



**What theory and the international experience suggest about
the role of manufacturing in good employment growth for
South Africa**

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1 Conceptual background

These notes try first to review some existing thinking on the role of manufacturing in development generally, and in the creation of decent employment. Special interest attaches to manufacturing since it has long been viewed by many as a key sector in development (e.g. Kaldor, 1967).

Thinking specific to minerals-dependent and/or dualistic economies is of special relevance to South Africa. Given the hypothesis that the relationship between manufacturing and development has been changing worldwide in the last couple of decades (Palma, 2005), that possibility needs to be borne in mind¹, including the idea that with the world now in the midst of the 'information revolution' it may be that the mantle of growth-driver has shifted to that part of the service sector tied to this revolution.

More generally, however, the need is to identify and/or clarify what makes a sector a growth driver. And it is necessary to recognise that a given sector can be growth-promoting under some circumstances and not under others. This could, for example, be simply the result of the fact that there is an appropriate balance say between production of tradables and the extent of commercial services; if the former are too large relative to the latter (as appeared to be the case in China until recently) then expansion of commerce could have positive multiplier effects (by releasing formerly repressed capacity to produce tradables) but if commerce is overextended then production of more tradables may raise productivity in commerce (i.e. get added output from it without any increase in inputs).

Finally, the other side of the coin from looking for sectors with special growth-promoting capacity is the (complementary) search for sectors (or firms, or whatever) which are particularly growth retarding. We should think in terms of the characteristics of such sectors or firms that make them either growth-promoting or growth retarding. One set of candidates for the growth-retarding label is sectors which come to be controlled monopolistically or oligopolistically, with the possible impacts of keeping out investment by potential competitors, slowing growth of input suppliers and output users and discouraging technological innovation. Rather than thinking in terms of a dichotomy, we should have in mind a spectrum of effects from strongly growth-promoting to strongly growth retarding and everything in between.

¹ Another possibility, though, is that the role of what we might call manufacturing activity has not been changing but that the impression of change has been created because the distribution of such activity across firms categorized in manufacturing, in services, and in other sectors has been changing. In most national accounting systems all of a firm's output and employment is classified under its major activity. Thus, when a manufacturing firm engages in selling activities, that output and employment is classified under manufacturing. If the firm stops doing so output and employment are reclassified from manufacturing to services even though in reality no such shift has occurred. Although firms in non-manufacturing sectors may also do some manufacturing, this may be less common. If such is the case, then a tendency for firms to outsource activities more and to specialize more in their core functions would lead to an apparent decline in manufacturing activity which was not a real one.

The appropriate criterion by which to judge whether a sector (or a firm or any other economic unit) makes a contribution to growth is whether its growth, *mutatis mutandis*, raises overall growth. Thus a sector can be said to contribute to growth as long as the growth it achieves is not offset or more than offset by shrinkage (or less growth) elsewhere. This criterion can be applied in a context of static economics (employed resources fixed, etc.) or in a context of dynamics. In a simple, static world, it is assumed that growth of one sector is at the expense of other sectors, but is 'efficient' as long as the contribution of the growing sector outweighs the shrinkage elsewhere, as it would, for example, if the growing sector were growing because of a cost-reducing technological improvement which raises its profitability relative to other sectors. A stronger contribution to growth could occur in any of four situations (since the taxonomy is somewhat arbitrary, so is the number of categories):

- i. The sector's efficiency is rising so fast that its output increase is achieved with a decrease in resources used so that it can release resources to other sectors;
- ii. The sector's growth has the effect of raising growth in other sectors through increases in demand for their output. This is what occurs under conditions of Keynesian underemployment equilibrium.
- iii. The sector's growth has the effect of raising growth in other sectors through complementarity in the processes of production. Thus production of manufactures becomes more difficult if the complementary services (transport, commerce, etc.) are in too short supply.
- iv. There are sufficiently strong positive spillover effects from a sector's growth as to outweigh any output declines elsewhere because of resource shifts to the growing sector.

These four cases are quite distinct conceptually. The first involves rapid technological change in the sector. Often but not always such rapid intra-sectoral change is accompanied by the spillover effects of mechanism (iv). This in the course of the computer and information revolution, a first major element of technological change was inside the computer-software sector. As of the late 1990s according to some estimates, nearly all or all of the productivity benefits of the IT revolution within the US at any rate, had occurred within that narrow sector (Gordon, 2000) but, as with earlier technological revolutions, a process of diffusion subsequently led to productivity increases in other sectors. Manufacturing's claim to special attention as a growth-driver has in many people's minds been associated with the machinery and equipment industry, which achieves productivity improvement within itself because it is the locus of much innovation and technology search, but is also the source of productivity increase in other sectors.

The nature of a sector's contribution to growth is likely to be related to whether that contribution tends to be one-shot or more continuous in character. A three-way distinction is helpful.

- a. In a static framework, a sector's growth can contribute to overall growth because its size was previously 'below optimal'. (This would be synonymous with 'below equilibrium' in an economy without market imperfections.) The contribution is by nature one-shot since when the sector's size rises to its optimal level there can be no further growth contribution from further growth of the sector; in fact further growth by it will lower overall GDP since the sector is now getting too large and the shrinkage elsewhere which its growth entails will lower GDP more than its

output increase raises it. Categories (i) and (ii) of the previous taxonomy have this character.

- b. In a Keynesian framework, growth of any sector promotes growth of other sectors through the increase in aggregate demand which its growth causes. In this world, then, all sectors can be growth drivers; which have the strongest potential depends on the marginal propensity to consume out of the income they generate. Clearly the potential for growth contribution through this mechanisms depends on the context; under full employment of resources it does not happen at all. With underemployment of some resources it can happen to some degree but the picture is a good deal more complicated.
- c. Other growth promoting by a given sector comes from its contribution to the broad sources of growth: savings/investment and technological change, this latter understood in the broadest sense of sources of productivity improvement. It is this type of contribution which most people have in mind when they think of growth drivers.

Ultimately we may not be much interested in whether a sector's contribution to growth occurs mainly within itself or mainly through its effects on other sectors, but in trying to understand the mechanisms involved and what the magnitude of contribution depends on, this is an important distinction. This means that, building a conceptual framework for the analysis of growth contribution, one relevant issue is the extent of factor movement among sectors, with technology thought of for this purpose as a factor of production. At one end of this spectrum would be an economy with 'n' sectors between which no movement occurs. In this world a sector which starts as a minor part of the economy (say under 5% of GDP) is unlikely to be much of a growth driver since even with strong cost reduction its share of GDP is unlikely to get really large, and since there are no linkages so it also can't contribute to growth elsewhere. It is still an interesting mental construct because in fact there are so many barriers to effective movement of some things between sectors, especially capital and especially between 'distant' sectors like large scale firms and very small ones. In this world sectors with good growth capacity would increase their share of total output as long as income elasticity of demand for their output was not too low. Of course it is unrealistic to assume that not even labour can move across sectors.

When one relaxes the constraints on movement of factors and technology between sectors, the indirect contribution of a 'growth driver' can now be larger or even dwarf those direct effects through cost reduction within the sector. The limiting (extreme) case here would be the independent R&D sector, part of services, whose whole rationale is to create better technologies for other sectors.

To recapitulate, a useful taxonomy of sources of growth distinguishes savings/investment; technological change; and increases in resource utilisation – either fullness of utilisation (avoiding unemployed resources) or efficiency of unitisation – i.e. good allocation of resources across uses. A sector could itself grow fast because it generated a lot of savings and did a lot of investment internal to itself, fostered improved technologies used by itself, or drew in previously underutilised or badly utilised resources to employ them itself. Or its contribution on any of these fronts could show up mainly in the growth of other sectors. Big sectors are, *ceteris paribus*, more likely to make a high share of their growth contribution within the sector and small ones within other sectors.

One could say that a sector is a better growth driver, relative to its size (i.e. generates more growth per unit of its own current output):

- i. The more savings and investment it undertakes or facilitates. So a high savings rate out of pectoral income is a plus. It is a bigger plus if the savings can be moved efficiently across sectoral lines, so that if the sector is saving more than enough to fuel its own growth, its surplus savings get to other sectors efficiently through some form of intermediation or through its own direct investment of those savings elsewhere. Capacity to invest is another plus, reflecting entrepreneurial skill. A sector could be better on the savings than the investment front or vice versa. Ability to borrow effectively will sometimes be a determinant of a sector's growth contribution, in cases where it has much growth potential itself.
- ii. The more it contributes to technological change. A good rating on this score could be due to research, development and innovation activities per se, to the presence of conditions under which the sector's advances are diffused effectively to other sectors, or something else. Thus household appliances (manufactured good) squeezed out domestic labour previous producing the same service because of capacity to innovate. It's also a plus if a sector is good at receiving technological transfer from other sectors when it can benefit from such transfer. Worst would be a sector which shows no technological advance itself and contributes nothing to other sectors, or one which generates or diffuses inappropriate technology. As with finance, a whole series of contextual characteristics will determine how much of a driver a sector can be on this count since they will determine how easily these technological spillovers occur.
- iii. The more it contributes to full resource utilisation, either within itself or in other sectors. Thus in a labour surplus economy, a labour intensive sector has the potential to absorb otherwise unproductive resources as it grows and such growth raises overall productivity in the economy.
- iv. The more it contributes to efficient resource utilisation, either within itself or in other sectors. Thus if it is currently of less than optimal size compared to other sectors, some amount of growth at the expense of thither sectors will raise GDP. Kuznets (1955) and others have attributed considerable overall growth to the movement of resources from less efficient to more efficient sectors, especially from agriculture to elsewhere. Alternatively this could be seen as a contribution of the sector which facilitates this shift, if one can be described as doing so. It is different from other growth drivers, however, in being possible only because of initial misallocation of resources across sectors.

We thus have eight boxes in the conceptual framework (Table 1); four sources of growth, with each of these possibly contributing to growth either in the same sector or in other sectors. In asking which sectors are more growth promoting one wants to distinguish between total contrition to the economy's growth and contribution relative to the sector's own size (e.g. relative to its existing share of GDP). Some big sectors presumably account for significant shares of total growth even though their growth promotion per unit of existing output is modest.

The conceptual framework should allow for the possibility that some growth cannot be attributed to any specific sector or otherwise designated component of the economy but is rather the result of two or more components interacting with each other in a growth-promoting way. No doubt much growth has at least something of this character. Since government does or should engage in a number of growth promoting activities, it must be including in any matrix of sectors.

Finally, it is important to distinguish the short and the longer run, not only because some of the mechanism involved in growth promotion are more likely to play out quickly than others, but also because a sector might make a positive contribution to growth in other sectors in the short run but a negative contribution in the longer run, or vice versa.

Table 1 – How a sector may contribute to overall growth

Nature of contribution	Within the sector	Impact on other sectors
Savings		
Improved technology		
Fuller resource utilisation		
More efficient allocation of resources		

Though economists debate the relative importance of investment and technological change as sources of growth – a debate complicated by the fact that the two are complementary to each other, no one questions that large increases in total factor productivity are essential for long run growth. Students like Bruton (1987, 1998) thus put the processes of learning and technical change at the centre of the growth story.

Given our concern with employment, the growth driver story must be linked to that variable. In so doing one wants to wind up with a concept which might be something like ‘weighted output and employment growth’ where ‘weighted’ means that one is taking account of both the impact on growth and that on the quantity and quality of employment. This requires one to think in terms of ‘good employment’ or ‘decent employment’ (DE) or something like that rather than just any employment. At the conceptual level it is easy enough to distinguish cases where the employment outcome is likely to be good – they are cases where demand for labour rises significantly. In applying the above framework to the employment question we basically ask with respect to each of the eight boxes, how much labour demand is likely to rise with a given increase in output (in the sector or elsewhere).

If a sector is good on the savings front, in the sense that its savings/value added ratio is high, it will then get good marks also on the employment front if those savings tend to go to uses which particularly raise the demand for labour. If the savings happen to be done by small entrepreneurs who invest them in expanding their own labour intensive operations, we assign a gold star. If those same entrepreneurs instead funnel their savings into the financial system, which then relends to large capital intensive firms, the employment impact will be much less positive. (In all this I abstract from second to nth round effects which may sometimes be of some importance too).

A similar story would hold in the area of technological contribution though a more complex and difficult one for two main reasons. First, unlike savings where in most countries it is reasonably safe to assume that ‘the more the better’, in the case of technological change this is not true since some new technologies may be inappropriate to the developing country setting.

The concept of inappropriateness is complicated but the essence is that many, probably most, industrial country technologies are, in their unadapted form, likely to lower the demand for labour and thereby worsen a country's income distribution because they are so much more capital and/or skill intensive than the current average in the country. A less likely but still quite possible outcome, where the difference between the new technology and existing more traditional ones is large and the latter is relatively productive is that the introduction of the new one will also lower national income or GDP. One may thus distinguish somewhat inappropriate (lowers demand for labour and worsens inequality) and very inappropriate (also lowers GDP) technologies. Unfortunately empirical work has not much clarified how often these levels of inappropriateness do show up; individual anecdotal evidence is abundant but the aggregate impacts are hard to sort out and this is the second obstacle to our understanding how growth and inequality interact with each other and, because it is part of that larger story, how a given sector does or does not contribute to growth of output and employment.

While it seems simple enough to deal with the conceptual side of sectoral growth contributions to employment (here growth of DE) it is tricky to identify such contributions empirically. For one thing, such identification requires data which allow one to distinguish jobs by quality. It also, in practical terms, requires that one settle, somewhat arbitrarily, on a dividing line between decent jobs and ones falling short of that. It is hard to get much out of the international literature since few authors tell the story on employment and wages (or other working conditions) simultaneously and link it with growth. It can in principle be done whenever there are household surveys with data on both variables together, but seldom is.

Additionally, the information gap with respect to who saves and where those savings wind up is serious in most countries and the gap of understanding about the process of technological change is even larger. It is thus difficult to sue microeconomic or sectoral data to get a reasonable quantitative feel for sectoral contributions. This limitation notwithstanding, there are some plausible hypotheses and some persuasive bodies of information.

Given that we want to get a better reading not only on how important manufacturing as a whole may be in the growth process but also whether certain services make comparable or larger contributions, it is important to get below the manufacturing umbrella and get at the features of narrower categories within manufacturing which are more or less growth promoting. It would be ideal to wind up with a list of features which would allow us to assess or predict the growth contribution of any type of activity, features that would give much more meaningful distinctions than that between manufacturing and services.

In doing this we would want to bear in mind aspects like firm size, presence or absence of foreign capital, dependence on the public sector for new technology and the performance of the latter, etc. Firm size may be especially important in understanding the technological change contribution. At the one end of a spectrum we have the Schumpeterian proposition that big firms do it (and of course lots of empirical evidence for that in industrial countries) but at the other end of the spectrum we have the view that much of the technology that they develop is inappropriate.

We expect some overlap between output growth driver sectors and ones which stimulate DE but how much remains to be seen. Most of the thinking thus far has involved the variable output. Presumably what we would like to have is a nice picture of what makes a sector an output growth driver, and what makes it a 'decent

employment' growth driver and what makes it an employed driver, quality of job disregarded. A first useful distinction is according to whether the growth generated occurs in capital or in labour intensive sectors.

Any sector which tends to run with excess capacity will seldom constitute an immediate drag on the growth of other sectors, so this may sometimes be true of commerce, (monopolistically competitive) or any sector in the throes of an oligopolistic sieving out of firms as oligopistic concentration proceeds will have lots of excess capacity (part of the competitive strategy) and will therefore not show up as a drag on other sectors. But when factors like these are at work, long run pull effects may be totally disguised by short run relationships.

In some sectors output is easier to measure than in others. Where price changes are disguised because we can only measure income changes this could be a problem.

2 Does manufacturing activity play an especially positive role in economic development, and if so how and when?

There are a variety of specific hypotheses suggesting a special growth role for manufacturing; in some cases manufacturing is part of a wider group of sectors with some special positive feature. These include:

- i. Technological change is fostered by a strong manufacturing sector, e.g. one with development of machinery industries (argued, *inter alia*, for China by Rawski, 1975, 1980). A proponent of this view is Bruton (1987, 1997). In arguing the importance of an advancing 'indigenous technology' he notes the importance of the role of the capital goods sector (1987, 256) and the increasingly accepted view that such a sector is important to economic development. One benefit of local production is the greater information about the local buyers' needs. The nature of the contribution hypothesised varies across authors. And the benefits may overlap with the special benefits that Summers and others have claimed to find for investment in machinery and equipment (vs. investment in construction and other types of capital). Here the argument is that it is machinery and equipment that leads most directly and strongly to output growth, based on empirical evidence.

Related questions:

- a. Is the manufacturing- growth relationship similar for follower countries as it was for leader countries? Does it depend on which machinery is still being imported and which produced domestically?
- b. Presumably the benefits in question relate more to some branches of manufacturing and less to others.
- c. What is the impact of FDI, i.e. manufacturing activities carried out by foreign firms?
- d. Does the payoff depend on selling the goods in the domestic market (embodied technological change) or does it accrue even if they are sold abroad?
- e. Does the character of manufacturing development affect the degree of adoption of appropriate vs. inappropriate technology? Is there any link here?

Likely there are no general answers to questions such as these but rather qualified and variegated ones.

Each of these questions may relate somewhat differently to the output variable vs. the employment variable. The development of indigenous technological capacity (Ranis, 1984) would be expected to have a greater impact on the more traditional and labour-intensive industries than on modern ones, where the technology is more likely to be borrowed directly from abroad. In any case, relevant information on a country's capital goods sector/indigenous technological capacity would include which sectors of the economy rely on locally-produced capital goods² and can interact closely with the suppliers in the design of or changes to those capital goods, and which groups of firms within those sectors (e.g. can smaller firms access design changes as well as larger ones?). The interface between a capital goods sector and export activity is also of interest. Exporters can often get information costlessly from buyers, as witness the case of Korea (Dahlman, Ross-Larson and Westphal, 1987), where firms were able to make a series of minor technological changes which do added up to large cost savings and improved quality, but were done by Korean-owned and operated activities.

A sometimes important aspect of the employment implications of technological change is the nature of links between larger and smaller firms in the same or similar industries. One natural source of equipment for smaller firms is the large ones in the same countries, since the former normally use older vintage equipment and prefer or are willing to do with used equipment because of cost advantages and lower risk attached. Nelson's (1982) model of technological diffusion assumes that technology flows with reasonable freedom from the newer vintage technology users to the older vintage ones.³ Colombia's textile industry has at times exemplified both this pattern and its opposite (Cortes et al, 1987).

At times large firms provided former workers with older weaving equipment for which they had no further use. At other times they destroyed these machines to make sure that they did not get into the used machinery market. Which route they took depended mainly on the degree of direct competition they expected from the smaller firms. One advantage of export activities and the relatively price-elastic demand faced by producers is that this strengthens the complementarity between larger and smaller firms and weakens the importance of their competition in a smallish domestic market. In a country like South Africa, with a strong modern sector, the mechanisms linking technology there and in the rest of the economy are clearly important; which of the Colombian outcomes is it closer to?

An important policy issue-related to technology is how to maximise the flow of better techniques to the non-frontier firms in the economy, by finding ways to facilitate the flow and ways to prevent those agents who wish to slow it from doing so. Brazil's SEBRAE (the institution providing assistance to smaller firms) has been a pioneer in encouraging such links through subcontracting, a common channel of transmission.

A capacity to produce capital goods often shades into capacity to repair and often grows out of that capacity, which in many countries tends to be developed during import substitution; both are often carried out by relatively small firms. In a case like

² The effect in question might not require national production of the capital goods, but rather production by suppliers not too distant either in distance or in technological focus from the buyers. Thus neighboring developing countries might supply each other's needs effectively, as Argentina and Brazil for example appear to do in adjacent zones of the two countries.

³ For a more complete treatment of the process of technological change, see Nelson and Winter (1982).

Taiwan, SMEs produced capital goods for SME buyers, with labour intensity relatively high on both sides of this trade. Repair activities often evolve into production of capital goods. Either production or importation of machinery can help to generate repair activities.

There is no doubt of the importance of technological change in growth. And there is equally little doubt that for good employment creation it must be the case that labour intensive activities (at least labour-intensive enough to provide good jobs for all) generally dominate in the economy or a significant part of it. Whether this is the case is likely to depend on the rate of technological progress in small and medium-sized firms using less modern technology. If this group loses its competitive position, which it will tend to do if its rate of technological advance is too far below that of the larger more modern sector, then the economy's structure will tend to an increasing dualism with the bulk of capital but a minority of employment in the more modern sector and with the bulk of workers engaged in low productivity generally informal sector production. Though much technological advance in SME firms as well as in larger ones will be labour-displacing in that it will raise labour productivity, it can be employment enhancing if it increases the market share of these firms, especially if it can do so at the expense of large more capital-intensive firms.

The degree to which manufacturing plays a special role in economy-wide productivity change through technological advance has been somewhat controversial. Most authors have assigned this sector, and especially the machinery and equipment part of it, a special role. But this view has been challenged, at least in the context of American economic history by Wright (1990) and others, who make the case that the mining sector was the locus of much technological change. Now, with the information revolution underway, it is natural to speculate that part of the service sector is increasingly at the centre of overall technological change. More generally, an important question is how the credit for improving technology should be shared between the using or buying industry and the providing or supplying industry.

- ii. Savings and investment is particularly fostered by manufacturing. Galenson & Leibenstein (1955) made this argument for large manufacturing firms in the 1960s. It has roots in the idea that manufacturing is a particularly entrepreneurial or 'capitalist' sector, hence more likely to save a lot and invest a lot from a given level of earnings. Anyway, whatever the theory, if it is empirically the case that this sector generates a level of savings disproportionate to its value added, that is a plus. As with technology changes, it matters which types of firms make this sort of savings contribution, as between those whose inclination is to invest in very capital-intensive technologies and those with the opposite tendency. Thus savings by firm size matters.
- iii. Production units are on average bigger in manufacturing and a higher share of investment is up front (fixed) so investment is on average riskier. When it occurs it is fairly routine for the expansion of complementary services to take place.
- iv. There may be greater potential for a strong growth dynamic in manufacturing because of a combination of tradability-- a feature of market areas where big increases in output can be accommodated, and elasticity of supply. Thus a special feature of manufacturing (and other tradables) may be that an increase in production strongly invites both further growth in the same sector as well as increased activity in commerce, finance and related services (in the sense of increasing the demand for these services). An increase in capacity in commerce may not so strongly invite more output of tradables like manufacturing. Clearly this is a matter of degree and no one would doubt that the information revolution

has induced more output of tradable by lowering costs of commerce. Whether it is the highly price elastic demand for a country's (or a region's) export products or the also large demand to which domestic producers get quick access when a market is protected and imports sharply reduced, the demand increase is greater than can be expected for any good or service which is not tradable and whose demand thus tends to increase gradually with domestic incomes. Since manufacturing is more tradable on average than the tertiary activities, this would mean that growth of manufacturing would more often be in a position to occur rapidly and to spur growth more generally through its spin-off or linkage effects. This growth mechanism comes into play most strongly when a country is suffering excess capacity. That excess can be most easily diminished by recourse to the export market, but this recourse is limited in the first instance to tradables. In nearly all of the growth acceleration experiences studied in Berry (2005) manufacturing was prominent among the fast growing sectors, though its precise role varied from case to case (see below). A key aspect of growth accelerations and of fast growth in general appears to lie in the way that it reduces perceived risks of 'followers', those who invest or upgrade technology because they see this paying off for others. This exemplifies Hirschman's idea that it is important to stretch the usually scarce entrepreneurial skills in developing countries. In an already rapidly growing economy there is both the perception of low risk if one invests in the fast growing sector but also lowered risk from investment in general since demand for all sorts of goods and services is rising fast. The combination of tradability and elastic supply in a given sector can trigger growth acceleration, and fast growth can be perpetuated by successful imitation and the general risk reduction brought by fast growth.

- v. Related to the previous point is the idea that the potential for learning how to produce more efficiently shows up differently in the case of tradables and non-tradables. The main strand of protectionist thinking involves the idea that a country needs to learn-by-doing in order to reach its potential. With non-tradables a country always has to produce them so up to a point the potential for learning is always there and there are no competing countries hoping one does not learn to produce better.
- vi. Manufacturing is less often monopolistically competitive than parts of the tertiary sector, with the result that the economy-wide gains from expansion more closely approximate the private gains than in those tertiary activities. Thus retail commerce sometimes has the feature that increased sales by one enterprise are nearly matched by decreased sales from another. The distinction may not be between manufacturing and services but between certain categories of each and certain other categories.
- vii. Manufacturing output may be especially growth promoting when it is currently underrepresented in output composition and there is high complementarity on the output side between it and other sectors.

While all of these possible mechanisms should be kept in mind as one addresses the question of manufacturing's importance as a sector, it will not be easy (or perhaps feasible at all in some cases) to get very far quickly in sorting out which ones are at play. In all cases a focus on manufacturing invites distinction among branches of manufacturing according to their features, and this in turn allows one to generalise as to what features are growth-promoting in some general sense and thereby to hone in on such sectors within the service category.

Most of the above-cited characteristics fall in the category of dynamic facets or mechanisms linking manufacturing and overall growth. There is also an essentially static aspect of the link between the size of the manufacturing sector and level of GDP, one related to how much of the sector is internationally competitive.

3 How to study manufacturing's role in growth

There are two broad and complementary approaches to probing manufacturing's potential role (or that of any other sector or group of firms) in a healthy output and employment growth process. One is the microeconomic route of trying to identify and quantify special mechanisms generating growth benefits: demand linkages to other sectors, technological contributions to other sectors, etc. Here knowing a lot about sectoral and industry characteristics (e.g. savings rates⁴). At the other extreme one can study the aggregate manufacturing-growth relationship using statistical or econometric techniques without necessarily trying to get inside the black box to understand the mechanisms. There are various in between levels, in the sense that one can be studying more or less disaggregated sectors and at very specific mechanisms or groups of mechanisms, etc.

Each of these approaches can be utilised in South Africa and elsewhere, with the experience from the latter requiring, as always, to be carefully interpreted for relevance to South Africa. Among other countries, the experience of those with structural similarities to South Africa is more likely to be relevant than that of others. For this reason it is of special interest to look at the experiences of mineral-dependent economies, of dualistic economies, and of highly inequalitarian countries (although there is considerable overlap among these groups) since SA evinces all of these features.

One also wants to distinguish among manufacturing sectors since some may be growth drivers and others not, or some may be growth drivers under some circumstances but not under other circumstances. Thus the machinery sector may be very important when a country is fairly closed, since its efficiency then determines the price of capital goods, but unimportant in economies with enough primary exports to import the needed capital goods. Its presence could be most negative if it has to be heavily protected with the result that capital goods are expensive in the economy, thus reducing the amount of real investment which can be financed with a given level of savings. Sometimes the high price is due to high costs (inefficiency) and sometimes to market power (often the case with cement, for example). Its effect will be most positive when it is not only price competitive with imports but provides advantages of proximity to and response to local needs. The value of capital goods to the buyer often depends on the availability of good advice and assistance from the seller. Frequently local suppliers can make useful alterations to the design of machines that raises their productivity locally. Thus a small Colombia producer of agricultural machinery was able to adapt imported designs to the local soil and other conditions and thereby raise their usefulness.

⁴ Which are probably more important than investment rates as long as the capital market works decently, although investing when the opportunity is there is of course important too so a sector could make a special contribution through its entrepreneurial level which facilitated investment.

Finally, in considering the import of the manufacturing sector for decent employment it is important to keep firm size issues in mind, both because in general size is related to technology and through that, among other things, to labour intensity, but also because the capital goods needs of firms tend to vary with their size—whether firms in the manufacturing sector itself or in other parts of the economy. Unless a country's machinery-producing industries are quite developed and sophisticated, larger firms tend to import most of their machinery and equipment (though in part this has often been due to their favoured position vis à vis access to rationed foreign exchange). Smaller firms, in search of simpler (often older-vintage) machinery and equipment can more often be supplied domestically. These firms are also more likely to rely on used machinery, often put on the market by larger firms which are moving to newer vintage technologies or simply do not want to deal with the repair costs of aging machinery. Sometimes the used machinery is imported, and a country that has firms specialised in importing and adapting and servicing used machinery and equipment has an advantage in fostering the SME sector with its sometimes impressive potential for employment creation.

The upshot of the above is that in assessing the contribution of a country's manufacturing sector to its growth and employment creation, it is important to understand the investment process and activities of the various sectors of the economy in order to judge where the capital goods related components of manufacturing fits into that investment process.

4 Empirical analysis / evidence

The discussion which follows constitutes a selective look at some of the evidence relevant to whether and when manufacturing plays a special role in growth of output and employment, with reference to several different settings within which manufacturing's role is played out.

Note first that the role of manufacturing varies greatly by type of developing country. One stylised fact about the process of economic development is that the employment and output shares of manufacturing tend to rise with per capita income, as that of agriculture falls. Later, services take over the largest sector and manufacturing's share may shrink; in fact its employment share has done so with great frequency over the last couple of decades (Palma, 2005). But these patterns are very much the average and there is considerable variation around that average trajectory. In any case this over time pattern provides little direct evidence on the extent to which manufacturing provides a growth motor, since the observed pattern could reflect no more than changing composition of desired consumption as income rises. A more interesting type of evidence relates to the sector's role in fast overall economic growth, when investment is typically high and technological change usually rapid. When trade allows the pattern of production to diverge considerably from that of absorption, it is possible to sort out somewhat better which changes are due to the preference system and which to other factors.

4.1 Manufacturing tradables booms

Manufacturing's role in growth may be expected to vary greatly according to whether it is a sector of comparative advantage or not. Most developing countries have primary products as their comparative advantage, at least in the early stages of development, i.e. either agricultural products or minerals. Most of the fastest growers of the last several decades, however, have been countries with a comparative advantage in manufactures, and when, as is usually the case, most of the exports are labour-intensive, the impact on employment and income distribution is quite positive. Such countries, beginning with Japan and the East Asian tigers, have achieved higher rates of growth than most other developing countries. This is presumably due in part to the more price elastic and stable demand for these exports than for most 'commodities', but also to their potentially more elastic supply. Thus a country is typically not highly constrained by limited demand for exports and, as long as the savings can be made available, can also expand capital stock and output quite rapidly.

Exporters of commodities, on the other hand, typically face inelastic demand and usually inelastic supply as well. So commodity export booms tend to run out, together with the overall growth they have stimulated. In short, manufacturing plays the pivotal role in a set of highly successful countries. Most of the cases of dramatic manufacturing export growth have also been exporters of light (labour-intensive) products so the employment effects have also been very favourable. Taiwan is the classic case of growth with equity on the basis of light exports after an agrarian reform which was followed by fast growth of agriculture and non-agricultural rural small enterprise. This gradually evolved into or was replaced by a strong urban SME sector with considerable capacity to export directly. Korea's story is similar in some respects but in this case the initial structure of manufacturing was much more large-firm based and the initial export surge, albeit of relatively labour-intensive goods, came from these large firms (Berry, 1997).

In the mid-1970s, however, both economic and political/policy pressure encouraged these mainly vertically integrated firms to subcontract more output to SMEs, a trend which increased the overall labour-intensity of the export activity and helped to raise employment and bring inequality in Korea down (Nugent, 1991). Because labour-intensive industries tended to be made up of smaller scale firms than are capital intensive ones, the total difference in employment created per unit of capital vis a vis large-scale capital intensive ones can be quite large, reflecting basic differences in technology and differences in firm size.

Taiwan and Korea can thus be viewed as the ideal types of light manufacturing exporting countries and they got great benefits from this capacity. Taiwan became the classic case of a developing economy driven by the dynamism and efficiency of its small and medium firms, with exceptionally positive outcomes on the employment and income distribution fronts. Korea, which started its industrialisation push on the basis of large, vertically integrated firms and was therefore initially less successful in employment creation, demonstrated that a country can, with the help of policy, evolve away from that model to one where SMEs play a much larger role.

Not all developing countries could take one or the other of these routes, even if they wanted to; both countries were able to take advantage of relatively deep endowments of human capital, rapidly growing world markets, and various types of support provided by the US for geopolitical reasons. Still, many lessons of general relevance can be learned from their experiences. In both cases, but especially Taiwan, an impressive apparatus was built up to encourage productivity growth and competitiveness in the SME sector (Lall, 1996); given its dominance this was pivotal

for overall economic growth. Korea, though somewhat less focussed on SMEs, also provides a rather impressive array of services to these firms (Kim and Nugent, 1999).⁵

Consistent with the view that technological improvement is key to growth, these two countries have been notable for their high spending on research and development, at 2.7% for Korea (1995) and 1.7% for Taiwan (1993) (Lall, 2001, 288). In Korea, with the still notable role of large firms, over 80% of R&D is financed by the private sector whereas in Taiwan, with the dominant role of SMEs, more than half comes from the government.⁶

The more general role of SMEs in manufacturing success stories

Because in most developing economies the majority of employment in non-agriculture is found outside the realm of large private firms and the public sector, the SME sector is important to success. Where it does not do well, the employment structure tends to become bimodal with the minority of workers in the large private plus public sector, with good wages and working conditions and the majority in the informal sector usually with low wage and less attractive working conditions. For the SME sector within manufacturing to play its role well must achieve the continuous productivity increase needed to support continuous wage increases.

In cases like Taiwan it is easy to understand that such progress would occur, given the attention directed to it by the government. In other countries the story is normally less positive. Still, the measured growth of factor productivity in the SME is often reasonably high. During Colombia's SME (and overall economic) boom from the late 1960s to the early 1980s, labour productivity rose by a little under 2% per year in this sector, a little less than that in large-scale manufacturing (about 2.5%) (Cortes et al, 1987, 47).

In Indonesia over 1975-96, the figure rose by 1.5% for large firms, 0.3% for medium-sized ones (20-99 workers) and 1.7% for small ones (5-19 workers). (Berry et al, 2001, 365). One may presume, and there is a reasonable amount of empirical evidence in support, that there is a considerable amount of trickle down of technological improvement with the purchase of used machinery, through the process of subcontracting, and so on. Where labour productivity does not increase nearly as fast as in larger firms, it would be expected that the SME sector would shrink relatively, unless it is concentrated in niches where competition from both larger firms and imports is not strong.

Since manufacturing usually accounts for only 5-20% of the labour force in developing countries, the employment implications of a strong SME component of the manufacturing sector would be limited if this component's links with the rest of the economy were no different from those of larger manufacturing firms or the public sector. There is, however, some presumption that large firms in a given sector tend to interact disproportionately with large firms in other sectors and smaller ones with

⁵ In a somewhat different context, Finland has performed impressively in supporting its SMEs and getting the resulting employment benefits.

⁶ For many industrial countries this ratio falls within the range 2.4% (USA, 1995) to 3.0% (Japan, 1995) while in most developing countries it falls below 1% (Lall, 2001, 288). Although the figures are not broken down by sector, it is reasonable to assume that a high share of R&D involves the manufacturing sector and that high overall figures imply high figures for that sector.

smaller ones. Little empirical data is available on the extent of this pattern, but considerable anecdotal evidence suggests that it may be fairly systematic. If so, the employment multiplier effect of growth occurring in manufacturing SMEs may be considerably greater than that accompanying growth of large manufacturing firms.

4.2 Manufacturing in minerals-dependent or 'natural curse' countries

In minerals-dependent economies (or others heavily dependent on natural resource-based exports) one would expect the share of manufacturing output and employment to be lower than it would otherwise have been, and might also expect manufacturing to play a significant role in the diminution of that dependency, with a need for especially astute policy to achieve the transition. When agricultural or mineral products provide a country's comparative advantage, the role of manufacturing is of course proportionately less; and that role is also more controversial. The frequency of the natural resource curse (Auty, 2001), with its central theme that the focus on certain natural resource exports tends to backfire in the form of slow growth, suggests that either agriculture or manufacturing or both need to be protected, supported and developed more than is likely to occur under the sole influence of market forces. Views vary as to which sector is excessively shrunken in such cases, as the primary export grows; the answer depends no doubt also on the country's precise economic structure.

Broadly speaking, however, the natural resource curse and Dutch disease literatures can be taken as provided support for the view that manufacturing often should have played a more important role than in fact it has in many of these countries. Sachs and Warner (2001), among others, emphasise the possible crowding out of manufacturing activity, which may be particularly growth-promoting because of its links to technological change. As they note, a complete answer on the natural resource curse awaits a complete answer on what it hurts to have crowded out.

Their interpretation is clearly consistent with the marked correlation between growth and reliance on manufacturing exports since the 1970s (Woolcock et al, 2001) and with the fact that, among countries relying on natural resource exports, a number of rather successful experiences (like Indonesia, Ecuador and other countries) have involved protection of manufacturing during mineral export booms. Is learning by doing a close function just of manufacturing, as Sachs and Warner assume or not, as de Ferranti et al argue for the US? Wright (2001) contends that it is the nature of the learning process that really matters. What is being produced matters less than how it is produced and what sort of accumulation process is being applied to what the economy produces.

Some hypothesis on the role of manufacturing in minerals-dependent countries can be gleaned from the experiences of the four minerals exporters studied in detail elsewhere – Chile, Nigeria, Indonesia, and Venezuela (Berry, 2006). To begin with the least successful case of the four, Nigeria, the story is one in which manufacturing never got off the ground in the sense of getting close to the world average share of employment in that sector – around 13-14%. By 1986 only 48% of the classified labour force was still in agriculture (down from over 70% at mid-century), with manufacturing's share sitting at a paltry 4.4%, commerce et al up to 25.0 and services to 15.3%. In manufacturing only 18.2% of the employed were paid and in commerce et al (dominated by women) the share was just 2.9%.

In terms of employment structure, Nigeria thus urbanised in a very 'informal' way—few paid jobs appear to have been available outside government. And employment was strongly skewed towards commerce, as reflected in the ratio of about six jobs in the commerce et al sector for every one in manufacturing, far above the normal range of about 0.7 to 1.5 or so. Nigeria's case was one in which manufacturing employment was low as the oil boom hit in the 1970s and stayed low. Commerce absorbed much of the labour supply which might under other circumstances have gone to manufacturing. Like the other oil countries, Nigeria has since that time had periods of faster and of slower growth, related to the price of oil, but the average over 1970-2001 was just 2.9%, not much above population growth and manufacturing has remained an insignificant employer.

In Venezuela the manufacturing share of employment appears to have been markedly higher (at about 9-10%) at the beginning of that country's oil-based growth (in the 1920s) than at the corresponding point in Nigeria and it then followed a rising trajectory to hit a peak at 16-17% by 1977. After this, however, as Venezuela entered its quarter-century of stagnation, the share dipped back down to under 15% by 2000. A major policy mistake was to invest in large, capital intensive public enterprises in industries related to oil. In the event Venezuela was not competitive in these activities, but did waste a large amount of resources in them while creating very few jobs and draining fiscal resources which would have been better used elsewhere. Similar patterns have characterised many other minerals-dependent countries. In all such cases the attempt to foster certain manufacturing activities becomes an Achilles heel which stunts overall growth.

Chile, in contrast to Nigerian and Venezuela, did achieve a painful (in terms of how long it took and the increase in income inequality which seems to have accompanied it) but ultimately successful exit from extreme minerals-dependency. The share of manufacturing in total employment had risen with the minerals-based growth to reach a relatively high 18% in 1987. Then, during the break-out boom of 1987-2003 this share fell to 13.3%; even though output was rising at about 6% per year, labour productivity was rising very fast at 5%, as were manufactured exports – growing at 15% per year over 1970-98 and reaching 14% of total exports by 1998. Indonesia featured a low share of employment in manufacturing as of the 1950s with this share rising fairly smoothly to reach 11.3% by 1997.

The experiences of these four countries, taken together, give some general support to the view that manufacturing employment is correlated with overall economic success. Venezuela's slipping from its good growth performance over a half century to its quarter century of stagnation was accompanied by a decline in the share of employment found in manufacturing whereas its earlier success involved a relatively high share in that sector. Nigeria's never getting on a sustained growth path was accompanied by a failure of the manufacturing share to ever reach a moderate level (of, say, 10%). In the other two cases the manufacturing share of employment was relatively high in Chile, though it did fall during the fast growth period as labour productivity rose dramatically, and rising from an originally low base in Indonesia.

4.3 The general experience: the role of manufacturing in overall growth

Many developing countries are neither excessively dependent on minerals nor other exports that create very few jobs nor major exporters of manufactures. What role has manufacturing played in such countries, most of which followed an import

substitution strategy of development over much of the post World War II period until the shift towards liberalisation in the last couple of decades, with that import protection focussed mainly on manufacturing? Some import substitutors have, of course, graduated to become major manufacturing exporters; in those cases the issue applies to their pre-manufacturing export phase. For this broad category there appears in general to have been a positive correlation between manufacturing growth and both total economic growth and non-manufacturing growth.

The difficulty in drawing meaningful conclusions from this correlation is that it could be the result of a variety of mechanisms, some implying that manufacturing was acting as a growth driver through one or more of the mechanisms discussed above but it might also be due to other mechanisms. For example, a frequent causal process has seen strong commodity prices lead to large foreign exchange revenues that then provide the funds to import machinery for the manufacturing sector. This process does not imply that manufacturing is acting as a growth driver.

As many authors have noted, the record of this import substituting industrialisation process has been mixed. In East Asia it preceded and is generally recognised to have contributed to the subsequent success as manufactured exporters. In Latin America growth was not at the East Asian levels but was a healthy 5.5% over 1950-80, with the best performances coming from larger countries (Brazil, Mexico, and Colombia) which did for the most part pursue the ISI strategy vigorously. Africa's growth was slow, but this could hardly be blamed on import substitution since it could be argued (Riddell, 1990, 38) that it was never really tried there. On the other hand, there were some clear failures as countries pursued this strategy and a number of identifiable weaknesses as time went on.

Bruton (1998) argues persuasively that the ISI strategy of pushing manufacturing by building up industries in the areas where the country had previously done considerable importing, but in the way it was applied. Similarly, he argues that the subsequently favoured outward orientation was also inadequate by itself to foster long-run growth. "...but once the leapfrog process is recognised as not possible, some form of protection for learning is necessary..." The key is to "design protection measures that induce learning rather than easy life" (Bruton, 1998, 930-931).

Linder's (1961) argument that goods must be sold domestically before being exported is, in this view, still generally applicable, though TNCs can in some cases substitute for the local accumulation of technological capacity and skills. In one extension of the proposition that competence begins with sales to the domestic market, it is sometimes noted that exports also begin with neighbouring (usually developing) countries before it is possible to move into more distant and demanding industrial country markets.

For manufacturing export success to provide the route to development learning is again the key. Some of the channels are relatively easy and straightforward; buyers often supply much of the needed assistance to allow national exporters to raise productivity and competitiveness. This may be especially true for smaller firms. In the light of this focus on learning and improving technologies the experience of Korea and Taiwan has a somewhat different interpretation from that often posited. Under Japan's colonial rule there was a big increase in physical and human capital. As the region became a source of supply for Japan's war effort, support was provided for the development of manufacturing, workers were trained, including at most levels of management and much knowledge transferred. South Korea's eventual president, General Park, studied in Manchuria when it was under Japanese control and learned the lessons of the Japanese state's involvement in the development process.

The experience of Latin America since 1980 suggests a process of widening productivity gaps among firms (for example, between larger and smaller ones) in the wake of trade liberalisation, with this process presumably being one of the factors underlying the increasing share of informal employment and the increases in income inequality (Stallings and Perez, 2000).⁷

The issue is thus not one of markets vs. governments or of inward vs. outward orientation, but rather of learning or not learning, engaging in continual technological upgrading or not doing so. "Minimal government" and "market friendly" are not illuminating notions..." "That some governments are deadly, that many are inept and uncaring is widely recognised, but there is much that only government can do." (Bruton, 1998, 931). Because the state's role is so important, learning is crucial for governments well as for firms and households. A matter of much controversy in recent decades is whether and what sort of 'industrial policy' a country should have. The issue relates mainly to its production of tradables, since in it is in connection with them that trade policy has typically been such an important tool of industrial policy, and that typically to the benefit of the manufacturing sector, or at least part of it. This too is something of a red herring. If a government has reasonable competence, it needs something of an industrial policy; it must provide various types of support to the private sector and not all of these can be sector neutral in character (Lall and Teubal, 1998)

It is true, though, that if a government is sufficiently incompetent and/or corrupt, it may be true that the less it does beyond the bare essentials the better. But the country should not expect a very successful development experience.

5 Generalising from manufacturing

Even though confirming econometric evidence appears not to be very strong, there seems no reason to doubt that in many countries a part of the manufacturing sector has been a driver of growth. The lack of the aggregate evidence relates in part to the difficulty of ruling out alternative hypotheses on the basis of statistical tests and in part on the infrequency of such tests.⁸ But much microeconomic evidence does attest to the technological progress within manufacturing sectors and the nature of much learning suggests that there be considerable spillover to other sectors. This spillover may be direct, as where manufacturing develops and produces machinery and

⁷ Trade openness and other aspects of industrial policy have also been linked in various ways to employment and inequality outcomes. A reasonable presumption during periods of import substituting industrialization was that, since protection usually went to relatively capital intensive and technologically sophisticated industries, its impact would be to worsen income distribution. This proposition was hard to test directly with inequality data since the policy usually did not change rapidly enough for it to be reasonable to expect to see the outcome in the inequality data. The relatively rapid trade opening in many countries at some point over the last two or three decades has provided a better laboratory test of this relationship and contrary to many predictions, inequality has typically increased in the wake of such liberalisation. It is, however, hard to know whether this was due to the trade component of liberalization packages, to other components, or to totally separate casual factors.

⁸ In one potentially interesting effort by Dasgupta and Singh (2005), the methodology is unclear and the results therefore unpersuasive.

equipment which raises productivity in other sectors⁹, or indirect, as where the accumulation of people with the skills to innovate, adapt and otherwise improve available technologies helps those other sectors when they draw on such skills themselves.

The reasonably high marginal output-capital ratios of most countries achieving fast growth episodes (Berry, 2005) also support the existence of these sorts of contribution. Nearly all of the growth acceleration success stories of the last half century have relied on strong industrial policies, and most have focussed much of that policy attention on manufacturing. This includes China, India, Korea, Indonesia, Malaysia and others. Such evidence is clearly consistent with the idea that manufacturing plays a special role in rapid development, though *per se* it falls short of proving it or clarifying the mechanisms. Fast economic growth, usually at least accompanied by if not based on manufacturing growth, generates high profits which lead to high savings and investment. And much government learning of how to manage and promote technology change and strong growth, generally, has been achieved in working with the manufacturing sector.

The relative role of manufacturing in growth promotion may have fallen in most countries over the last couple of decades. This might be suggested by the fact that the share of manufacturing output has fallen or levelled off in many countries after a general and often strong upward trend over 1960-80 (Dasgupta and Singh, 2005, 1039) while the employment share has also tended to fall, sometimes more drastically (Palma, 2005, Table 1). In the European Union countries, at least, the combination of a slowing of output growth and a widening of the productivity growth gap vis a vis services led to the big decrease in manufacturing's employment share. Something similar may have happened in much of the developing world as well. This leaves a puzzle: even if the output and employment shares are behaving less positively than before, if sectoral labour productivity has been rising sharply, may this not suggest as fast or faster development and/or adoption of better technologies than before. The possibility is there, though the experience of Latin America suggests that the productivity growth has been uneven and hence not positive for employment creation.

A related question is the extent to which TNCs, now increasingly involved in manufacturing in developing countries will serve as a good mechanism of technology diffusion. Perhaps the main reason to suppose that manufacturing's role as growth driver has fallen is the Information Revolution, which appears to be as capable of raising productivity in many service sectors as it is in manufacturing and whose spread clearly depends on various services.

Regardless of the answer to whether manufacturing's relative role as growth driver has changed significantly or not, it seems safe to conclude that a considerable amount has been learned about what makes a sector a growth driver during the period of rapid manufacturing growth. Whatever sector can contribute to growth through its role in the advance of technologies, especially that technology favourable to employment creation, deserves the same policy attention as parts of the manufacturing sector have in the past received from those governments really geared to achieving fast and healthy growth.

⁹ One of the key innovations in the East Asian countries was the two-wheeling tractor, of great utility in the smallfarmer agriculture of the region.

Appendix – Methodological complexities in interpreting the empirical sectoral growth evidence

When a clear statistical relationship shows up between manufacturing growth and growth in other sectors it is normally consistent with the proposition that one or more of the features of a 'growth-driver' sector are at work. But it is normally also consistent with many other hypotheses, including that a set of factors outside the manufacturing sector promote growth simultaneously in that sector and in others, and the possibility that growth in other sectors causes that in manufacturing (the direction of causation issue). After one finds a statistical link, whatever it is, then one can start to rule in some hypotheses and to rule out others. One can test for Granger causation, based on the idea that events in the causing sector precede those in the sector where the effects are felt. But the lags between cause and effect can be complicated, there may be serious measurement problems, especially in the services sector, relationships may change over time and differ from country to country, etc. it is likely to require a lot of high quality statistical work before econometric testing provides a great deal of evidence on these issues.

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