Agriculture: A Perspective from History, the Metrics of Comparative Advantage, and Limitations of the Market to Understand the Role of State in a Globalising World

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ABSTRACT

Multilateral agencies and economists with much influence have been urging laissez-faire in agriculture. While success with the rich countries has been minimal despite the commitments under the WTO, many poor countries with much agricultural potential in the long run have been coaxed to adopt near free trade in agriculture with disastrous results especially for the poor in these economies. There are fundamental problems in achieving even global (leave aside optimum for any particular country) optimality through world trade in agriculture given the immovability of land. Additionally the fact that poor countries start their transformation process with much of their population engaged in agriculture imposes special requirements upon agriculture. Incomes have to rise in agriculture to overcome poverty and to constitute rising domestic demand for modern manufactures and therefore the infant industry argument holds with additional force.

We bring together the historical experience of agricultural development, the relationship between economic development and agriculture, trade in agriculture, the role of state action especially in the late industrialisation context. The differences between land endowed and land poor countries are recognised in their analyses. We develop a perspective on the comparative advantage of nations in agriculture and the evolution of the same. The metrics of agriculture and trade, arising out of the dynamics of the share of agriculture in GDP, the dependence of agriculture on land endowments, the biological limits to consumption of agricultural products, underlie a dynamic structural model of the revealed comparative advantage which is developed and tested using panel data from about 100 countries. The nature of agricultural products on several dimensions – its long lead in production, its perishability in some cases, its storability in others, but above all the grouping of many agricultural products into low price and income elasticity of demand – is used. The purpose is to draw insights that can usefully inform the content of state intervention, and trade policy especially from the point of view of a country like India which is likely to lose its comparative advantage in many agricultural products as incomes rise.

The comparative advantage of countries in agriculture is most usefully characterized as rising of the arable land endowments per person and declining as the per capita income rises relative to the worlds "average" per capita income. A structural model on the lines above is estimated empirically. The Model is also dynamic since the rise in per capita incomes at a faster rate in transforming countries can be used as data to predict with a high degree of reliability that they would see a decline in their competitiveness. Similarly countries with low arable land per person would see a rapid fall in their competitiveness.
Yet land abundance in poor countries does not automatically result in high competitiveness. [The abundance of easily mined other natural resources like fuels acting through the balance of payments could lower greatly the revealed competitiveness of agriculture]. To realize the same, much land has to be brought under the plough and enhanced, a task where the role of the state is important. Irrigation development as also the use of machinery on land enhances the competitiveness of agriculture. And the former is dependent much upon the ability of the state to put together public irrigation and support private irrigation. Even more importantly the investments in storage, market support, transportation, information provision, demonstration of new technologies and extension all of which are required at the beginning of the agricultural transformation require active intervention of the state.

The problem for the poor countries with land abundance is compounded by the large distortion of international prices resulting from subsidization by rich countries as they face declining competitiveness in

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agriculture due to very high incomes. The coaxing of land rich poor countries in this situation to embrace laissez faire policies by the multilateral agencies is shameful and nothing short of suicide for these countries. The costs of subsidization in the rich countries are very small and the political benefits very large, so a roll back of subsidization is least likely.

Agriculture is the first industry where surpluses can arise to stoke development as such. The historical evidence that no country of substantial size has been able to industrialize without a prior or simultaneous agricultural revolution has to be noted. And the infant industry argument is valid for agriculture as much as for industry. Both these further condemn the laissez faire position. Protection of agriculture is therefore the least distortionary way for the "large" land-poor poor countries as they advance to protect their employment. Protection alone without active support of the state to overcome the significant market distortions in agriculture and its inputs may not be enough. Protection in land scarce economies ought to be scaled down only as such economies are able to absorb labour shed by an advancing agriculture in other segments of the economy.

Functionality also demands that the role of the state in agriculture and subsidization recognizes not only the market failures arising out of the public good nature of many inputs, but also the perversities that low price and income elasticities, when combined with the long "lead" can bring to the functioning of markets. Similarly the structure of the value chain from production to final consumption in distant lands – especially the fact that the aggregators and processors in the value chain would be able to capture rents – creates the basis for a crucial role for the state in trading, stocking and processing. Shortages and variations in output again create the need for buffer stocking. Successful late agricultural transformations have been built upon the state playing these roles. The state's role in processing while crucial has not generally been successfully realised, the complexity of the tasks being a basic bottleneck. Laissez faire policies in agriculture when without reference to the stage of development, and state failure to compensate for the market perversities underlie the disaster that agriculture has been for poor countries with much agricultural potential.

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Introduction

In this paper we bring together the historical experience of agricultural development, the relationship between economic development and agriculture, trade in agriculture, the role of state action especially in the late industrialisation context. The differences between land endowed and land poor countries are recognised in their analyses. The purpose is to develop a perspective on the comparative advantage of nations in agriculture and the evolution of the same. The metrics of agriculture and trade, arising out of the dynamics of the share of agriculture in GDP, the dependence of agriculture on land endowments, the biological limits to consumption of agricultural products, underlie a dynamic structural model of the revealed comparative advantage which is developed and tested using panel data from about 100 countries. The nature of agricultural products on several dimensions – its long lead in production, its perishability in some cases, its storability in others, but above all the grouping of many agricultural products into low price and income elasticity of demand – is used. The purpose is to draw insights that can usefully inform the content of state intervention, and trade policy especially from the point of view of a country like India which is likely to lose its comparative advantage in many agricultural products as incomes rise.

SECTION I
PERSPECTIVES FROM HISTORY

As the economy develops and incomes rise, wage costs are bound to rise. Agriculture which is less amenable to labour saving technological changes[3] and slower in productivity growth as compared to manufacturing, becomes less competitive as free market forces that transcend national boundaries (through free trade in agricultural products) are allowed to operated. This is so because the richer more advanced country would in using high cost labour be expensive in its output of agriculture having limited recourse to compensating technological changes and use of capital. Land being essentially limited enhances the problem. Imports from countries that are not yet on the industrial track with their lower `wages' or labour costs would be the norm. This conclusion would be valid for a world without differences in land man ratios[4] Land rich countries though would be able to moderate this decline in competitiveness since the abundance of land would allow with modest investments improvements in agricultural productivity. But over the

[3] This is not only due to the inherent aspect that in agriculture the effort is really to tease out greater utility from nature's biological processes, but also because in many ways the factors cannot be considered as independent, the production function itself imposing complementarities of a very significant kind.

[4] This is generally understood in terms of arable land. But since the arable land can be increased by capital investments especially irrigation but also public land conversion and augmentation programmes, the land constraint must be seen as having some play. The scope though for land augmentation in land scarce economies should not be exaggerated, since these come with rapidly increasing unit costs. Recent discoveries and innovations in biotechnology which can alter the genetic make up of plants and animals in the laboratory directly rather than through pain staking and uncertain breeding over generations, does not really liberate agriculture from land (since the photosynthetic aspect would still rule). Such developments would bring in the technology provider into the value chain, along with aggregators, stockists and traders, and processors. Only developments that can either greatly improve the technical efficiency of plants or allow them to grow on non-solar sources of energy could fundamentally alter the land constraint.

longer period since incomes can only rise exponentially and land remains constant, the problem of declining competitiveness of agriculture though moderated emerges[5] even in these countries.

When many other countries which are land scarce also succeed in industrialisation, and world per capita incomes begin to converge the land rich country that industrialised early would witness its agricultural competitiveness re-emerging. This for instance is the case of the US, which now is a net exporter of agricultural products. Some which were land endowed in an extreme way, Australia, Canada and New Zealand would not have lost their agricultural competitiveness at all, despite high incomes. Others land rich and wherein the industrialisation process has not gone fully ahead to make them rich countries (Brazil, Argentina, Uruguay), would be among the most competitive countries in agricultural products.

Corn Laws and their Abolition as Turning Points in the Industrial Transformation of Densely Populated Economies

Britain was a (relatively) densely populated economy which became the first industrial nation. Its industrialisation itself was predated and caused in many ways by the agricultural revolution that began c. 1650 and went on until 1750. (Bairoch, Paul 1976; Lewis, Arthur 1954; Lewis Arthur, 1978) The agricultural revolution was inter alia caused by the replacement of the old three field system of farming by continuous cultivation with turnips and other crops providing the fertility to the soil and the use of horses with improved harness for deeper ploughing. (Overton, 1998). Effective land as such increased over the period, and additional works resulting in drainage and connectivity through canals improved the realisation and market reach of farmers, to make England a substantial exporter of food and agricultural produce through the continent. When the industrial revolution began in 1740s, with the emergence of the machine mode of production in Lancashire the first flush of demand for the textiles could come from a prosperous agricultural sector and from the New World colonies of Britain. And a little later, it came most importantly by replacing Indian manufactures which Britain had hitherto imported. (Habib, Irfan, 1975). The industrial revolution allowed incomes to rise on a sustained basis and by 1815 British agriculture required the Corn Laws (protective measures against imports of cheap foods from not as yet industrial Europe and the Americas). The Corn Laws resulted in the terms of trade shitting in favour of agriculture to result in higher British wages not only in agriculture but in manufacturing as well. British industrial transformation which could have slowed down considerably had the Corn Laws continued was put back on the rails with the abolition of the Corn Laws c. 1848. The abolition, in reducing the costs of labour through the decline in food prices ensured the predominance of British manufacturing through rising competitiveness that allowed it to penetrate the vast Indian market on its own steam rather than on the basis of restrictions and use of force against Indian manufacturing as was the case earlier c. 1830s. That allowed Britain to complete its industrial transformation and for the logic of laissez faire to be enshrined as a doctrine of state policy.

Emigration Mitigated the Employment Effects of Abolition of Corn Laws

British agriculture "lost out", and considerable numbers of unemployed would have arisen had not out-migration to the New World not taken place on a large scale.[6] As much as 35% of the population even then would have been occupied in the agricultural sector since about 20% of the national output by c. 1848 arose from it. The emigration from the UK which up to the 1840s had been under 100, 000 annually, zoomed with the abolition of the "Corn Laws". The abolition of the

[5] This presumes that the income of only the country in question is rising, and all others' incomes are nearly stagnant. As countries follow each other in industrialization, catching up by others can symmetrically improve the costs in the country in question.

[6] Classical political economy came into its own with the pamphleteers arguing for and against the "Corn Laws". David Ricardo was the more famous of them who argued for the abolition of the "Corn Laws", whose analysis and arguments developed classical political economy.

Corn Laws cemented capitalist development since the modern bourgeoisie which had gathered strength through the late eighteenth century now became the true ruling class in the first industrial nation. The abolition of the "Corn Laws" must also be seen as the first industrial nation (which also created the world trading system) overcoming its land constraint through the transference of a part of its agriculture to land endowed areas of the new world. It was emigration from the UK and industrialising Europe that created settlement agriculture in the New World. Germany too through its industrialisation showed much the same phenomenon with the difference being that the migrations were not only to the new world since 1870s, but to Russia and the Austro Hungarian Empire as well. Matching this out migration its sources of food and agricultural imports included the still agrarian countries of central and eastern Europe. Therefore the spread of agriculture for export in the New World could be considered as the extension of European agriculture since much of the factors labour (other than the slave and indentured labour), entrepreneurship and capital were often European in origin.

The process of declining agricultural competitiveness witnessed by the land poor early industrialisers, had therefore to be managed in a way that did not disturb the industrialisation process that was on. Germany managed the same through its dependence on central and Eastern Europe. France some what better endowed with agricultural land to start with[7], but with slower industrialisation, saw its competitiveness declining only slowly, and agriculture was supported much longer and more steadily. That itself may have slowed down the transformation process. In recent times France has been the centre of protectionism of agriculture in Europe.

Land Rich Middle Income Countries

Land rich middle industrialisers – Argentina, Brazil, US - witnessed the problem in reverse. Therein the early industrial interests had to fight against an entrenched and highly competitive agriculture based on land abundance and slavery- as in Brazil and southern US, and on migrant labour alone as in Argentina and Brazil in the very large farms – Latifundia.[8] The Latifundia system of large "capitalist" farms based on artificially low cost of labour due to the "monopoly" of the landed elite over land considerably lowered the cost of non-slave labour. The principal issue here from the point of view of the industrial bourgeoisie was the protection of industry against cheap imports from the already industrial countries (UK and later Germany), a need that all industrial countries had to make for.[9] In land rich countries like the US, Argentina and Brazil, which were in intense commercial links with the already industrial countries of Europe, based on food and raw materials exports and import of manufactures and luxuries, industrial interests would necessarily have had to confront the modern landed interests and force them to accept high tariffs on imported manufactures and luxuries. In the US the victory of the Yankees in the Civil War is inter alia to be seen as the resolution of the same in favour of the industrial interests. In Brazil and Argentina, the Latifundia were too strongly entrenched and politically powerful to be overcome, and industrial growth was slowed down considerably and even arrested due to the continuing power of the landed interests. (Frank, A.G., 1975).

In Russia and Eastern Europe, also land abundant, the landed interests were the feudal lords who were able to gain out of the vast exports of food, timber and agricultural raw materials to industrialising western Europe. This arrested the decline (which had been on since the Napoleonic wars) of feudalism and may even have allowed a "second serfdom" in Eastern Europe to emerge. After the formal abolition of serfdom in Russia in 1860, functional serf-landlord relations declined only slowly to be finally overcome only with the Stolypin reforms and the Revolution of

[7] It may well be that the slowness of France in its industrialization, reduced its potential to absorb labour in the manufacturing sector, and the loss of its colonies in America may have further put pressure to convert forest and other lands into arable land.
[8] Also called the "hacienda" in Mexico and Central America.
[9] Even England the first industrial nation had to protect its rising manufactures from cheap imports from India.

1905. Grain exports and vast uncultivated lands which could easily be put to the plough in Ukraine and the steppes allowed Russia in the pre-Soviet period to emerge as a raw material supplier to modern Europe.

Land-Poor 'Late'-Industrialisers

Japan which began its industrialisation with the Meji Restoration similarly had to face the problem of surplus labour in agriculture and of the agricultural constraint simultaneously. The extreme scarcity of land meant that there was little export of agricultural products to prime the industrial revolution that was going through hot house development since the Meji restoration and especially from 1880 onwards.[10] Mountainous terrain made additions to arable land most difficult. Therefore very soon as Japan emerged as an industrial power[11] (despite low per capita incomes), it had to find colonies in Manchuria and Korea and later in China for sourcing raw materials and food as also to settle its surplus labour from agriculture. It is only with the success of these efforts that Japan became a world power just before the start of WWII. Similarly both South Korea's and Taiwan's industrialisations (both land poor) were characterised by the rising terms of trade in favour of domestic agriculture, once the industrialisation process had reached an advanced stage of being autonomous, i.e. from 1975 onwards. Before this stage agriculture had grown at rates between 4 and 5% to deliver the economy from the agricultural constraint, so that the protectionism after this period could be moderated by imports. (Lee, Eddy 1981). This rapid growth of agriculture resulted in absorption of manufactures in the agriculture sector. The rapid growth of agriculture was especially facilitated by the land reforms carried out under Syngman Rhee. In effect, 1975 is the equivalent of the abolition of the Corn Laws for South Korea. After this period agriculture could only grow slowly since it was losing competitiveness as incomes grew by leaps and bounds, and Korea was land constrained. Korea could afford quick and significant liberalisation of its agriculture owing to the high capacity of its growth process to absorb surplus labour from agriculture, since Korea systematically pursed export led growth strategy[12]. Much the same can be said about Taiwan.

The land rich countries which have also made their industrial transformation successfully are Australia, Canada, US, New Zealand.[13] Agriculture in these countries continues to be competitive, and they hold the mirror for countries like Ukraine, Kazakhstan, Mongolia, Uruguay, Zimbabwe and others if these were to grow to become rich countries. Thailand and Malaysia which are moderately land endowed, but being only middle income are nevertheless currently nearly as competitive as the land rich, rich set.

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[10] Rice was the initial export, but was soon replaced by silk which was a product that embodied more labour than land. As Japan succeeded industrially manufactures especially textiles based on imported cotton, and light engineering items became important export items.

[11] In terms of the employment structure, Japan may be said to have reached midway into its industrial transformation by 1905 itself, when the proportion employed in agriculture had declined to less than 40% and that in industry had risen to above 30%. But incomes remained low due inter-alia to the agricultural constraint and the dependence upon the state and armaments industry for investment.

[12] Export led growth in certainly not the laissez faire that the World Bank (1994) believes it to be. It is the systematic promotion of both exports and import substitution. Such simultaneous promotion of exports and importables goods production is `ruled out' by the overly stylised two factors, two country two commodity standard model of trade, that informs the WB/IMF. A more correct 3-factor model of trade makes this not only possible but also explains the finding that P_x/P_m was close to the international price ratio, not as evidence of laissez-faire (as the WB and laissez faire economists would claim) but as arising out P_x/P_{mt}, P_m/P_{mt} being far from the international ratio, due inter alia to the undervaluation of the currency. Such policy in reasonably diversified economy like South Korea did not result in inflation because of the use of `idle' (surplus) labour in exports. See Morris, S. (1997)). The structural economists while being right to point to the massive state intervention in the East Asian economic transformations, could not explain the `puzzle' of P_x/P_{mt} being nevertheless close to the international ratio.

[13] Russia too should belong this category once it is able get back on its feet as a market economy with the appropriate institutional superstructure.

SECTION II
THE STRUCTURAL BASIS FOR THE COMPETITIVENESS OF AGRICULTURE.

The discussion in the previous section, on conceptual grounds suggested two key basis for the competitiveness of agricultural products –the per capita income and the land man ratio (more correctly the potential arable land man ratio). In this section we establish the empirical underpinnings for the same.

Defining RCA

Potential agricultural competitiveness for a large number of countries being brought out through detailed case by case analysis is difficult and would not lead anyway to usable cross-country measures, so we work entirely with revealed agricultural competitiveness. Word Development Indicators 2005 have been used for the analysis. Our index of revealed competitiveness of agriculture (RCA) is :

RCA(Agriculture) ={ (Agriculture products, raw materials and food exports in exports of a country)/(Imports of the same in total imports of the country)}/{Ratio of all countries Agriculture exports share of all countries Agriculture imports share}

$$Ln(RCA) = Ln[\{\frac{E_{Agri}}{M_{Agri}} \cdot \frac{M}{E}\} / \{\frac{\sum E_{Agri}}{\sum M_{Agri}}) \cdot \frac{\sum E}{\sum M}\}]$$

Where $E_{Agri}; M_{Agri}$ are exports and imports of agricultural products and $E; M$ are exports and imports (including of non-factor services) of the country in question; and the summation is over the set of countries as a whole. This measure adjusts for other influences on the country's balance of payments such as the role of direct non-factor services on which a country can build its comparative and competitive advantages. It also adjusts for the deviation between exports and imports (of goods and services) that is possible if the country in a significant way is an importer or exporter of capital in a sustained way. These exports and imports are not expected to be balanced, and this is a measure that is widely used.[14]

We expect RCA to be affected be a function of the agricultural land abundance, and the wage rate in agriculture. The latter is most easily proxied by the per capita income of a country in purchasing power parity terms. But since countries are more currency areas then tariff areas in a functional sense[15] current accounts tend to balance and capital flows on a net basis can only be limited.[16] Therefore mismatch between exports and imports have over the longer run to be

[14] This is a development on the original Balassa measure (Balassa, B. 1965), correcting for asymmetry that is there in the original measure. A simpler measure would be the first factor alone since the second factor is not expected to change for any particular year. For panel data though it is better to use the more correct measures. On a global scale exports are bound to be equal to imports barring for the fob/cif factor, there is only a constant that separates the simpler measure from the more correct measure. Of course for a more limited set of countries the original measure would be appropriate. See for instance Morris, S. (1986) and Vollrath, T.L. (1991)

[15] This is brought out in Aliber, Z.A. (2001) for instance. Thus even if all tariff and non-tariff barriers were to collapse, the essence of countries is their particular currency which would impose currency risks and premiums to define the boundaries of countries. Countries are essentially currency areas rather than tariff areas.

[16] The US whose currency is accepted as global currency is an exception and so are countries following export led growth which today earn the global dollar stocks to keep the world economy rolling. The Feldstein-Horioka "puzzle" is another way of saying that countries are essentially currency areas. See later footnote.

matched by other items on the current account. The volume of trade is very much influenced by currency values,[17] as also is the trade gap. Therefore in order to eliminate these effects RCA measure adjusts for the ratio of exports and imports. But this is not sufficient since there are other non-factor services on the current account and our measure only adjusts for the exports and imports of goods hence we would need to adjust for some of these other factors.

In the first instance in a world of no policy variations and distortions we would expect the RCA to be primarily dependent upon arable land abundance, and other investments that enhance effectively the land productivity. Arable rather than total land is expected to be the determinant, since the cost of converting non arable land into arable land is considerable now that much of the land easily converted has already been, except in the poor land abundant countries of the subtropical grass lands and temperate grasslands. Therefore in our model the agricultural potential – the fitted RCA underestimates the potential of the poor land abundant countries. Nevertheless since there is no other way we could have worked out the amount of convertible land only the arable land figures were used. Since the purpose is to argue that the poor land-abundant countries are the worst victims of the distortion by the rich countries of the global trade in agriculture, our estimate may be seen as being most cautious in this regard. Similarly, we could consider this measure of arable land as being useful to understand the current and immediately foreseeable future to map out the agricultural competitive potential. The per capita income in dollar (exchange rate terms) is the other determinant of cost. The wage rate of agriculture which is expected to be proportional to the average income. We break this up into two factors the per capita income on constant international dollars (PPP) and the PPP factor, which is the ratio of PPP GDP to exchange rate GDP. The latter (increase in the ratio) measures the policy induced affect (undervaluation) of the currency. The average percapita income is also a "weak" influencer of the demand for agricultural products. Since the bulk of the demand of agriculture is inferior to the demand for manufacturing only a weak dependence on per capita income is normally expected. But since there are many countries that are poor enough the demand side effect of per capita income cannot be ignored. And that would work the same way as labour cost so that we would not be able to separate the demand and supply side influences on the RCA.

Therefore

$$Ln(RCA) = Const. + \alpha(i, f, m)In(L/Pop) + \beta \cdot \ln(y) + \delta \cdot factor(idiosyncratic) + \bar{\lambda} PolicyCumStrategy(trade, services)$$

Where $\alpha(i, f, m)$ are aspects of the production function influencing use of irrigation, fertilisers and machinery. i is percentage of crop land that is irrigated, f is the fertiliser consumption in 100 grams per hectare of arable land, m is the number of tractors per hectare of arable land, L/Pop is the amount of arable land per person, and y is the per capita income in constant 2000 dollars, at purchasing power parity (PPP). The idiosyncratic factors are factors like large natural resources extraction whose exports have no systematic basis – a good example of which would be oil[18]. Hence the only adjustment here is for the trade in fuel, and in our model

$$factor(idiosycratic) = \ln\{\frac{E_{fuel}/E}{M_{fuel}/M}\}$$

[17] This is the macroeconomic monetary theory of international trade. While theories of comparative advantage and its variants can explain in a little way the pattern of international trade, the volume of international trade is "explained" by the simple gravity model and relative exchange rate suitably defined. The value of the currency is the key short term variable in explaining (besides aggregate world demand) the trade over time and especially the trade gap for any particular country.

[18] If all natural resources are put together and there are many tradable minerals and materials, then a rough dependence of the same on land area is expected. And their exploitation is roughly expected to be dependent upon the level of development itself. While this is no doubt true the idiosyncratic aspect which

which is the log of the ratio of the share of fuel exports by the share of fuel imports i.e., the approximate RCA in fuels.

Estimating the Model

The first regression is to estimate RCA in agriculture with only these factors which we may call the structural part of the model.

The residues from this model are then regressed on the $PolicyCumStrategy$ variables. In our model these variables are proxied by the approximate RCA in commercial services which is $Ln\{\frac{ES_{comm.serv}/ES}{MS_{comm.serv}/MS}\}$ i.e., the log of the ratio of the export of commercial services in exports of services to the import of commercial services in import of services. Other proxies are $Ln(\frac{E}{M})$ which captures the role of the goods sectors. The two together proxy the role of the current a/c since there is always some scope to have an imbalance in the current account financed by capital imports or of financing capital exports. This is to incorporate the notion that countries' current accounts have to balanced in the long run. Another variable reflective of macroeconomic policy influence on trade especially manufactured goods exports from the transforming economies, is the PPP ratio which is the ratio of the PPP Income to Exchange Rate Income at current dollars. This ratio when adjusted for structural factors is the best explanatory variable for whether or not a country is following export led growth policies. When so adjusted it measures the degree of undervaluation of the currency which is the most important macroeconomic determinant of the emphasis on trade in goods and services, and especially so of produced goods (manufactures). We also incorporate a measure of openness of economies since this when adjusted for structural factors is reflective of the trade strategy being pursued. For justifications and the role of these variables in understanding trade and development see Morris, S. (1997).

The second regression helps us to understand the compositional aspects of the RCA in agriculture. Many countries have low RCA in agriculture despite favourable structural factors (land man ratio) because they have followed strongly export led growth policies for instance, or because their advantages in services are even greater. So the second stage regression, further confirms the first stage structural model.

Both stages of the regression are carried out on panel data from 1962 to 2003 encompassing all the countries for which the relevant data was available. There were about 124 countries (for the year 2003) and 2322 observations in all. The data was taken from the World Development Indicators of the World Bank, 2005; a standard data base available in CD form.

The Results

From table 1 it is obvious that all factors are significant and as expected. Fertiliser use has a negative coefficient i.e. reduces the exponent of the production function for land and increases the same for labour since the regression variable in this case is the land per unit of population. In other words as is to be expected from the literature, while irrigation and machinery enhance more the efficacy of land than of labour, fertilisers enhance more the efficacy of labour, and hence its use is well known to be large in the high labour cost economies. We have not used capital in agriculture as a variable since no relevant data on the same is available and in our model, and the

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is amplified by the fact that some of the resources principally oils and fuels are highly tradable and demanded in large quantities, and the existence of many countries of very small areas and a few of very large areas, overrides the systematic aspect. Since in any case our task is not the understanding of the patterns of trade in natural resources, we take this as given.

effect of machinery partly captures this aspect. The structural model therefore explains over 40% of the variation in the revealed comparative advantage, and is therefore usable. As expected the arable land is an important determinant of the revealed competitiveness in agriculture with an elasticity of nearly 60%. The average arable land per person among the set of countries and over the period from 1962 to 2003 is approx. 0.32 hectares. So a 100% increase in the land 'endowment' for any one country ceterius paribus has a 60% increase in the RCA. Similarly an increase in the percapita income by 100% reduces the RCA by almost 22%! If the arable land remains nearly constant then the impact of growth and development on the reduction in RCA ceterius paribus is high and in one direction. Consider the percapita income to double, and the population to increase by 30%. This would reduce the RCA by (22+0.3*60) i.e. approximately 42% which is what a decadal growth at high growth rates would imply. Thus for countries that start off with low land endowment per person, such as the East Asian or even India, growth would necessarily reduce the RCA. Significant declines in the RCA can be expected for the fast growing high population density countries. On the other hand slower growing countries could expect to see their RCA rising, as other countries income rise relatively faster. Arresting declines in RCA up to a point is possible especially with machinery and irrigation use. The coefficients here are small so with the arable land remaining the same the scope is limited, especially of irrigation, but since capital use in the form of machinery can be increased significantly the retention of RCA by rich countries such as the US is based on the use of machinery that is labour replacing as is substantiated in this model.

In this model natural resource endowments that are exploited viz fuels have a significant impact on the revealed comparative advantage of agriculture. Acting through the balance of payment account (more correctly through the current a/c as mentioned before) export of fuels given a country's fuel resources makes possible less exports of other products including agriculture and hence the decline in the RCA. The elasticity here is large 15%. Thus a sudden finding of oil in an LDC with an RCA of 1.0 in agriculture, that brings about an increase in the oil export/import ratio by say 5 could reduce the RCA by 45% to 0.65, unless of course the country adopts counteracting policies[19] that push exports of agriculture.

"Policy" Sub-Model

In the second stage we regress the residuals from the first structural regression on the macroeconomic policy and strategy proxies $\bar{\lambda} PolicyCumStrategy(trade, services)$ which we have already identified.

$$\bar{\lambda} PolicyCumStrategy(trade, services) = \lambda_0 + \lambda_1 \cdot Ln\{\frac{ES_{comm.serv} / ES}{MS_{comm.serv} / MS}\}$$

$$+ \lambda_2 \cdot Ln(\frac{E}{M}) + \lambda_3 \cdot (\frac{E+M}{Y_{Atlas}}) + \lambda_4 \cdot (\frac{Y_{PPP}}{Y_{Atlas}})$$

For the third factor viz the openness ratio, we have used the exports and imports at current dollars and the income as the gross national income at current dollars (Atlas Method). Y_{ppp} is the gross national income (GNI) in international dollars.

Table 2 reports the results. Observe that all coefficients are significant and the influence of macroeconomic strategy is clear enough. The RCA of agriculture as of other trade items (all trade items) is positively influenced by the PPP ratio as is to be expected given the arguments in Morris, S. (1997). Therein we had argued that the non-structural part of the PPP ratio is the policy induced undervaluation (overvaluation) of the currency which almost entirely characterises the

[19] The monetary theory of international trade helps us to understand that the new found exports of raw material would put pressure on the exchange rate to appreciate ceterius paribus, which would then have to be countered to keep up the exports of the original products including agriculture, or they would fall.

macroeconomic aspect of "Export led growth" (or its antithesis i.e. bias against exports). Thus higher PPP (higher undervaluation) improves the net exports (standard macroeconomics) given than most economies have some diversity in the export basket. In transforming economies this can be sustained without inflation, since there are `idle' resources (manpower) that can be increasingly employed. Or the productivity gap between the transforming country and the developed countries can be taken advantage of by adding to the capital stock per worker. And this ratio has the maximal impact on the manufactured competitiveness (arguments and empirical support in Morris, S. (1997)). Commercial and manufactured goods exports negatively impact agricultural goods competitiveness per se but only through the income effect which we have already incorporated, and through the openness ratio. Thus countries pursuing trade strategies that actually make them more open (when they succeed their trade ratios increase) would see a decline in their agricultural competitiveness even if per se the export of agriculture is positively impacted by the undervaluation of the currency.

Now we consider the countries in the groups that we have put them, as in Table 3. [Refer to figures 2 to 18 for the discussion below covering RCA and its structural and explained component according to the model. The figures plot the Log of the RCA as revealed, the structural component which is the fit from Model 1 and the "explained" component is that due to both model 1 and the "Policy Sub-Model"].

Cairns Group and Land Abundant Countries

Consider for example Thailand a Cairns Group[20] member which unlike Korea, Taiwan or Hong Kong is relatively[21] land abundant, both because of lower population density and the development of arable land over much of the pre-war period when "swamp" forests were drained and converted to arable land to result in the export boom of rice and other food crops. (Takaya, 1987).

The system of canals laid out from Bangkok that went deep into the surrounding area allowed rice to emerge as an export crop. With sharp rise in its income since the mid-sixties there has been a decline in its agricultural competitiveness though it is still positive as revealed by the Log of the RCA. The structural component of the RCA is lower than the observed RCA and this has pulled down the RCA with a lag as expected. The per capita income growth which was particularly rapid over the eighties has pulled down the RCA. In contrast the East Asian currency crisis which rudely interrupted growth has arrested the decline in the RCA for Thailand. With relatively more land Thailand need not loose its agricultural advantage any time in the near future, though as it reaches rich country income levels its RCA would go below that of France since its land man ratio is lower than that of France. Thus while today Thailand is part of the CAIRNS group its very success as an industrialiser would continue to result in decline in its structural RCA though the gap between the RCA as observed and the structural RCA would be significant since in the region it is one of the better endowed countries in terms of land.

Now consider Australia which is land abundant and rich. Its log of RCA has been holding steady at levels close to 1.55 though the structural RCA shows a gap and a decline over the eighties though this decline is nowhere near as rapid as in the case of Thailand. In the long run Australia with an arable land endowment of 2.46 hectares of land per person and with the potential to bring more land under cultivation with little effort, would without doubt retain or even increase its

[20] The Cairns group consists of a set of countries with significant shares of their exports being in agricultural products who came together to pressure the rich protected nations of Europe and the US to reduce their barriers to imports. The agricultural debate in the WTO is led on the reform and liberalization side by the Cairns group. They are typically land rich or potentially so. The average share of agriculture in merchandise exports was nearly 20%, value added per worker ranged from US$ 564 (Indonesia) to 38500 per worker (average 7700) vis-à-vis for the world as a whole of 8.5% and US$864 per worker. (http://www.cairnsgroup.org/statistics/economi_statistics.pdf accessed on 2nd December 2006).

[21] Relative only to many other East and South Asian economies. The arable land would of course be very small relative to some of the African countries, or the new world.

RCA. It is archetypical of new world agriculture which would all become the agricultural power houses of the world, as Asian incomes catch up and Asia turns service and manufacturing oriented[22].

Land Abundant Poor Countries

Now consider the land abundant poor countries for example Togo, Paraguay or Zimbabwe. See also Table 4 which brings out the average values (over 2000-2003) of certain aspects of the economic structure and the structure of agriculture in select countries. Their current abundance of arable land at 0.54, 0.55 and 0.25 hectares per person is an underestimate of their ultimate potential since the scope to expand agriculture by adding to the arable land is large, if policies and state capacity to overcome the market distortions in agriculture and the distortions in global agriculture materialise. These are the countries most hurt by the high subsidies of the rich countries. Their revealed RCAs are high. Some of them operate at higher than the structurally determined RCA while others are at lower levels. The difference is explained by factors that are omitted from the analysis such as subsidies in the advanced countries, locational factors, the economic position of countries in their close proximity etc. More importantly a rise in the revealed as well as the structural RCA which should have been observed if these countries were successfully on their path of agricultural specialisation (and industrialisation) is not seen.

Nigeria similarly has large potential which is being occluded by its exports of oil. As can been be seen, the discovery of oil brought down the RCA while the structural RCA remained unchanged. The sharp fluctuations in the RCA of these set of countries is most remarkable and that is indicative of the high risk in agriculture for countries starting off today which in turn has kept the structural RCA from growing through investments in converting `waste' and forest land to arable land and to land enhancing investments such as irrigation. Irrigation proportion remains very low in these countries, which is an aspect of their failure in agriculture. Land rich, rich countries have enhanced their land through investments in irrigation as can be seen.

Land Poor Countries

Many of the land poor countries which have either transformed or are on their way (Sri Lanka, India, Korea, Japan, China) perforce show high levels of irrigation development that would have been initiated in their early days of their transformation by their need to make do with the available land. Despite this as some of them have completed their transformation (Japan and lately Korea), their RCAs have fallen rapidly. And others would witness the same fall in the years to come as they too successfully raise their incomes. Investments in irrigation and in machinery, besides of course public and extension related factors (not analysed) are the key determinants of their ability to moderate their decline in the RCA in agriculture. Too rapid a decline in RCA would not be functional since the labour so suddenly shed would not be able to find employment elsewhere in the economy.

India

India's initial state led investments allowed the RCA to be "high" and rising, which stabilised with the income growth in the 80s. And in the 90s when growth continued at high rates the RCA has tended to decline though not as rapidly as in the East Asian countries typified by either China or Thailand. Structural RCA had of course declined earlier as the incomes grew in the eighties. The period from the mid-sixties to the end of the seventies when Indian growth was much slower than the world average allowed both the structural RCA and the observed RCA to rise. It was also helped by the development of minor irrigation over the same period. In less than another decade

[22] Vernon, Raymond (1966), Lewis, Arthur (1978) were among the many who anticipated this "reversal" of comparative advantage.

of rapid growth much over world average growth rates, the LNRCA of India will fall below zero, which would be "Corn Law" point in India's transformation.

China

In China the "Corn Law" point would well be in the late nineties or the first decade of this century itself, although this is masked by the major changes in China's trade balance on account of fuel principally oil. Although the observed LNRCA has fallen dramatically with the rapid growth of income over the eighties and the nineties, the structural RCA has remained stable after its rise in the eighties. Clearly the pursuit of export led growth has resulted in a stupendous increase in manufactured exports enhancing China's RCA in manufactured exports allowing its RCA in agriculture to fall despite the steady aspect of its structural RCA. The structural RCA rose and kept steady due to a fall in the RCA of fuels as China's imports of fuel ballooned.

Korea

Korea's "Corn Law" point may have been reached in the mid seventies or earlier. The structural RCA in Korea, and the pursuit of export led growth has allowed Korea to have a lower LNRCA in agriculture as compared to its structural LNRCA which was kept from falling rapidly due to increase in irrigation in the earlier period up to the mid seventies and thereafter due to large increase in the machinery used until the eighties. Continuing income growth in the nineties results in fall in the structural LNRCA so that there is no doubt that Korea is well past its "Corn Law" point. The ratio of food exports to food imports was only about 0.26 in the early years of this century. For Japan at rich country income levels and East Asian land man ratios, the ratio is as low as 0.04.

The significance of the income and the arable land endowment per person we find very convincingly to be as expected. In conclusion therefore both by the good fit of the simple structural model, and the results being as expected from the conceptual discussion of the country typology we uphold the conceptual model.

Metrics of RCA

We therefore present the empirically derived model as:

$$RCA_{Agri} = e^{2.917} \cdot (L/Pop)^{0.59+0.002 \cdot i+0.02 \cdot m-0.0001 \cdot f} \cdot y^{-0.23} \cdot \left(\frac{E_{fuel}/E}{M_{fuel}/M}\right)^{-0.16}$$

In the model with purely the structural factors (not taking into account the aspect of the idiosyncratic fuel trade, and ignoring the effect of irrigation, machinery and fertiliser use) the revealed comparative advantage in agriculture changes with arable land endowment per person and the per capita income in the following manner.

$$RCA_{Agri} = 18.5 \cdot l^{0.59} \cdot y^{-0.23}$$

where $l = (L/Pop)$ is the per head endowment of arable land. This gives elasticities of 0.50 and -0.23 with respect to arable land and per capita income in the movement of RCA. The same can also be presented as

$$RCA_{Agri} = 18.5 \cdot L^{0.59} \cdot Pop^{0.26} \cdot Y^{-0.23}$$

so that with population growth ceterius paribus the RCA increases. This could be understood in terms of larger population ceterius paribus as lowering costs which improves the agricultural

competitive advantage. Clearly this holds even over the range where population is below satiation levels in food, since there is ample evidence from episodes of famines and even from regular agricultural trade that net exports can take place from poor economies which are not satiated in a biological (need) sense. India's exports not just in the British period but even today is based on many (perhaps a fifth of the population) itself going on hungry stomachs.

SECTION III
PECULIARITIES OF AGRICULTURAL PRODUCTS

Not a Produced Good

Agriculture is somewhere between being a natural resource and a produced good. It is both a resource and a produced good. [Manufacturing is usefully considered as a produced good unconstrained by land.] Agriculture is dependent upon land, but land is immobile across countries, and so is labour[23]. With only one of the factors being mobile –viz capital the trade in agricultural goods alone cannot bring about global level optimality in the use of land to produce agricultural goods[24]. On the other hand in a global sense with free trade in manufactures, manufactures would show a tendency even if weak to get located in the least cost places, if there is openness to foreign capital flows too[25]. The need to use technology though would limit the ability of poor countries[26] to house manufacturing in a continually deepening manner without strategic action to create the basis for its workers to engage with modern machinery and processes. The immobility of land can only in part be compensated by public investments that enhance land productivity –principally irrigation and land reclamation investments. Land rich countries competing with land poor countries would be able to generate rents that are not eroded if the output from the land rich countries alone is not able to serve global demand. These rents are akin to the rents in natural resource products in high demand that accrue to the endowed nation. Nations that have low cost oil wells, and in quantities far above their needs for example would generate vast rents[27]. In manufacturing though since there are no scarce inputs, rents that are not

[23] The movements of skilled labour to countries such as Canada, US and Australia from countries such as India today are very small in relation to either the emigration in the pre-war period from Europe, or what is possible if there is true liberalization to allow the movement of persons to provide services and carry out work. That even small differences in opportunities can draw much labour movement is illustrated by the vast internal labour movements in countries like India, China and also across regions (within the Indian Subcontinent or within Africa for instance).

[24] Factor price (of labour) equalization across the globe in the theoretical sense may still obtain if capital is truly mobile. Despite the large gross flows of capital especially short term largely speculative, the actual net realized capital flows are small. The so called Feldstein-Horioka puzzle is another way of saying that capital is not truly mobile.

[25] Least cost does not mean least factor cost alone. There are competitive factors which given a certain modicum of local development, would result in global entrepreneurship and capital to engage labour. Some of the east Asian economies (notably Vietnam, Malaysia, Thailand) after some diversification of the economy through import substitution were able to build their manufacturing sectors on collaborations with global firms in manufacturing and through FDI.

[26] With highly competitive FDI now, especially those from the East Asian countries well on their way to industrialisation in light manufactures and engineering the state's ability to provide a workable environment for business – infrastructure, skills and some education of the workforce, sufficient local demand (depends to a large extent on agriculture growth itself), basic legal institutions for business, and sound macroeconomic policies (above all polices that retain surpluses locally) are all that are required. Notably technology, innovation, and entrepreneurship are not really critical at least to stoke the industrialisation process. The ability to derive coordination economies while important is not critical if the path of exports to already industrialised countries is opened up through MNCs and other non-FDI channels –international subcontracting for example.

[27] These rents may have to shared with dominant MNCs from the early industrial countries if the endowed country lacks much of the technology and capability to invest and mange natural resource extraction. This

whittled away do not happen. Only the market power resulting from intellectual property and trade secrets would generate "rents" . Even these are constantly on the attack through competition. In a more dynamic sense these could (when not excessively protected) be treated as profits necessary to create the incentives for innovation.[28]

Development and Share of Agriculture

In the already fully developed countries agriculture constitutes a mere 1-3% of the GDP and 2-6% of employment. Hence without imposing too large a cost on the rest of the economy, it is possible for such countries to subsidise their agriculture if agriculture in not competitive. Since the labour productivity in agriculture is typically lower (sometimes as low as half that of the manufacturing and commercial services sectors) in agriculture relative to that in the rest of the economy, protecting agriculture also happens to be pro-labour and especially pro-poor, more so when farms are not large. The so called aggregate measure of support which in such countries could range from 30% to 80% (Japan), is a measure of the total transfers to the sector. But the deadweight losses[29] to the country are much less. This ability and the relatively low social cost is at the core of the resistance to giving up support of agriculture in the rich countries.

On the other hand in the poor countries, with industrialisation not having begun or very early on their industrialisation, agriculture could constitute as much as 50 % or more of GDP. More importantly the proportion of people employed in (more correctly dependent upon) agriculture would constitute around 2/3rds of the population. Substantial subsidisation of agriculture especially via budgetary measures would be out of question and agriculture may have to be the sector from which resources have to flow out to form the initial capital required for industrialisation.

In countries that have created a modern industrial sector but have much of the transformation ahead of them, agriculture while constituting a low 25% of the economy could be the source of livelihood for as much 50% or more of the population. Such countries typically have dense populations (are land scarce). A case in point is India. Late industrialising countries could have substantial dependence upon agriculture, because agriculture is these economies is the residual sector holding much of the disguised unemployed which await their engagement in the expanding modern sector via the onset of a Lewisian process of growth. The agriculture question in these countries is important for an additional reason that the sector should shed labour only at the rate that the modern sector can absorb the labour so shed. This may well mean that agriculture is required to be protected since being land scarce, agriculture may not be competitive enough globally as incomes rise. The continuation of poverty (slow growth) could of course keep agriculture competitive but that is a competitiveness that is built on the back of hungry peasants who have no other opportunities. Capital additions have limited scope especially if the land enhancing investments (irrigation and reclamation) have already taken place.

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is the case for instance in oil, copper, aluminium, iron ore, where the technology is protected and available with only a limited number of players.

[28] Not all returns to IPRs can be so justified. Much are merely returns to monopoly, to creation of barriers to entry, and to investments made to protect IPRs all of which are wasteful, and yet are not distinguishable from the "genuine" returns to innovation. See Magee, Stephen (1977).

[29] It is true that these deadweight losses are small only in the static sense. In a more dynamic consideration where current fallows could evolve over a period (that typically exceeds 30 years) into forests and original parkland, the environmental value of such assets, at high income levels could be very large. Therefore, the current subsidisation of agriculture, could be very costly in a dynamic sense. One could counter argue though that, such re-conversion would have as its obverse the conversion to agricultural land of ecologically and environmentally important forests (the rain forests, and savanna) elsewhere in poor countries, which would be a great loss to society as a whole. This counter argument would then necessarily lead to the need for transfers from rich countries to environmentally crucial poor countries to keep their ecological systems, which are of value to the world as a whole, intact.

State Failure in Land Rich Poor Countries

Land rich poor countries[30] ought to be very competitive in agriculture, if even a modicum of modern agricultural practices are in place. This category as such exists because war and political strife have prevented investments in agriculture and land improvements from taking place. A lot of the initial investments in agriculture to allow land endowments to be exploited have to be made by the state, being public in character[31], [32]so that the importance of the state cannot be overstated[33]. As such it is not surprising that there are many examples of land rich poor countries failing to exploit their agricultural potential. Similarly, the very fact that much of the surplus from agriculture can arise in the form of rents, the danger of income inequalities and latifundia kind of development context be ruled out. Hence of the importance of type I[34] land reforms that eliminated overlordship in land. The most important external factor compounding the problem is of course the distortion of global agricultural prices caused by the subsidization of agriculture by the rich countries, especially when the poor land endowed countries are persuaded to be open to imports, by inter alia the multilateral institutions, which often have the power to determine policy.

Land rich middle income countries would be the most important exporters of agricultural products without subsidization. Therein agriculture would be developed to exploit much of the potential of the land since the incomes are not too high to prohibit all but large firms to operate, unlike in the rich land rich economies. And unlike in the land scarce middle and low income countries too much public and private capital per unit of land is not required to expand output.

Market Distortions and Perversities

While markets in agriculture are free from fundamental market failure, there are many perversities which need recognition. And the impact of these in poor countries can be severe both on the ultimate producer of agricultural products (typically peasants and small farmers) and on consumers. Much of the perishables in trade are outputs of agriculture in the broader sense, requiring therefore processing, refrigerating and special care in transportation. This per se is not

[30] The very existence of this category ought to draw attention to the fact that the conditions for growth and the exploitation of the potential of country, go beyond the existence of markets to those aspects of governance and polity that create the conditions for economic engagement. And laissez faire alone would not work through the global economy. Countries which are problematic are Afghanistan, Sudan, much of Africa, Indonesia, Burma, to name a few. It is not the mere existence of land per se but the arable land that is important. Some countries like Indonesia can bring additional land under cultivation only with great difficulty. Others with even small investments and new (modern) processes can considerably enhance the land under cultivation. But poor capacity of the state and little awareness of the key role of the state rather than cost per se is the problem.

[31] These are typically investments in transport and communication links that allow the produce to reach lucrative markets typically outside the country. Examples would be investments in storage and processing, in supportive irrigation, pest control, extension services, and marketing arrangements.

[32] The Gerschenkron hypothesis states that the later a country industrialises, the greater is the role of the state. Agriculture too is no exception. (Gerschenkron, Alexander, 1966). The importance of the prior or simultaneous agricultural revolution to industrialization has been emphasized by Bairoch, Paul (1976), among many others.

[34] Type I category of R.P. Dore (1965). Type I is the abolition of overlordship on land. New world economies with white peasant settlers – U.S. (other than South), Australia, Canada, NZ avoided this development. Japan carried out such reforms with the Meiji restoration, India on independence and Russia with the Stolypin reforms. The victory of the Yankees in the civil war decimated the Southern slavery based landed interests. Type II land reforms relevant for densely populated economies is the assurance the ownership rights or security of tenure to the actual cultivator. This was carried out in Japan immediately after World War II under Mac Arthur, South Korea under Syngman Rhee, in Taiwan in the later forties and early fifties, and in India, despite much discussion could be carried out only in Kerala (late fifties) and in West Bengal (1983).

the problem since many other products could involve significant costs in transportation and storage, but for perishables from agriculture they tend to be high and interact with the long lead in production (that at the minimum could range from a season to many years- as in the case of horticulture). The high storage costs act to reduce the speculative possibilities and the length of the lead tends to enhance the same. Price elasticies could vary considerably in the perishables and those with low price elasticities would be subject to larger volatility than those with high price elasticities. But the scope for traders and speculators to extract value would be limited since speculative storage is expensive. The advantage in these products therefore goes over to the processing, aggregation or retailing segments of the business. Producers and consumers being in very large numbers, and intermediaries being few in number (which is the case in most agricultural products) would allow the intermediary (and in this case the processor-retailer-aggregator) to extract out value above costs thus rents from dominance of the entire value chain.

Consider now non perishables whose storage costs are not too large – food grains, cotton, oilseeds, and other fibres. If the lead is also large as in the case of most grain and seed crops (unlike storable tubers, cheese), price elasticities are again low leading to high volatility which would tend to get enhanced due to the intermediary's speculative stocking behaviour. The wholesale trader rather than the other elements in the supply chain would be able to extract value above costs and hence rents from the production to distribution chain.

Now consider the income levels of the ultimate producer. If these are closer to subsistence levels then the ability of the producer to hold on to stocks is limited so that large inter-seasonal variation in farm gate prices result out of the inability to hold out against low prices post harvest vis-à-vis the buyer (aggregator or trader). This would make farmers even more vulnerable to losses when there are sudden increases in production, because that could lead to price crashes locally, with the farmer having few mitigating measures such as storing his own output. The capacity of the local farmer level grain elevators in the US and Canada while small relative to the capacities of aggregators served to moderate the inter seasonal and inter year variations in prices and hence acted as a check on the ability of intermediaries to extract out too much rent from the chain.

Consumer Side Aspects

Shifting the attention to the consumer, when the income and price elasticities are not small (flowers, non-basic fruits, cotton, processed fish, exotic grains and seeds) the perversities arising from the structure of the value chain, and long lead need not be large. But when the income elasticities are small (food grains, pulses), the perversities would be damaging at low levels of income. To illustrate the point let us consider a poor household in a poor society with about 80% share of its income being normally spent on food. Let us now imagine a 20% shortfall in food production over the usual and imagine there are limited possibilities of imports, and no public storage. Then given low income and price elasticities the adjustment would take place at price levels which would be very high over the current price even as high as say twice the current level. At this price while the well to do could still maintain their consumption of food, the poor would necessarily have to reduce their consumption of food (i.e. starve) to adjust, so that there is "market failure" since consumption of food cannot be either pre-phoned or postponed (unlike durables or luxuries for instance) and survival itself is now at stake. Of course the final solution to this problem is to ensure that all people have incomes high enough to cover such basic consumption many times over. Obviously therefore it is this failure more than the 'failure' of the trade being able to extract rent out of the chain per se that gives credence to market intervention operations (buffer stocking) as a public activity that can mitigate such risks of starvation. Similarly a rise of 20% in output suddenly could result in steep price fall to hurt the farmer, and the inter-temporal moderation aspect in the activity of the trader would come about only at much value loss to the producer and the consumer. See Fig. 1 for a schematic representation of the nature of agricultural products.

The Chain of Value Addition and Appropriability

Now consider global markets in food grains. The wholesale trade would be dominated by players from the advanced countries simply because they were the early starters and the relevant exchanges etc would be located in the early developed countries. Over a long period of evolution the players from these countries would also have consolidated themselves. Another factor is the closeness to large markets which are also willing to pay a premium (typically large and rich countries) for the products of agriculture especially food. The earliest of the agricultural surpluses resulting in significant exports arose in the UK and US, France and Germany[35] and local traders from these countries especially the latter grew to dominate the international trade and exchanges in grain. Late producers and especially those whose comparative advantage is temporary being based on low cost and subsistence labour would not have the basis (not even in the future) for challenging the dominance of global players, in the crucial segment of the value chain viz in global trade and speculation.

As a result, and as discussed the ability of the farmer to gain out of 'free-trade' per se when unsupported by measures such as public (or cooperative) buffer stocking or state (cooperative) processing and marketing, would be very limited, since the ability of global traders and processors to extract value out of poor country agricultural producers would be considerable. This leakage of value in grain trade is an added reason for state initiated buffer stocking and support of processing, and cooperatives. Hence the urgings of laissez-faire economists that countries like India should give up or greatly reduce buffer stocking and instead use imports and exports to manage inter temporal variations rings hollow. Typically a surplus for country like India would almost inevitably lead to a large price drop (sometimes even to below costs) in the global markets and similarly a significant shortfall to large rise in prices. It is only when there is significant buffer stocking in India that international trade can be taken advantage of since the stocking agency has the ability to punish private stockers when they speculatively bid up prices beyond what is considered desirable. When there is no shortage as such (averaged over time) buffer stocking would be sustainable and even profit earning[36]. It is this economy and the need to bring the collective power of producers in international trade to counter the role of established private players often acting in conjunction with the states of their own countries that has given rise to a significant role for state trading in agricultural products even in countries like Canada.

Even when perishables are involved the established processor located closer to the markets of the developed countries would be in advantageous position vis-à-vis the producer and the small scale aggregator or packer in the LDCs, particularly those whose comparative advantage in agriculture

[35] The political control over vast colonies by the European powers in the late nineteenth century when the global markets in many agricultural commodities came into their own (on the back of the steam ship and railways) allowed the European powers to establish dominance over many tropical and subtropical commodities like rubber, coffee, sugar, cotton, cocoa, vegetable oils etc. Later neo-colonial control over the weaker independent states of Latin America furthered the control over these and other commodities including bananas, tobacco and grains

[36] The functionality of well crafted buffer stocking and more generally of market intervention operations (MIO) in enhancing the value derived by both consumers and farmers, and in bringing about sustained increases in production is illustrated by the success of the National Dairy Development Board in vegetable oils. In the case of food grains, the stocking role (even though inefficiently carried out) of the Food Corporation of India (FCI) has been most crucial to the enhanced output in India, and to the success of the Green Revolution as such. The inefficiencies arising out of public distribution, or the high costs incurred in storage due to political interference in the procurement and stocking activities, and inefficient management should not deter the policmaker from the great value delivered by buffer stocking in India. In 2001-02 when there was a large fall in food output, the large stocks were drawn down by as much as 15 m. tonnes. And without a whimper in prices, the needs were met. Had India to import this large a quantity the ports would have been choked and international prices would have gone up to make the imports very expensive even if feasible .

is newly found, and is more on account of low cost of labour[37]. Amplifying this asymmetry are the phyto-sanitary conditions[38] imposed by rich importing countries, which not only have the effect of protecting domestic high cost producers but also of knocking off considerably the benefit that poor countries could have had out of their exports and indeed of being a factor in the advantage of multinationals (from the importing rich countries) vis-à-vis exporting firms from the poor countries.

SECTION IV
IMPLICATIONS FOR THE STATE'S ROLE IN AGRICULTURE

"Public" Goods

Many inputs required for agriculture suffer from excludability problems being nearly public in nature – better practices, inoculation of animals, better breeds of plants and animals for instance – so that the state's support of extension, research and development of new varieties[39] and of better practices is beyond doubt. And countries successful in agriculture have all made these efforts. Since latitude is an import determinant of the specificity of local plants and animals not all R&D can be borrowed or imported. Therefore the state's actions in directly carrying out of R&D and extension and supporting private players, in buying out technology from large MNCs for common and unrestricted use (very much like site licenses for software that educational institutions use) are very critical to the process of agricultural transformation today.

Irrigation and Water Use

Similarly other physical inputs like irrigation development[40] (especially those based on storage) can have large positive externalities, sub-additivity of costs and large scale, pushing investments in these areas to either natural monopolies or to suffer appropriability problems. These necessitate state regulation and support if nor direct intervention. Other modes of provisioning such as user participation in development and management, would also have to be coaxed out and engineered by appropriate policy and regulation. Extraction irrigation while privately feasible can lead to subtractability problems especially when the ground water resource is scarce, necessitating property rights innovations besides regulation and control. The conjunctive use of water is another factor that renders the provision of unregulated water and irrigation services problematic. Similarly investments in watershed to enhance ground water retention while socially profitable, is not privately, and so would not happen without state intervention or support. And where

[37] For land abundant middle income country, perishables and processing oriented agricultural products – meat, fruits and juices, fish are important income earners and such countries could have the countervailing power against the buyers in the advanced countries due to size and scale effects of local aggregation and processing.. An example in case of is that of meat in Argentina.

[38] Many of these could even be idiosyncratic.

[39] The fact that large MNCs operate in the development of new varieties does not erode the validity of this position. Excludability is itself a problem principally because the second generation of seeds naturally retain significant characteristics of the original seed. This reduces appropriability to the company carrying out R&D since farmers can use second generation seeds without having to pay for the same. Similarly appropriability is also affected by the fact that the core approach and technology to create new varieties especially through genetic modification are shareable across a wide variety of crops and lines, so that to improve appropriability socially wasteful investments that improve appropriability are a large part, perhaps the bigger part, of the R&D expenditure undertaken by privately owned firms. The economic rationale for the 'terminator' gene while valid for a privately owned firm is socially wasteful. Also firms doing R&D would have to be large and sufficiently global to be able to improve appropriability (by internalisation) since there are large scale and scope economies in R&D and product development. For an interesting and brilliant analyses of the nature of market failure in technology and R&D and the MNC as a response to the same see Magee, Stephen (1977).

[40] For a detailed discussion on the nature of market failure herein, and for solutions to the same that are also sensitive to the possibilities of state failure and help to create efficient markets see Morris, S. (2005).

enhancement of ground water is critical (when rainfall is bunched for a few days or months in the year) the role of the state even in appropriable extraction based irrigation cannot be overemphasized.

Small Sizes and Inputs

When farm sizes are small there are many additional operations that become problematic and need the state's attention. Thus deep ploughing when farm sizes are not large enough for a tractor to be economically employed may have to be given up (which is a social loss) till such time as markets in tractor hire services develop. Land shaping, land bunding and drainage management investments are fully appropriable only at larger farm sizes so either norms or practices that are socially accepted to maximize such benefits have to emerge or they have to be supported by the state through both rules and institutions (including common property institutions), and extension and investments.

Technology Adoption and Changes in the Practice

Small farmers could not afford the fixed cost of large or global searches for information on returns to crops, markets, inputs, practices etc. So typically learning from each other and imitative behaviour result. While learning from each other is enormously functional , it also creates the scope for "herd like" behaviour with few of the possibilities being realized when left without any external direction. Similarly, the embedding of errors in the practice can result. The scope for herd like behaviour resulting in too many farmers picking a crop to result in composition fallacies, or at any time few crops being in the radar of the farmer, are possible. To overcome these, and to prevent the errors of "Chinese whispers" creeping into the process of practice dissemination, it is important for public or publicly sponsored organizations to provide the relevant information on markets, prices, technologies, seeds, inputs, practices etc for small fees. Such kiosks and organisations do develop as farmers' income rise and throughput increases and specialization emerges, but they would be problematic in the early stages of modernization or during periods of cropping changes. Falling IT costs and the development of the world wide web can with state support and with cooperative make a quantum jump in the ability of very small farmers to access such information[41].

Information tends to be valued when credible, and new practices (and crops) carry with them risks. Thus, the mere availability of information that a particular crop, say button mushrooms would be lucrative along with detailed information on the practice alone, would not on that count make many farmers try out button mushrooms. A demonstration would be necessary in most cases and the smaller the farmer the larger is this need. Hence smaller farmers can be expected to experiment with a much a lower probability than farmers who operate at a very large scale of operations. Experimentation in practice on the basis of new information available in land rich economies is realized through a certain degree of asymmetry in farm sizes. This makes the system efficient in a dynamic sense. When even the largest farms are too small to "experiment", which is the case in much of Asia[42], the role of demonstration to allow for the unfoldment of dynamic economies and allocative efficiencies cannot be overemphasized.

[41] The e-choupal a network of information on prices and practices for farmers initiated and managed by the ITC as part of its extension services to farmers is an important development and could result in similar developments by corporates having an interest in procuring agricultural products. ITC having diversified itself from tobacco to vegetable oil and other products, has found in the e-choupal a way to improve the lot of farmers by reducing the role of middlemen.

[42] This does not mean that small firms are not functional or that there is a need for farms to merge or consolidate etc. The arguments in favour of small owner managed farms in a situation of large disguised unemployment are many. In such situation peasant farms which maximise "value added" rather than profits and, therefore, use labour maximally would result as the dominant form of production. They would also have higher yields per unit of land. And both features are socially optimal given the land scarcity and the labour surplus. Also small farms in distributing incomes more evenly improve the purchasing power of the

These above dimensions of market inadequacies necessitating state intervention in some manner are widely recognized, but the dimensions of failure arising out of the nature of agricultural commodities, price and income inelasticity in low income societies are not adequately recognized in much of the current, especially laissez-faire literature. It is to these that we now turn.

Buffer Stocking in Poor Societies

We have already established the need for buffer stocking in poor societies that are still on their agricultural transformation. Poor societies could also have a problem of poverty which would need the poor to be subsidized to access such basic services as primary health care and basic nutrition. In situations marked by food shortages the need for rationing and parallel distribution present themselves. But parallel distribution and rationing have a role only during shortages, while the role of buffer stocking is justified generally given the vast inter year variations in output and the inter-seasonal variations in price against which poor farmers have little recourse. Poverty in societies such as the Indian which has overcome its agricultural problem on the supply side can and should be addressed through transfers and such other direct measures[43]. Since the problem in India is really of insufficient demand due to poverty, the logic of parallel distribution and rationing are not justified and need to be given up forthwith. They are the dysfunctional vestige of the past. Thus buffer stocking needs to be completely unbundled from rationing and subsidization, rationing and parallel distribution abolished and subsidization put on the direct (transfer) mode. The resulting savings can be stupendous[44].

Shortages and Public Distribution

Shortages in the early stage of agricultural development when it is still an infant industry are quite likely even in land abundant countries. It is only after a certain rather longish period of production over and above subsistence that agriculture achieves a degree of stability, and is able to deliver an increasing surplus per person. If the standard practice in response to the shortage is to use imports then in most cases major damage would be done to the economy and to agricultural development. This is because in most cases agriculture is a livelihood for a large part of the population and whose incomes (already at subsistence) can never rise with such non-intervention or laissez faire. Unless manufactures-export led growth can realize vast foreign exchange to import agricultural goods from day one, the management of shortages through rationing and buffer stocking and in a

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population, limitations in which can be a major retardant to industrialisation especially in the early expansionary stage of growing out of industrial enclaves. Small firms when free of incentive incompatible systems like share cropping or insecurity of tenure, can greatly expand output even when they are "not profitable" in a capitalist calculation. These aspects of small firms are at the core of the rapid agricultural growth of Korea (1963-1974), China (since the re-peasantisation of collectives in 1979) and Taiwan (1960 to 1975) and Japan (1950-1964), and West Bengal after Operation Barga (1983). When the socially correct measure of total yield per geographical hectare is used, small firms are significantly more efficient than large farms in India. (These large farms are themselves small by any international comparison and are more like small household enterprise rather than capitalist enterprise.)

[43] First best measure would be land reform itself especially in the population dense areas, which would be a one shot way to overcome the endowment failure. Similarly, endowments enhancing measures such as free and compulsory primary education, and the pursuit of labour absorbing growth strategies have been successful in East Asia. Continuous attempts at redistribution indulged by the Indian state through "programmes" such as the Integrated Rural Development Programme (IRDP), or the Public Distribution Systems (PDS) have had the worst record.

[44] Today the state spends as much as Rs. 6.22 to deliver one rupee of subsidy via the "Public Distribution System" to the poor, when through direct transfer one rupee of spending (on food) could have been delivered at a cost lower than 10 paise. And public buffer stocking when unbundled entirely from the other objectives can be profitable besides being socially beneficial in a major way. Planning Commission (2005). On kerosene the fiscal cost alone is over Rs. 24,000 crore annually to deliver less than Rs.8000 crore of subsidy to all kerosene consuming households and probably about Rs. 3000 crore to deserving poor households. See Morris, S., Ajay Pandey and S.K. Barua (2006).

way that does not destroy the incentive to produce locally is important. This can be ensured by "market intervention operations" (MIOs) that integrates imports (and exports) into it. Such strategies are known to have paid rich dividends in India (wheat, rice, milk, and oilseeds) and China (wheat and rice), and was instrumental in these countries reaching self sufficiency with significant productivity gains.

MIO in Storables

The role of the state even in surplus countries in buffer stocking to facilitate exports from a position of strength is obvious enough given the discussions in the earlier section. Such intervention when carried out from clearly stated objectives by well managed state owned trading enterprises, and without interference in their day to day functioning, can act to effectively curb or counter the market power of global and multinational trading and aggregating firms. This is true in areas like grains, coffee beans, tobacco, etc – storables and more so those with low price elasticity

Processing and the State

For the state to effectively intervene in processing related investments is more difficult since here the technicalities, the marketing and retailing interfaces can be daunting for state enterprises. Assuming that they wanted to, would it have been easy for the Central American governments to be able to compete to reduce the monopoly power of the banana MNCs – the trio of Dole, Chiquita Brands International (earlier United Fruit) and Del Monte, all American companies? Processing support by the state to counter entrenched multinationals have relevance for poor countries with much agricultural potential in the future. But the question remains of motivation and state capacity. It is in the land poor manufacturing orientated countries where we see efficient and growth orientated states. Industrialists and importers turned manufacturers can come together to put political pressure to demand state support to industry, and the setting up of public enterprise in areas of market failure to lead developments cannot be overemphasized. In contrast, dispersed farmers would not be able to pressure governments unless they are politically mobilized as farmers. Vast numbers of small producers at low levels of incomes even in 'large' supplier countries in products like pineapples, bananas, fish, cashew, cacao continue to labour at a pittance with wages no higher than the average in the country, while the value chain from production to final sale in the supermarkets generates vast rents to the processor and dominant players in the chain.

Even a state like India which has been able to play an important role in non-perishables in their imports, in the export aspect has not been successful. And in processed agriculture parastatal role in MIO has been minimal or entirely absent. Roles in these areas have been purely promotional and regulatory as for instance in implementing standards and phyto-sanitary conditions specified by individual importing countries. Typically new producing countries have had to wait for domestic demand in perishables with the rise in their incomes before the ability of local processors and marketing firms to retain value could take place. In other words the ability of the domestic economy to retain values is higher for countries with larger domestic markets. Surprisingly there are as yet no models for either efficient state enterprise, or for public private partnerships in this area. The commodity boards of many African countries typically did not cover perishables and were not particularly successful, even in storables like coffee, sisal, timber etc. In India cooperatives have been important in a few cases as for instance in milk and sugarcane to deliver much value to the farmer. While farmers in India since the Green Revolution have much collective political power and they have been able to exercise the same in the area of storables, through instituting state procurement and support prices[45], in the area of perishables despite the

[45] Even here it was the era of shortages and rationing and actually the need to procure grain for the towns in the face of shortages (especially during 1962-1970) originally, that laid the basis for the elaborate monopoly of the state in long distance trade, storage and prime distribution. As surpluses emerged during the 70s

political pressure to do something[46], success has been elusive because the value created by investments in processing in the early days in poorly appropriable so that private capital would be shy[47]. And tasks are sufficiently complex for a parastatal working to simple rules and procedures to contribute in the area of perishables, especially when markets are non-local.

CONCLUSIONS

The comparative advantage of countries in agriculture is most usefully characterized as rising of the arable land endowments per person and declining as the per capita income rises relative to the worlds "average" per capita income. A structural model on the lines above is estimated empirically. The Model is also dynamic since the rise in per capita incomes at a faster rate in transforming countries can be used as data to predict with a high degree of reliability that they would see a decline in their competitiveness. Similarly countries with low arable land per person (most of the Asian manufacturing and service oriented economies – Taiwan, China, India, Nepal, Vietnam, Korea) would see a rapid fall in their competitiveness. Some like India are competitive today only because of their very low incomes, and the food needs of many being not satiated.

Yet land abundance in poor countries does not automatically result in high competitiveness. [The abundance of easily mined other natural resources like fuels acting through the balance of payments could lower greatly the revealed competitiveness of agriculture]. To realize the same, much land has to be brought under the plough and enhanced, a task where the role of the state is important. Irrigation development as also the use of machinery on land enhances the competitiveness of agriculture. And the former is dependent much upon the ability of the state to put together public irrigation and support private irrigation. Even more importantly the investments in storage, market support, transportation, information provision, demonstration of new technologies and extension all of which are required at the beginning of the agricultural transformation require active intervention of the state.

The problem for the poor countries with land abundance is compounded by the large distortion of international prices resulting from subsidization by rich countries as they face declining competitiveness in agriculture due to very high incomes. The coaxing of land rich poor countries in this situation to embrace laissez faire policies by the multilateral agencies is shameful and nothing short of suicide for these countries. The costs of subsidization in the rich countries are very small and the political benefits very large, so a roll back of subsidization is least likely.

Agriculture is the first industry where surpluses can arise to stoke development as such. The historical evidence that no country of substantial size has been able to industrialize without a prior or simultaneous agricultural revolution has to be noted. And the infant industry argument is valid

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organizations such as the Food Corporation of India became vehicles of state's support to agriculture especially in storables by procuring excess production, and providing price support.

[46] The incessant talk of food processing, the setting up of a Ministry in Food processing and the "concessions" given to food processing, the setting up of the Agricultural Produce Marketing Cooperatives have not really served to overcome the problem generally.

[47] When the business becomes stable and of sufficient volume, private capital would find the same attractive, but would come at the cost of value loss to the diffuse and large number of producers. If efficient state parastatals continue to function even as markets mature, then value retention by farmers even when competing private processing and marketing chains operate can be very large. This for example is the case in both milk and vegetable oil in India, because of the remarkably efficient and innovative parastatal- the National Dairy Development Board. There was a crying need for such organizations in forest produce, fish, many fruits and vegetables, but most parastatals have only been of moderate success. Today of course the marketed surpluses are large enough for a private sector to exist. As markets have grown lagre retail players in compressing the value and logistic chains have today begun to offer enhanced values to both consumers and producers.

for agriculture as much as for industry. Both these further condemn the laissez faire position. Protection of agriculture is therefore the least distortionary way for the "large" land-poor poor countries as they advance to protect their employment. Protection alone without active support of the state to overcome the significant market distortions in agriculture and its inputs may not be enough. Protection in land scarce economies ought to be scaled down only as such economies are able to absorb labour shed by an advancing agriculture in other segments of the economy[48].

Functionality also demands that the role of the state in agriculture and subsidization recognizes not only the market failures arising out of the public good nature of many inputs, but also the perversities that low price and income elasticities, when combined with the long "lead" can bring to the functioning of markets. Similarly the structure of the value chain from production to final consumption in distant lands – especially the fact that the aggregators and processors in the value chain would be able to capture rents – creates the basis for a crucial role for the state in trading, stocking and processing. Shortages and variations in output again create the need for buffer stocking. Successful late agricultural transformations have been built upon the state playing these roles. The state's role in processing while crucial has not generally been successfully realised, the complexity of the tasks being a basic bottleneck. Laissez faire policies in agriculture when without reference to the stage of development, and state failure to compensate for the market perversities underlie the disaster that agriculture has been for poor countries with much agricultural potential.

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[48] Subsidies to agriculture in the form of lower prices on inputs, and input subsidies in general are highly distortionary, and unless they are reduced to tradable endowments would even hurt the provisioning organizations. (Morris, S. 2005; Morris, S., 2006). Therefore the position that India can and should liberalise the trade in agriculture without worrying about buffer stocking or market failure (Landes, 2004) would be dangerous as they are already proving to be. A more cautious position that rejects laissez-faire as the key to further development of agriculture and instead worries about correcting the market side distortions (Vaidyanathan, A., 2000) is therefore substantiated . Similarly the need to enhance key resources that agriculture uses –especially water through both expansion and efficient technologies – which are all characterized by market failure has been emphasized by many. Cf. Alagh, Y,K (2001).

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Table 1: Results of Regression of $Ln(RCA)$ in Agriculture

Variable		Coefficient	t-value	Signi.
$Const.$		2.9170	13.1350	0.0000
$\ln(L/Pop)$	α_0	0.5900	17.8370	0.0000
$i \cdot \ln(L/Pop)$	α_i	0.0020	4.5191	0.0000
$m \cdot \ln(L/Pop)$	α_m	0.0202	13.4894	0.0000
$f \cdot \ln(L/Pop)$	α_f	-0.0001	-12.1745	0.0000
$\ln(y)$	β	-0.2293	-9.2598	0.0000
$\ln\{\frac{E_{fuel}/E}{M_{fuel}/M}\}$	δ	-0.1566	-22.4643	0.0000
No of observations				2322
Adjusted R-sq				0.409
F-ratio				268.865

Table 2: Results of Regression of Residuals (of $Ln(RCA)$ of the Structural Model) on Policy and Strategy Proxies [Stage 2]				
Variable		Coefficient	t-value	Signi.
Constant	λ_0	-0.2563	-5.7909	0.0000
$Ln\{\frac{ES_{comm.serv}/ES}{MS_{comm.serv}/MS}\}$	λ_1	0.1789	6.1092	0.0000
$Ln(\frac{E}{M})$	λ_2	-0.2138	-4.5960	0.0000
$(\frac{E+M}{Y_{Atlas}})$	λ_3	-0.2810	-7.2232	0.0000
$(\frac{Y_{PPP}}{Y_{Atlas}})$	λ_4	0.1288	3.1122	0.0019
No of observations				2154
Adjusted R-sq				0.0690
F-ratio				40.8786

Table 3: An Obvious Classification of Countries For Understanding Competitiveness in Agriculture			
	INCOME		
	RICH	MIDDLE INCOME	POOR
LAND POOR	[Japan, Germany, UK, France] Agriculture most subsidised. The subsidies of these countries the cause of much of the distortion which hurt the LAND RICH and the POOR-LAND RICH countries in the long run. Support to agriculture is "not expensive" "Over exploitation of land is possible which is sub-optimal from the perspective of the world as a whole.	[South Korea, Taiwan, China] At a stage where they have to decide the pace of their liberalisation of agriculture. Those with rapid economic growth have been able to carry out much liberalisation to increase their import dependence. Others with less rapid growth, end up protecting their agriculture since labours dependence on agriculture is considerable. Such economies while not having competitiveness in the sector as a whole could nevertheless be competitive in a wide variety of subsectors that idiosyncratic to their geography or which command a premium in the world market.	[Bangladesh, India, Nepal, Vietnam]. The countries that originally drew much of the food aid. Those that are on their industrialisation would lose competitiveness as wage incomes rise after the disguised unemployment is over in these economies. But that is still a while off. They would have to moderate their openness to agricultural imports on account of the need to protect the large employment in agriculture. Competitiveness in a wide variety of agricultural products especially those labour intensive. But competitiveness does not result in substantial net exports since phyto-sanitary conditions of production and processing are poor. Agricultural competitiveness only a temporary phenomenon on the run up to the unfoldment of their manufacturing/ tradable service competitiveness in labour intensive manufacturing. South Korea, Taiwan and China started here.

Table 3: An Obvious Classification of Countries For Understanding Competitiveness in Agriculture

	INCOME		
	RICH	MIDDLE INCOME	POOR
LAND RICH	[Australia, Canada, New Zealand, USA] Much of the worlds surplus food and agricultural products arise in these economies. The competitive potential is large, but full potential of the land may not be exploited since it may not be economical to do so given high labour costs. Thus crops and activities that demand close attention of labour may not be competitive – dairying, vegetable crops, flowers etc. Similarly very high incomes and competitiveness in other activities – services as in the case of USA adversely affects the competitiveness of agriculture. Typically part of the CAIRNS Group in WTO negotiations. High labour costs make agriculture a very capital and land intensive business. Even then the labour earnings out of agriculture may only just match the high labour incomes in non-agriculture. Extreme land abundance is required to make this group competitive and can even make the agricultural income higher than average income in other sectors of the economy.	[Brazil, Argentina, Uruguay, Thailand, Malaysia] The cash cows of world agriculture. Many of these countries constitute the part of the CAIRNS Group. Labour incomes in agriculture could match and sometimes even exceed those in non-agriculture. As these become richer they would need to be extremely land abundant to be able to hold on to agricultural competitiveness. But the rapid growth of China and India (countries that would ultimately have to import agricultural products) which are relatively poor in land could ensure their competitiveness even with high incomes.	[Paraguay, Malawi, Zimbabwe, Sudan, Myanmar, much of sub-Saharan Africa] The potential stars of world agriculture. Generally unable to exploit their long term potential because of wrong policy, state incapacity to provide the complimentary factors, poor communication links, and global "market failure" in agricultural products. (Arising out of dominance of trading and processing MNCs of other countries, high volatility which can be exploited by global traders, asymmetrical market structure in value added chain, distortionary support of agriculture by the rich countries, and some protection by land poor countries). The public aspect of the supply side factors, and the sunk cost aspect of those suffering decline in agricultural competitiveness are the major limitations. The protection of agriculture by rich countries hurts them most.

Table 4: Some Aspects of the Structure and Performance of Agriculture in Select Countries

	United States	Thailand	Australia	Japan	Argentina	France	New Zealand	Togo
	2000-2003	2000-2003	2000-2003	2000-2003	2000-2002	2000-2003	2000-2003	2000-2003
Population (million)	287	61	20	127	36	59	4	5
Agriculture value added per worker (constant 2000 US$)	48006	573	27864	24832	9091	38089	28364	402
Agriculture, value added (% of GDP)	1.606	9.300	3.633	1.352	6.923	2.731	8.960	37.724
Agricultural value added (current US$ billion)	149	12	13	58	12	36	4	1
Land area hectares (million)	916	51	768	36	274	55	27	5
Land use, arable land (% of land area)	19.218	31.059	6.483	12.197	12.290	33.531	5.597	46.148
Land use, arable land (hectares per person)	0.617	0.260	2.565	0.035	0.930	0.312	0.385	0.539
Land use, irrigated land (% of cropland)	12.617	25.728	4.925	54.720	4.469	13.334	8.478	0.684
Agricultural machinery, tractors per hectare of arable land	2.727	1.386	0.633	45.619	0.890	6.853	5.067	0.003
Cereal production (million metric tonnes)	329	31	33	12	36	63	1	1
Cereal yield (kg per hectare)	5835	2729	1844	5975	3331	6896	6416	1019
Fertilizer consumption (100 grams per hectare of arable land)	1093	1023	464	3066	244	2221	5704	74
GDP per capita, PPP (constant 2000 international $)	34538	6657	27073	26028	11519	25821	20663	1584
GDP growth (annual %)	2.379	4.596	3.124	1.396	-5.364	1.885	3.486	1.468
Agricultural raw materials exports (% of merchandise exports)	2.406	3.675	5.363	0.512	1.635	1.030	13.081	16.948
Agricultural raw materials imports (% of merchandise imports)	1.362	2.828	1.172	2.731	1.789	1.733	0.949	1.216
Food exports (% of merchandise exports)	8.079	14.651	20.677	0.562	44.673	11.104	48.400	19.134
Food imports (% of merchandise imports)	4.432	4.779	4.905	12.850	5.071	8.395	8.169	20.099
Fuel export share /fuel import share	0.172	0.220	2.641	0.019	4.139	0.274	0.194	0.028
Commercial service exports/ commercial service imports	1.298	0.887	0.989	0.621	0.552	1.293	1.063	0.436
Merchandise exports /merchandise imports	0.593	1.075	0.888	1.223	1.443	0.987	0.952	0.698
Openness ratio	0.193	1.094	0.352	0.182	0.193	0.481	0.539	0.680
PPP ratio (#World Bank)	1.011	3.269	1.331	0.785	1.774	1.107	1.433	5.257
"Agriculture market influence factor" in exports	12.097	2.878	2.546	0.709	0.580	6.966	1.448	0.022
"Agriculture Market influence factor" in imports	82.063	7.908	5.714	63.133	0.657	42.316	1.681	0.114
RCE	1.128	1.989	2.805	0.115	4.999	1.307	6.621	3.895
RCM	0.627	0.829	0.658	1.686	0.742	1.096	0.986	2.304
RCA	1.800	2.400	4.271	0.069	6.751	1.193	6.717	1.713
Log of RCA	0.587	0.875	1.449	-2.687	1.908	0.176	1.904	0.517

Table 4: Some Aspects of the Structure and Performance of Agriculture in Select Countries –(cont.)								
Country Name	Nigeria	Malawi	Paraguay	Zimbabwe	India	Korea, Rep.	Sri Lanka	China
Period	2000	2000-2003	2000-2002	2001-2002	2000-2003	2000-2003	2001-2002	2000-2003
Population (million)	127	11	5	13	1040	47	19	1276
Agriculture value added per worker (constant 2000 US$)	774	122	2275	277	397	9735	733	354
Agriculture, value added (% of GDP)	28.811	37.081	21.779	17.521	23.613	3.770	20.282	15.547
Agricultural value added (current US$ billion)	12	1	1	2	111	20	3	191
Land area hectares (million)	91	9	40	39	297	10	6	933
Land use, arable land (% of land area)	30.963	23.384	7.459	8.324	54.403	17.212	14.018	15.130
Land use, arable land (hectares per person)	0.222	0.209	0.550	0.249	0.157	0.036	0.048	0.111
Land use, irrigated land (% of cropland)	0.755	1.284	2.195	3.493	33.651	60.401	32.269	35.888
Agricultural machinery, tractors per hectare of arable land	0.106	0.065	0.557	0.745	0.943	11.755	1.114	0.653
Cereal production (million metric tonnes)	21	2	1	1	229	7	3	395
Cereal yield (kg per hectare)	1120	1269	1976	824	2326	6206	3415	4831
Fertilizer consumption (100 grams per hectare of arable land)	66	400	319	407	1032	4294	2913	2576
GDP per capita, PPP (constant 2000 international $)	878	571	4555	2307	2553	16095	3388	4254
GDP growth (annual %)	4.200	0.594	0.015	-7.000	5.448	5.591	1.210	8.274
Agricultural raw materials exports (% of merchandise exports)--	0.006	2.563	12.973	11.148	1.170	0.909	1.643	0.843
Agricultural raw materials imports (% of merchandise imports)	0.936	1.429	0.815	1.689	3.499	2.962	1.255	4.220
Food exports (% of merchandise exports)	0.139	86.885	69.607	41.217	12.395	1.540	21.205	5.031
Food imports (% of merchandise imports)	20.157	15.610	14.628	7.496	5.579	5.551	14.317	3.703
Fuel export share /fuel import share	184.815	0.007	0.010	0.037	0.150	0.201	0.001	0.382
Commercial service exports/ commercial service imports		0.227	1.525		1.004	0.825	0.785	0.846
Merchandise exports /merchandise imports	2.405	0.689	0.465	0.553	0.834	1.073	0.788	1.087
Openness ratio	0.897	0.604	0.404	0.527	0.210	0.632	0.679	0.506
PPP ratio (#World Bank)	3.016	3.549	3.427	4.691	5.452	1.519	4.081	4.564
"Agriculture market influence factor" in exports	0.004	0.059	0.034	0.003	1.018	0.648	0.005	3.093

Table 4: Some Aspects of the Structure and Performance of Agriculture in Select Countries –(cont.)								
Country Name	Nigeria	Malawi	Paraguay	Zimbabwe	India	Korea, Rep.	Sri Lanka	China
"Agriculture Market influence factor" in imports	2.267	0.121	0.161	0.001	6.361	15.441	0.005	29.945
RCE	0.016	9.641	8.914	5.558	1.462	0.264	2.421	0.634
RCM	2.353	1.836	1.677	0.976	0.982	0.921	1.661	0.858
RCA	0.007	5.687	5.416	7.608	1.495	0.287	1.457	0.737
Log of RCA	-4.976	1.694	1.681	1.790	0.398	-1.251	0.377	-0.306

Figure 1: A Schematic Representation of Market Efficacy in Agricultural Products

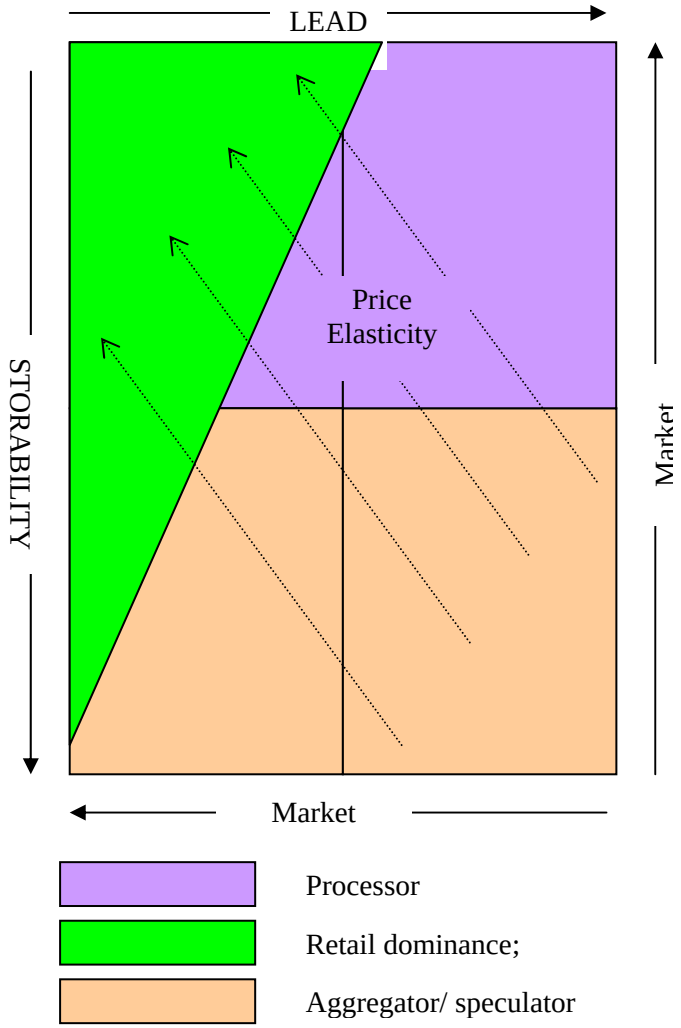
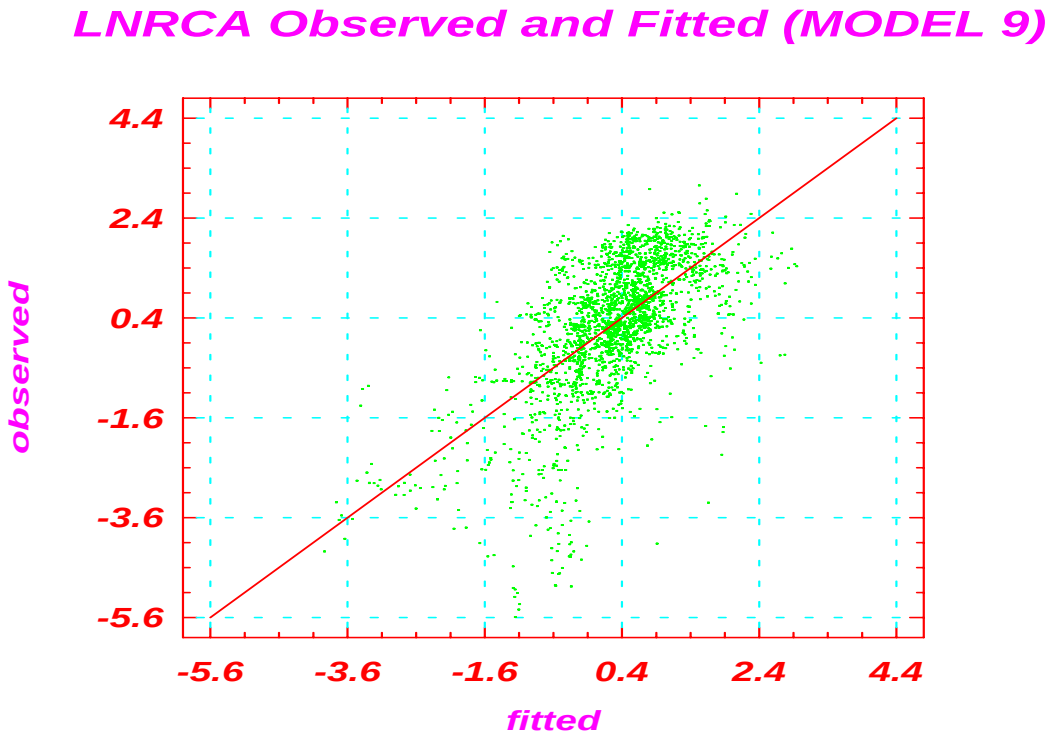


Figure 2



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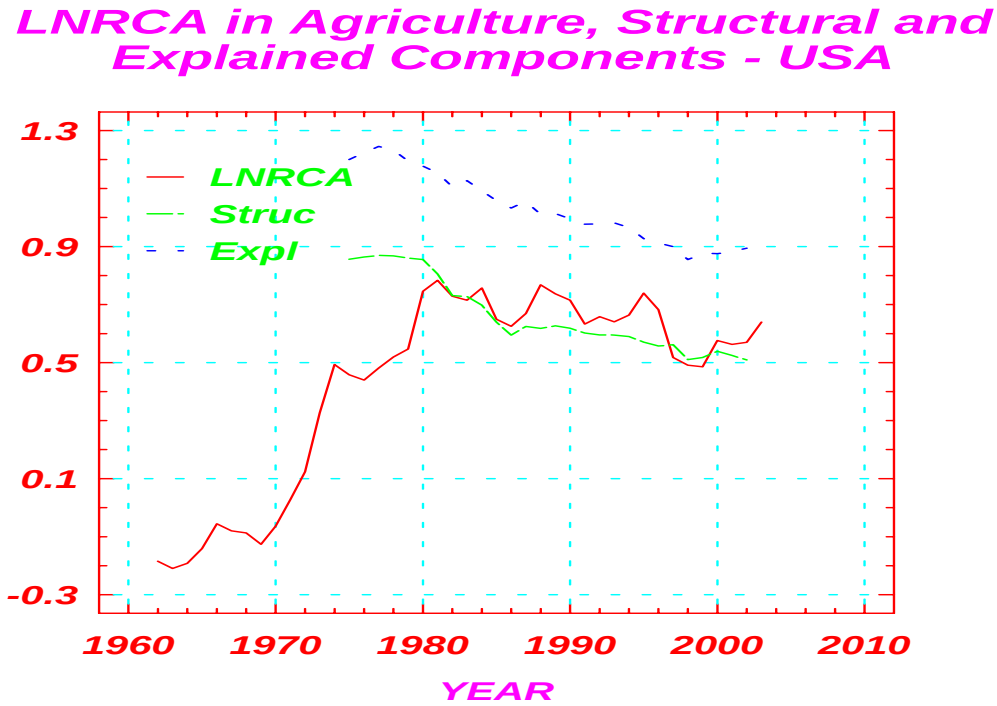

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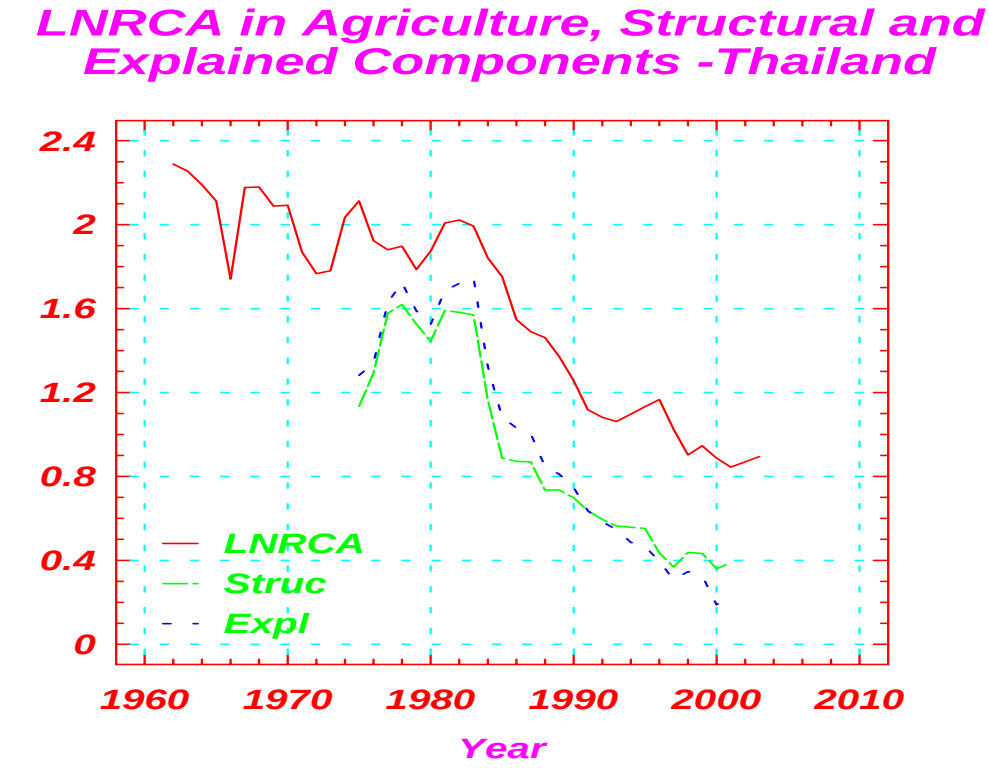

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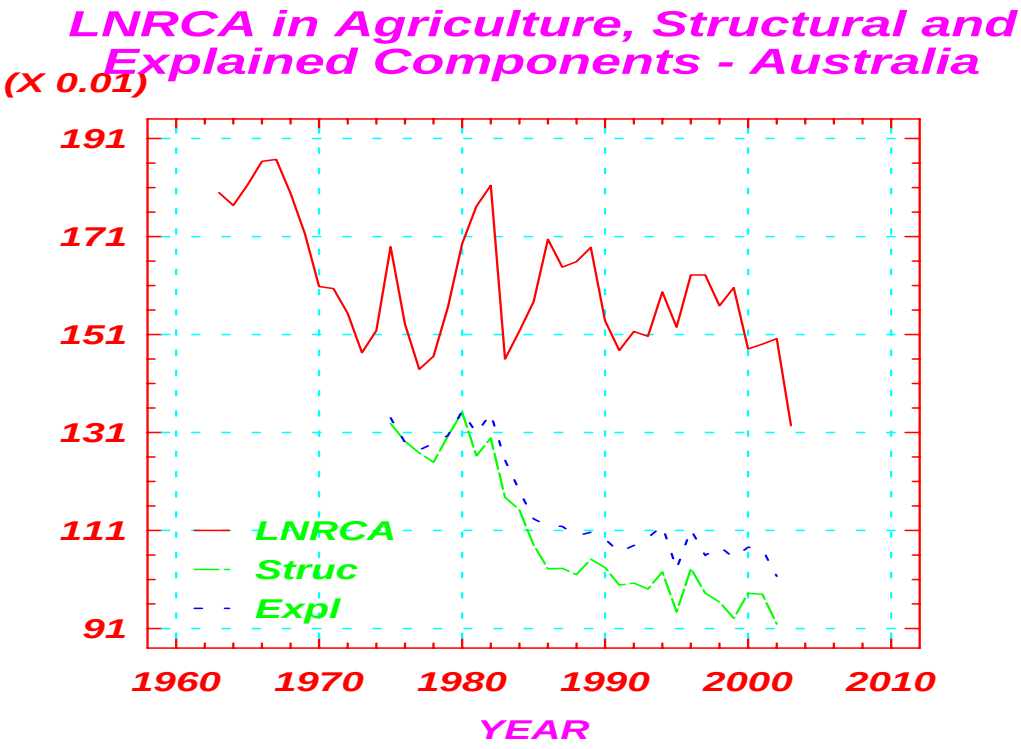

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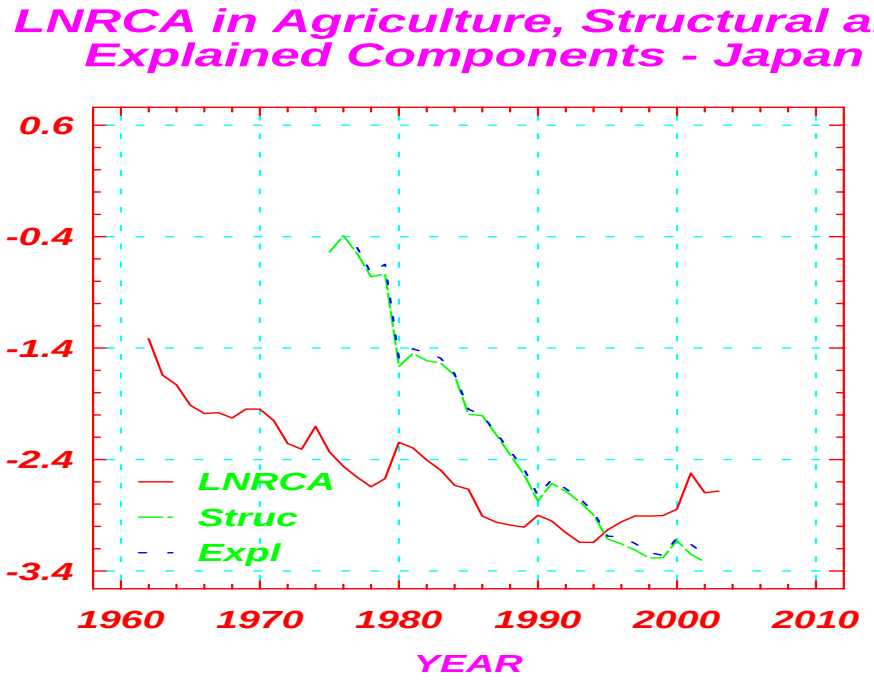

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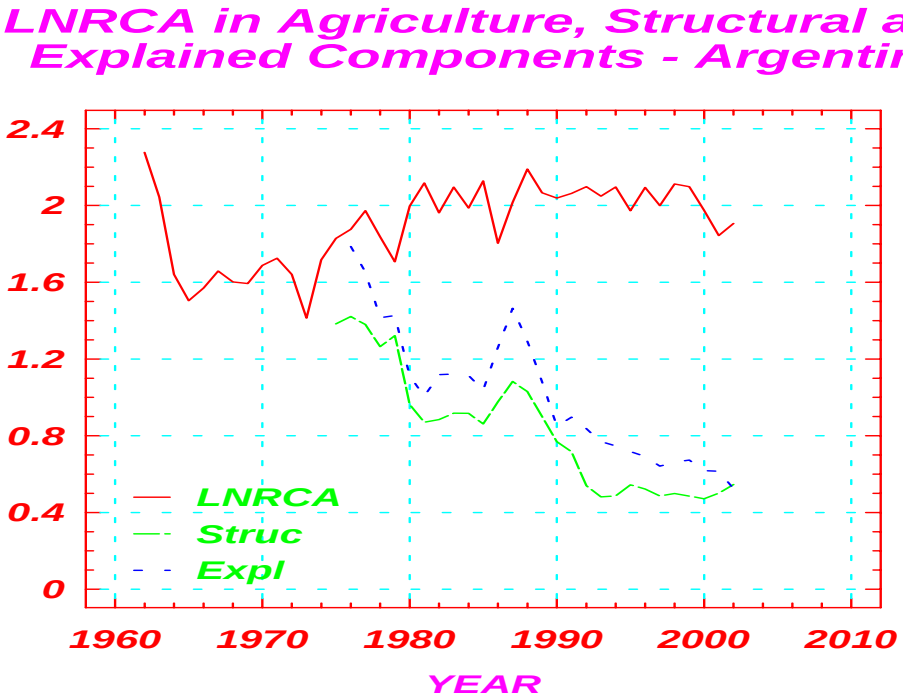

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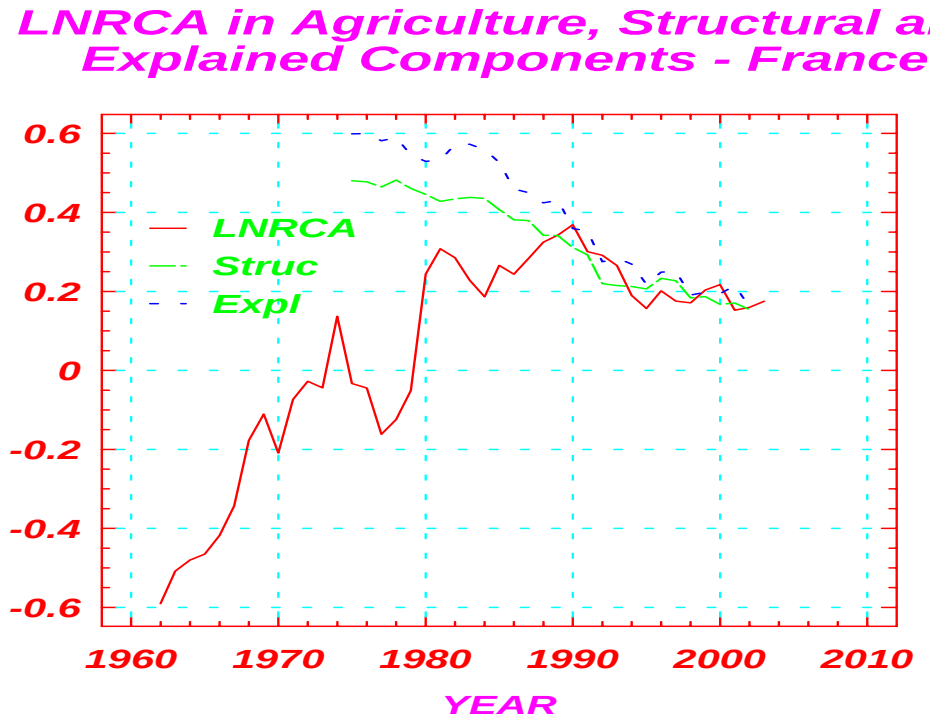

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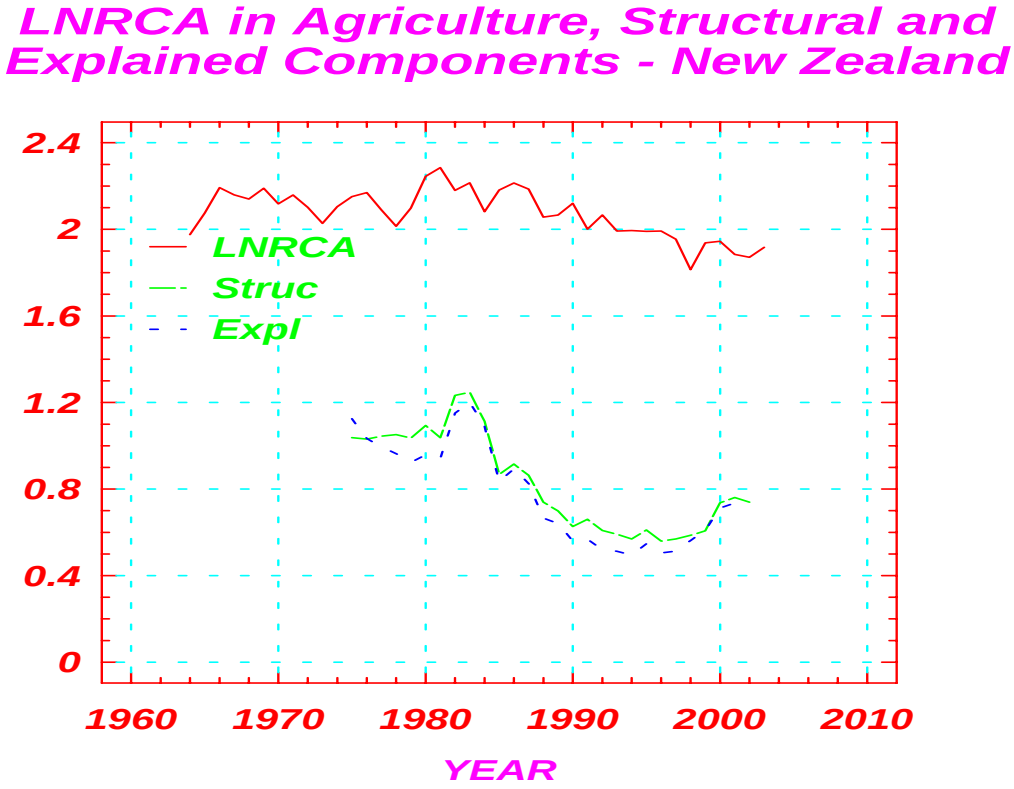

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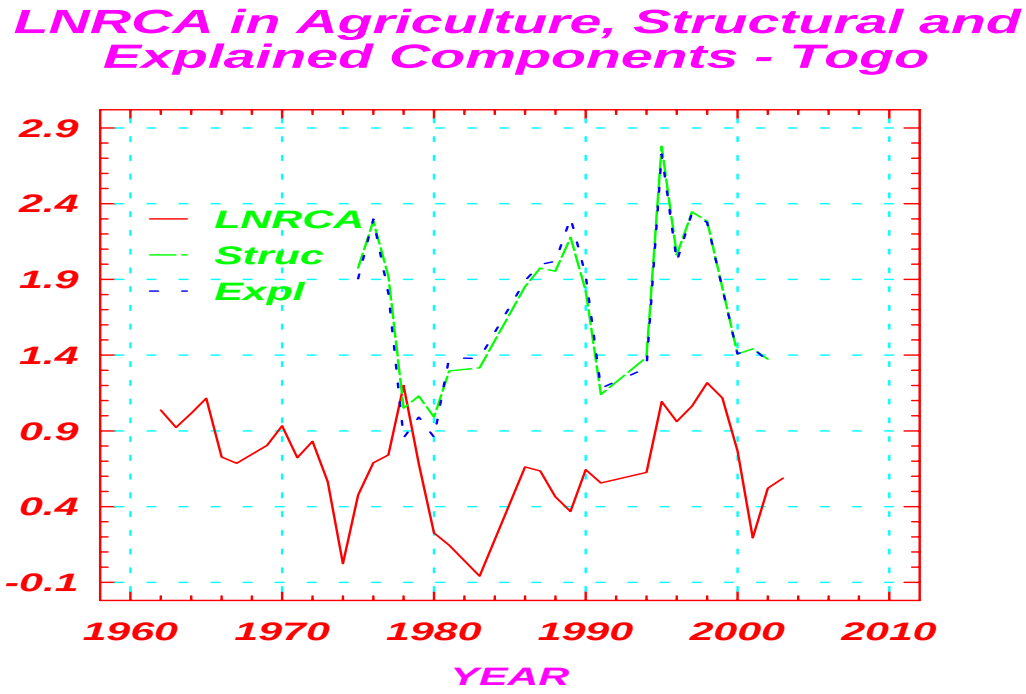

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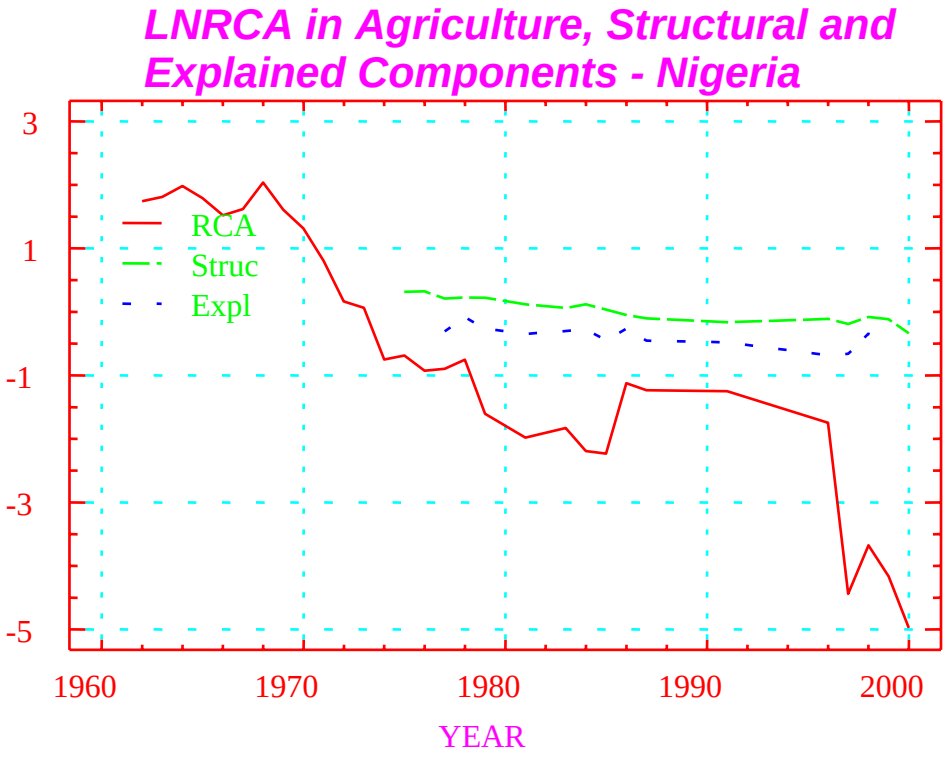

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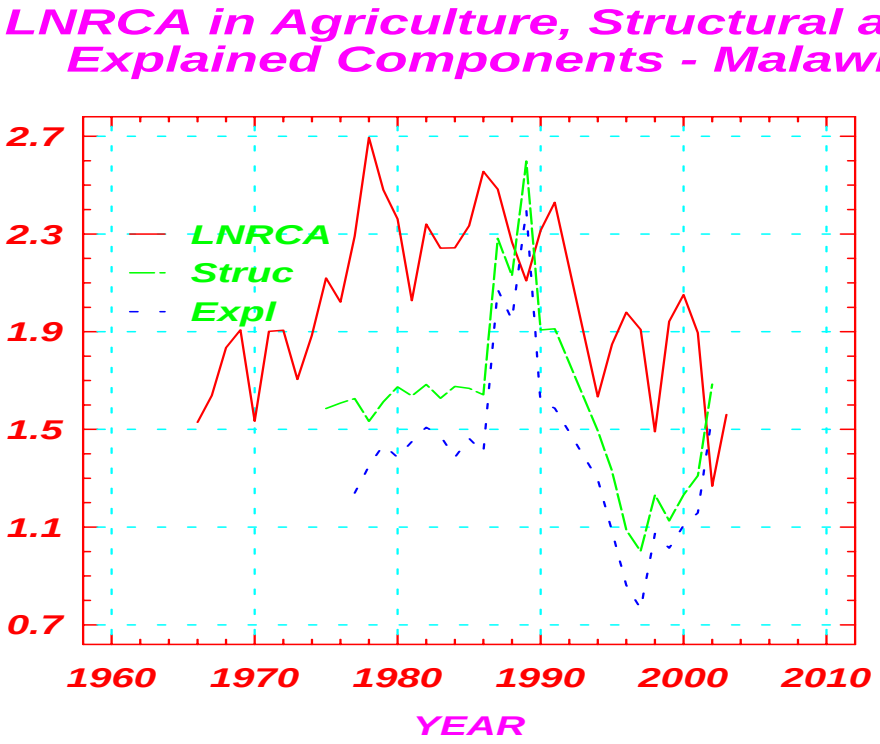

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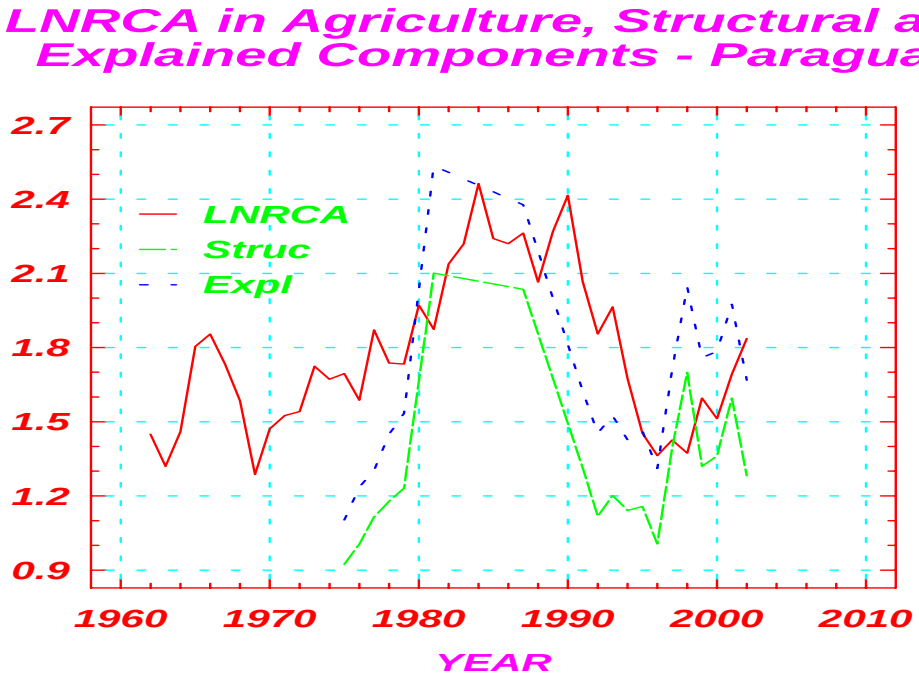

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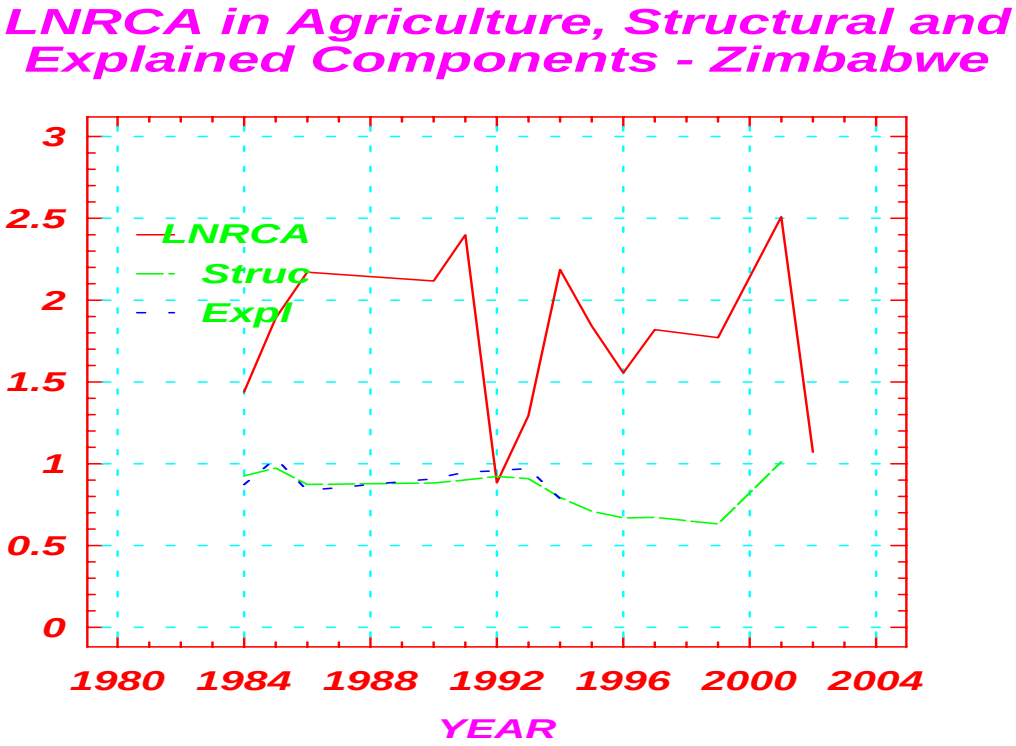

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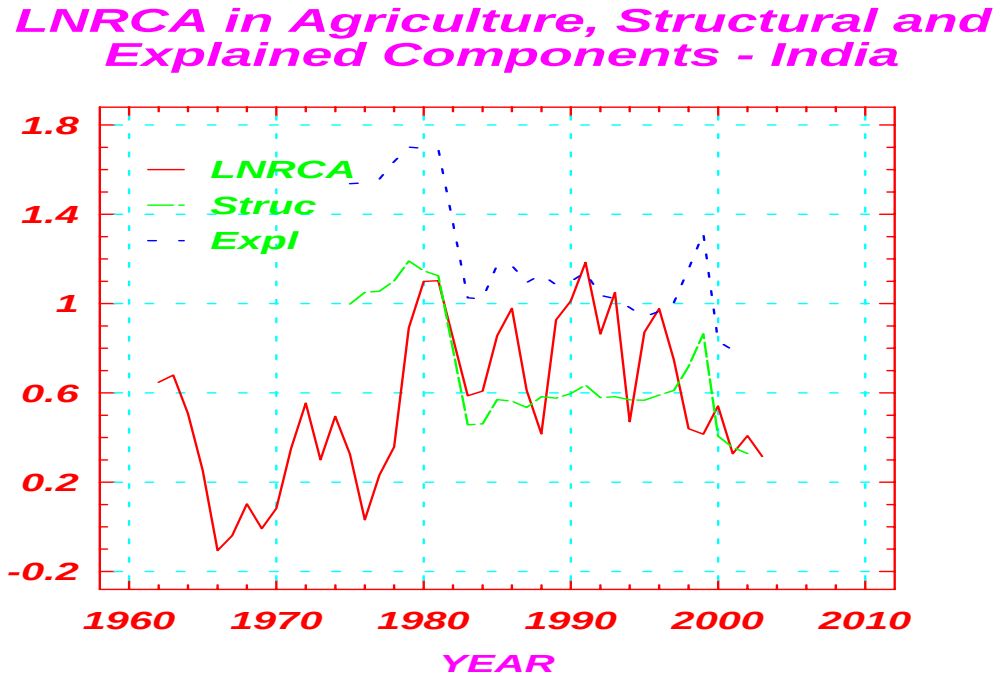

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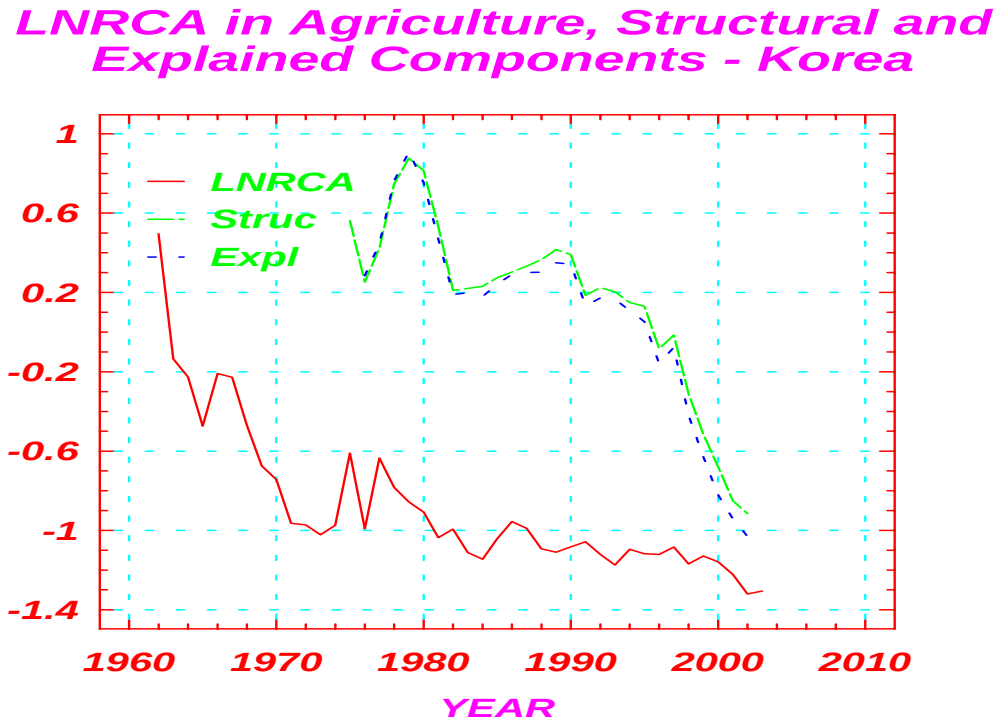

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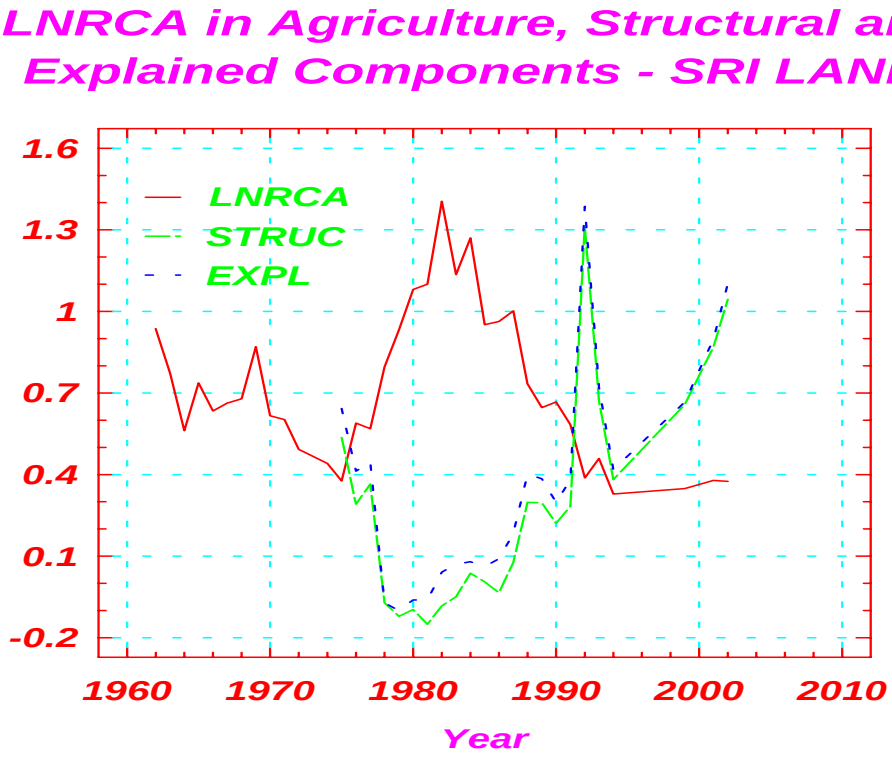

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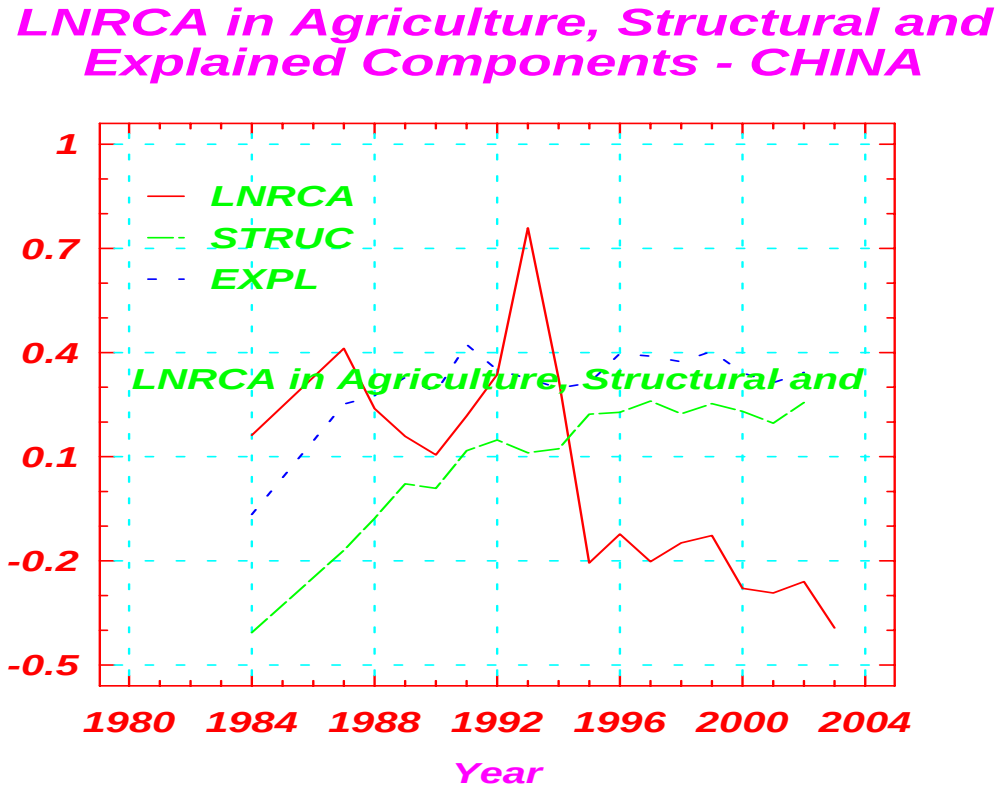
LNRCA in Agriculture, Structural and Explained Components - CHINA
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