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**ECONOMIC GROWTH,  
ENVIRONMENTAL ISSUES AND TRADE**

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**Centre for Economic Policy Research**

25-28 Old Burlington Street, London W1X 1LB

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## ABSTRACT

### Economic Growth, Environmental Issues and Trade\*

This paper explores the implications for trade relations of the greening of world politics. It modifies the standard theory of changing comparative advantages in a growing world economy to show the effects on trade of taking into account the fact that the demand for domestic environmental policies increases as economies expand. The demands for environmental policies would not be a problem if they were confined to first-best policies. Trade problems arise, however, when those policies undermine an industry's competitiveness (for which protection from imports is then sought), or when a trade policy measure is adopted in an attempt to impose one's own standards on another country's environment, or when trade liberalization is opposed by environmentalists. The paper shows how all three unnecessarily threaten to undermine the global trading system and how, in the cases of coal and food, trade liberalization could well improve rather than worsen the global environment.

JEL classification: F10, O19, Q20

Keywords: environment, comparative advantage, trade relations, global trading system

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## NON-TECHNICAL SUMMARY

This paper explores the implications for trade relations of the greening of world politics as economies grow. In the first major wave of concern for the natural environment in the late 1960s/early 1970s, the main trade concern was that the imposition of domestic environmental policies would reduce some industries' international competitiveness, causing them to seek compensation such as tariff protection from imports. The more recent wave of environmental concerns, however, is much more intense, more widespread, and likely to affect a much broader range of countries and sectors than was the case in the 1970s – and not least through its effects on foreign trade and investment. Present concerns are more pervasive, partly because their scientific basis is perceived to be more solid and more worrying than was the case twenty years ago, and partly because the world's population and income per capita have each increased by 40% since 1970 – the annual volume of output and consumption has doubled and thereby added substantially to the demand for the goods and services of the natural environment. Unfortunately the supplies of those goods and services are not unlimited and markets for many of them are under-developed or absent. The latter is being tackled in advanced economies via institutional innovations, and is not a major problem in traditional societies. But the creation of appropriate new institutions is often slow in 'modernizing' poor economies, where population and consumption growth will be concentrated for the foreseeable future, and it is largely absent at the international level where cooperation among sovereign governments is required for efficient solutions. Hence the growing interest in rich countries in using one of the few instruments available to them, namely trade policies, as a stick or a carrot to influence environmental outcomes in other countries.

This interest in using trade measures to address environmental issues is worrying for at least three reasons. First, trade policy measures typically will not be the first-best instruments for achieving environmental objectives. Their use in place of more efficient policy instruments thus reduces unnecessarily the level and growth of global economic welfare as conventionally measured, and may even add to, rather than reduce, global environmental degradation. Second, concern for the environment is increasingly used by traditional import protectionist groups as a convenient excuse for raising trade barriers. Third, if this lead to an escalation in trade disputes, it could be followed by retaliatory action, the end result of which would be to undermine the multilateral trading system on which global prosperity depends.

There is another important sense in which environmentalism is putting at risk the global trading system: the claim by some environmental groups that liberalizing world trade will harm the environment. Trade liberalization would raise global

incomes and relocate some production and consumption, and both of these effects worry environmentalists. With respect to higher incomes, they simply assume that there will be greater demands on the environment due to increased spending. This ignores the fact that income growth also brings with it changes in behaviour, such as a slowdown in population growth and a demand for the adoption and enforcement of more stringent environmental standards.

With respect to the environmental effects of a relocation of production and consumption following trade liberalization, perceptions are often inappropriate because they focus only on the most direct effects. As an illustration, this paper examines the likely effects of liberalizing two of the world's most distorted commodity markets, namely coal and food. Both are highly priced in many industrial countries and underpriced in many poor countries, relative to prices in the international market. Since coal consumption is pollutive it is not unreasonable that its use is taxed in rich countries, but protecting those countries' coal producers via import barriers has an adverse environmental effect in that it lowers the international price of coal and hence encourages coal use in the rest of the world, thereby adding to acid rain and greenhouse gases. Furthermore, liberalizing coal trade in poor countries would raise its price there, reducing global coal consumption further. While the increase in their exports would depress the international coal price, this would not cause pollution in other countries to rise so long as the latter's tax on coal was adjusted to prevent the domestic consumer price from falling. Thus coal trade liberalization has the potential to improve rather than worsen the environment. Moreover, since such a reform would increase economic welfare as conventionally measured (for the usual gains-from-trade reasons), it contrasts markedly with the various costly proposals to reduce greenhouse gases by imposing carbon taxes globally.

In case of food, trade liberalization concerns environmentalists mainly through its effects on production rather than consumption. With less farm price supports in Western Europe the domestic concern is that villages would be depopulated, fewer cows would be available to manure alpine pastures, etc. As well, it is feared that a reform-induced increase in international food prices would induce (a) more deforestation in the tropics as developing countries sought to expand their agricultural land area, and (b) more intensive use of chemical fertilizers and pesticides there. Yet global food models show most of the expansion in output would be from already cleared land in countries such as Argentina and Australia, and that the more intensive use of farm chemicals in the expanding farm sectors would be from a relatively low base: those countries currently use less than one-twentieth of the amounts of chemical fertilizer per cropped hectare that high-priced countries such as Switzerland use. The same would be true of farm output expansion in the former centrally-planned economies of Europe. There the alternative use for labour and capital is likely to be in smokestack industries, so in that region too a boost to farming could improve the natural environment.

This is not to deny that there may be other circumstances in which trade liberalization could worsen the environment. Where those circumstances result from inappropriate domestic environmental policies, the response should be to seek first-best environmental policies. Where they result from genuine differences between countries in preferences concerning the global commons – or even more fundamentally in views about what constitutes the global commons – the scope for friction between countries is considerable. The challenge is to ensure that this does not translate to trade disputes that undermine the global trading system on which future prosperity, and thereby the next generation's concern for the natural environment, depends.



## ECONOMIC GROWTH, ENVIRONMENTAL ISSUES AND TRADE

Kym Anderson

The United Nations Conference on Environment and Development, held in Brazil in June 1992, was riding the second major wave of public concern with environmental degradation. The first wave of widespread public interest, in the late 1960s/early 1970s, focused mainly on industrial pollution within and between neighbouring advanced economies. The foreign trade and investment issues raised at that time were confined mainly to the concern of industrial capitalists and workers in rich countries that the imposition of stricter pollution standards at home than abroad would lower their international competitiveness, from which they sought protection.<sup>0</sup> Following a lull in interest brought on by the economic disruptions of the 1973-82 oil-shock period, the current wave of public concern for the natural environment is much more intense, more widespread, and likely to be sustained and to affect a much broader range of countries than was the case in the 1970s - not least through its effects on foreign trade and investment.

This phenomenon is worthy of the attention of those concerned with trade policies not only because environmentalism has already become a non-trivial influence on policy, but also because, like regionalism, environmentalism poses a threat to the liberal multilateral trading system on which global economic prosperity depends.

The present paper seeks to address four sets of questions concerning this development. First, in what ways and why are environmental issues having a more pervasive influence on public policy? Second, how is this greater impact of the natural environment on policy going to affect trade specialization in various groups of countries as the world economy grows over time? Third, what impact will new trade liberalization initiatives have on the environment? And fourth, how might individuals and countries respond to these changes? While the greening of world

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<sup>0</sup>See, for example, Baumol (1971), GATT (1971), Siebert (1974) and Walter (1975, 1976). Such protection from import competition is of course not warranted on economic efficiency grounds, because the environmental policy is aiming to eliminate an unjustifiable (implicit) subsidy rather than add an unjustifiable tax (Snape 1992).



politics has the potential to boost global welfare broadly defined (although the gains will not be spread evenly and some communities could be made worse off), the paper concludes that there is a considerable risk that the policies adopted in response to environmental concerns will be so far from first-best as to worsen welfare in many countries through eroding the global trading system. And in the process they may even to add to rather than reduce environmental degradation.

### **1. Why environmental issues are becoming more pervasive**

The list of environmental concerns has grown rapidly in recent years, and it has taken on more of a global orientation. Air, water, soil and visual pollution at the local or national level is increasingly being seen as emanating from the production or consumption of not only industrial goods but also primary and service sector products. Some of that pollution is believed to be also damaging the environment on a global scale, for example through climate change and ozone depletion. Hence people are worried by the use of CFCs and the emission of CO<sub>2</sub>, etc. not just at home but also abroad, particularly as economic growth and industrialization spread to poorer countries with laxer environmental policies. Likewise, more and more people are concerned about deforestation, species extinction and animal rights at the global level, regardless of national boundaries. And ongoing integration of the world economy brings with it concerns for consumers about the safety of imported products. Since personal values play an important role in international debates on these issues, the scope for friction between countries is considerable.

Fluctuate though it might with the business cycle, this heightened concern for the environment and for product safety is likely to keep growing. One reason is that, even though uncertainties remain, the scientific basis for many of these concerns is perceived to be more solid now than was the case twenty years ago. Another is that the world's population and real per capita income have each increased by about 40 per cent since 1970 and the annual volume of output and consumption has doubled. These increases are adding continually to the demand for the goods and services provided by the natural environment (including essentials for human health such as clean air, potable water, filtered sunlight and natural medicines; raw materials; the capacity to absorb wastes; and aesthetic and recreational services such as those obtained from visiting or even just knowing of

the existence of unspoilt wilderness areas with a diverse abundance of plant and animal species).

Unfortunately, the supply of these environmental goods and services is not unlimited, and markets for many of nature's services are incomplete or absent.<sup>1</sup> Markets are under-developed because of disputed, ambiguous or non-existent property rights or because of the high cost of enforcing those rights. It is true that the more advanced economies have established institutional structures to help handle the tasks of arriving at a social consensus on what are appropriate environmental policies for that society, of allocating property rights, and of enforcing policies. The same is true in some traditional societies before they begin to 'modernize'. But the creation of appropriate new institutions is often slow in 'modernizing' poor economies where population and consumption growth will be concentrated for the foreseeable future; and they are largely absent at the international level where cooperation among sovereign governments is required for efficient solutions. Hence the growing interest in rich countries - particularly on the part of proposers and drafters of international environmental agreements - in using one of the few instruments currently available to them, namely trade policies, to influence environmental outcomes in other countries. Already we have seen the use of trade provisions on affected products (e.g., in the Montreal Protocol on CFCs), but as well there are proposals to use trade sanctions on unrelated products in the hope of persuading poorer countries to adopt stricter environmental policies (e.g., threats to provide less access to textile and other markets of industrial countries unless logging is curtailed).

## **2. The relationship between economic growth, environment, trade and welfare**

The standard theory of changing comparative advantages in a growing world

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<sup>1</sup> This does not apply equally to all environmental resources of course. The doomsdayers such as Meadows et al. (1972) have been proved spectacularly wrong in predicting the exhaustion of minerals and energy raw materials, for example, because they have failed to take into account economic feedback mechanisms. Beckerman (1992) and Crowson (1992) note that the cumulative world consumption of many minerals during the past quarter century exceeded 'known reserves' at the beginning of the period and yet today's revised 'known reserves' exceed those of twenty five years ago!

economy, which has been developed without consideration of environmental concerns, can readily be modified to incorporate at least some of those concerns. As espoused by Krueger (1977) and Leamer (1987), this theory suggests that when a poor country opens up to international trade, its exports initially will be specialized in primary products. This is because its stocks of man-made capital relative to natural resources are comparatively low. Should those non-natural capital stocks per worker expand more for this country than globally, the country's comparative advantage will gradually shift from primary products to manufactures and services (except for those primary products in which competitiveness is retained through the development of new technologies involving sufficient factor intensity reversals). This shift will begin at an earlier stage of economic development, and the non-primary exports will tend to be more intensive in the use of unskilled labour, the more natural resource-poor or densely populated the country. Should the country continue to expand its capital per worker relatively rapidly, its exports will tend to become steadily more capital intensive over time. In the case of manufactures not subject to factor intensity reversals, this process then leaves room in international markets for later-industrializing countries to follow suit in exporting their way out of poverty.<sup>2</sup>

With the help of the Leamer triangle depicted in Figure 1, that theory can provide a rough idea of different countries' comparative advantages as of 1989. The triangle illustrates countries' relative endowments of three factors, denoted N for natural resources, L for labour time and C for man-made capital (human, physical, knowledge, etc.). Proxies used here to represent the natural resources to labour ratio and the capital to labour ratio are land area per capita and gross domestic product per capita. (Crude though these proxies are, more sophisticated indexes are unlikely to change greatly the relative positions of the country groups shown in Figure 1.) These ratios are measured in log terms along the NL and LC sides of the triangle, respectively, the mid-point of each being the world average which is taken as the numeraire. Thus point W represents the global average endowment of all three factors. Countries located in space WAN - which includes Africa and Latin America - have below (above) average per worker endowments of man-made capital (natural resources), and so would have a comparative advantage in primary

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<sup>2</sup> There is simultaneously an expansion in the importance of intra-industry trade among industrial economies as they grow, for the reasons mentioned in Grant, Papadakis and Richardson (1993), but that development does not negate the trends mentioned above.

products and a comparative disadvantage in skill-intensive manufactures and services, and conversely for Western Europe and Japan which are located in the WBC space.

If national boundaries were such that there were no international environmental spillovers, this story need be complicated only slightly to allow for the fact that as the country's per capita income and industrial output grow, the value its citizens place on the environment increases and with it their demands for the implementation of costly domestic pollution abatement policies, at least after certain threshold levels of income and/or pollution are reached. Beyond that threshold point, the severity of such abatement policies is likely to be positively correlated with per capita income, population density and the degree of urbanization.<sup>3</sup> If all economies were growing equally rapidly, the progressive introduction of national environmental policies would tend to cause pollution-intensive production processes to gradually relocate from richer and/or more densely populated countries to poorer and/or more sparsely populated countries.<sup>4</sup> They would also slow or reverse the growth in demand for products whose consumption is pollutive, and more so in rich and/or densely populated countries. If more-advanced economies are net importers (net exporters) of products whose production (consumption) is pollutive, these countries' optimal environmental policies would worsen their terms of trade to the benefit of poorer economies, and vice versa (Siebert et al. 1980; Anderson 1992a). Thus even countries without (or with unchanged) environmental policies will be affected through trade and investment by the development of environmental policies in other countries. Given that the natural environment is part of the stock of natural resources, that it provides services that are valued increasingly as incomes rise, and that national environmental policies may need to be introduced to ensure the optimal use of the services of the environment, then a country's comparative advantage will be affected by the distribution of environmental resources globally and the pattern of

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<sup>3</sup> Two recent papers reporting evidence in support of the claim that the demand for implementing and enforcing pollution abatement policies is income-elastic are Grossman and Krueger (1991) and Radetzki (1992). See also Deacon and Shapiro (1975) on the correlation between income levels and voter attitudes toward environmental priorities.

<sup>4</sup> The term 'pollution-intensive production processes' should be broadly interpreted to include activities such as mining in pristine areas or leisure services that may attract undesired local or international tourists.

environmental policy interventions.<sup>5</sup>

In terms of Figure 1, this amendment is easy to accommodate if there are no international environmental spillovers, given the proxies used to measure N, L, and C, namely, land area, population and GDP: the closer are countries located to point N and the further away they are from point C in the Leamer triangle, the weaker will be their density of economic activity (GDP per hectare) so the stronger will tend to be their comparative advantage in goods and services whose production is pollutive, *ceteris paribus*.<sup>6</sup>

The story becomes more complicated, however, when account is taken of policy reactions to international environmental problems such as the global commons, species depletion or animal rights. The ban by the Convention on International Trade in Endangered Species (CITES) on ivory trade provides an extreme example: the strong comparative advantage that southern African nations had in elephant products virtually disappeared when the ban was introduced in 1989. Another example is the proposed limitation on imports into high-income countries of tropical hardwoods, the aim of which is to discourage deforestation. This too would reduce export growth and specialization in those products by developing countries still well endowed with hardwood forests. A third example is the Montreal Protocol on phasing out the use of CFCs and halons which, through trade provisions, effectively limits both the relocation from signatory to non-signatory countries of industries producing or using CFCs, as well as encouraging non-signatories to accede to the Protocol.<sup>7</sup> And there is the infamous tuna example,

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<sup>5</sup> This inclusion of environmental policies as a determinant of comparative advantage is in the spirit of Clarida and Findlay's (1992) analysis of trade in which the government plays an active and potentially positive (rather than inactive or negative) role in development.

<sup>6</sup> The extent of international relocation of productive activities due to the enforcement of environmental standards should not be exaggerated, however. Recent studies suggest the effect of such policies on comparative costs may be quite minor. See, for example, Leonard (1988) and Low (1992). As well, Tobey (1990) finds little evidence of actual changes in patterns of trade specialization in response to the imposition of environmental regulations since the 1960s. However, as noted by Leidy and Hoekman (1993), the absence of changes in trade patterns may simply be because import barriers were raised to offset any decline in competitiveness in affected industries.

<sup>7</sup> For details of the Montreal Protocol see, for example, Benedick (1991) and Enders and Porges (1992). A list of the other major international environmental

involving the United States' ban not only on the use of dolphin-unfriendly nets by its own tuna fishermen but also on the importation of tuna which US authorities deem to have been caught in dolphin-unfriendly nets. The domestic US ban alone would have boosted Mexico's comparative advantage in tuna fishing, but the subsequent US ban on tuna imports instead reduced it.

In the latter two examples especially, the motive for trade policy action is a mixture of national competitiveness concerns and a concern in rich countries (typically not shared to the same extent by poorer countries) for the global commons. The clear conflict of interest between the two groups of countries, and the fact that trade measures are being used to achieve the first group's environmental objectives, increase the likelihood of trade disputes between the two parties. And these are but minor examples of a large and rapidly growing number of international environmental issues on which countries will have different views.<sup>8</sup>

This increasing use of trade measures to address environmental issues are of concern for at least three reasons. First, trade policy measures typically will not be the first-best instruments for achieving environmental objectives. Their use in place of more-efficient instruments thus reduces unnecessarily the level and growth of global economic welfare as conventionally measured, and may even add to rather than reduce global environmental degradation.<sup>9</sup> Despite this, producer interest groups and some environmental groups are finding it mutually advantageous to use environmental arguments to support claims for import restrictions, particularly

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agreements with trade provisions is provided in GATT (1992, Appendix 1).

<sup>8</sup> For a discussion of other environmentally related trade measures in use or under consideration, see GATT (1992, Part III).

<sup>9</sup> The ban on ivory trade again provides a case in point. By lowering the value of elephant products, the ban reduces the incentive for rural Africans to tolerate elephants trampling their crops and so ultimately could result in fewer rather than more elephants in some areas. In other areas, the value of the animal has fallen so much that it is no longer profitable to cull the herd. An unfortunate consequence is that bushland in national parks is being decimated by the increased number of elephants, which is of course endangering other species.

Even the **threat** of trade restrictions can be environmentally counterproductive. The talk of European import bans on tropical hardwood logs has encouraged Indonesia to ban log exports. But since felling has been allowed to continue, this policy has lowered the domestic price of logs and thereby raised effective assistance to Indonesia's furniture and other timber-using industries to extremely high levels (GATT 1991, p.127). At that lower timber price it is not surprising that less of each tree is now used.

when stricter environmental standards are imposed on domestic producers.<sup>10</sup> The second concern, then, is that the environment will provide a convenient excuse to raise trade barriers. And third, should this lead to an escalation in trade disputes, it could be followed by retaliatory and counter-retaliatory action, the end result of which would be an undermining of the multilateral trading system on which global economic prosperity depends.

But there is also another important sense in which environmentalism is putting at risk the global trading system. It is closely related to the second concern mentioned above, and has to do with the claim by some environmental groups<sup>11</sup> that liberalizing trade will harm the environment. It is to that which we now turn.

### **3. Effects of trade liberalization on the environment**

The actual trade patterns of countries have been affected not only by the determinants of comparative advantage discussed above but also by the pattern of distortionary policies introduced by national governments. A distinctive feature of that global pattern of distortions is that poor countries have tended to discriminate against their primary and labour-intensive export manufacturing sectors in which they have a comparative advantage and to favour their import-competing industrial sector, while in advanced economies those industries losing comparative advantage that are significant employers (agriculture, coal mining, textiles, cars) are the ones assisted most, especially via protection from import competition.

Economic policy reform, and particularly trade liberalization, would lead to (a) higher incomes in both sets of countries and (b) an international relocation of production and consumption. Both of these effects worry some environmentalists. With respect to higher incomes, they simply assume that there will be greater demands on the environment due to increased spending. This ignores the fact that income growth also brings with it at least three pertinent changes in behaviour patterns.

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<sup>10</sup> See the discussion in Hillman and Ursprung (1992) and Hoekman and Leidy (1992a), as well as the empirical evidence analysed by VanGrasstek (1992) of voting behaviour of U.S. senators.

<sup>11</sup> See, for example, Shrybman (1990), Ritchie (1990) and Arden-Clarke (1991).

The first one, already alluded to above, is that as economies open up and incomes rise, more stringent environmental policies are put in place. This is partly because the demand for such policies has a high income elasticity after middle-income status has been attained. At the same time, more resources are available to spend on improving the environment. As well, the political cost of supplying such policies falls with the opening up of the economy to trade and investment. It falls because liberalization expands the opportunities to acquire more environmentally benign production processes and consumer products and thereby lowers the cost of (and hence the opposition to) implementing stricter standards.

Secondly, higher incomes in poor countries inevitably lead in time to lower population growth rates. This, along with the increased employment opportunities resulting from trade liberalization, is likely to have a major effect in reducing the rate of environmental degradation due to population pressures in developing countries. In rural areas it means fewer people denuding hillsides to eke out a subsistence income, while in urban areas it means fewer squatters in shanty towns with poor sanitation and water (World Bank 1992).

And thirdly, the increase in the value of poor people's time in developing countries will raise the relative price of wood and charcoal as sources of household fuel. Since four fifths of the timber harvested in developing countries is used as household fuel, this alone could have a major beneficial impact in reducing deforestation and CO<sub>2</sub> levels.

But, in addition to not appreciating these behavioural changes, environmentalists are often misguided also in terms of the environmental impact of trade liberalization through its effects on the international location of production and consumption. Two of the world's most distorted commodity markets are those for coal and food: both tend to be priced well above international levels in advanced economies and well below them in developing countries (particularly the former centrally planned economies). Yet it is not difficult to demonstrate that liberalizing trade in these commodity markets is more likely to improve than to worsen the global environment. We begin with coal, the consumption of which damages the environment, and then consider food where it is the activity of production that is damaging the environment.<sup>12</sup>

<sup>12</sup> Another important case of particular importance to East Asia, but which has been studied less, concerns trade in logs and timber products (see GATT 1992, p.38,



### (a) The case of coal<sup>13</sup>

Coal, which supplies nearly one-third of the world's energy, is a major contributor to local and international environmental problems, including global warming and acid rain. Since liberalizing trade in a commodity typically leads to an expansion in its global consumption, one might expect coal to be an example where trade reform would worsen the environment. But in fact this need not be the case. On the contrary, provided domestic taxes on coal consumption are introduced or adjusted to ensure the coal price to consumers does not fall when trade is liberalized, both economic welfare and the environment would improve.

Coal import restrictions imposed by numerous industrial economies, together with their subsidies to domestic coal mining, ensure that industrial countries as a group (which account for one-third of global coal consumption) import less coal than they would if their markets were unrestricted.<sup>14</sup> This has depressed the international price of coal (and hence of other energy sources). If those domestic producer subsidies and import restrictions were to be replaced by a tax on coal consumption which kept the consumer price in those industrial countries at its present level, coal production would decrease and imports would rise but consumption and hence domestically generated pollution from coal use would remain unchanged. Moreover, greater demand by those countries for coal imports would raise the international price of coal (and other energy sources), thereby reducing energy consumption and hence pollution in the rest of the world.

While industrial country reform alone would lower global pollution, it represents only half the story. This is because coal is priced at only a small fraction of the international price in many developing and former centrally planned economies (the latter accounting for about half the world's coal consumption).<sup>15</sup>

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Box 6).

<sup>13</sup> This and the next section draw on Anderson (1992b).

<sup>14</sup> Data from Jolly et al. (1990) suggest that the combined effect of import protection and direct producer subsidies was to cause the domestic producer price of coal to be above border prices in 1986 by about 100 per cent in the United Kingdom, 240 per cent in West Germany and 290 per cent in Japan. See also Steenbilk and Wigley (1990).

<sup>15</sup> According to data published by the International Energy Agency (1992), during 1988-90 the domestic price of steaming coal used for energy, as a proportion of the

Should these countries reform their coal markets their domestic prices would rise substantially, leading to less coal being burnt and hence less pollution from these countries (assuming alternative fuels are not more environmentally damaging, in which case they too are probably under-priced). While the increase in their exports would depress the international coal price, more or less offsetting the increase that would result from liberalization by industrial economies, this would not cause pollution in other countries to rise so long as the latter's tax on coal consumption was adjusted so as to prevent their domestic consumer price from falling below the pre-reform level.

Hence coal trade liberalization in poorer countries - especially the former centrally planned economies - could add substantially to the positive environmental effects of liberalization in advanced industrial economies. And since such reform would at the same time add to welfare as conventionally defined, for the usual gains-from-trade reasons<sup>16</sup>, it contrasts markedly with the various proposals to reduce global warming by imposing carbon taxes globally - proposals on which international agreement in any case would be extremely difficult to reach.<sup>17</sup>

### **(b) The case of food**

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West European import price, was 15 per cent in Czechoslovakia, 20 per cent in Poland, 32 per cent in Hungary and 27 per cent in India. Prices in the former Soviet Union may have been even lower, especially when valued at the shadow exchange rate. Prices for steaming coal in China vary a lot by region, but even at the overvalued official exchange rate the Plan prices (which apply to about two thirds of all coal) were well below half the US export price in 1989 (Albouy 1991, p.5). Burniaux et al. (1992, p. 55) suggest the user price of coal in 1985 averaged less than 55 per cent of border prices in all of Eastern Europe, the former Soviet Union, China and India.

<sup>16</sup> In fact the welfare gains would be even greater than the above single-commodity, partial-equilibrium analysis suggests. This is because of the opportunities for substitution in consumption among coals of different quality (in terms of their pollutiveness) and between coal and cleaner fuels.

<sup>17</sup> Evaluations of the costs and distributional consequences across countries of such proposals can be found, for example, in Nordhaus (1991), Burniaux et al.(1992), Cline (1992) and Winters (1992). The Burniaux et al. study models the effects of reducing carbon emissions both with and without current energy user price taxes/subsidies in place. The results - consistent with the above conclusion - show that the level of emissions by the year 2050 would be 20 per cent lower if present distortions in energy user prices were to be removed.

Liberalizing trade in farm products concerns environmentalists mainly through its effects on production rather than consumption. In Western Europe, part of the fear is that lowering farm price supports in industrial economies would harm the local rural environment (via more depopulation of villages, less manicuring of alpine pastures, etc.). But there is concern also for what the higher international food prices that would result from reducing agricultural protectionism in rich countries would do to the natural environment in the tropics. Two undesirable consequences are feared there. One is that, through encouraging developing-country agriculture, tropical deforestation would accelerate to make available more cropping and grazing land and that this would add to global warming and reduce the biodiversity of plants and animals. The other perceived undesirable consequence is that the available farm land in the tropics would be used more intensively with heavier doses of chemical fertilizers and pesticides. This would add to soil and water contamination in those countries and to chemical residues in their food.

These concerns are understandable, but they are based on a less-than-complete picture of the environmental effects of liberalizing agricultural support policies (in addition to which they ignore the usual welfare effects of trade liberalization, which would be positive for both rich and poor countries - see Tyers and Anderson (1992, Ch.6)). To obtain a more complete picture requires first examining the effect of reform on the total volume and location of the world's food production, then to ask how that relocation would alter land use in the affected locations, and thirdly to examine what environmental policy changes might accompany food trade liberalization.

According to one recent set of modelling results, even if all industrial countries were to fully liberalize their food markets and agents adjusted immediately, there would be almost no change in global food output: the net decline in farm output in reforming industrial countries would be matched almost exactly by the net increase in developing country output (top of Table 1). Developing country output would not increase more because even in the long run it is expected those countries would continue to insulate their domestic markets somewhat, that is, they would not allow all the international price increase to pass to their producers and consumers. The regional changes in production are shown in the rest of Table 1. Most of the production cutback is projected to take place in the EC-12:

three quarters of the grain and two fifths of the meat reductions would occur there. While most of the output expansion would occur in developing countries, according to these results, a little over a quarter would come from the least densely populated rich countries of North America and Australasia - in America's case partly because the acreage set-aside program also is assumed to be abandoned as part of its reform. Apart from China with its contribution of one-fifth to the expansion of grain (although this represents only a 2 per cent increase in its own output), the developing country that is projected to expand most is Argentina. It accounts for more than one eighth of the global expansion of both grain and meat. Other Latin American countries would supply much of the rest of the additional output, with the more densely populated countries of Asia and Africa contributing little, especially relative to their populations.

How the environment would be affected by these relocations of production depends on how the global use of farm inputs would alter following liberalization. With respect to intermediate inputs, several points can be made. First, it is clear from Figure 2 that chemical fertilizer applications are strongly correlated with producer price incentives. Countries with relatively low producer prices such as Argentina, Australia and Thailand use less than one twentieth the amounts of chemical fertilizer per cropped hectare that high-priced countries such as Switzerland use. Even just within Asia the range has been very wide for fertilizer, and wider still for pesticide use (Table 2) - despite the provision in the poorer countries of considerable subsidies to users of farm chemicals. Moreover, the extent of contamination of soil, water and air from farm chemicals depends on their use not only per cropped hectare but also relative to the total land area of a country. It happens that the highly protected countries of Western Europe and Northeast Asia crop a quarter and a sixth of their land, respectively, whereas the rest of the world crops only a tenth of its land on average. Hence the extent of pollution from farm chemicals is even more strongly related to current producer support policies than Figure 2 and Table 2 suggest.

It follows that an international relocation of crop production from countries with high-priced food to those with lower prices would reduce substantially the aggregate use of chemicals in world crop production and in particular their very high use in Western Europe and Northeast Asia. While it is true their use in other countries would expand, that expansion would be from a low base and to still-modest levels in terms of their pollutive and food-contaminating effects (and it

could be more or less offset by reductions in the subsidies currently offered to users of farm chemicals in those countries). And the same is true for the effect of liberalization on the use of inputs in livestock industries. The relocation of meat and milk production would be associated with a decline in the extent to which the world's livestock is fed grain (often mixed with growth hormones) rather than pasture. The greater use of the latter less-intensive method would reduce not only air, soil and water contamination associated with the disposal of animal effluent but also the chemical additives in the livestock products we eat.

What about the use of labour and capital? If agricultural profitability was reduced in advanced industrial countries, labour and capital that would otherwise have been employed in agriculture would find employment mostly in the relatively unpolluting services sector or in industrial activities which for the most part already have basic environmental protection policies in place. By contrast, in the less-developed economies where food production would expand, the capital required for that expansion might otherwise be employed in smokestack manufacturing or mining activities which could well be more pollutive than farming at the margin if adequate environmental policies are not in place. Also, some underemployed rural labour would be attracted into the expanding commercial farm sector. If the latter workers 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 real price of wood for fuel (the main component being the value of time involved in collecting and chopping it). Cleaner fuels such as kerosene would then be used more and forests would be depleted less. This effect on the environment could be very substantial because, as mentioned earlier, four fifths of logs felled in developing countries are used as fuel.<sup>18</sup>

Finally, what about land use? Virtually all the econometric evidence suggests that in practice very little land would be taken out of farming in liberalizing countries solely because of a fall in output prices. Instead, there would be an immediate decline in the value of land which would in turn lead quickly to less use being made of land substitutes such as farm chemicals, irrigation water and concentrated animal feeds. Over time their use would fall even more because the decline in the price of land would reduce the bias in research toward the

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<sup>18</sup> A similar set of comments could be made about the positive effects on the environment in rich and poor countries of liberalizing trade in textiles and clothing.

development of land-saving technologies (Ruttan 1971). Moreover, a lower price of land would reduce the incentive to clear remaining forests, wetlands and other wildlife habitats in these countries. These positive environmental effects would add to the conventionally measured gains in economic welfare for the reforming countries.

But wouldn't there be more land cleared for farming in those countries where food production would expand? The answer is probably no in the case of North America and Australasia where, according to Table 1, nearly a third of the extra grain and meat output would be produced. In these countries there are strict deforestation regulations that prevent indiscriminate felling. In any case, in the United States the bulk of the increased grain output would come from bringing back into production farm land that had been previously idled by the set-aside provisions of the price-support programs.

In the developing countries the area used for food production may well expand, so the question becomes: by how much? Some of that extra land might be drawn away from plantation cash crops which also use farm chemicals, so that may not represent a net addition to environmental damage. The concern of conservationists, however, is that more tropical forests would be felled, reducing their value as wilderness areas, sources of plant and animal biodiversity and as absorbers of the world's ever-larger emissions of carbon dioxide. Yet empirical price response studies suggest there would be relatively little extra felling in response to aggregate output price increases. Consider, for example, the three countries that Table 1 suggests would be responsible for producing two thirds of the developing countries' extra grain and two fifths of the extra meat following reforms abroad, namely, Argentina, Brazil and China. A recent study of Argentina suggests a 10 per cent permanent increase in the real price of farm products would cause the area farmed to increase by less than 5 per cent even after two decades (compared with increases in farm labour and capital equipment use of 15 and 18 per cent, respectively). Similar results were found for Brazil: a 10 per cent product price increase there would in the long run increase land use in farming by 6 per cent, labour use by 18 per cent and capital equipment use by 27 per cent.<sup>19</sup> As for China, a recent growth-accounting study found that during the 1965-85 period, none of China's rapid farm output growth was attributable to land expansion (Fan 1991).<sup>20</sup>

<sup>19</sup> See Cavallo (1989) and Lopes (1977), both quoted by Lutz (1992).

<sup>20</sup> The responsiveness of land use has been low in Southeast Asia also. In

Since any liberalization of industrial countries' farm policies in the 1990s is unlikely to cause more than a 5 per cent rise in food prices in developing countries, the annual expansion in the area used for farming that would result from such a reform would be at most a small fraction of 1 per cent.<sup>21</sup>

An important qualification to the results reported in Table 1 strengthens even further the likelihood of freer farm trade benefitting the global environment. It has to do with the effects in Eastern Europe and the former Soviet Union. The analysis reported in Table 1 effectively ignored those countries by assuming they do not transmit international food price changes to their domestic markets. While that seemed a reasonable assumption at the time the results were generated, it is of course no longer so. A rise in international food prices now would boost farm incomes and employment there and in so doing reduce both the prospect of political instability and the incentive to divert resources away from agricultural relative to industrial activities. Given the present parlous state of pollution abatement by East European industry, this is a further way in which food policy reform could reduce European and global environmental problems.

### **(c) Global versus regional trade liberalization**

The above discussion provides but two case studies of global trade liberalization. It cannot be inferred from them alone that global liberalization of all trade in goods and services, of the sort being negotiated as part of the Uruguay Round, would necessarily be beneficial for the environment, *ceteris paribus*. But what we do know from economic theory is that, in the absence of other distortions or market failures, radial reductions in all trade barriers will improve welfare as

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Thailand, for example, a 10 per cent increase in the price of crop products is estimated to increase the demand for cropland by less than 1 per cent (Phantumvanit and Panayotou 1990).

<sup>21</sup> The study referred to in Table 1 estimates that full liberalization by industrial countries would raise international prices of temperate foods by 25 per cent. It is clear from the Uruguay Round negotiations that it will be difficult politically to deliver even as much as a one-third liberalization in the 1990s. Moreover, developing countries transmit only a fraction of any international price change to their domestic markets even in the long run, so 5 per cent is probably an upper limit on the domestic price rise that could be expected from such reform this decade. According to the above econometric evidence, this would translate to less (in many cases much less) than a 3 per cent increase in the demand for agricultural land over the decade - and during the past decade the supply of farmland in developing countries grew at 5.5 per cent as a result of logging.

conventionally measured (Hatta 1977). Indeed, **so long as optimal environmental policies are in place**<sup>22</sup>, welfare will improve even after taking into account any adverse effects of liberalization on the environment (Anderson 1992a).

Can the same be said about regional integration arrangements such as the NAFTA or the EC's 1992 single market program and its evolving accords with EFTA and the reforming economies of Eastern Europe? The global welfare effects (not counting the effects on the environment) are less clear-cut because trade diversion may offset trade creation, especially with the increasing propensity of countries to impose anti-dumping duties, VERs and other covert trade barriers both within regional blocs and against the rest of the world (Hoekman and Leidy 1993). And the environmental effects are even less certain because, in addition to the usual impact of production relocation and changes in relative prices faced by consumers, the regional agreements typically will have explicit or implicit provisions for harmonizing environmental laws to some extent.<sup>23</sup> On the one hand, one might expect standards to become stricter when new members have higher standards than existing members (EFTA versus EC-12). On the other hand, environmentalists fear that standards may be harmonized downwards when a bloc admits members with lower standards (Mexico versus the United States and Canada; Eastern versus Western Europe). The latter risk is small for the cases mentioned, however, given the relative political strengths of the existing and joining countries. In those cases, then, the effect on the environment of creating or expanding a regional bloc is likely to be positive for the same sorts of reasons (and with the same provisos) as they are for global trade liberalization.

There are two differences between regional and global trade liberalizations that may be of some significance, however. The first is that if regional

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<sup>22</sup> This is of course a non-trivial proviso, and more so the more an environmental problem spills over to other countries or involves the global commons.

<sup>23</sup> Harmonization provisions such as minimum standards tend to be written into regional integration agreements presumably to reduce the risk of member countries competing by undercutting each other's pollution tax rates (particularly in oligopolistic industries as a form of strategic industrial policy - see Barrett (1991)). A less likely motivation is to reduce the prospect that pollution taxes are raised by each country to ensure polluting industries are 'not in my back yard' (the NIMBY prospect). For an analysis of the differing effects of these two scenarios, see Markusen, Morey and Olewiler (1991).



liberalizations become a substitute for global liberalizations, then to the extent that they apply only to a subset of the world economy they will boost global income less and thus cause less greening of world politics (for the reasons mentioned above at the beginning of Section 3). And the other is that comparative advantages will change differently if the regionalism route is adopted instead of multilateralism. Specifically, suppose Mexico or Eastern Europe were to adopt environmental policies much closer to those of the US or EC than other middle-income countries.<sup>24</sup> Then the former's competitiveness in pollution-intensive industries would tend to be lowered to some extent, to the benefit of otherwise similar economies outside those blocs - unless those blocs, as a consequence of enlargement, become sufficiently more powerful in imposing their standards on other countries.

#### 4. Implications for the future

This paper has sought to clarify a number of points concerning the nature and some of the trade effects of the greening of world politics. The first point is that the current wave of concern for the environment is much more intense, more widespread, and likely to be sustained and to affect a much broader range of countries than was the first wave around the early 1970s. This is partly because more is now known about the nature and the considerable extent to which we are degrading the natural environment. But the demand for many of nature's services is increasing also because of rapid population and income growth. The growth in the supply of environmental services, by contrast, is limited by their non-renewability and/or by incomplete markets for them, particularly in poorer economies and at the global level where cheap-rider problems are especially acute.

Second, because of genuine national differences in the demand for and supply of services from nature, countries will necessarily have different optimal environmental policies. In cases where there are no international environmental spillovers, attempts to harmonize domestic environmental policies across countries will be costly because they deny the existence of one of the determinants of

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<sup>24</sup> Such adjustments can happen even without changes in environmental laws in the poorer new members of a bloc. For example, the lowering of trade barriers may result in some producer and consumer equipment from the richer countries being more competitive and less pollutive than local substitutes. An obvious case in point is second-hand cars which have catalytic converters moving south from the U.S. or east from Germany.

comparative advantage. But it is necessary also to acknowledge that some environmental problems **do** spill over to neighbouring countries and the global commons, both physically (acid rain, ozone depletion, global warming) and psychologically (species depletion, deforestation, animal rights). Since countries will differ also in their capacity and preparedness to reduce the overseas environmental impacts of their activities, the scope for friction between countries, brought about by this challenge to national sovereignty, is considerable. It is especially great when there are interactive environmental problems, as with global warming and deforestation: poor countries see global warming as caused by rich countries' earlier deforestation and continuing high levels of carbon emissions, while rich countries see tropical deforestation as reducing the world's capacity to absorb more carbon emissions as well as reducing its stocks of plant and animal species and of pristine wilderness areas. Since rich countries can better afford to worry about these problems, poor countries feel they should be paid to contribute to rich-country welfare through curtailing tropical deforestation activities.

Third, one of the few ways in which countries with a preference for strict environmental standards can influence the environmental policies of other countries is via trade measures. This is of concern partly because trade instruments are almost never going to be first-best policies for achieving global environmental objectives (their stick and/or carrot role in international environmental agreements being the main potential exception), and also because they are open to abuse by traditional protectionist groups seeking covert government assistance. They are thus likely to cause trade disputes and retaliation, which could ultimately undermine the global trading system. And that system is further undermined by the misinformation being circulated by some environmentalist groups in rich countries concerning the effects that multilateral trade liberalization would have on the global environment.

How might individuals and governments respond to these developments? Opportunities, as well as challenges, present themselves. The main opportunities involve altering domestic production and consumption in response to changes in the terms of trade brought about by changes in other countries' environmental policies and preferences. As well as the traditional smokestack industries, this could affect service industries (e.g., promoting eco-tourism exports), primary sectors (e.g., marketing food exports as being relatively low in chemical additives), and high-tech activities (e.g., exporting anti-pollution equipment). But in addition there is the

opportunity simply to set an example by not using trade measures for environmental purposes (e.g., adopting dolphin-friendly labelling provisions for tuna cans in the United States instead of banning imports of Mexican tuna; or limiting production rather than exports of logs from tropical countries), and by giving higher priority to liberalizing trade in cases where it would have the additional benefit of reducing local and global pollution (e.g., freeing more of the market for coal in China, perhaps in return for greater access to developed country markets for light manufactures).

The challenges that present themselves include minimizing not only the extent to which individual countries use the environment as an excuse to raise import barriers but also the tendency for this trend (toward greater use of trade measures for environmental purposes even though they are far from first-best) to erode the global trading system. The GATT process itself offers one obvious channel. Another is during negotiations leading directly to international environmental agreements. And a third will be through the UN Commission to be set up to replace UNCED. By stressing there - just as several Asian delegations did at the Rio conference last June - that an Uruguay Round agreement probably would do more for the global environment in the 1990s than any conceivable series of international environmental agreements, perhaps those environmentalists opposed to trade liberalization will gradually be persuaded to switch their attention away from trade measures and toward more appropriate environmental policy instruments.

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Table 1: Effects on global food production of total liberalization of industrial countries' food policies, 1990

(per cent)

	Grains	Meats
<u>Proportional change in production (%) in:</u>		
All industrial countries	-5	-6
Developing countries	3	8
TOTAL WORLD	<u>-0.3</u>	<u>3.0</u>
<u>Shares (%) of production decline in industrial countries due to:</u>		
EC-12	73	61
EFTA	13	7
Japan	14	32
TOTAL	<u>100</u>	<u>100</u>
<u>Shares (%) of production increase in other countries due to:</u>		
North America	30	20
Australia/NZ	2	6
Argentina	13	14
Brazil	11	9
Other Latin America	11	20
China	21	5
South Asia	5	3
Other Asia	5	12
Africa/Middle East	2	11
TOTAL	<u>100</u>	<u>100</u>

Source: Calculated from printouts used in Anderson and Tyers (1993) as reported in Anderson (1992c, Table 8.2).

Table 2: Producer-to-border price of rice and use of chemical fertilizers and pesticides per hectare of paddy, various Asian economies, 1970s

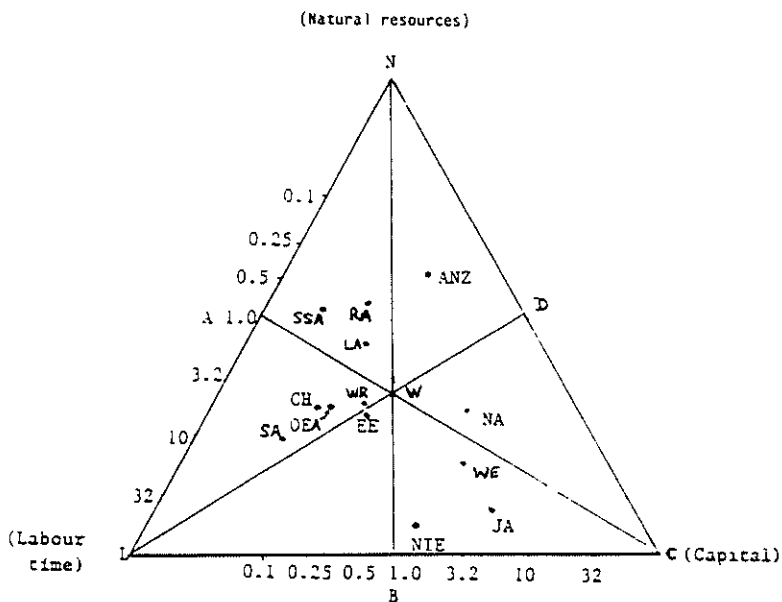
	Chemical fertilizer		
	Producer-to-border price of rice	use per ha. of paddy land, kg per year,	Pesticide use per ha. of paddy land, kg per year,
	1976-80	1976-79	1970-78
Burma	0.37	9	0.16
Thailand	0.70	11	0.97
Sri Lanka	0.76	65	0.11
India	0.76	32	0.33
Philippines	0.77	29	1.36
Bangladesh	0.93	11	0.02
Indonesia	0.98	57	0.38
West Malaysia	1.73	97	1.92
Taiwan	1.85 <sup>a</sup>	252	3.48 <sup>b</sup>
South Korea	2.66 <sup>a</sup>	311	10.70
Japan	3.75 <sup>a</sup>	340	14.30

<sup>a</sup>From Anderson, Hayami and Others (1986, pp.128, 130, 133).

<sup>b</sup>Based on application to all crops on all cultivated land during 1979-81, from Department of Agriculture and Forestry, Taiwan Agricultural Yearbook, Taipei, 1988.

Source: Barker, Herdt and Rose (1985, pp.77, 89 and 237).

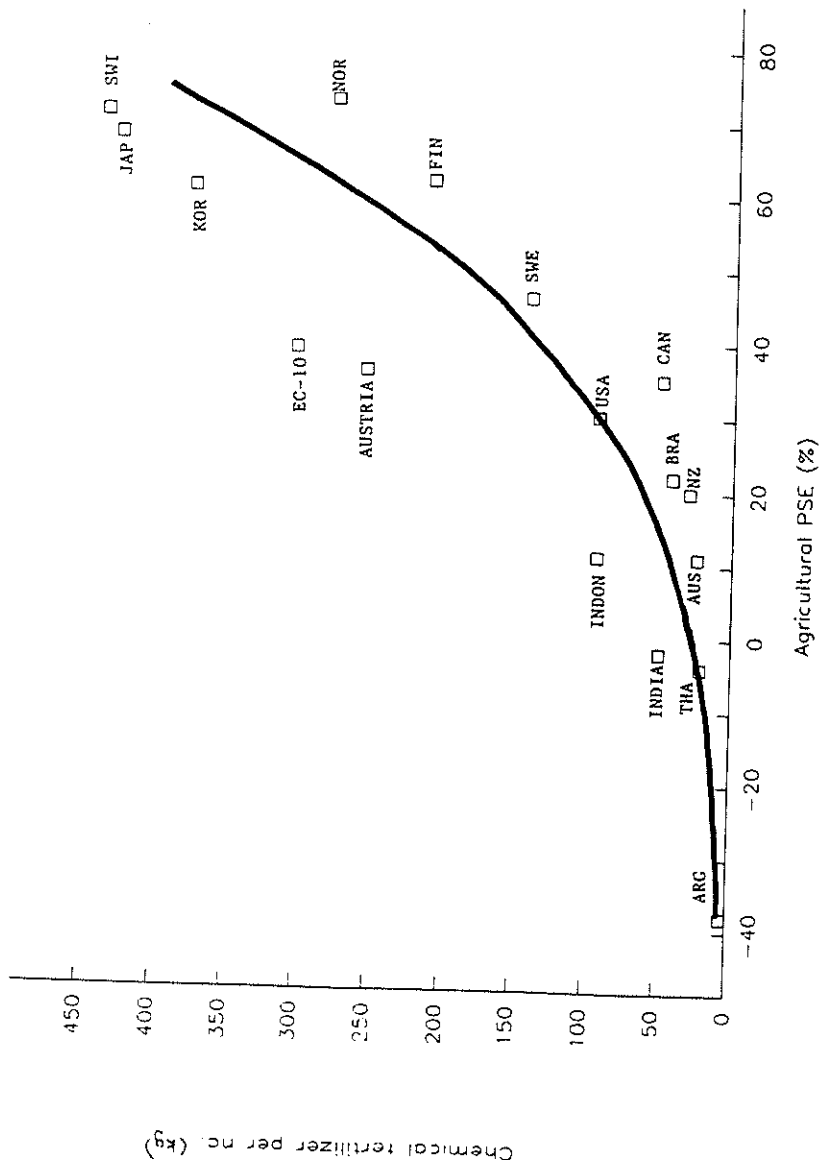
Figure 1: Relative endowments of natural resources, labour and capital,  
various economies, 1989<sup>a</sup>



<sup>a</sup>The distance along NL from N measures the population density as a ratio of the world average (0.39 people per hectare of land). The distance along LC from L measures national product per capita as a ratio of the world average (US\$3980). Both scales are in logs. Along any ray from C to the NL line the population density is constant, and similarly for rays from the other two corners of the triangle. W is the world's endowment point. Countries are represented as follows: ANZ Australia and New Zealand, CH China, EE the East European economies, JA Japan, LA Latin America, NA the United States and Canada, NIE East Asian's four newly industrialized economies, OEA other East Asian market economies, RA Russia and the 5 former Soviet central Asian republics, SA South Asia, SSA Sub-Saharan Africa, WE the West European economies, WR the 9 western republics of the former Soviet Union. The estimates used for per capita income for Eastern Europe and the former Soviet Union are US\$2350 and US\$1780 respectively, based on World Bank (1991) and other estimates reported in CEPR (1990, p.33). The relative incomes and population densities within the former Soviet Union are derived from data in the report by the IMF et al. (1991). Purchasing power parity measures of income, if they were available for all countries, would show less differences across countries but this would alter little the relative position of country groups in the above triangle.

Source: Adapted from Leamer (1987) using data from the IMF et al. (1991) and the World Bank (1991).

Figure 1: Relationship between agricultural producer subsidy equivalent (PSE) for 1979-89 and use of chemical fertilizer per hectare of cropped land in 1985, various countries/country groups



Source: Data from Anderson (1992b, Table 2).