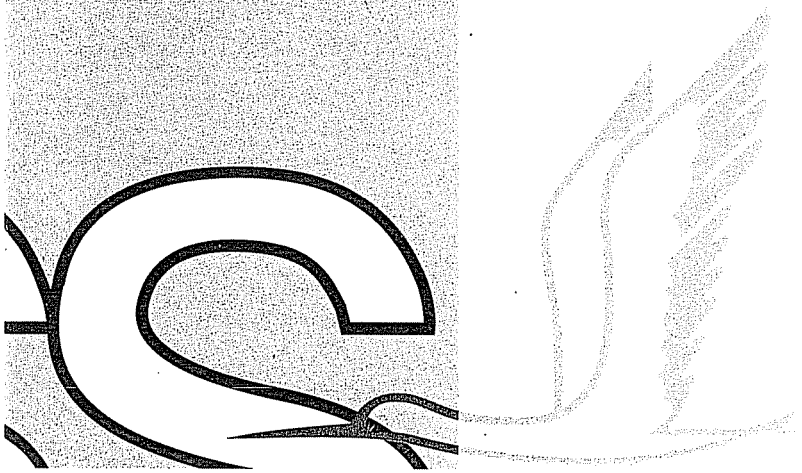
Institute of Social Studies

Technology and Industrial Competitiveness in Developing Countries

Professor Charles Cooper



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Professor Charles Cooper
Director of the Institute for New Technologies
of the United Nations University (UNU/INTECH)
Maastricht

Inaugural Address delivered on 28 September 1995 as Professor of Technology and Development Economics at the Institute of Social Studies, The Hague,The Netherlands

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by Charles Cooper

Technological change engages our attention. I suspect that even those who believe themselves to be essentially ignorant about technology - and perhaps not very interested in it - nevertheless experience, from time to time, a sense of wonder at the extraordinary things which new technologies are able to do. Perhaps we are as bewitched by technology, and nearly as convinced of its omnipotence as were the Europeans of the last years of the nineteenth century.

Economists do not escape from this. In the last ten years or so they have shown a greatly increased interest in the economic effects of technological change. In doing so they have been prolific in the creation of new theoretical structures - about economic growth for example, or about the factors that determine the directions of trade - in which technological factors play a central role. These theories are not always as new as their authors seem to imagine, but that does not really matter. It is much more interesting that the putatively new approaches to technology they include are, to all appearances, enthusiastically discussed in a discipline, which shares at least one feature with the great theologies - namely a deep reluctance to contemplate any changes in its basic assumptions. I would guess that the

reason for this new found openness, is that the actual experience of technological change in reality presents us with important challenges which the older restrictive theories are not very good at explaining.

But it is not my purpose to discuss how economic theory is trying to cope with the facts of technological change. I will leave that for another occasion. Instead - as the title of my lecture indicates - I will discuss the role which technological change appears to play in the industrial competitiveness of developing countries. I will not theorise about this - at least not in any comprehensive way - though the facts which I shall present certainly seem to need some new theory. I would prefer to concern myself with a question which is of very practical concern in developing countries, namely, is technology important for the international competitiveness of developing countries - especially in the industrial sectors?

There are two rather obvious reasons for suspecting that it might be very important. First, the world economy is now much more open than it was two decades ago. Most countries have opened their markets to international competition. Industrial firms have to be competitive - not just in order to be successful in export markets, but increasingly also to survive in their own home markets. This alone should lead us to expect that the effects of new production methods and new products will be more rapidly and deeply felt throughout the developing world than in the old days of protected markets and there is a good deal of evidence that this is indeed the case.

The second reason is that technological change seems not only to have accelerated, but to have diffused through a much wider range of industrial sectors than before. It used to be sensible to describe the traditional sectors of early industrialisation - food and beverages, textiles, garments, wood products and the like - as technologically stagnant or at least very slow moving. But new technologies have changed that. These traditional sectors are increasingly influenced by automated control, CAD/CAM systems, and new materials. They are no longer Cinderella sectors of slow technological change. This is presumably important for developing countries. There was a time when the internationally slow rate of technological change in these sectors seemed to make them particularly appropriate for countries which had a weak technological capability. Today the supposed advantage of a slow rate of technological change is no longer so evident.

Both these observations suggest that technological change must surely be a critical concern in industries in developing countries, and that we might as well take our question as answered and look for something more interesting to discuss. However, I wish to argue that there is still a lot to discuss and that the role of technological change in competitiveness is less obvious than these simple (and partially correct) arguments suggest.

To show this I will summarise some of the ideas we have been working on at Maastricht. First I will explore relations between competitiveness and technological change through some intercountry comparisons. This will lead to the notion that there are different paths to industrial competitiveness, not all of which involve a commitment to rapid technological change. Second I

will discuss the differences between these paths, focusing especially on employment and income distribution. Then finally I will make some points about policy. Please note that I have chosen my words carefully on this last point. I cannot promise in one short lecture to say anything definitive about policy. I will however try to make a few observations about the problems that need to be addressed.

The research on which I shall draw was based on data on 118 developing countries drawn from the IBRD World Tables. We used this data source to measure the competitiveness of these countries in international industrial markets and also to measure technological change. We measured competitiveness by the growth of manufactured exports over the 20 years from 1970 to 1990. We distinguished countries which showed a sustained growth of industrial exports over that period[1], from those countries in which industrial exports were either stagnant or very erratic - and we measured the compound growth rates of manufactured exports in the usual way. Similarly we calculated the growth of value added per worker (or labour productivity) in the manufacturing sector as a measure of technological change and distinguished countries which show sustained growth of value added per worker from those that don't. Both these measures can be questioned, but arguably both are defensible.

[1] To do this we calculated the usual regression of time on the logarithm of a constant price series of manufactured exports. We defined those countries for which the regression is significant at the one per cent level as showing 'significant and sustained' growth in manufactured exports.

Industrial Competitiveness and Technological Change.

We will start the story with the data on export growth. These showed that in the period from 1970 to 1990, 37 developing countries out of the 118 for which there was data, showed a sustained growth in manufactured exports. The growth rates for exports ranged from about 4 per cent per annum, to quite remarkable rates of more than 20 percent per annum. The highest rates were in Mauritius (26 percent per annum), Indonesia (25 percent) and Sri Lanka (22 percent). These are historically unprecedented growth rates for manufactured exports for such a long period. The NICs also had high rates (South Korean manufactured exports grew at over 18 percent per annum in this period), and the second tier NIC's - Indonesia, Malaysia and Thailand - had export growth rates at or above 20 percent. China and India also successfully entered world industrial markets, with high rates of export growth.

The question next addressed was: how far are these country performances in exporting manufactured goods related to technological factors as measured by the rate of growth of value added per worker in the various manufacturing sectors?

Table 1 shows the situation. For the moment ignore the breakdown of the data in the Table between two groups of countries. There are 24 countries for which there is full data - that is data on both manufactured exports and value-added per worker in manufacturing - over this period. So 13 out of the 37 countries which showed significant growth of manufactured exports are not included. The growth rates of productivity in the manufacturing sectors have varied from less than zero (in

Mauritius and Sri Lanka for example) to rates around 5 percent or more (in China, Indonesia and Korea). Some of the high export growth countries have not had significant productivity growth at all - and in the large group of 81 countries which have not entered manufactured export trade to any marked extent, there are none which show significant growth of productivity in manufacturing.

Even a casual look at the data in the table suggests that there is no simple relation to be found between our measures of export competitiveness and of technological change.

This is not altogether surprising. Even *within* the manufacturing sector, international competitiveness may be based on various conditions: for example, on abundant labour and consequent low real wages, or on the availability of cheap natural resources. These conditions are plainly reflected in the export growth data. Sri Lanka and Mauritius - and to some extent Malaysia too - exported low wage labour intensive goods. The Latin American manufacturing export economies have been specialising in resource based industrial exports since they opened up to world trade in the 1980's. Competitiveness on these terms does not have much to do with technological change.

Nevertheless, it would be mistaken to allow the lack of a linear relationship in these data, to obscure the role of technological factors in the trade pattern. In the first place, some of the countries listed in the Table have shown remarkable technological performances. Growth of labour productivity over 20 years at rates of 4 to 5 percent is extraordinary and it would not be sensible to ignore the implications that may have had for

the development of manufactured exports. One simple way of ordering the data is simply to split the group of countries into a sub-group with high productivity growth and a sub-group with low productivity growth. I have done this in the Table, and I chose - arbitrarily - to make the dividing line at a productivity growth rate of 2 percent. This gives us the division into Groups IA and IB in the Table. In fact most of the 13 countries for which we do not have full data, probably also belong in the Group IB. We can think of the Group IB as including countries which have in the main pursued trade patterns based on their traditional sources of *static comparative advantage*, whilst the countries in Group IA have focused far more on capturing sources of *dynamic comparative advantage.*

From case studies we know that the high productivity growth pattern in the Group Ia countries arises from two sources: *first*, from relatively high rates of productivity growth in all sectors even in the so called traditional ones (like textiles or garments for example) and *second,* shifts in production from traditional, lower productivity sectors to sectors where the rates of technological change are inherently higher in all countries - especially the electrical and non-electrical machinery sectors and the production of electronic consumer goods. These sectors are sometimes described as sectors where the rate of technological learning tends to be higher than elsewhere[2]. It is becoming quite fashionable to describe these two ways of accelerating technological change, as technological upgrading.

[2] Technically described as sectors with a high elasticity of learning.

Technological upgrading is just a way of describing the process by which a number of countries have moved from an initial concentration on labour intensive manufacturing exports to higher productivity and higher value added forms of manufacturing production. It is important to remember that countries which have upgraded have all started from an initial successful export trade in labour intensive low technology goods. So what the data tell us is that some countries - Group IA - have upgraded technologically over the period, and others have not (Group IB). Both groups have had high export growth rates. The question which I would like to consider now is: what difference does it make from a developmental point of view whether countries expand manufactured exports simply by sticking to their traditional sources of static comparative advantage, or whether they exploit possibilities of dynamic comparative advantage? Is technological upgrading a good thing?

Before addressing that directly, I would like as a preliminary to note that the evidence about "technological upgrading" does not easily fit some of our more venerable assumptions in development economics. One respectable and much quoted source of such assumptions is the Fei and Ranis development of the Lewis dual economy model which Ranis has recently reworked. The Fei and Ranis predictions are sensible enough. They anticipate a first phase of industrial exports of a highly labour intensive kind which will switch the economy away from its traditional primary export pattern. This "export substitution" process results in very rapid industrial expansion. Later, at what these authors call the 'commercialisation point' where the labour surplus of the dual economy is fully absorbed, they predict a

process of technological upgrading (though they do not use that term). So for Fei and Ranis, technological upgrading is driven by the labour market. When industrial labour becomes scarce, there will be a move towards higher productivity technologies. This I suspect is the position most of us take.

The argument does not really work. In practice countries which have upgraded - Korea, Taiwan, Indonesia, Thailand, India and China - all seem to have entered periods of accelerated technological change and increasing labour productivity, much earlier in the growth path, whilst there was still substantial surplus labour in the economy. I do not have time to argue through this question. I merely note it - and suggest that the answer may be found in some other features of the labour market - namely in the availability of quite large supplies of low cost skilled labour in these countries.

Let me turn now to the implications of the different growth paths from a development point of view in other words, back to the question: is technological upgrading a good thing?

Real Wage Growth and Employment Growth.

As far as the developmental impacts of the different types of growth path are concerned, an obvious place to start is with their effects on employment: obvious, because one of the points that is frequently made about technology and export development in developing countries is that there is a contradiction between the use of high technology in the interests of increasing the competitiveness of manufactured exports on the one hand and

the need to create employment and reduce underemployment on the other. How important has this been as far as the 'technology upgraders' are concerned.

The answer must be: probably not very. The high productivity growth economies have had very high rates of manufactured exports and the effects of this expanding export demand have outweighed the productivity effects of technology upgrading - at least in the last twenty years. The point is clear from the data which we showed in Table 1, where the top ten economies from the standpoint of manufacturing productivity growth had an average rate of productivity growth of 3.6 percent and an average rate of growth of exports of 13 percent. The export growth rates which have been attained have much outweighed the effects of productivity growth on employment in these economies.

Chart 1 shows the relationship between manufacturing employment growth and export growth in the high export economies. The 'adjusted R-squared' for the relationship between employment and exports is above 0.7, which is very high for this kind of data. And the more important point is that the regression is *not* improved at all by the inclusion of the rate of growth of labour productivity as an explanatory variable. The effect of export growth is dominant. One could, of course, argue that the rate of growth of employment in the high productivity economies would have been higher other things being equal if they had done less technological upgrading. But that is a risky kind of argument, since we don't know whether other things - especially export growth - would have been equal. All one can say is that the low productivity growth economies got a larger

amount of employment out of each unit of manufacturing export value, than did the high productivity ones - but that cannot be a basis for any kind of policy conclusion.

In short, both the high productivity and the low productivity economies gained from a distributional point of view from export growth, because of its strong effects in generating manufacturing employment. Productivity growth in the high productivity economies, though very large by any reasonable standards, nevertheless did not undermine employment growth there. It is interesting that amongst the economies which have successfully mopped up surplus labour in the past two decades, there have been some (Korea, Taiwan, Singapore and other NICs, which have had very high productivity growth, as well as some more 'traditional' low productivity, labour intensive exporters. Will export demand remain buoyant enough to sustain this state of affairs in the future? I simply don't know, and I doubt that anyone does.

The distribution of welfare is also importantly influenced by the real wage, through what is called the functional distribution of income - that is the distribution of manufacturing value added between wages and profits. Are there important differences from this point of view, between countries that upgrade and countries that do not?

Table 2 shows the data on the growth of real earnings per worker in the high export economies, once again divided between the high and low productivity growth paths. There are some striking points in the data.

First, the high productivity growth economies, (with the exception of Mexico) have had sustained growth in real earnings per worker. The asterisks indicate that the coefficients are statistically significant at one percent. Moreover, with a couple of exceptions, the growth of real earnings has been high over the period.

Second, for the low productivity group the picture is less happy. Generally the growth rate of real earnings has been much lower than in the high productivity group - as indeed one would expect. In particular, over this 20 year period real earnings in some of the highly labour intensive high export growth countries, have actually declined in some cases and remained effectively constant in others. Competitiveness may sometimes be necessary for economic development, but these data leave one with a suspicion that - as Paul Krugman has recently observed - it might not be sufficient.

The point is taken further in Chart 2, which plots the rates of growth of real earnings per worker against the rate of growth of value added per worker. There is a discernible and statistically significant relationship as one would expect. To be a bit formal about it, the adjusted R-squared for this relationship is 0.55 and the test statistics for the regression coefficient show it is significant at the one percent. I am well aware that there are too few data points for comfort, but nevertheless - given the plot in Chart 2 - it is unlikely to be a spurious relationship. Low productivity growth economies have low real wage growth.

The regression also suggests that on the average for this group of high export economies, the rate of growth of value added per

worker has not been much different from the rate of growth of real earnings per worker. This means that the share of profits and the share of wages in the division of value added (that is the functional distribution of income), has remained roughly constant in the group as a whole. The share of labour in value added is important from the point of view of income distribution across the manufacturing sector. Also, in a market economy the incentive for firms to invest depends on maintaining profit levels. From this standpoint the situation in the high productivity economies is more favourable from that in the low productivity ones. In the former, profits share may be kept high without too much pressure on wages, because value added per worker is growing fast. In the low productivity economies, where competitiveness has depended importantly on keeping real earnings per worker down, maintaining profits share (or increasing it in order to avoid a fall in *levels* of profitability as value added per worker has fallen) requires more stringent sacrifices in terms of real wage growth. The battle for income shares is all the more intense in these circumstances.

What can be said about developmental implications of high and low productivity export growth paths ? I think there are three points to be made. Two are conclusions from what has just been said; the third is a qualification.

First, over the past twenty years or so, both types of growth path have had strongly positive implications through their effects on income growth and especially employment growth. Indeed, the mopping up of surplus labour has depended first and foremost on taking advantage of export markets for manufactures - at least in a number of important countries. The underlying point is that

the income elasticity of demand for manufactured goods is generally higher than for primary outputs, and developing countries which shift to manufactured exports - even low productivity ones - benefit directly from this.

Second, the high productivity path has distributional advantages over the low productivity path, because of its generally favourable implications for the development of the real wage. This does not guarantee a more equitable functional distribution of income, but - as the data show - it makes it more likely. Furthermore, it might be argued that the high productivity path opens the way to a type of virtuous circle, which is to some extent observable (at least in some sub-periods): since a high rate of wage increase has been associated with a high rate of labour productivity increase, profits have grown at more or less the same rate. This has positive incentive effects on industrial investment - which in turn probably stimulates the incorporation of further technological advances.

Third, the qualification: income distribution is not mechanically fixed by labour markets and productivity. It also depends on institutional factors. A good example of this is the effect of the different growth paths - high and low productivity - on the gender division of labour. There is actually very little known about this, which is one reason why we have engaged on a large project - with the support of UNIFEM - on technological change and women's employment. Evidently the impacts of technological change on women's employment are likely to be importantly mediated by labour market conditions - especially whether there is a structural labour surplus in the economy or not. But we might also expect that they will be influenced by the

nature of the technological growth path associated with the development of manufactured exports. I would like to illustrate this by three examples, which draw heavily on the work of my colleague Prof. Swasti Mitter.

In the first place, in labour surplus economies which follow a path of labour intensive (low productivity growth) exports, competitiveness in the face of international technological change, as we have seen, may require cost cutting by methods other than improved technological efficiency. This usually means a fall in real wages. There is substantial evidence - mainly from export zones - that the employment of women workers is used as a way of achieving such reductions. This is noticeable in particular sectors - like garments - where cost cutting can take the form of substituting less well organised female labour for male labour. The positive distributional effects of increasing employment through exports may be offset by such considerations.

Second, special problems can arise in the transition *out* of the low productivity pattern. Technological upgrading to higher levels of labour productivity - which as we have seen may happen in the context of labour surplus - has resulted in cases where women workers are replaced by men. The gender distribution of income is then affected. For example, Mitter quotes Narayan and Rajah who show that technological upgrading in the electronics industry in Malaysia resulted in a fall in the proportion of women in the workforce from 80 per cent in the low technology phase, to 67 per cent after production had been computerised. She also notes deterioration in conditions and nature of women's work. So the positive real

wage effects of upgrading may be offset to some degree by negative distributional effects due to changing gender patterns of employment.

Thirdly, with more complete transitions to a higher productivity growth path in the industrial sector, other factors become important in determining the scale and nature of women's employment. The higher productivity technologies may open up the prospect of more skilled employment which underlines the importance of prior training. And, as Mitter shows, the transition is usually accompanied by an accelerated growth of the service sector. This has opened up new opportunities for women's employment which should be more equalising.

So - in general - the distributional effects of the different growth paths are more complex than our observations on the functional distribution of income suggest, though those observations are probably a helpful point of departure.

A Synopsis and Some Points for Policy.

How are we to bring all this together and relate to matters of policy ?

The key point in the discussion has been the idea of alternative technological paths to competitiveness in manufactured exports - the high productivity growth path and the low. This is an extreme dichotomy, since countries do not necessarily belong wholly to one category or the other and since there are always some in transition. For example, Malaysia is now plainly

shifting from a low productivity path to a high as surplus and immigrant labour is absorbed. It is nevertheless helpful heuristically to think in terms of a dichotomy.

There are interesting similarities in the patterns we have observed empirically and some of the theoretical results which Krugman and others have developed on technology and trade. Those results suggest that technological learning processes linked to production may in some circumstances produce a 'lock in' to a pattern of comparative advantage. Countries may get stuck on relatively low productivity growth paths. They also suggest that selective policy interventions - the so-called 'narrow moving band' of subsidy and export promotion - may break out of the 'lock in' and generate increasing shares in markets for manufacture exports. Both phenomena - the lock in and the transition - appear to be present in the group of countries we have discussed.

Although the question is not discussed in precisely these terms there is a great deal of concern amongst policy makers in various parts of the world with the risks of becoming locked in to a pattern of static comparative advantage and with the advantages of finding ways to make the transition - in other words to achieve technological upgrading. The concern with structural transformation of industry in the ECLAC for example stems directly from worries about the adequacy of an industrial export pattern based heavily on resource based industries, for the long run growth of income. In an open world economy, where there are strong short run pressures towards static comparative advantage, such worries are bound to be more and more expressed. In effect this means that many of the old questions of

static versus dynamic comparative advantage, will come back on to the agenda. And if this is right, there will be a real concern with the question of how to make the transition from low productivity growth paths to high.

It would be disproportionately ambitious to try and answer that question in the short time available - and I won't. Instead, I will sketch some of the points that a proper answer will have to encompass in this concluding part of the lecture.

I will briefly address two issues. First I will discuss the role of the labour intensive phase of manufactured export development. Then, second, after a brief statement of the advantages of the high technology path, I will touch briefly on some economic aspects of the transition from one path to the other, as well as on the risks that might be involved.

To start with: the low productivity path. The low productivity growth, labour intensive phase of manufactured export development is especially important for the large majority of developing countries which have yet to develop a sustained growth of manufactured exports. I would like to suggest that the importance of this phase of manufactured export development is overlooked in a lot of current debate. The desire to find some general formula which will allow countries to emulate the NICs by making the transition to the high technology path has obscured important considerations. It has, in particular, obscured the problems facing countries which are new entrants to world trade in manufacturing. The low technology growth path to competitiveness is important for those countries - and to others which are at an early stage of industrial exports. I suggest,

more generally, that the low technology path is important for the following reasons.

First, because all countries in the high productivity group have gone through it - and indeed economic history would show that the presently industrialised countries followed a similar route. This is so obviously relevant and important for that large majority of developing countries which have yet to enter world trade in manufactures, that it needs no further comment. They can only enter trade in manufactures by the low productivity route.

Second, the low productivity phase is not necessarily a phase of technological stagnation. The history of Korean export development has shown that. So, for example, Prof Youngil Lim - a recent visitor to the ISS as to INTECH in Maastricht - has given us data to show that in the first ten years of Korean export development from 1960, the number of products being produced for export markets expanded from about 200 to nearly 3000. This is product innovation on a major scale in 'low technology' sectors. Other authors have shown how important technological learning in the low productivity simple sectors was in the Korean and Taiwan development. And evidence from other NICs would reinforce the point. It is obviously simplest to start the search for dynamism in the pattern of comparative advantage, in lines of production at which the country is already capable. As a strategy, it is a good deal less risky than jumping to sectors where the country has had very little experience.

Not all countries have followed dynamic strategies in the low productivity sectors. For example, Sri Lanka and Mauritius have

stuck to their 'static comparative advantage' sectors for many years, but have not accumulated much technological capability or generated productivity growth in them. But other countries have focused on learning in the simple sectors to good effect. Indonesia seems to be a good example.

Third, low productivity and high productivity growth paths are not alternatives. They are importantly complementary. This may be argued as follows. The learning processes which are central to technological upgrading depend on the growth of production in the high productivity sectors and lines of production. In turn the growth of production depends on investment. Now in most of the economies which are under discussion here, investment in the high productivity sectors is highly dependent on imported capital goods. For example Pack and Westphal have shown the great importance of imported plant and equipment in the learning processes in Korean high productivity sectors. But imports of capital goods depend on exports. The low productivity exports of countries like Korea, Taiwan and the second tier NICs have played a key role in supporting the investments on which high productivity growth depends. This intersectoral dependency - especially important in smaller open economies (but also relevant in larger ones with technologically backward capital goods sectors) is overlooked in most of the literature. Elsewhere I have shown that an optimal path of accumulation in the context of technological learning, will nearly always depend on an initial development of low productivity manufactured exports in exchange for imported capital goods.

Fourth, technological upgrading is risky. It may fail. It is widely agreed, for example, that the Korean 'heavy industry strategy' of the 1970's failed seriously. It was just such a high risk effort at upgrading. It did not come off. In such a situation, low productivity exports are an important way of hedging risks. They played that role in the Korean case, and after the collapse of the heavy industry strategy the continuance of low productivity exports helped to finance the capital goods imports for the much more successful upgrading to light electrical machinery production, electronics and automobiles.

Finally, and most obviously, low productivity exports are an important way of absorbing surplus labour - especially relatively unskilled labour. They may be more important in the future if international demand for developing country exports grows less rapidly than in the past.

For all the importance of the low productivity phase, there is a legitimate concern with technological upgrading. It has many advantages. It is necessary in the long run anyway, because once labour markets tighten, and real wages rise, survival in an open world economy will require it . And more immediately, it is a way in which countries which have already started manufacturing exports can meet competition from below, as more low wage producers seek to enter the market. There is in fact a collective interest at work. It is in the interest of newcomer low productivity exporters that the countries ahead of them should upgrade, so as to leave the low wage end of the market for manufactures free for new entry. Upgrading moves countries into export markets where the income elasticity of world demand is higher, and so helps to maintain export growth -

especially when real wages are rising. And finally, in a dynamic world of technological change, the low productivity growth path may only be sustainable if real wages actually fall.

There is a substantial and growing literature on how upgrading has taken place and on the role of government in inducing it. Pack and Westphal have written convincingly of the Korean case; Dahlmann on Taiwan and Korea; Wade has discussed the role of the state in both countries. I do not intend to repeat their findings here, nor to enter the debate on the role of the state. Instead, I will conclude with two observations about the nature of the upgrading process. One of these is an analytic economic point. The other is about institutional preconditions.

The economic point is missed in much of the current discussion. It is simply that the process of technological upgrading has much in common with the process of investment, and needs to be thought about in much the same way as we think about investment. What do I mean by this? Let me try to explain.

The point is that technological upgrading usually involves a shift of resources from sectors in which a country already has a short run comparative advantage, to sectors or lines of production where it is presently not competitive, but where - with a bit of luck and a lot of technological learning - it is anticipated that it will become competitive in a reasonably short period of time. It is an infant industry idea. Like all such, it involves a short run cost as resources are diverted from more productive (less sophisticated) sectors to sectors which are currently less productive. The justification for this shift must be that the eventually, with enough accumulation of technological

capability, the new upgraded sectors will in turn become the more productive ones. There is a short run sacrifice of incomes, in the interests of a long run gain. This is the analogy to investment. And it means that upgrading needs to be approached in much the same way as investment. For example, it may not be possible for very low income countries to do much upgrading, simply because present income necessarily has a high relative importance in the situation of poverty. The future is discounted at a high rate.

Second, and this will be my final remark, it is quite clear that there are important, rather tough preconditions for successful policies of technological upgrading. Like all learning processes, technological upgrading depends on the capacity to learn, which in turn and rather paradoxically depends on what has been learned in the past. This is one of the few points on which all sides of the debate about technology and competitiveness are agreed. The success of the NICs and of new entrant countries like China and India, was importantly mediated by prior industrial experience, which was very considerable in Korea of the 1960's and is equally so in India and China of today. It is also mediated by a large supply of well educated managers, workers and bureaucrats. And the wider development of the technological infrastructure of countries - what is nowadays called the national system of innovation - is also critical. We know surprisingly little about these preconditions for the generation of technological capability and there is a lot of research to do.

TABLE 1: HIGH EXPORT GROWTH ECONOMIES

Growth of Manufactured Exports and Value Added per Worker 1970-1990

Country	Export Growth 1970-91	VA per Worker Growth 1970-90
IA Countries with high value added growth per worker		
Korea	18.44 *	5.71 *
China	9.9 *	4.5 *
Indonesia	25.49 *	4.49 *
Pakistan	4.39 *	4.19 *
Uraguay	7.69 *	3.88 *
Thailand	21.15 *	3.09 *
Mexico	10.46 *	2.96 *
Singapore	16.38 *	2.58 *
Barbados	10.54 *	2.2 *
India	5.62 *	2.12 *
AVERAGE	**13.01**	**3.57**
IB. Countries with low value added growth per worker		
Turkey	20.32 *	1.93 *
Malaysia	17.54 *	1.71 *
Chile	7.4 *	1.46 *
Brazil	15.09 *	1.09 *
Peru	13.49 *	0.17
Venezuela	10.21 *	-0.63
Fiji	9.06 *	-0.79
Philippines	16.61 *	-0.87
Panama	9.14 *	-0.9 *
Morocco	13.25 *	-1.54
Sri Lanka	22.42 *	-2.23
Tonga	13.51 *	-3.3
Mauritius	26.21 *	-3.77 *
Trinidad	4.52 *	-3.87 *
AVERAGE	**14.19**	**-0.82**

TABLE 2:HIGH EXPORT GROWTH ECONOMIES

Growth of Value Added per Worker and of Real Earnings 1970-1990

Country	Productivity Growth		Earnings Growth	
Countries with high value added per worker growth				
Korea	5.71	*	6.91	*
China	4.5	*	3.66	*
Indonesia	4.49	*	5.91	*
Pakistan	4.19	*	4.22	*
Uruguay	3.88	*	0.88	
Thailand	3.09	*	1.75	*
Mexico	2.96	*	-0.84	*
Singapore	2.58	*	3.74	*
Barbados	2.2	*	0.88	*
India	2.12	*	1.41	*
Countries with low value added per worker growth				
Turkey	1.93	*	2.17	*
Malaysia	1.71	*	2.08	*
Chile	1.46	*	5.86	*
Brazil	1.09	*	4.26	*
Peru	0.17		-1.63	
Venezuela	-0.63		1.87	
Fiji	-0.79		0.53	
Philippines	-0.87		-1.37	
Panama	-0.9	*	0.6	*
Morocco	-1.54		-1.19	*
Sri Lanka	-2.23		-0.33	
Tonga	-3.3		-3.76	
Mauritius	-3.77	*	-0.13	
Trinidad	-3.87	*	2.06	

Chart 1

Export Growth and Employment Growth

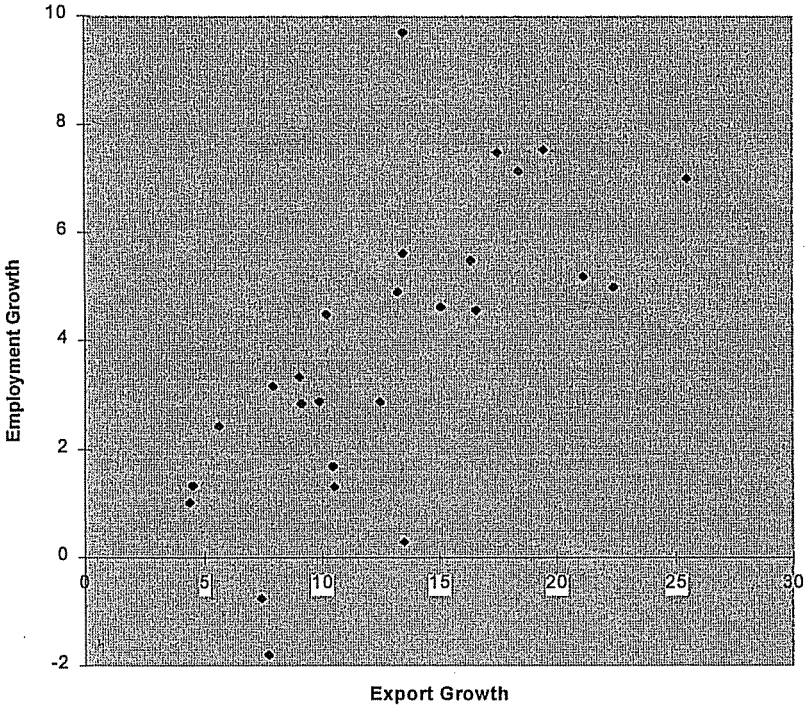

Chart 2

Growth of Value Added per Worker v. Growth of Real Earnings per Worker