	-235	-222	-281	-319	-280	-163	-57	31	31
Indonesia	na	na	-27	113	113	-19	-60	-86	86
Malaysia	-135	-126	-267	-515	-213	36	79	2	56
Philippines	-33	99	-132	-99	-30	132	163	318	155
Thailand	na	na	-163	-130	-18	-34	-36	13	-1
Vietnam	na	na	na	na	na	-33	-73	-1	57
Bangladesh	na	na	na	20	-22	26	-3	-12	5
India <sup>a</sup>	0	-6	-43	-43	0	97	7	1	57
Pakistan	-7	78	-2	-47	-41	-19	-35	-11	4
Sri Lanka	-217	-195	-155	-207	-116	-60	-8	66	40
<b>Asian dev. economies</b>	<b>-125</b>	<b>-115</b>	<b>-166</b>	<b>-174</b>	<b>-136</b>	<b>-46</b>	<b>-9</b>	<b>40</b>	<b>61</b>

<sup>a</sup> Estimates for China pre-1981 and India pre-1965 assume the nominal rates of assistance to agriculture in those years were the same as the average NRA estimates for those economies for 1981-84 and 1965-69, respectively, and that the gross value of production in those missing years is that which gives the same average share of value of production in total world production in 1981-84 and 1965-69, respectively. This set of assumptions is conservative in the sense that for both countries the average NRA was probably even lower (more negative) in earlier years.

Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Martin (2008).

Table 8: Relative rates of assistance (RRA) to agriculture,<sup>a</sup> Asian focus economies, 1955 to 2004

	(percent)									
	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04
<b>Japan</b>										
NRA Ag.	37.2	44.5	50.4	47.3	70.8	67.0	127.7	129.7	133.4	133.6
NRA Non-Ag.	2.5	3.9	3.8	2.8	1.6	1.1	1.3	1.1	0.8	0.7
RRA	33.9	39.1	44.9	43.3	68.1	65.2	124.8	127.1	131.4	132.1
<b>Northeast Asia</b>										
NRA Ag.	-43.1	-42.5	-42.2	-41.3	-40.0	-18.4	-26.2	-1.7	14.7	12.0
NRA Non-Ag.	40.9	40.8	40.0	39.7	39.4	71.1	18.8	15.0	6.8	3.3
RRA	-58.2	-57.7	-56.6	-55.7	-53.7	-51.9	-38.0	-14.2	7.4	8.5
<b>Korea</b>										
NRA Ag.	-3.3	4.9	16.3	46.1	71.8	118.6	159.8	197.6	164.8	171.9
NRA Non-Ag.	45.6	37.1	22.3	11.4	11.7	6.8	5.7	3.3	2.3	1.7
RRA	-32.6	-21.4	-4.8	30.5	53.9	104.8	145.9	188.2	158.8	167.3
<b>Taiwan<sup>b</sup></b>										
NRA Ag.	-15.8	4.7	3.9	12.0	8.9	18.7	33.8	46.3	54.9	70.9
NRA Non-Ag.	8.8	9.3	8.8	7.5	7.0	5.2	4.5	2.6	1.8	1.0
RRA	-22.5	-4.2	-4.5	4.2	1.7	12.9	28.0	42.5	52.2	69.0
<b>China<sup>b</sup></b>										
NRA Ag.	-45.2	-45.2	-45.2	-45.2	-45.2	-45.2	-35.5	-14.3	6.6	5.9
NRA Non-Ag.	41.6	41.6	41.6	41.6	41.6	41.6	28.3	24.9	9.9	5.0
RRA	-60.5	-60.5	-60.5	-60.5	-60.5	-60.5	-49.9	-31.1	-3.0	0.9
<b>Southeast Asia</b>										
NRA Ag.	na	-5.8	5.6	-10.2	0.1	4.9	-0.9	-4.7	0.0	12.1
NRA Non-Ag.	na	11.5	15.4	20.2	22.0	21.1	18.0	11.5	8.2	8.1
RRA	na	-15.5	-8.5	-25.3	-18.0	-13.4	-16.1	-14.5	-7.7	3.7
<b>Indonesia</b>										
NRA Ag.	na	na	na	-3.8	10.4	10.5	-1.9	-7.5	-9.7	13.9
NRA Non-Ag.	na	na	na	27.7	27.7	27.7	26.5	17.6	10.6	8.1
RRA	na	na	na	-24.7	-13.6	-13.5	-22.5	-21.3	-18.3	5.4
<b>Malaysia</b>										
NRA Ag.	na	-7.6	-7.9	-9.4	-13.7	-4.9	1.4	2.6	-0.2	1.5
NRA Non-Ag.	na	7.4	7.0	7.1	6.5	5.2	3.9	2.8	2.0	0.9
RRA	na	-14.0	-13.9	-15.5	-18.9	-9.6	-2.4	-0.3	-2.2	0.6
<b>Philippines</b>										
NRA Ag.	na	-1.7	14.3	-6.0	-7.2	-4.0	15.8	16.7	35.7	23.5
NRA Non-Ag.	na	19.0	20.3	16.3	16.3	12.9	11.0	9.9	8.6	6.4
RRA	na	-17.4	-5.0	-19.8	-20.3	-14.9	4.3	6.1	24.9	15.9
<b>Thailand</b>										
NRA Ag.	na	na	na	-23.1	-15.9	-2.3	-6.9	-6.4	1.8	-0.2
NRA Non-Ag.	na	na	na	16.1	16.0	14.2	11.1	10.0	8.9	7.8
RRA	na	na	na	-33.7	-27.5	-14.4	-16.3	-14.9	-6.5	-7.4
<b>Vietnam<sup>b</sup></b>										
NRA Ag.	na	na	na	na	na	na	-15.9	-26.4	0.0	20.7
NRA Non-Ag.	na	na	na	na	na	na	4.3	-11.2	1.5	20.8
RRA	na	na	na	na	na	na	-19.2	-17.4	-1.3	0.0
<b>South Asia</b>										
NRA Ag.	4.7	3.9	4.4	9.7	-7.7	1.8	47.1	0.2	-2.4	12.7
NRA Non-Ag.	112.7	115.5	143.1	81.7	57.8	54.6	39.9	18.6	15.0	10.1
RRA	-56.2	-56.8	-57.0	-39.8	-41.6	-33.3	5.1	-15.5	-14.9	3.4
<b>Bangladesh</b>										
NRA Ag.	na	na	na	na	3.1	-3.9	17.5	-2.4	-8.0	4.0
NRA Non-Ag.	na	na	na	na	28.4	22.4	28.5	33.3	29.0	23.4
RRA	na	na	na	na	-19.7	-21.5	-8.6	-26.7	-28.6	-15.8
<b>India<sup>b</sup></b>										
NRA Ag.	5.2	5.2	5.2	12.6	-7.4	4.1	67.5	2.0	-2.3	15.4
NRA Non-Ag.	113.0	113.0	113.0	83.1	64.8	59.3	48.6	15.9	12.6	5.2
RRA	-56.3	-56.3	-56.3	-38.3	-43.8	-33.5	11.7	-12.1	-12.9	12.5
<b>Pakistan<sup>b</sup></b>										
NRA Ag.	na	-1.0	21.7	9.3	-11.8	-9.3	-5.9	-10.2	-2.6	1.5
NRA Non-Ag.	na	169.7	224.5	146.7	44.0	48.3	45.1	39.3	27.0	14.6
RRA	na	-63.8	-62.4	-55.9	-38.6	-38.6	-35.1	-35.2	-23.0	-11.5

Table 8 (continued): Relative rates of assistance (RRA) to agriculture<sup>a</sup>, Asian focus economies, 1955 to 2004

	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04
Sri Lanka										
NRA Ag.	-2.7	-25.7	-27.6	-18.5	-29.0	-15.4	-11.2	-1.3	14.0	10.8
NRA Non-Ag.	104.9	124.6	138.4	70.7	52.9	57.1	59.0	47.1	36.4	22.9
RRA	-52.5	-66.6	-68.0	-51.6	-53.5	-46.2	-44.3	-32.9	-16.3	-9.8
Asian dev. economies <sup>c</sup>										
NRA Ag.	-29.0	-27.7	-26.9	-24.3	-31.3	-18.8	-11.2	-2.6	7.5	11.7
NRA Non-Ag.	66.8	67.1	70.9	50.3	50.3	38.3	15.4	14.9	9.6	4.3
RRA	-57.5	-56.4	-55.3	-47.9	-44.7	-40.8	-22.8	-15.2	-1.9	7.1
Dispersion of national RRAs <sup>d</sup>	21.9	30.7	36.2	37.6	41.5	51.9	56.0	65.1	50.5	50.8

<sup>a</sup> The RRA is defined as  $100 * [(100 + \text{NRA}_{\text{ag}}^t) / (100 + \text{NRA}_{\text{nonag}}^t) - 1]$ , where  $\text{NRA}_{\text{ag}}^t$  and  $\text{NRA}_{\text{nonag}}^t$  are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.

<sup>b</sup> Estimates for China pre-1981 and India pre-1965 are based on the assumption that the nominal rates of assistance to agriculture in those years was the same as the average NRA estimates for those economies for 1981-84 and 1965-69, respectively, and that the gross value of production in those missing years is that which gives the same average share of value of production in total world production in 1981-84 and 1965-69, respectively. This NRA assumption is conservative in the sense that for both countries the average NRA was probably even lower in earlier years, according to the authors of those country case studies.

<sup>c</sup> Weighted averages of the above national averages, using weights based on gross value of national agricultural production at undistorted prices.

<sup>d</sup> Simple average of the standard deviation around a weighted mean of the national RRAs for the region each year.

Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Martin (2008).

Table 9: Relationships between nominal rates of assistance to farm products and some of its determinants, Asian developing economies, 1960 to 2004

Explanatory variables:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Ln GDP per capita	-0.28* (-0.03)	-0.21* (-0.03)	-0.23* (-0.03)	-0.22* (-0.03)	-0.11 (-0.05)	-0.06 (-0.05)	-0.14 (-0.06)	-0.16* (-0.06)	-0.38* (-0.10)	-0.28* (-0.9)	-0.44* (-0.10)	-0.38* (-0.11)
Ln GDP per capita squared	0.23* (-0.02)	0.20* (-0.01)	0.21* (-0.01)	0.21* (-0.01)	0.19* (-0.02)	0.15* (-0.02)	0.21* (-0.03)	0.18* (-0.02)	0.23* (-0.03)	0.19* (-0.02)	0.22* (-0.03)	0.21* (-0.03)
Importable		0.33* (-0.04)	0.34* (-0.04)	0.32* (-0.04)		0.40* (-0.04)	0.41* (-0.04)	0.40* (-0.04)		0.39* (-0.04)	0.39* (-0.04)	0.39* (-0.04)
Exportable		-0.13 (-0.04)	-0.12 (-0.04)	-0.14 (-0.04)		-0.03 (-0.04)	-0.03 (-0.04)	-0.03 (-0.04)		-0.04 (-0.04)	-0.04 (-0.04)	-0.04 (-0.04)
Revealed Comparative Advantage <sup>a</sup>				0.03* (-0.01)				-0.07* (-0.02)				-0.04 (-0.03)
Trade Specialization Index <sup>b</sup>			0.11* (-0.03)				-0.13 (-0.09)				-0.03 (-0.10)	
Constant	0.14* (-0.01)	0.03 (-0.03)	0.00 (-0.03)	-0.02 (-0.04)	0.07* (-0.02)	-0.11 (-0.04)	-0.05 (-0.05)	0.07 (-0.07)	-0.49* (-0.12)	0.23* (-0.11)	-0.19 (-0.09)	-0.08 (-0.10)
R <sup>2</sup>	0.10	0.27	0.27	0.27	0.07	0.23	0.22	0.22	0.14	0.28	0.29	0.29
No. of obs.	2766	2766	2594	2594	2766	2766	2594	2594	2766	2766	2594	2594
Country fixed effects	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes

<sup>a</sup> Revealed comparative advantage index is the share of agriculture and processed food in national exports as a ratio of that sector's share of global exports (world=1).

<sup>b</sup> Net exports as a ratio of the sum of exports and imports of agricultural and processed food products (world=1).

Notes: Dependent variable for regressions is NRA by commodity and year. Results are OLS estimates, with standard errors in parentheses and significance levels shown at the 99%(\*). The main explanatory variable is Ln GDP per capita in \$10,000s.

Source: Author's estimates

Table 10: Value of consumer tax equivalent of policies assisting producers of covered farm products, Asian developing economies, 1965 to 2003

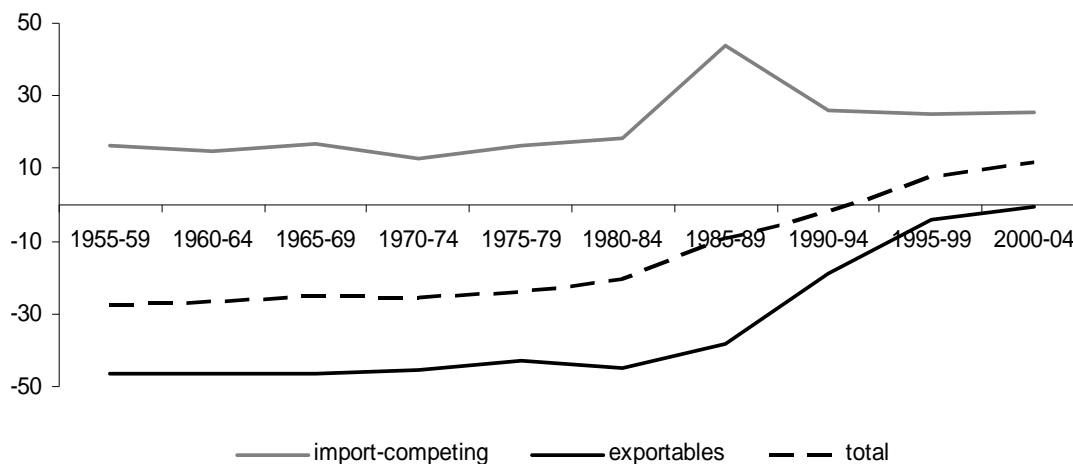
(constant 2000 US\$ million at primary product level, using the US GDP deflator)

	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-03
Korea	635	1607	6020	9497	13019	19275	16969	14617
Taiwan	675	466	636	1287	2586	3711	4284	3964
China	na	na	na	-62859	-33988	923	58257	44497
Indonesia	na	-1676	2147	3378	-500	-884	-2524	4849
Malaysia	5	2	163	196	208	169	43	67
Philippines	485	-890	-467	96	1808	2059	4178	2509
Thailand	na	-1552	-1253	-347	-229	-344	168	83
Vietnam	na	na	na	na	-36	-939	320	991
Bangladesh	na	-1546	771	-668	1193	-75	-621	300
India	-17659	-27664	-12120	-2586	11985	-6025	-5811	9079
Pakistan	1636	-317	-698	-433	27	-883	-543	189
Sri Lanka	-38	46	-107	-94	-26	124	206	99
<b>Asian dev. economies</b>	<b>-9961</b>	<b>-24347</b>	<b>-3060</b>	<b>-46901</b>	<b>-40694</b>	<b>-8400</b>	<b>17749</b>	<b>32686</b>

Source: Calculated from Anderson and Valenzuela (2008).

Figure 1: Nominal rates of assistance to exportable, import-competing and all<sup>a</sup> agricultural products, Asian developing economies,<sup>b</sup> 1955 to 2004

(percent, weighted averages across 12 economies)



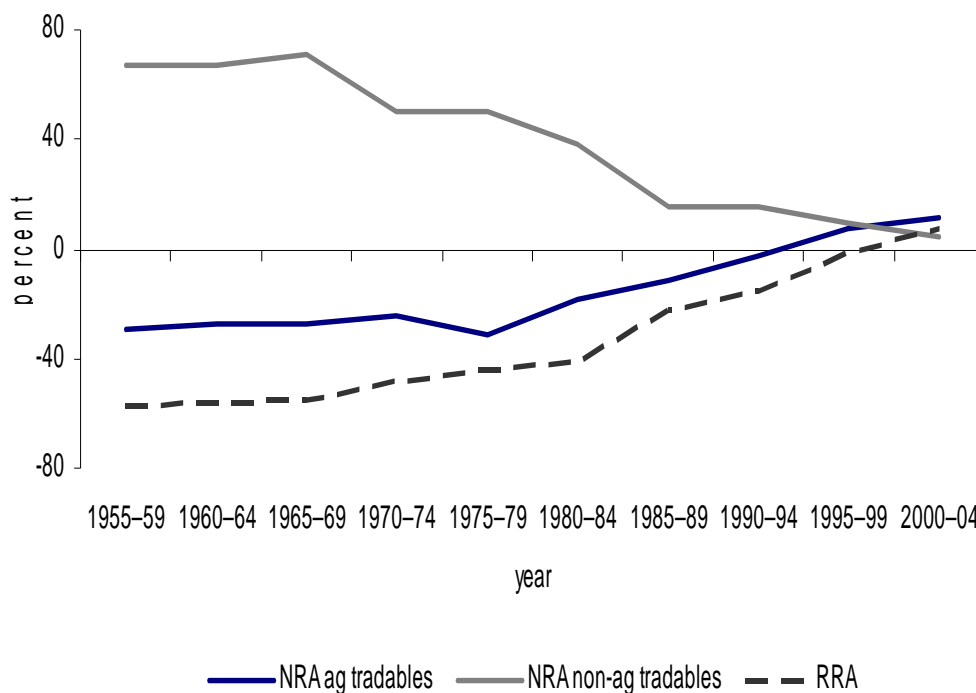
<sup>a</sup> The total NRA can be above or below the exportable and importable averages because assistance to nontradables and non-product specific assistance is also included.

<sup>b</sup> The exportables, import-competing and total estimates are based on China pre-1981 and India pre-1965 values estimated on the assumption that the nominal rate of assistance to agriculture in those years was the same as the average NRA estimates for those economies for 1981-84 and 1965-69, respectively, and that the gross value of production in those missing years is that which gives the same average share of value of production in total world production in 1981-84 and 1965-69, respectively.

Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Martin (2008).

Figure 2: Nominal rates of assistance to agricultural and non-agricultural tradable products and relative rate of assistance,<sup>a</sup> Asia developing economies,<sup>b</sup> 1955 to 2004

(percent, weighted averages across 12 economies)

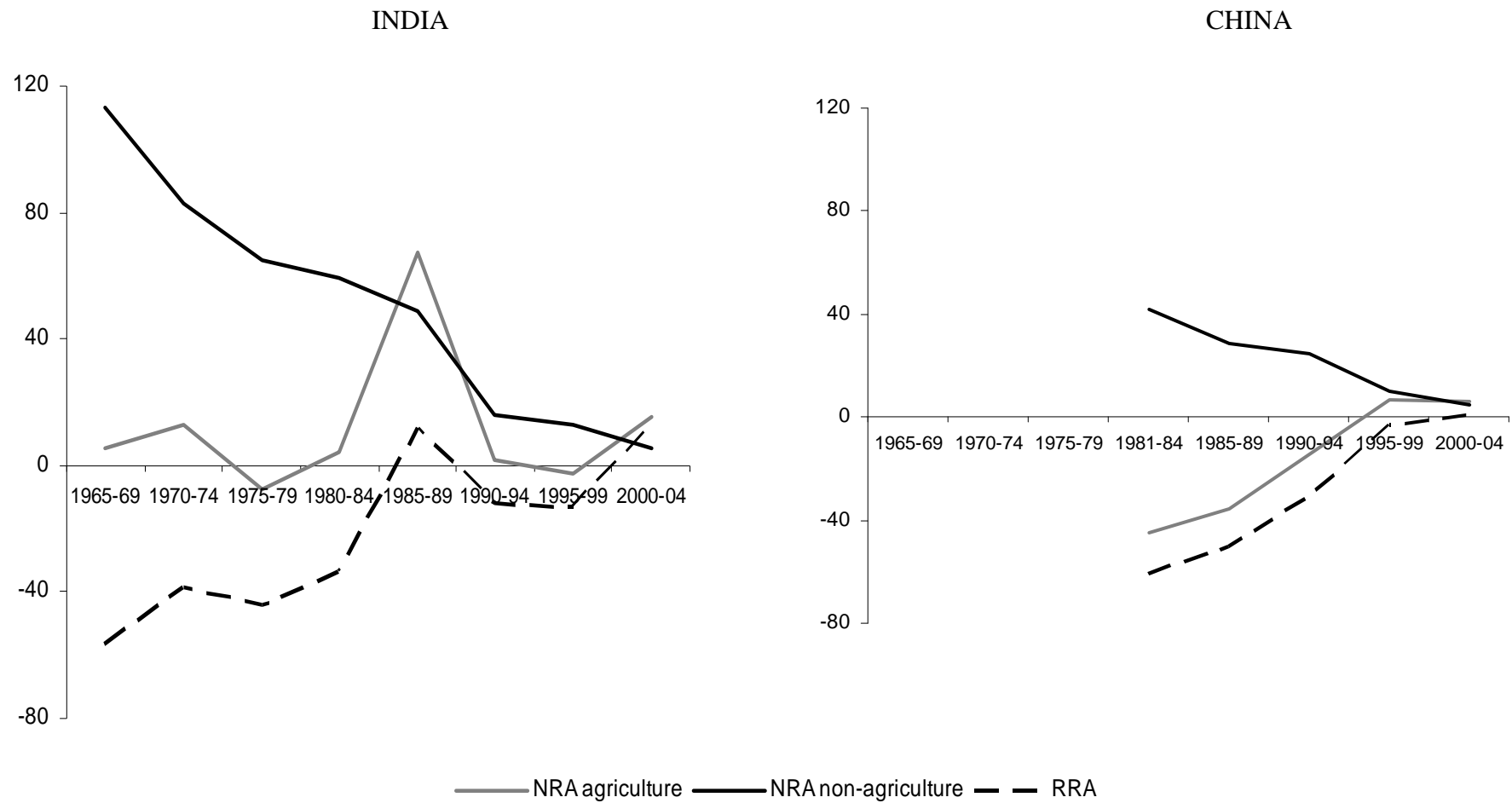


<sup>a</sup> The RRA is defined as  $100 * [(100 + \text{NRA}_{\text{ag}}^t) / (100 + \text{NRA}_{\text{non-ag}}^t) - 1]$ , where  $\text{NRA}_{\text{ag}}^t$  and  $\text{NRA}_{\text{non-ag}}^t$  are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.

<sup>b</sup> The exportables, import-competing and total estimates are based on China pre-1981 and India pre-1965 values estimated on the assumption that the nominal rate of assistance to agriculture in those years was the same as the average NRA estimates for those economies for 1981-84 and 1965-69, respectively, and that the gross value of production in those missing years is that which gives the same average share of value of production in total world production in 1981-84 and 1965-69, respectively.

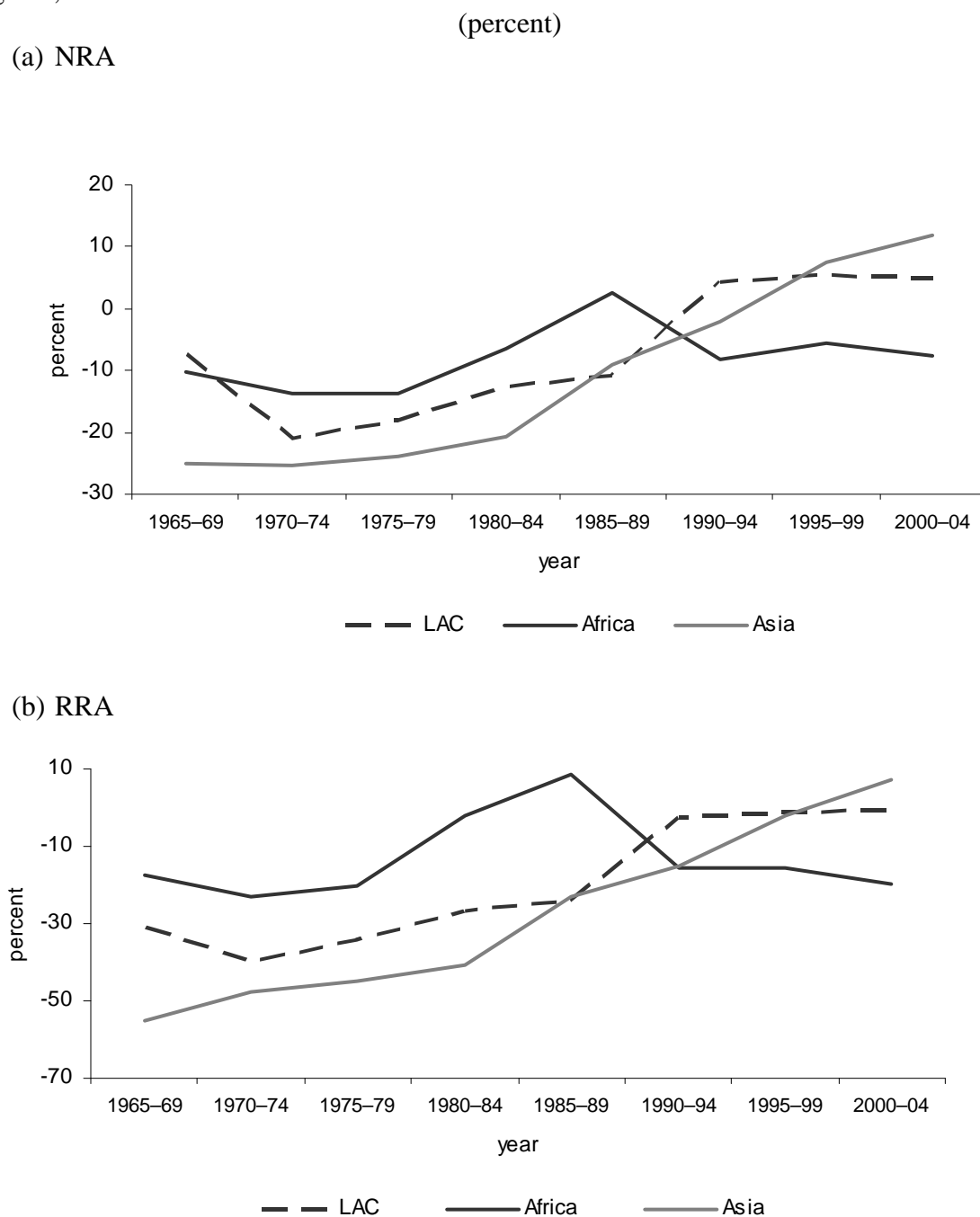
Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Martin (2008).

Figure 3: Nominal and relative rates of assistance, China and India, 1965 to 2005  
(percent)



Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Martin (2008).

Figure 4: Nominal and relative rates of assistance,<sup>a</sup> Asian, African and Latin American regions, 1965 to 2004<sup>b</sup>



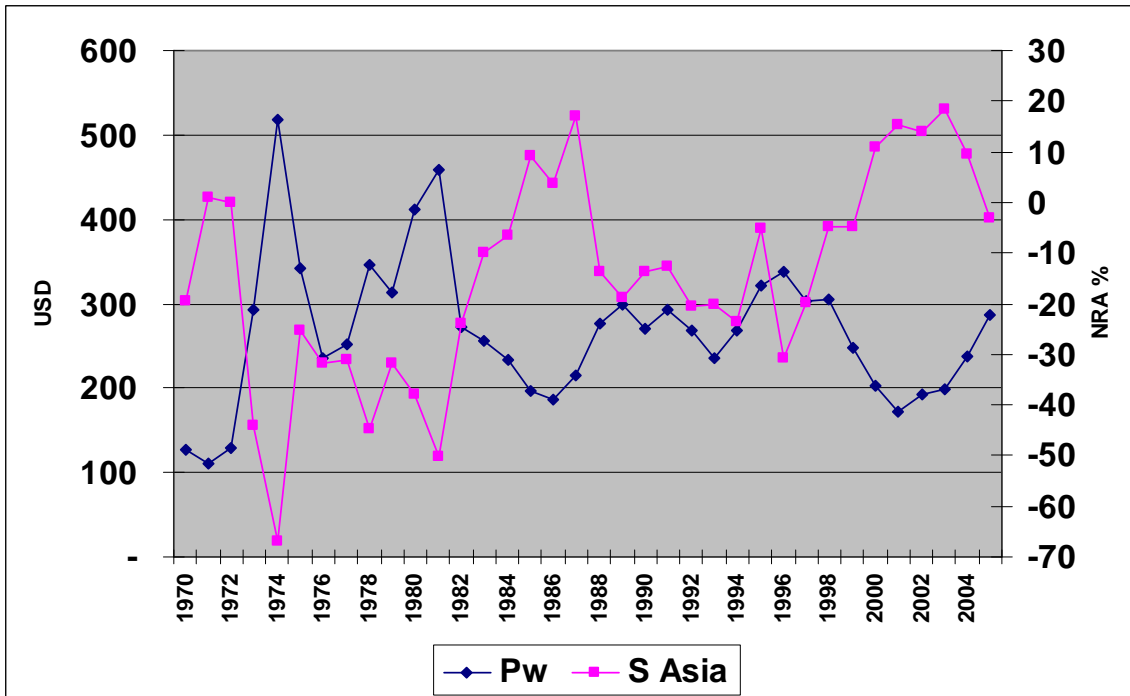
<sup>a</sup> 5-year weighted averages with value of production at undistorted prices as weights.

<sup>b</sup> Estimates for China pre-1981 and India pre-1965 are based on the assumption that the nominal rates of assistance to agriculture and national share or regional agricultural production in those years were the same as the average NRA estimates for those economies for 1981-84 and 1965-69, respectively.

Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Masters (2009), Anderson and Martin (2009) and Anderson and Valdés (2008).

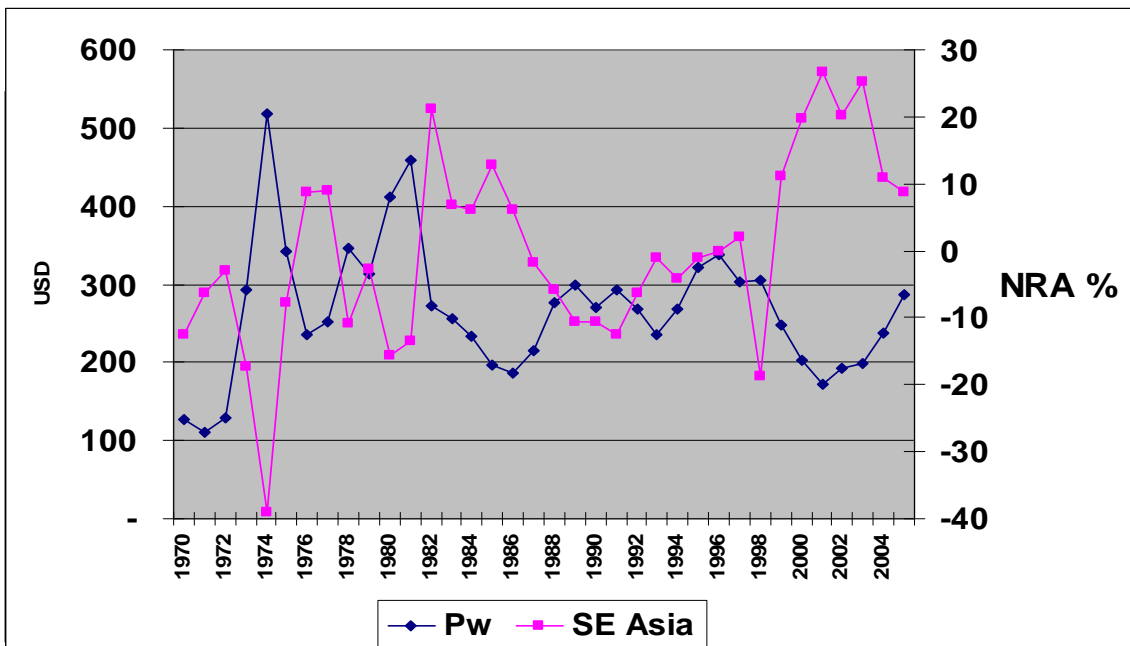
Figure 5: Rice NRA and international rice price, South and Southeast Asia, 1970 to 2005  
(left axis is int'l price in USD, right axis is NRA in percent)

(a) South Asian focus economies



Correlation coefficient is -0.75

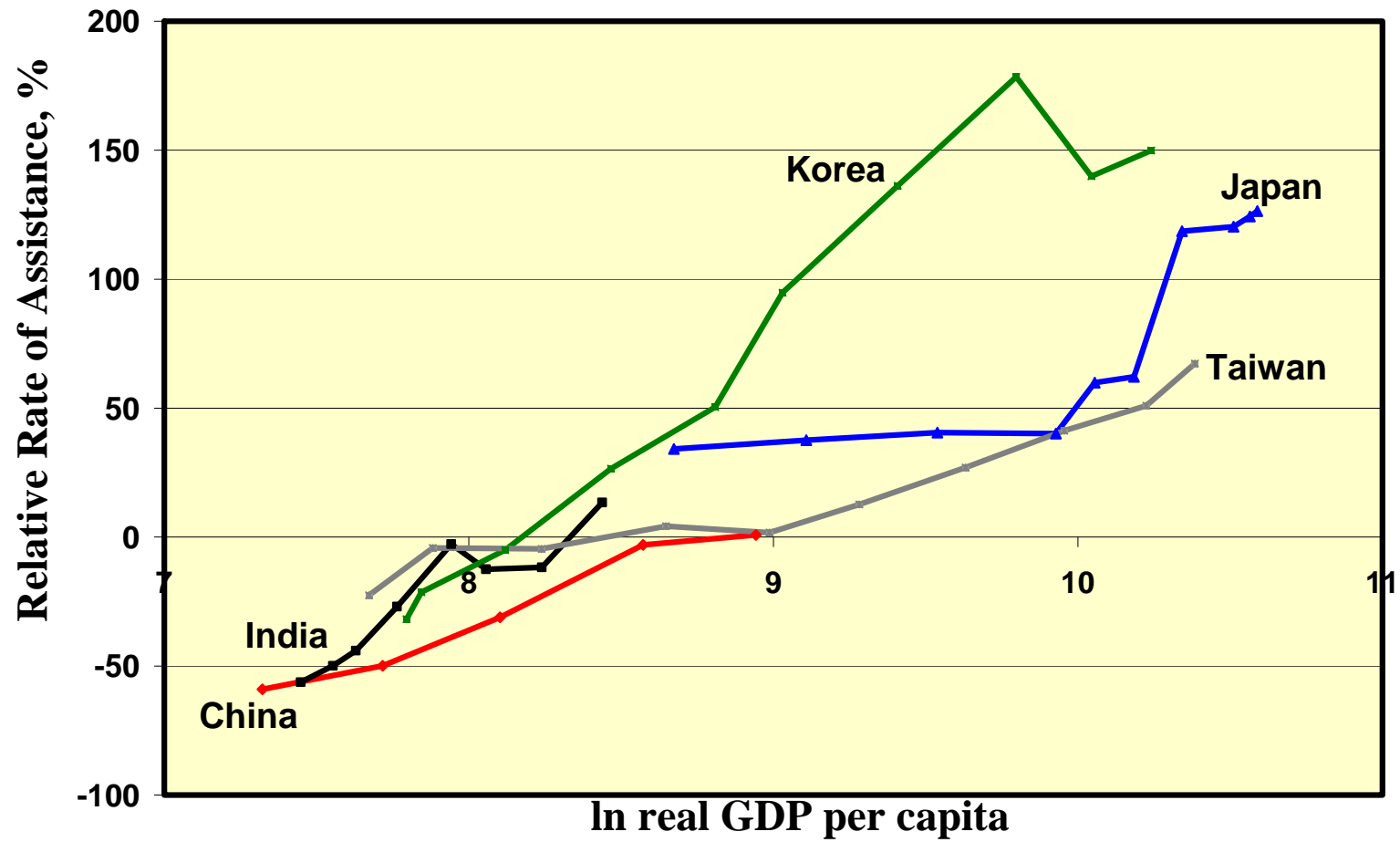
(b) Southeast Asian focus economies



Correlation coefficient is -0.59

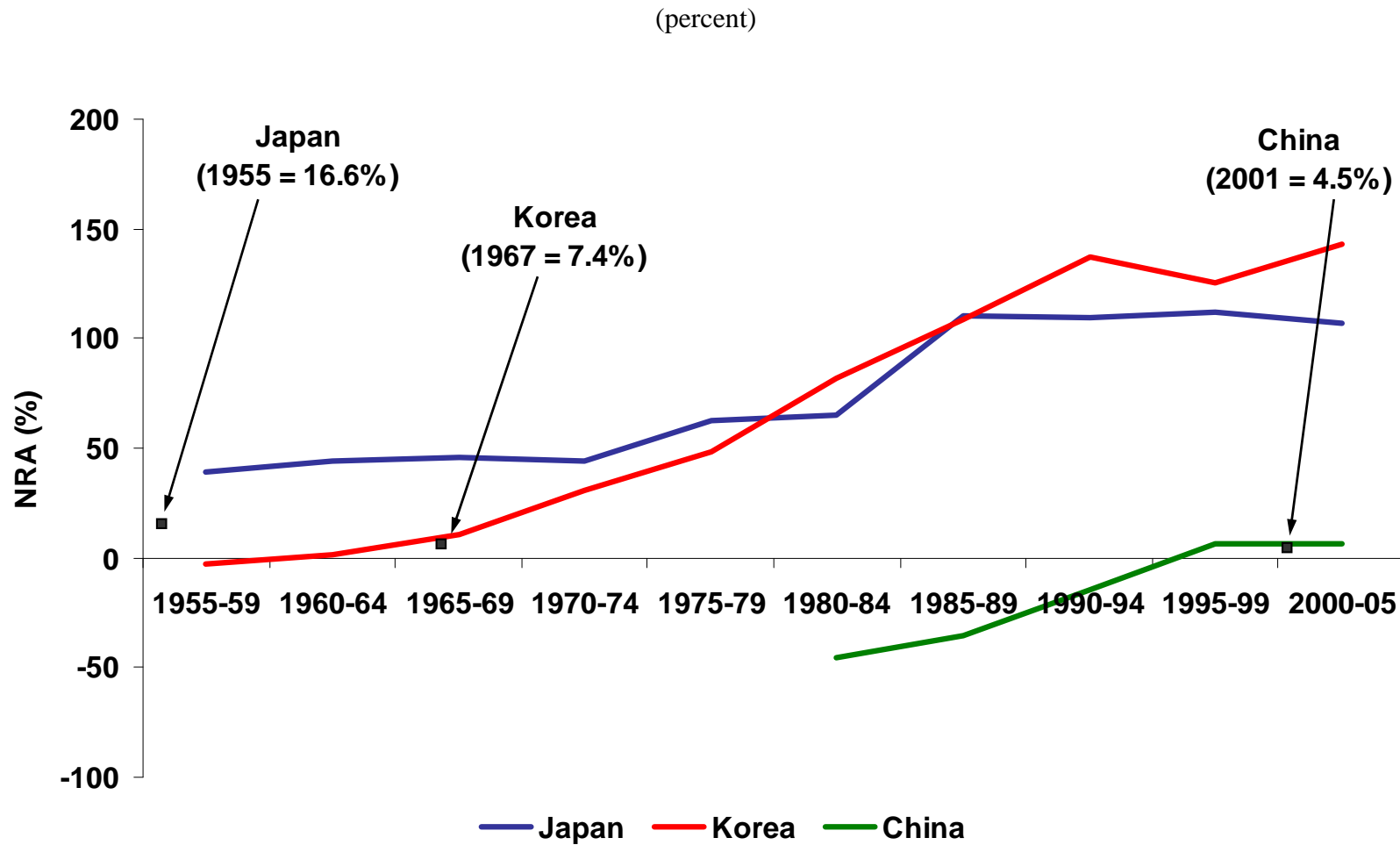
Source: Author's compilation based on data in Anderson and Valenzuela (2008)

Figure 6: RRAs and log of real per capita GDP, India and Northeast Asian focus economies, 1955 to 2005



Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Martin (2008).

Figure 7: NRAs for Japan, Korea and China and date of accession to GATT or WTO, 1955 to 2005



Source: Calculated from Anderson and Valenzuela (2008), which draws on national estimates reported in Anderson and Martin (2008).