



UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION

Inclusive and Sustainable Industrial Development Working Paper Series  
WP 03 | 2015

# TECHNOLOGICAL UPGRADING IN GLOBAL VALUE CHAINS AND CLUSTERS AND THEIR CONTRIBUTION TO SUSTAINING ECONOMIC GROWTH IN LOW AND MIDDLE INCOME ECONOMIES

**RESEARCH, STATISTICS AND INDUSTRIAL POLICY BRANCH**

**WORKING PAPER 3/2015**

**Technological upgrading in global value chains and  
clusters and their contribution to sustaining economic  
growth in low and middle income economies**

Raphael Kaplinsky  
Development Policy and Practice  
Open University  
Science Policy Research Unit  
University of Sussex



**UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION**

**Vienna, 2015**

## **Acknowledgements**

This working paper is part of a collaborative research effort of UNIDO and UNU-MERIT. It has been commissioned as a background paper for the UNIDO Industrial Development Report 2016.

I am grateful to Eddy Szirmai for constructive comments on an earlier draft.

The designations employed, descriptions and classifications of countries, and the presentation of the material in this report do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. The views expressed in this paper do not necessarily reflect the views of the Secretariat of the UNIDO. The responsibility for opinions expressed rests solely with the authors, and publication does not constitute an endorsement by UNIDO. Although great care has been taken to maintain the accuracy of information herein, neither UNIDO nor its member States assume any responsibility for consequences which may arise from the use of the material. Terms such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment. Any indication of, or reference to, a country, institution or other legal entity does not constitute an endorsement. Information contained herein may be freely quoted or reprinted but acknowledgement is requested. This report has been produced without formal United Nations editing.

Á  
Á  
Á  
Á  
Á  
Á  
Á  
Á  
Á  
Á  
Á  
Á  
Á  
Á  
Á

### *Abstract*

*This paper begins with a discussion of the role played by upgrading in the promotion of sustainable growth. Upgrading is discussed in two different contexts, that of industrial clusters and that of global value chains (GVCs). Drawing on global and African experiences, the paper addresses the upgrading agenda required to enable dynamic clusters to meet both domestic needs and progressively also needs in external markets. In the discussion of value chains, the paper distinguishes between vertically specialised and additive GVCs and shows how the upgrading agenda necessarily varies between these two families of GVCs. The paper concludes by briefly discussing two issues. The first is to distinguish between the upgrading agenda which is essential for sustaining economic growth and that which addresses the inclusivity (and thus sustainability) of the growth path. The second addresses the circumstances in which it may be possible to pursue these varied upgrading strategies simultaneously.*

JEL CODEs: O10, O33, F14, F60

Keywords: Global Value Chains, Industrial Clusters, Upgrading, Africa, Additive Value Chains, Vertically Specialised Value Chains

## 1. INTRODUCTION

It is unquestionable that rapid economic growth in many low and middle income economies has significantly reduced the numbers living in absolute poverty in the global economy. However, it is equally evident that despite this progress in aggregate global incomes, there remain very substantial pockets of absolute deprivation.<sup>1</sup> Moreover, notwithstanding a pattern of successful income transfers in some Latin American economies over the past decade (Cornia, 2012), relative poverty in much of the global economy – that is, inequality within economies rather than between global citizens<sup>2</sup> – has increased sharply, not least in the industrialised north.

These developments are increasingly reflected in global policy debates. It is now widely recognised that growth on its own is unlikely to meet the objectives embodied in the soon-to-expire Millennium Development Goals, or those likely to be included in the Sustainable Development Goals now under development. Thus the challenge of delivering inclusive growth is now high on the policy agenda. However, the inclusiveness of growth paths is important not just as a normative end in itself. If growth is not adequately inclusive, it may not be politically and socially sustainable. It is not surprising therefore that there is growing interest in the contribution which industrialisation might make to inclusive and sustainable growth.

The pervasive liberalisation of trade and industrial policy forces global competition into the domestic arena in all economies. Withstanding the potentially immiserising effect of the intense competition, globalisation requires that economies develop the capacity to innovate.<sup>3</sup> But it is not just the capacity to innovate which is required, but to innovate faster than rivals, that is to upgrade.

In this paper we confine the discussion to two elements of the inclusive upgrading policy agenda. The first focuses on those aspects of policy which affect upgrading trajectories within industrial clusters. Here the focus begins with the domestic economy, since most of these clusters arise spontaneously to meet domestic demand. The second policy agenda turns to the patterns of upgrading which are relevant when production is geared to the external market, particularly when production occurs within the framework of global value chains (GVCs).

---

<sup>1</sup> There is considerable confusion on the numbers of people living below the MDG US\$1 a day poverty line following the recalculation of the PPP rates which is currently being undertaken. For example, according to the 2005 PPP rates there were 456m people below \$1 a day in India and 355m in SSA in 1990; using the new 2011 PPP rates, these numbers are estimated to be much lower, at 59 million and 157 million respectively.

<sup>2</sup> Considering global income distribution in terms of countries (that is not taking account of population) leads to an outcome of increasing global inequality. If countries are population-weighted (and particularly if China is considered), global inequality falls even though inequality within China has increased (Milanovic, 2005)

<sup>3</sup> By 'immiserisation' we refer to a situation in which the level of economic activity increases but is associated with falling real incomes.

A number of important observations frame this discussion. First, as observed above, globalisation represents a moving target of competition. Standing still will confine an economy to falling standards of living and hence the capacity to upgrade is critical for achieving sustainable growth, whatever its form. Second, many low- and middle-income economies (as well as some high-income economies such as Australia, Canada and Russia) have benefitted and are likely to continue to benefit from rising resource prices (Dobbs et. al., 2011; Farooki and Kaplinsky, 2012),<sup>4</sup> and this sets an important context for directing policy to achieve greater inclusion. Third, upgrading and the policies required to deliver this outcome, is necessarily contextual. It will vary by the degree and nature of capabilities in the economy, the size of the economy, its resource endowments and its location. It will also of course vary temporally, and at this point in time, economic growth in most economies is heavily influenced by the capacity of producers to insert themselves productively in GVCs. And, finally, and as a consequence of the structure of GVS, the capacity to upgrade is determined as much – and perhaps mostly – by shifts in positioning within sectors rather than in the capacity to diversify into new sectors.

This background paper begins with a discussion of the role played by upgrading in the promotion of sustainable growth (Section 2). Section 3 turns to the upgrading challenge in industrial clusters. Drawing on global and African experience it addresses the upgrading agenda required to enable dynamic clusters to meet both domestic needs and progressively also needs in external markets. In Section 4 the paper turns to GVCs. It distinguishes two families of GVCs – vertically specialised and additive GVCs – and shows how the upgrading agenda necessarily varies between these two families of GVCs. The paper concludes by briefly discussing two issues. The first is to distinguish between the upgrading agenda which is essential for sustaining economic growth and that which addresses the inclusivity (and thus sustainability) of the growth path. The second addresses the circumstances in which it may be possible to pursue these varied upgrading strategies simultaneously.

## 2. RENTS, INNOVATION AND UPGRADING

In *The Wealth of Nations*, Adam Smith postulated that the most important contributor to long-run income growth is the increase in productivity, that is, intensive rather than extensive growth. Smith went on to argue that specialisation and the division of labour provided the key to productivity growth. In turn, "...it is the power of exchanging that gives occasion to the division of labour, so the extent of this division must always be limited by the extent of that power, or, in other words, by the extent of the market" (Smith 1776: 31).

---

<sup>4</sup> The argument that resource prices are likely to remain robust over the medium- to long-term does not mean that individual commodities such as iron ore and coal will not suffer from excess supply.

In Smith's day – and in the case of the small scale and informal sector in many contemporary low and middle income economies - an increase in scale meant trading with neighbouring districts or cities. But now, with sustained and massive advances in communication and information processing technologies, the market is increasingly global. Globalisation provides the scope to gain from scale economies and in so doing, to reap the benefits of specialisation. But larger markets offer a further benefit. Selling into demanding and competitive markets exposes producers to new ways of processing, new capital goods, new customers and new product designs. Given the rapidity of technical progress in highly competitive global markets, the capacity to learn through exporting offers rewarding prospects for economic management and for individual producers.

There are a number of economies and many firms which have managed to grasp the opportunities provided by rapid export growth to achieve sustained income growth. The most prominent examples of economies are those in Asia – initially Japan from the 1950s and 1960s, then the Asian Tigers (Hong Kong, Korea, Singapore and Taiwan) from the 1970s and 1980s, and most recently China after the mid-1980s. This wide-ranging economy-wide success was built on the performance of successful exporting firms such as Toyota (Japan), Samsung (Korea), Acer (Taiwan) and Huawei (China).

However, the *potential* for reaping these different benefits made possible through participating in global markets does not automatically translate into the *reality* of achieving these gains. Consider the experience of the Central American economies in the 1980s and 1990s who sought to promote export and income growth through an expansion of Export Processing Zones (Kaplinsky, 1993). Many firms burnt their fingers in this phase of export expansion. For example, a Dominican Republic assembler of jeans for the US market invested \$150,000 in new equipment in 1989. It began exporting 9,000 jeans a week at a unit price of \$2.18, but in the space of 12 months the quantity and price of these exports fell progressively to 5,000 and \$2.00 and then to 3,000 and \$1.87 respectively. Fourteen months after beginning production, the firm's primary buyer cancelled the contract and the firm was bankrupted. These firm-level developments resulted from macroeconomic policies in the Dominican Republic and in neighbouring countries. They engaged in a progressive round of IMF-World Bank supported competitive devaluations. As surrounding economies devalued their currencies at a greater rate the \$ value of Dominican Republic wages rose above those paid in other regional economies, leading to the bankruptcy of the jeans exporter. Thus, this mode of export growth did not provide for sustainable income growth. Rather, it led either to a fall in the size of the economy as firms and countries were excluded from global markets or for immiserising growth, that is, a process of increasing economic activity with declining real incomes.

What makes the difference between these positive and negative outcomes? The answer lies in the capacity to exploit and generate rents, to appropriate rents and to protect rents. Rent describes an environment of scarcity in the context of demand. The holder of rent benefits from an absence (relative or absolute) of competition, protected by one or more barriers to entry. The more

desired the scarce attribute, and the higher the barriers to entry, the higher are the resultant incomes. If these barriers to entry can be protected, then the resultant incomes are sustainable over time. Where they cannot be protected, the ability to generate new rents ('dynamic rents') provides for sustained growth of production and income. Hence the capacity to benefit from rents on a systematic and dynamic basis provides the key to a gainful insertion into global export markets and for high and growing incomes. Conversely, the inability to generate and appropriate rents subjects the producer to intensifying competition, and hence the prospect of low, and in some cases, falling incomes.

Three primary sources of rent affect income streams.<sup>5</sup> The first are resource rents. These are "gifts of nature" whereby a producer has access to relatively better land or resource deposits than a rival, and where the price of the resource is set by the costs of production of the less well-endowed producer. Examples of such resource rents can be found across the resource sector – particularly fertile agricultural land, high ore-content minerals close to the surface, and low-cost and accessible hydrocarbon deposits.

The second major category of rents are those which are created by producers, increasingly through the systematic application of knowledge to production. Typically these are referred to as "Schumpeterian" (or "innovation") rents. These rents may be generated by developing better production processes than rivals, introducing higher quality or differentiated products or developing forms of organisation which are superior to those utilised by rivals whose costs structures determine final prices. It is helpful to think of these rents as "endogenous rents", that is they are endogenous to the participants involved in the chain of production. In GVC analysis the ability of firms in various links of the chain to create such endogenous rents is understood through the concepts of process, product, and functional upgrading (Humphrey and Schmitz, 2000).

Complementing these endogenous "created" rents are the exogenous rents which are external to the production chain participants, but which influence their capacity to generate rents. Thus compared to rivals in other economies, producers may benefit, for example, from access to better forms of infrastructure, from lower cost and directed financial intermediation, have access to a better trained workforce and to other inputs which affect their capacity to produce effectively.

Whilst these three categories of rent – resource, endogenous and exogenous – are distinct, they are not independent. For example, the capacity of the productive sector to generate and appropriate rents will be a function of the environment in which they operate and the exogenous rents which it provides. Moreover, chain participants are able to influence the policy environment and help to shape the structure of exogenous rents. Similarly, although resource rents are a gift of nature, innovation by chain participants in the search for

---

<sup>5</sup> Since the focus of this discussion is on investment and upgrading, we will not consider a fourth component of rent, that is, the exercise of monopoly power to exclude competitors.



endogenous rents may lower the costs of resource extraction or produce technologies which compensate for low-grade resource deposits (Wright and Czelusta, 2004).

In summary, the inclusive growth and industrialisation challenge lies in the capacity to exploit resource rents, to generate rents through innovations, to protect rents by constructing or taking advantage of barriers to entry and then, finally, to appropriate rents. The capacity to upgrade opens the door to reaping these diverse rents. For many small scale and informal sector enterprises, this rent agenda is acted out in the domestic economy; for larger scale firms, the rent agenda requires engaging with foreign competitors.

We begin with a discussion of upgrading in clusters in Section 3. The reason for focusing on clusters are twofold. First, most (but not all) clusters in low and middle income markets use labour intensive and small scale technologies and meet the needs of domestic and low income consumers. These clusters are thus not only the source of growth, but also of inclusion, particularly since there are few signs that the large scale formal sector enterprises will be able to meet the challenge of creating jobs in economies with very high rates of unemployment. Second, most of these economies suffer from a “missing middle” between small and micro sized enterprises (SMEs) and the large scale formal sector. Dynamic clusters thus provide a stepping stone in the growth trajectory of these economies. But if this dynamism is merely a form of extensive growth – the replication of what exists – it is unlikely that they will deliver sustained and sustainable growth. Hence the capacity to upgrade is a core challenge confronting clusters globally, including in low and middle income economies.

In Section 4 we turn to upgrading in GVCs. As we will see, an increasing proportion of global trade now occurs within the framework of GVCs. But unless producers can insert themselves gainfully into these GVCs they face the prospect of engaging in a race to the bottom. Gainful insertion in GVCs requires the capacity to upgrade.

### 3. UPGRADING IN INDUSTRIAL CLUSTERS

The fastest growing district of Italy during the 1970s was the Emilia Romagna region, which had the country’s highest per capita income. In 1980 the average firm size in the Emilia Romagna region was five employees. Ninety per cent of these firms employed less than 99 workers. During this period, the region experienced very rapid industrialisation – between 1951 and 1971, the share of the population employed in industry rose from 25% to 51%. In 1983 Emilia-Romagna accounted for 10% of Italy’s exports, and had a trade surplus of \$5bn.<sup>6</sup>

---

<sup>6</sup> All data in this paragraph are drawn from Best, 1990: 204-205

One of the striking features of this export success in Italy is that economic sectors were often spontaneously clustered in particular towns. Woollen textile firms concentrated in Prato, ham producers in Parma, ceramics in Sassuolo and ladies footwear in Brenta. Hence, the phrases “clusters” and “industrial districts” were largely synonymous in the Italian context and this ambiguity in nomenclature continues to exist. As a general rule in most countries clusters are generally concentrated sectorally in particular districts. Initially the cluster may begin with the manufacture of the final product, but as it develops, it draws in related suppliers, user firms, business services providers and buyers. (Although in some cases, clusters include firms drawn from a variety of unrelated sectors, for example when the cluster is located in an industrial park, in what follows we refer to clusters as comprising firms from a particular sector and its related industries).

But these industrial districts are not confined to Italy. In the film industry, production is clustered in Hollywood, Bollywood and Nollywood. High-tech firms are clustered in Silicon Valley. In Seattle, specialist software firms operate in the vicinity of Microsoft and firms specialising in new materials are clustered around the Boeing plant. Similar clusters have developed in the electronic games industry in the UK, with regional clusters of capabilities as well as firms in Guildford, Leeds, Brighton and Dundee. In Germany, metalworking and machine tools are clustered in mid-sized “Mittelstand” firms in Bad Wurtenburg and, in France high-tech enterprises are clustered around Sophia Antipolis.

The emergence of these clusters is explained by the presence of external economies. As Alfred Marshall who pioneered our understanding of industrial districts (a synonym for clusters) observed, these external economies were driven by market forces and were an “unintended or incidental by-product of some otherwise legitimate activity” (Marshall, 1919: 221). External economies in cluster development reflect a variety of spillovers. One clear advantage of clustering is the existence of a pool of skilled labour. For example, the electronic games clusters in UK cities are characterised by a large turnover of firms, with high mortality rates. But as some firms die, new ones emerge, drawing on the pool of mobile labour in the environs. Another form of external economy is the existence of a pool of specialised suppliers. This can be widely observed in the auto sector, with component firms clustering around assembly plants such as Toyota City in Japan and (formerly) Michigan in the US. Third, this supply base is often located near a set of advanced Research and Technology Organisations in what is called a ‘National’, ‘Regional’ or ‘Sectoral’ system of innovation. A fourth important source of external economy is that clusters draw buyers to an area, in the knowledge that one amongst the many co-located firms (or indeed shops, in the retail sector) will be able to meet their needs. Finally, where production systems require rapid response (for example, when market demand is customised or is volatile), or involve the transport of bulky materials, the co-location of suppliers and assemblers can reduce inventories and transport costs.

However, notwithstanding the demonstrated contribution of market forces to spontaneous cluster development, detailed examination of the performance of

clusters in an increasingly competitive global economy after the 1970s showed the limits of external economies. It became evident that successful and dynamic clusters could not be sustained if they relied on unintended and accidental external economies alone. For example, how could the small Italian clothing, footwear and furniture firms which dominated global sales meet the needs of buyers purchasing in large volumes? The answer was that these firms operated in *consorzia*, sharing brandnames and showrooms, often agreeing to common designs and dividing large volume orders amongst a large number of small scale suppliers (Piore and Sabel, 1984; Best, 1990). Other forms of cooperation included access to finance. In Modena, Italy, during the 1970s, 3,500 firms participated in a Loan Consortium, providing financial guarantees to members obtaining loans from banks. This not only provided access to finance, but because of low default rates, meant that the costs of loans was 1.5-2% lower than for non-members (Best, 1990: 215).

Thus it became evident that dynamic and sustainable clusters were characterised by what has come to be called “collective efficiency” (Schmitz, 1995a). This involved two phenomena. The first was the external economies which arose as unintended and unplanned consequences of simple agglomeration. As we saw this comprised benefits such as a reservoir of skills, local suppliers and a “magnet” for customers seeking alternative suppliers. The second component of collective efficiency is when firms in the cluster engage in purposeful, planned joint action.

The experience of clusters in the high income economies suggests that successful collective efficiency depends on the degree of trust amongst members. Two elements of trust can be identified from these examples (Humphrey, Kaplinsky and Saraph, 1998). The first is competence trust, the knowledge that members of the cluster have the capabilities to not only meet existing technological and organisational challenges, but in a dynamic and fluid world economy, to also respond to new and often unanticipated technological and organisational challenges. The second form of trust is contractual trust – can the members’ word be depended on, will they adhere to their commitments?

But important as inter-firm cooperation and trust might be, they are generally not enough to ensure a cluster’s survival in a turbulent world. Clusters often also require support from government, whether this be local, regional or national government. In Italy, where government was highly decentralised, during the heyday of its industrial clusters the Emilia Romagna region was dominated by municipal governments. As the clusters increasingly participated in global markets and as technology became increasingly challenging (including as a result of the diffusion of computers), local governments helped sectorally specialised service centres provide training and technological support. In the UK’s new media and computer games sector, local government in Sussex supported the development of a large, and now almost entirely privately-funded support centre, assisting more than 2,000 members with business development, training, accommodation, labour mobility, marketing and other services ([www.wiredsussex.com](http://www.wiredsussex.com)).

## **Cluster Development in Growing Global Markets**

The industrial clusters developed around Birmingham during Britain's industrial revolution (recognised by both Marshall and Marx) served a local market. This was true of most clusters until the advance of globalisation. After the 1960s trade policy reform swept through much of the world economy and the consequent liberalisation challenged clusters in a number of ways. First, as the market widened, they had to learn to meet the demands of alien and distant consumers with whom they were not familiar. Second, they had to produce in much larger volumes, since typically the global buyers who were driving globalisation sought to sell into a variety of markets at the same time. A third challenge increasingly confronting the vibrant clusters of the 1960s and 1970s was the rapid advance of new technologies. This required a shift from artisanal production to semi-automated and automated production. It also vastly increased the knowledge content in production, requiring member firms to become increasingly specialised and to invest in skills, R&D and design. These challenges posed major problems for clusters across sectors, and many of the clusters which had dominated global trade in sectors such as footwear, ceramics, clothing and furniture failed to make the required transitions. The Italian industrial districts which had been the exemplar for industrial districts during the 1980s and 1990s saw a sharp rate of decline (Rabellotti et al., 2009).

The fourth challenge was even more daunting for cluster development. As we will see below, the expansion of the global economy in the last quarter of the twentieth century was largely driven by global value chains. Successful participation in these chains is very demanding and producers have to dance to the tunes of global buyers of final and intermediate products and services. Unless producers can meet these needs, they are excluded from these global value chains. Trust – competence and contract – is just as critical in these vertical global chains as it is in the horizontal industrial clusters. But so, too, is the capacity of individual producers in the chain to wrestle not only with improvements in process and product, but also in their positioning in these global value chains. The upshot of this transition from “horizontal” (i.e. industrial district) to “vertical” (i.e. GVC) allegiances has often placed insuperable pressures on clusters and cluster members, radically altering the policy attraction of promoting industrial clusters in an era of global production and forcing a deep structural reorganisation of their form and structure.

## **Industrial Clusters in Low and Middle-Income Economies**

So much for the dynamic clusters in high income economies. But what of clusters in low and middle income economies? It is widely argued that clusters in low and middle income economies are distinctive from those clusters in the high income economies (Schmitz and Nadvi 2000). These differences take the following forms.

First, many clusters, particularly those in the least developed economies or in localities of great poverty in middle income economies, are essentially survivalist in nature. Unlike the dynamic clusters of Emilia Romagna, the

participants in these clusters have few alternative sources of employment. Hence they engage in petty manufacturing or services, often on an occasional or “casual basis”. These clusters remain essentially static for many years, showing little signs of upgrading or firm development. The second distinguishing feature of the low income clusters is the market which is served. This is overwhelmingly local in nature. The entrepreneurs essentially make the sorts of products which they themselves consume and there is little incentive for product upgrading or for the extended division of labour which, as Adam Smith observed, is a function of the size of the market. Third, and this is a strength of a limited number of these low income clusters, they do have the advantage of providing “riskable”, small steps for improvement. In theory this provides the capacity for SMEs in these economies to fill the “missing middle” between the myriad of small firms and the large, often foreign-owned enterprises which dominate the industrial sector (Schmitz, 1995a). This then raises the possibility of shifting policy from support for SMEs (a widely used policy lever in many economies) to support for industrial clusters in which SMEs participate.

China’s experience with industrial clusters is distinctive in terms of their history, their size, their external orientation and the role played by government. Whilst China has a long history of cluster development (Enright et al., 2005) the recent dynamism of their clusters has been driven by proactive government policies. This policy agenda began in the immediate post-revolutionary period in which Mao Zedong actively promoted clusters as a strategic defence against the possibility of hostile external forces. Building on this experience (although following a very different approach to FDI, technology transfer and market orientation), a series of Special Economic Zones (SEZs) were established, providing tax and other incentives and designed to promote exports through inward FDI and (increasingly) joint ventures between Chinese and foreign owned firms. The first five experimental SEZs were established between 1980 and 1984, a further 14 were created in 1984 and the number has expanded rapidly since then. Support for clustering in general, and SEZs in particular, has not been limited to the central government. Provincial government was also an active participant in cluster development as was city and township government. China’s Township and Village Enterprises (TVEs) were the backbone of its industrial development until the end of the twentieth century.

Initially these clusters concentrated in labour intensive sectors, and although of diminishing relative importance in the economy, they continue to make a major contribution to output, exports and employment. By 2006, in 15 labour intensive industries, there were an estimated 536 clusters, with an average of 923 enterprises, \$620m of sales and 51,883 employees per cluster (Wang and Mei, 2009). Most of these industrial clusters were located in formally constituted SEZs. In total, these SEZs – labour intensive and high-tech - were estimated to account for 22% of China’s GDP and 60% of exports and to have resulted in 30m jobs in 2007. More recently, the SEZs have concentrated on high tech sectors and between 1995 and 2010, these high tech clusters accounted for half of the value of high tech industrial output and one-third of China’s high-tech exports (Zhihua, 2014).

## **African Experience with Clusters<sup>7</sup>**

With more than 50 countries, each with its own history and trajectory, with different ecologies and endowments of natural resources, there is inevitably a range of cluster experience on the African continent. Moreover, unlike the widely documented European and Chinese clusters, the characteristics of most African clusters are poorly recorded. Although it is thus difficult to generalise with any confidence across such a diverse landscape, a review of what is known about African clusters does point to a few general trends.

An extensive search of the English-language academic literature documents, with varying degrees of detail and with different focal points, yielded information on the experience of 25 African clusters (Table 1). These span 9 economies – Egypt, Ethiopia, Ghana, Kenya, Nigeria, Mauritius, South Africa, Tanzania and Uganda. They include clusters in the south, east, west and north of the continent, and both the manufacturing and agricultural sectors. The African cluster experience is considered in relation to the major determinants of cluster dynamics in other regions of the global economy, and with a focus on their capacity to upgrade.

The first consideration is the market for the cluster's output, since the nature of the final market is a primary determinant in the organisation of competitive supply. The second issue considered is the dynamism of the cluster with respect to its growth and upgrading trajectories. Not all clusters are dynamic, and the evidence suggests that static clusters either are survivalist in nature or 'die'. The third is the nature of the external economies which explain why most clusters exist. These are the spillovers between co-located enterprises which are unplanned, in particular with regard to labour and skills, the proximity of suppliers and customers and the extent of specialisation between firms. Beyond unintended external economies lies the possibility of joint action between enterprises, distinguishing in our analysis logistics, marketing and training. Finally, the institutionalisation of support to each of the clusters is assessed. This support may be provided by government, by formal associations developed by the private sector and by parties external to the economy, such as lead firms or aid agencies.

All of these observations are judgements made on the basis of publically available material on the nature and the performance of these 25 clusters. It is not possible to subject these clusters to any form of numerical analysis since each of these clusters has been documented in a different form.

---

<sup>7</sup> This discussion of African clusters is drawn from Kaplinsky and Morris, 2014a

Table 1: Africa's Experience with 25 Clusters

Cluster		End Market	Evidence of Dynamism	External Economies	Collective Action	Forms of Institutional Support
Egypt	Dormiatt Furniture (Domestic)	Local, National	None	Labour supply, availability of suppliers, customer attraction, specialised service providers	None	Cluster/sectoral
	Dormiatt Furniture (Export)	International	Growth, Upgrading	Labour supply, availability of suppliers, customer attraction, specialised service providers	Marketing, Learning, Logistics	External
Ethiopia	Merkato Leather Footwear	Local, National	None	Labour supply, availability of suppliers, customer attraction, specialised service providers	Logistics	Government, Cluster/sectoral, External
	Shiro Meda Handloom	Local, National	None	Labour supply, availability of suppliers, customer attraction	None	External
Ghana	Suame Metalwork	Local	Upgrading	Labour supply, availability of suppliers, customer attraction	None	Government
	Suame Vehicle Repair	Local, Regional	None	Availability of suppliers, customer attraction, specialised service providers	Learning	Government, Cluster/sectoral, External
Kenya	Gikomba Furniture	Local	None	Labour supply, availability of suppliers, specialised service providers	None	None
	Ngong Furniture	Local	Growth	Labour supply, availability of suppliers	None	None
	Kibuye Furniture	Local	None	Labour supply, availability of suppliers, specialised service providers	Logistics	Cluster/sectoral
	Eastland Garment	Local	None	Labour supply, availability of suppliers, customer attraction, specialised service providers	None	None
	Kamukunji Metalwork	Local	None	Availability of suppliers, customer attraction	Marketing, Learning	Government, Cluster/sectoral
	Ziwani Vehicle	Local	Upgrading	Availability of suppliers, customer attraction	Learning	Cluster/sectoral, External
	Lake Victoria Nile Perch	Local, National, International	Growth, Upgrading	Availability of suppliers, customer attraction, specialised service providers	Logistics, Learning	Government, Cluster/sectoral, External
Lake Naivasha Cut Flower	International	Growth, Upgrading	Labour supply, availability of suppliers, customer attraction, specialised service providers	Marketing, Learning, Logistics	Government, Cluster/sectoral, External	

Nigeria	Otigba Computer Hardware	National, Regional, International	Growth, Upgrading	Labour supply, availability of suppliers, customer attraction, specialised service providers	Marketing, Learning, Logistics	Cluster/sectoral
	Nnewi Auto Parts	National, Regional	Growth, Upgrading	Labour supply, availability of suppliers, customer attraction, specialised service providers	Logistics	Cluster/sectoral, External
Mauritius	Textile & Clothing	International	Growth, Upgrading	Labour supply, availability of suppliers, customer attraction, specialised service providers	Marketing, Learning, Logistics	Government, Cluster/sectoral, External
South Africa	Cape Clothing & Textile	National	Growth, Upgrading	Labour supply, availability of suppliers, customer attraction, specialised service providers	Logistics, Learning	Government, Cluster/sectoral, External
	KZN Clothing & Textile	National	Growth, Upgrading	Labour supply, availability of suppliers, customer attraction, specialised service providers	Logistics, Learning	Government, Cluster/sectoral, External
	Durban Automotive	National, International	Growth, Upgrading	Labour supply, availability of suppliers, customer attraction, specialised service providers	Marketing, Learning, Logistics	Government, Cluster/sectoral, External
	South African Wine	Local, National, International	Growth, Upgrading	Labour supply, availability of suppliers, customer attraction	Marketing, Learning	Government, External
Tanzania	Mwenge Handcrafts	Local, National, Regional	Growth	customer attraction, specialised service providers	Learning, Marketing	Government, Cluster/sectoral
	Gerezani Metalworks	Local, National	None	customer attraction, specialised service providers	Learning, Marketing	Government, Cluster/sectoral
	Keko Furniture	Local, Regional	Growth	Labour supply, availability of suppliers, customer attraction, specialised service providers	Learning, Marketing	Cluster/sectoral
Uganda	Fish Processing	Local, National, International	Growth, Upgrading	Availability of suppliers, customer attraction, specialised service providers	Logistics, Learning	Government, Cluster/sectoral, External

Source: Kaplinsky and Morris 2014a



Moving beyond this summary of 25 clusters (Table 2), we now consider each of these cluster characteristics in more detail. The first issue is whether there is any correspondence between the location of the final market and the dynamism of the clusters (Table 2). A clear pattern emerges here. The three clusters selling primarily into global markets, the six clusters selling into national markets and the 10 clusters selling into domestic and regional markets show signs of both sustained growth and upgrading. By contrast, the seven clusters selling into the immediate vicinity show the least signs of growth and upgrading – they are predominantly survivalist clusters. It is not possible to determine the direction of causality in these numbers, that is whether only dynamic clusters are able to sell outside local markets, or whether the act of selling outside local markets leads to enhanced growth and upgrading.

**Table 2: The final market and cluster dynamism**

Market Orientation	Evidence of Dynamism			Number of Clusters
	Growth	Upgrading	Growth & Upgrading	
Local only	1	2	0	7
Domestic (Local and National)	2	2	2	6
Domestic and Regional	1	0	1	4
Domestic and International	5	5	5	5
International only	3	3	3	3

Source: Kaplinsky and Morris, 2014a

As can be seen from Table 1, all of the 25 clusters benefit from at least one of the four categories of external economies – labour skills spillovers, proximity of suppliers, proximity of customers and the development of inter-firm specialisation and the division of labour. Table 3 considers the prevalence of individual external economies in these 25 clusters. It shows that 12 of the clusters benefit from all four types of spillover, eight benefit from three types, and five benefit from two types of externalities. In none of the clusters did firms benefit from only one type of external economy.

**Table 3: Prevalence of external economies**

Evidence of External Economies	Number of Clusters
Availability of Labour Supply	18
Availability of Suppliers	23
Customer Attraction	22
Inter-firm specialization	19
2 External Economies	5
3 External Economies	8
All 4 External Economies	12

Source: Kaplinsky and Morris, 2014a

International experience shows that clusters achieve collective efficiency when members build on these accidental external economies and take deliberate joint action to strengthen cluster performance. Table 4 considers three types of joint action – skill development, marketing and logistics – and the extent to which this is associated with cluster dynamism. Approximately 75% of the 16 clusters cooperating in skill development have experienced sustained growth or upgrading, or both. A smaller number of clusters cooperated in either marketing (10 of 25 clusters) or logistics (11 of 25 clusters). Logistics cooperation is particularly closely associated with growth and upgrading, whereas joint marketing does not appear to be as important. The more clusters engaged in different types of joint action simultaneously, the more likely this was associated with cluster dynamism. Once again, causality cannot be imputed from these aggregate data alone.

**Table 4: Cluster dynamism and join action**

Evidence of Collective Activity	Evidence of Dynamism			Number of Clusters
	Growth	Upgrading	Growth & Upgrading	
Learning	12	11	10	16
Marketing	8	6	6	10
Logistics	10	10	10	11
1 Collective Activity	0	3	2	5
2 Collective Activities	7	5	5	9
All 3 Collective Activities	5	5	5	5

Source: Kaplinsky and Morris, 2014a

Finally, there are a variety of forms of institutionalisation of joint action activities. One source of support is through government, either national or local government or both. Another form of institutionalisation is that created by the members of the cluster itself, or by sectoral associations. These institutions are both private sector driven. The third form of support is provided by parties external to the economy, such as through aid or NGOs. Table 5 shows the distribution of these institutional support programmes in the 25 clusters. The largest number of clusters received multiple types of support – from government, through the firm's own contributions and from external sources. Four of the clusters support institutions were entirely the result of private sector cluster and sectoral initiatives, and an additional three involved collaborations between governments and the private sector.

**Table 5: Institutional support for joint action**

Evidence of Institutional Support	Number of Clusters
Only Government	1
Only Cluster/sectoral	4
Only External	2
Government & Cluster/sectoral	3

Government & External	1
Cluster/sectoral & External	2
Government, Cluster/sectoral, External	9

Source: Kaplinsky and Morris, 2014a

## The Upgrading Agenda in Industrial Clusters

The review of global and African experience show that clusters are widely observed as a natural outcome of economic activity, and with the exception of some of the Chinese Special Economic Zones, they have arisen spontaneously as a consequence of the external economies associated with geographical clustering. Although many – perhaps most – clusters in low and in many middle income economies are predominantly static and survivalist in nature, there is experience in many low and middle income economies of successful and dynamic cluster development. The dynamic clusters are associated with an extension of their sales from the immediate locality to national, regional and foreign markets. They are also characterised by a range of external economies, particularly with regard to skills, the clustering of suppliers which provides for specialisation amongst firms, being a magnet for buyers, developing trust to support collective action and by the capacity to upgrade their operations. Numerous types of institutional support also accompany dynamic cluster development. A major obstacle to cluster development in many low and middle income economies is poor infrastructure, particularly transport, water, power and secure accommodation.

A key characteristic of most of these clusters is that they involve small scale producers and that they often originate in the informal sector where many of them continue to operate. Most of these clusters also produce low priced “poor quality” consumption goods for the poor. Hence the consolidation and expansion of these clusters fits well with the inclusive industrialisation and inclusive growth agendas. However, as these clusters grow, as competing domestic clusters expand and as trade liberalisation deepens, it is essential that these clusters upgrade on a continuous basis. What does this imply for an upgrading agenda?

As we observed above, two types of clusters can be identified. The first are those which have emerged “naturally”; the second are those (such as the new Chinese Special Economic Zones) have been established *ab initio* as a result of policy interventions. Although the upgrading agenda is common to both types of clusters, their upgrading trajectories and the drivers of upgrading will likely vary.

The cluster upgrading agenda involves four main arenas for action – in final markets, in process technology, in organisational technology, and in the inter-firm division of labour which includes positioning in the value chain.

### The role of markets in cluster upgrading

Consumers play an important role in upgrading in a number of respects. First, more demanding consumers require producers to focus on the design and quality of their output, and on the process and organisational technologies which they use to deliver these product characteristics. But whilst it is often the case that these new markets are more demanding, there may also be cases where clusters target a less demanding set of consumers. This too will require a change in product portfolio and in the derived production processes. Thus, being confronted by new demands from consumers and by the offerings of competitors is often the prime driver for cluster upgrading and this applies whether the extended market is in the domestic economy or abroad.

There is an additional respect in which markets affect the upgrading agenda. In northern economies there is a well-documented process of user-driven innovation where predominantly sophisticated consumers interact with producers in the design and development of new products (von Hippel, 2005). Although largely undocumented in low and middle income economies, similar user-producer interactions also occur, as in the case of mobile phone applications in Kenya (Foster and Heeks, 2013). Entirely undocumented are cases where users interact with producers in informal sector clusters, but there are no reasons to believe that such synergies do not exist and that they have no role to play in cluster upgrading. This will probably begin with user-producer interactions which lead to the upgrading of products, but in many cases this will probably also involve the upgrading of processes.

#### Upgrading production processes

Most clusters in low and middle income economies – be they survivalist or dynamic – tend to use small scale and basic technologies, much of which may be second hand. Often this is because their small final markets do not allow for the purchase of large and scale-intensive technologies, but it also may be a reflection of the high acquisition costs of more sophisticated equipment. The upgrading challenges in these clusters, particularly in informal sector clusters, are complex. In some cases the solution to process upgrading lies in the purchase of new and better equipment. In other cases, the challenge might be to improve the equipment which is already being used in the cluster. A further solution might be to search for new sources of capital goods which represent an improvement in what they use, but may be of “lower quality” than equipment purchased from more established capital goods suppliers. Here there are particular prospects for south-south transfers of technology.

A good example of these upgrading challenges can be observed in Kenya’s furniture industry (Attah-Ankomah, 2014). In recent years, many of the clustered furniture manufacturers have switched from using northern based machinery to much cheaper equipment from China. These Chinese machines are generally less robust and produce to a lower quality than the northern-origin machines. But they have much lower barriers to entry, are more labour intensive and generally have lower costs of production. Kenyan machinery manufacturers – also operating in the informal sector – have responded to this market opportunity and either produce their own cheaper versions of furniture manufacturing equipment, but with even lower quality output, or help to

“blend” a combination of Chinese and northern machines, utilising northern motors.<sup>8</sup> The overall impact is an improvement in both productivity and in product quality and at least one of the furniture clusters is venturing into much higher quality final markets using a mix of Chinese and blended equipment. Similar benefits derived from utilising Chinese and Indian equipment can be observed in agricultural mechanisation in Tanzania (Ageyi-Homles, 2014) and in Uganda’s apparel sector (Botchie, 2014).

### Organisational upgrading

In many cases, particularly in informal sector clusters, there may be more scope for upgrading, and with lower barriers to entry with disembodied organisational technologies than from the introduction or adaptation of embodied technologies. This may involve workflow, quality procedures, storage of materials, maintenance of machines and business strategy. These “soft” elements of process technology are often reduced to the development of Business Plans and the provision of finance by governments and NGOs. But whilst these are important issues, they meet only a restricted part of the organisational technology upgrading agenda. It is notable that in each of the East African clusters using Chinese and Indian equipment described above, there is no evidence of structured attempts to facilitate cluster upgrading by addressing skill development, machine maintenance and repair and workflow. Each of these arenas were the sole responsibility of the individual entrepreneurs and in most cases, there has been very little change in any of these clusters.

### The Inter-firm division of labour and functional upgrading

As Adam Smith observed, one of the major drivers of productivity growth is specialisation within firms and in the division of labour between firms. This is often a natural outcome of cluster dynamics, as Schmitz documented in the Sinos Valley footwear industrial district in Brazil (Schmitz 1995b). An increase in the inter-firm division of labour poses multiple upgrading challenges for clusters. It reflects a drive towards the specialisation of components manufacture and their disassociation from assembly. But increasingly it also involves the development of specialised business services providers, for example, in the extension of standards in value chains and in the provision of support with regard to finance and marketing.

Once enterprises begin to participate in governed value chains, they also then need to engage with the challenge of functional upgrading. That is, an upgrading strategy may involve the capacity to change position in the chain, perhaps moving from low-skilled assembly to more skill-intensive component manufacturing, or beginning to design, brand and market products independently. The drive towards functional upgrading may only have broader economic benefits if the cluster as a whole changes its position in the value chain. If individual firms merely swap their position in the chain, they may gain

---

<sup>8</sup> The idea of “technological blending” was introduced by Bhalla in 1975 to describe the blending of traditional and modern technologies (Bhalla, 1975)

or lose as separate economic agents, but there may be little upgrading in the chain as a whole.

## 4. UPGRADING IN GLOBAL VALUE CHAINS

### The Rise of GVCs

As we will see below, the driving force in the post 1970s deepening of globalisation was the extension of global value chains (GVCs). In its simplest form, the VC is a descriptive term, referring to a series of sequential activities which transform inputs, through various stages (links), into final outputs (Porter, 1985 and 1990). In this sense, the VC lacks analytical content. Its value lies in its being an heuristic tool which provides a synoptic overview of the activities involved in a chain of production. However the *VC theoretical framework* provides an analytical skeleton to this descriptive flesh. The central insight into this analytical framework was provided by Gereffi in 1994 (Gereffi et al., 1994). He observed that the increasing fragmentation of VCs required coordination, and that this coordination involved power relations, which he referred to as “governance”. He also observed, as we will discuss below, that the increasing fragmentation of VCs was being played out on a global level, with the resultant trend toward the global dispersion of production.

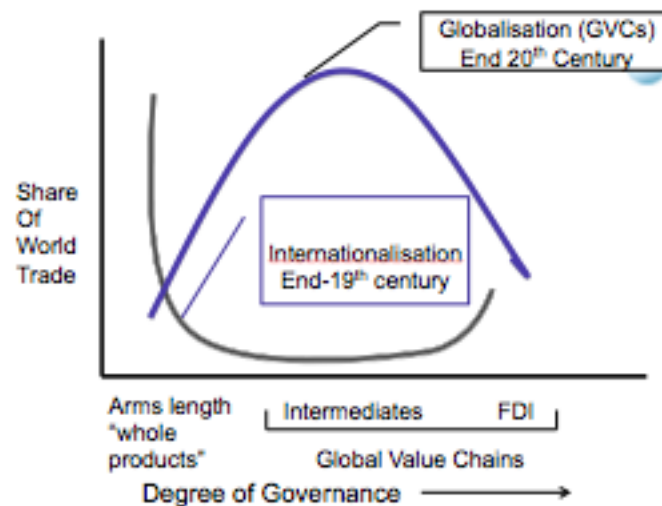
Underlying the extension of GVCs is the division of labour highlighted by Adam Smith as being the source of productivity growth. From the late 1960s, we can observe a development in corporate strategy in which firms specialised in their core competences. This meant that they focused their efforts on those activities which customers valued, which were relatively unique to the firm and which were difficult to copy (Hamel and Prahalad, 2004). In other words, they sought to concentrate on their rents, and to develop the capabilities to develop dynamic rents when barriers to entry were eroded and when customer preferences changed. All other activities were outsourced. Initially much of this outsourcing was proximate to their core operations, but as global transport and communication channels improved and as capabilities became increasingly dispersed globally, outsourcing took the form of offshoring. It is this widespread trend towards offshoring by global buyers that led to the rapid export-led growth of the East Asian economies during and after the 1970s (Feenstra and Hamilton, 2006).

The global extension of these VCs resulted in a structural transformation of the global economy. The significance of this becomes apparent if we compare the late twentieth pattern of global integration with that of the late nineteenth century (bearing in mind that the trade-GDP ratios in both eras were comparable). The economic textbooks tell us that in perfect markets, trade occurs between unrelated parties in anonymous arms-length transactions. No one buyer or seller is sufficiently dominant such that their actions affect the price of these transactions. At the other extreme of these trade relations are vertically integrated firms, often operating on a global basis. Faced with the transaction costs involved in purchasing inputs, the danger that suppliers might gain insights into their core competences and erode their rents, and the

reluctance of some suppliers to invest in production processes for a single buyer, firms have often chosen to internalise rather than to outsource the links in the chain (Williamson, 1985). Somewhere in-between these arms-length and internalised structures to global trade lies a category of trading links which are not characterised by equity relations between firms in the chain, but involve “sticky” (that is repeated and trust-intensive) relations between trading partners. The GVC analytical framework addresses this category of non-anonymous and trust-intensive trade relations, particularly involving parties with thin or no equity links. But it also includes intra-firm trade within transnational corporations (TNCs). Both of these sets of trading relations involve coordination and governance and thus hierarchies of power between the different parties in the trading value chain.

In the late nineteenth century the bulk of international trade was in arms length transactions, although intra-firm trade was growing rapidly as large firms began to extend their operations, first within national borders (Chandler, 1977) and subsequently across national borders (Wilkins, 1974). But after the 1970s, as an increasing number of firms in an increasing number of sectors began to focus on their core competences and to offshore the sourcing of non-core competences, the category of governed, non-equity linked trade grew rapidly. Figuratively speaking, the structure of trade in these two eras of global integration (internationalisation and globalisation) looks like the picture depicted in Figure 1. On the vertical axis is the notional share of global trade; the horizontal axis depicts the degree of governance in these trade flows.

**Figure 1: The structure of global trade in the late 19<sup>th</sup> and late 20<sup>th</sup> centuries.**



We have an underdeveloped capacity to put accurate numbers to this notional picture depicted in Figure 1. Recognising the growing significance of GVCs in trade, the OECD and the WTO have homed in on the share of intermediates in global trade as an indicator of GVC trade. By 2012, more than half of total global merchandise exports and more than two-thirds of traded goods and services comprised intermediate products and services (OECD, 2012). The

World Trade Organisation estimates that 28% (\$5tr out of \$19tr) of global trade in 2010 involved double-counting, that is the value of intermediate products traded *directly* across national borders and *indirectly* and subsequently incorporated in final products (UNCTAD, 2013). This definition of GVC trade is not analytically equivalent to that implicit in the GVC analytical framework (since some of the trade in these intermediate products involves arms length-relations), but it serves as a useful proxy for the absolute and growing size of GVC trade in global trade (Sturgeon and Memedovic, 2010).

## **Sectoral Differentiation: Two Families of GVCs**

It is customary to distinguish between two sets of VCs (Gereffi et al., 1994; Gereffi, 1999). The first are ‘buyer driven’ chains, in which the lead firm is at the forward end of the chain, either interfacing directly with final consumers (for example, Walmart), or commanding the brandnames which define competitiveness in final consumer markets (for example, Nike and Levi-Strauss). By contrast, ‘producer driven’ chains are commanded by firms holding core technologies, such as General Electric in the power turbine sector, Intel in chip architecture, Ford and Toyota in the automotive sector, and Microsoft in personal computer software. These two types of chains are archetypes in the sense that in some sectors there are both buyer- and producer-driven chains,<sup>9</sup> and within chains there are often components of buyer-driven sub-chains in producer-driven chains and vice versa.<sup>10</sup>

Beyond this taxonomy of buyer- and producer-driven chains lies another distinction which has particularly important implications upgrading and sustainable growth. This is the contrast between chains which involve ‘vertical specialisation’ and those which are essentially ‘additive’ in nature.

### Vertically specialised value chains

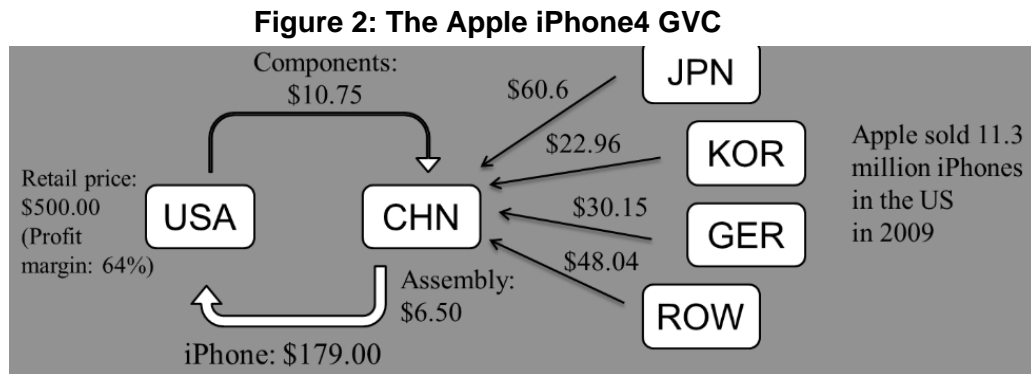
Vertically specialised chains result from the fracturing of VCs as firms specialise increasingly in their core competences and outsource non-core activities. This leads to the fragmentation and slicing up of production into a myriad of sub-processes. These activities can be undertaken in parallel – that is, at the same time - and since there is little processing loss in production and no degradation of inputs, there is no intrinsic need for the various stages to be co-located. They thus lend themselves ideally to global dispersion. The well-known example of the Apple iPhone4 illustrates this well (Xing and Detert, 2010). Each device retailed at just under \$500 in the US. The phones were exported from China - ‘made in China’ – at a unit price of \$179. But the value added in China was only \$6.50, with the balance made up of imported components (for example, valued at \$80 from Korea, \$25 from the US and

<sup>9</sup> For example, in the apparel sector, Nike outsources all production and operates as a buyer-driving governor, whereas Zara’s command over its chain arises from its competences in production and logistic organisation.

<sup>10</sup> For example, whereas Walmart and Tesco exert meta-governance in their fruit and vegetable GVCs, there is also a degree of countervailing producer-driven power by the firms governing logistics in these sectors.



\$16 from Germany), and service payments to Apple in the US.<sup>11</sup> This reflects a production chain in which parts are sourced from all over the world, are assembled under Apple's design in China and then branded and marketed in the US and other final markets (Figure 2).



Source: Xing and Detert (2010)

The more complex and extended the chain – that is, the greater the number of stages in value addition - the more likely it will be vertically specialised. In general this occurs in the manufacturing sector where final products are assembled using a variety of components (more than 3,000 in an automobile, and more than 15,000 in an aero engine). A reconfiguration of the way in which services are produced, also means that these too can comprise of a range of ‘assembled’ activities. For example, call-centres are part of a much larger fragmented chain of production, distribution and after-sales support. This fracturing and global dispersion of services is also increasingly evidenced in higher knowledge content activities in the legal, architectural and health sectors.

### Additive value chains

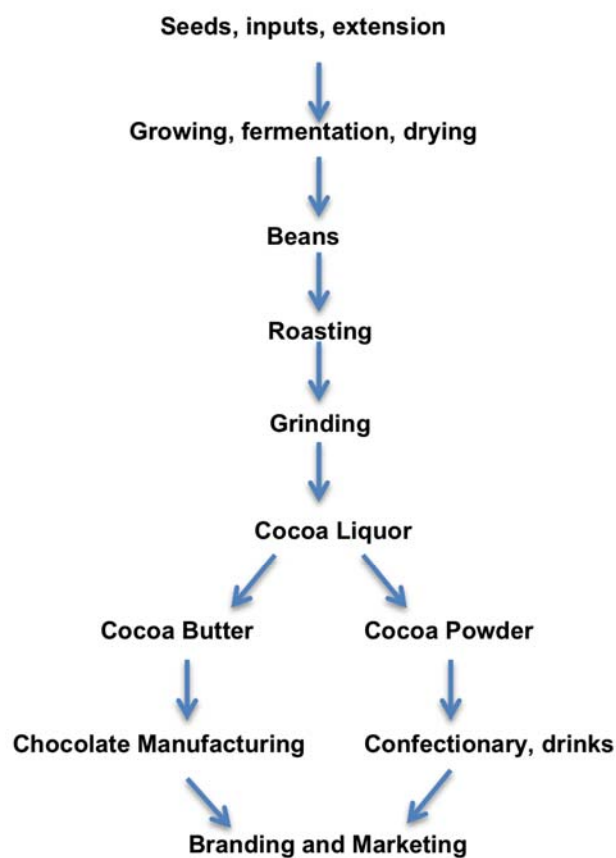
Additive VCs involve a process of sequentially adding value to each stage of the chain and in this sense they contrast sharply with the structure of vertically specialised GVCs which involve in-parallel production of various stages of the products manufacture. Additive GVCs tend to characterise the resource sector where the primary input into the final conversion process makes up a large proportion of total value of the final product, where the primary input may be varied as a result of the specific characteristics of the resource, and where processing losses may form an important component of overall product value.

A typical example of an additive chain is the production and processing of cocoa into chocolate (Figure 3). This involves a series of sequential stages,

<sup>11</sup> An important caveat needs to be made to this oft-cited example. This is that these numbers only reflect the first-round of disaggregation. However many of the inputs imported into China are themselves a product of vertically specialized sub-chains, so that the overall value added in China (and indeed in all the countries reflected in Figure 2) are likely to be rather different from those reported by Xing and Detert. Rather than undermining the analysis by Xing and Detert, this caveat reinforces their central observation of the fracturing of GVCs.

which unlike vertically specialised chains, are difficult to execute in parallel. Beyond the growing stage, there is greater scope for geographical fracturing of production, and there are a variety of outcomes in the post-growing and post-primary processing geographical division of labour.

**Figure 3: The Cocoa Additive Value Chain**



In the cocoa sector Ghana and Cameroon provide two examples of contrasting forms of geographical fracturing, albeit within the confines of an additive and sequential value chain (Kaplinsky and Morris, 2014b). In Ghana industrial policy was instrumental in building human resource capabilities and infrastructure, Global grinders responded to this by integrating backward, relocating processing facilities and buying activities within Ghana. This secured supplies and increased their flexibility to meet global chocolate manufacturers quality and price specifications in the context of an expectation of increasingly constrained global supply. In contrast, in Cameroon the lack of

public initiative has resulted in the export mainly of raw cocoa beans, with very thin domestic value added.<sup>12</sup>

As in the case of the producer- buyer-driven taxonomy, there is no water-tight coincidence of sector and vertical specialisation/additive GVCs. Whilst GVCs in the manufacturing and services sectors are increasingly vertically specialised, there are exceptions to this general trend and some manufactured products are better suited to sequential value addition even in the same sector. For example, in the apparel, furniture and footwear sectors there are two distinct VC structures. Production for large volume standard products tends to be fractured and globally dispersed (that is, closer to the vertically specialised mode), whereas production for rapid-response, smaller volume and higher income market niches tends to occur in more vertically integrated chains closer to final consumer markets (that is, more like additive VCs). Similarly in the service sectors we can observe a mix of globally outsourced fractured chains (for example in call centres) and close-to-the market holistic chains (for example, financial services).

Nonetheless, despite this heterogeneity of form in manufacturing and services, the resource sectors tend to be dominated by additive value chains for a number of reasons. The options for the fracturing of the chain are often more limited. Resource extraction is relatively immobile, that is, it is determined by a gift of nature, hence the oft-used phrase “fixed point commodities” to characterise this sector. Second, in the case of almost all natural resources there is extensive weight/volume loss in processing. Third, the quality of many agricultural commodities (such as sugar) degrades if they are not processed soon after harvesting. Fourth, when there are few rents in forward processing (in other words, many producers can compete against each other), lead firms often encourage value additive value chains in resource producing economies, for example in the manufacture of plywood and veneers. And, fifth, as we have observed, in the resource sector the ‘product’ is built up in a series of sequential stages as the raw materials pass through various stages of processing. This is contrast to manufacturing and some services where many sub-processes can be undertaken in parallel.

These differences are reflected in the structure of global trade. A joint enquiry between the World Trade Organisation and the OECD estimates that around 75% of global trade occurs within GVCs, and that the vertically specialised chains are growing more rapidly than are the additive GVCs. However, from the perspective of low income economies, this balance between chain types takes a different form. In Africa’s cases, more than 75% of exports involved additive chains, a direct consequence of Africa’s specialisation in the resource sector (OECD, 2014).

## Upgrading in GVCs

---

<sup>12</sup> For other examples of contrasting patterns of geographical dispersion in additive GVCs, see Kaplinsky and Morris 2014b and Morris and Fessehaie 2012.

The heterogeneity and spread of GVCs means that there is a complex upgrading agenda required to facilitate sustainable growth. Here we can distinguish three levels of action – economy-wide policies which have a derived impact on GVCs, policies specific to all GVCs and policies which are specific to each of the two families of GVCs.

#### Economy-wide policies and their impact on upgrading in GVCs

We begin briefly by considering the relevance of general policies designed to support upgrading in all sectors, serving both domestic and foreign markets. Here we are informed by a broad emerging consensus on industrial policy. This draws on the recognition that resource allocation is characterised by both market and policy failure. An exclusive focus on market failure provided the rationale for the dirigiste import substitution policies of the 1950s, 1960s and 1970s in the developing world. The focus on state failure accompanied the rolling out of the neo-liberal agenda in the 1980s and 1990s. Now, a more measured stance is emerging which gives renewed legitimacy to the role the state can play in supporting (as opposed to commanding or guiding) the development of capabilities in the productive sector (Rodrik, 2004; Chang, 2014). The developmental challenge then revolves around the social and political conditions in which this alliance can be forged.

Within this emerging consensus, there is broad-ranging agreement around a number of policy agendas, and specifically with regard to policies addressing market failures in public goods. Foremost amongst these is the issue of human resource development. Closely allied to this agenda is the development of institutions in the National Systems of Innovation (NSI), and in support for Research and Development. Also of foremost importance is the development of infrastructure, particularly information and communications technology, but also physical infrastructure (such as the railways, ports and aerospace which are required to facilitate global trade).

Other dimensions of generalised policies to support the dynamism of the productive sector are more controversial, but nevertheless widely-evidenced. Although there is a widespread and generalised commitment to an open trading environment, in reality many countries continue to craft their trade policies to support the particular needs of their productive sectors. Key sectors are often excluded from trade liberalisation (the US, for example, limits exports of hydrocarbons and prohibits foreign ownership in the airline sector) and bilateral trade deals proliferate. There is also a difference in the approach adopted towards factor mobility and ownership. In general, capital is more mobile than labour, but some countries are more open to labour mobility than others, and many countries continue to pursue ownership-specific policies which favour domestically owned firms. Finally, the complexity of technological progress is growing rapidly such that no economy can hope to compete across the range of sectors and thus virtually all economies provide

incentives to promote the growth of particular sectors.<sup>13</sup> However, the degree of commitment to sectoral targeting varies widely across countries.

### Policies supporting a rent agenda across GVCs in general

The GVC analytical framework identifies four categories of upgrading – process, product, functional and chain upgrading (Humphrey and Schmitz, 2000). The mechanisms which determine the pattern of upgrading and the distribution of chain rents are widely addressed in the GVC literature (see the plethora of material available at <http://www.globalvaluechains.org>; <http://www.capturingthegains.org>; Kaplinsky and Morris, 2001). Space constraints limit us from fleshing out these mechanisms, which include:

- *Chain governance* (Gereffi et al., 1994, 1999 and Gereffi et al., 2005): Chain governors determine the division of labour in the chain, and this defines the capacity of individual firms to generate and appropriate rents. For example, IKEA limits the capacity of its furniture suppliers to develop and (especially) to brand their product offerings (Kaplinsky, Morris and Readman, 2002). It confines its suppliers to process improvement and systematically searches for alternative suppliers in order to ensure a competitive supplier environment and low cost supplies. On the other hand it protects its high rents by commanding its brand name and retailing exclusivity. Thus a key objective in GVC upgrading is for firms to enter into chains which provide the scope for upgrading their operations and to move out of links which have very low barriers to entry.<sup>14</sup>
- *Market Insertion*: Different markets have different requirements and provide the scope for different margins (Staritz and Morris 2014). They are increasingly segmented and volatile, especially in high-income markets. Although markets in low and middle-income economies are beginning to experience similar patterns of segmentation and volatility, in general they tend to be more price sensitive, less quality sensitive and involve a smaller role played by civil society in defining market preferences such as organic, labour and environmental standards (Kaplinsky, Terheggen and Tijaja, 2011). Moreover, command over brand names is an important determinant of rent distribution, and helps to explain the pattern of functional integration whereby formerly lead

---

<sup>13</sup> Strategic support for the military sector is clearly evident across many economies and this has spawned a number of technologies of commercial importance (including the internet) (Mazzucato, 2013). Other examples of sectoral incentives are the UK support for the automotive sector, the US for the hydrocarbon and processing sectors and Germany for renewable energy.

<sup>14</sup> For example, selling furniture into smaller retail outlets offers greater scope for producers to design and brand their own products, although with much smaller volumes than those involved in serving IKEA and other global multiples (Kaplinsky, Morris and Readman, 2002).

manufacturing firms have vacated production and subcontracted this to low and middle income economies.

- *The importance of standards:* Different final markets and different GVCs impose different standards on producers (Gibbon and Ponte, 2005; Kaplinsky, 2010). Some of these standards are set by governments (for example, phytosanitary standards), some are set of lead firms in their GVCs (for example, Toyota imposes standards affecting quality, delivery and cost on its tiers of chain suppliers) and others are set by civil society (for example, labour standards). These standards have implications for who is included in GVCs (often smaller producers find it difficult to meet these standards), but they play an important role in the upgrading challenge since many standards institute processes which help to endogenise and strengthen innovative capabilities amongst producers.
- *Power Asymmetry:* Many GVCs are characterised by the increasing concentration of buyers (Gereffi, 2014), sometimes involving final retail chains and in other cases intermediary firms such as Li and Fung in the apparel sector and Foxconn in the consumer electronics sector. In general, there is much less concentration amongst producers (particularly many agricultural GVCs) even though the requirements for participating in GVCs tends to exclude the very smallest producers (<http://www.capturingthegains.org>). This power asymmetry affects the division of labour in GVCs and the capacity of different producers to upgrade their offerings.
- *Ownership and Embeddedness:* Different patterns of ownership affect the pattern of supply chain upgrading and hence upgrading trajectories in the GVC. The prime movers of supply chain upgrading were the Japanese auto firms in the 1970s and 1980s (Cusumano, 1985), These procedures were subsequently widely copied by many US and European firms, but less so by TNCs originating in the developing world such as those originating in China (Fessehaie and Morris, 2013) who are less adept at assisting their suppliers to upgrade. But not all differences are associated with the nationality of ownership, and in some environments, different types of 'foreign' owners may be differentially embedded in the local economy, as is the case in the apparel industry in Madagascar (Morris and Staritz, 2014).

These “building blocks” of chain upgrading are evidenced to varying degrees and in varying ways *across the spectrum of GVCs* and each can be strengthened or weakened by policy intervention. They comprise a generic set of GVC-upgrading issues and are not affected by either the buyer-/producer drivenness of GVCs, or whether they are vertically specialised or additive GVCs.

#### Policies specific to each of the two families of GVCs

Beyond policies which are generic to the productive sector in general and to all GVCs are those policies required to respond to the different demands of the two families of GVCs identified earlier, namely vertically specialised and additive GVCs.

*“Thinning” in vertically specialised GVCs*

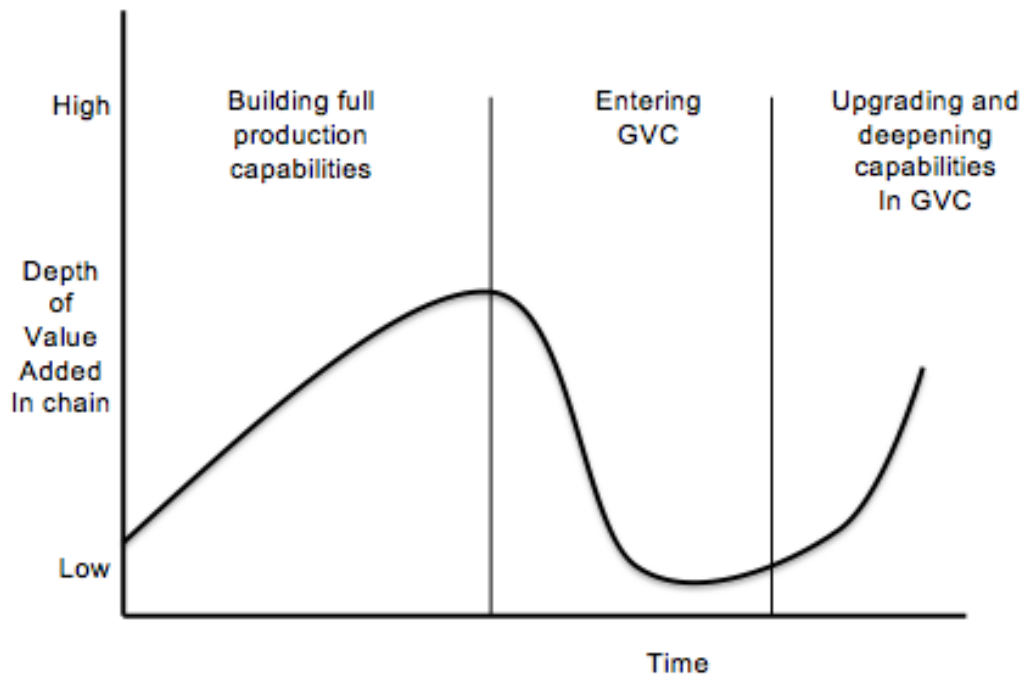
Traditional industrial policy has been focused on the building of value added in strategically chosen sectors. In many respects, most notably perhaps in the example of Ford’s River Rouge integrated automobile plant in the late 1920s<sup>15</sup>, a similar mentality can be observed within the private sector. However, the development of strategic corporate agendas designed to specialise in core competences (involving the outsourcing of much of the products value added) went against the grain of these value-deepening policies. Firms reduced their share of product value added, and since much of this outsourcing was offshored, so did many economies, importing many of the intermediates used in production. Thus, by the end of the first decade of the twenty first century, a survey of the largest US manufacturing firms found that they simultaneously accounted for 89.2% of all exports and 88.1% of all imports (US Census Bureau, 2013). That is, their operations were deeply embedded in GVCs in which much of the intermediate components in production were sourced from abroad.

We characterise this policy of outsourcing in GVCs as one of “thinning out” and contrast this with the building up of value added which has historically characterised industrial policy (Figure 4). In this environment firms and economies specialise less in sectors and products than in capabilities. The value they add through their activities may comprise only a small fraction of the product’s final production cost, and an even smaller component of its final price given the growing importance of branding and marketing in many sectors. However, the process of thinning (defined as a share of total product value added) may involve a transition from low value added to high value added activities in the chain. Having initially “thinned” their contribution, the firm may over time seek to rebuild its share of value added in a sector, but seldom seek to emulate the value adding ambitions of the traditional import substituting policy agenda.

---

<sup>15</sup> In Henry Ford’s mass production River Rouge plant constructed in 1927, virtually the whole value of the car was added in a single plant from the unloading of iron ore, through the manufacture of steel and the manufacture and assembly of the components into the final vehicle.

Figure 4: “Thinning” out in vertically specialised GVCs<sup>16</sup>



From the perspective of the firm to which the activities were outsourced, this may involve two contrasting strategies. For those firms who are newly incorporated into the chain or who are new entrants into the sector, the strategy is one of “thinning in”. That is, they enter the chain by contributing a low proportion of product value added. An example of this are the firms which are newly established to assemble apparel on a cut-make-and-trim basis. On the other hand there are supplier firms who have long operated in the sector and for whom chain entry involves a “thinning out” of activities, reducing the range of activities which they have historically undertaken. Keeping the apparel sector as an example, this would represent the experience of a firm which gives up its own design and brandnames to assemble apparel for an outsourcing lead buyer.

Given that much of the outsourcing of non-core competences was offshored, the policies which specifically address the promotion of vertically specialised GVCs, particularly in the short run, relate primarily to trade policy. The objective here is to reduce the impediments to international trade, such as removing quotas and tariffs on imports, introducing incentives to promote exports and removing “at the border” bureaucracy and obstacles which hinder trade. Complementing this trade policy is the creation and smooth functioning of trade infrastructure such as ports and airports and the introduction of effective access to the internet. In economies where entry into export markets is provided by foreign lead firms, the vertically specialised GVC policy agenda also generally targets the development of Export Processing Zones (referred to as Special Economic Zones in China). These EPZs provide inducements to

<sup>16</sup>

The structure of this Figure was suggested by Will Milberg.



foreign investors such as freedom from the taxes and labour legislation which are required in production for the domestic market and the provision of subsidised accommodation. In some cases, the policy framework supporting vertically specialised GVCs involves policies introduced in other economies. Trade Agreements such as the African Growth and Employment Act (AGOA) and the Caribbean Trading Initiative (providing preferential market access into the USA) were in part specifically designed to foster the expansion of vertically specialised GVCs in exporting economies.

Beyond the trade policies promoting the early development of these vertically specialised GVCs are follow-on policies designed to deepen presence in rent-rich links in the chain. Primarily executed at the firm-level, this often follows an upgrading trajectory reflecting the four categories of upgrading identified in the GVC theoretical framework, namely process upgrading, product upgrading, functional upgrading and chain upgrading (Humphrey and Schmitz, 2000). This upgrading trajectory is widely evidenced in the Asian economies which have successfully pursued a vertically specialised GVC path (Figure 5). The firm enters the GVC by merely assembling to the designs of the lead firm (for example, the iPhone 4 in China). Its upgrading trajectory in this early stage is one of process improvement. Initially it may concentrate on improving its efficiency and subsequently, as capabilities increase, the firm may move from assembly to manufacturing (that is, the transforming of materials) and incorporating a greater degree of self-produced or locally-sourced components.<sup>17</sup> As capabilities deepen the firm may shift to product upgrading, developing the capacity to design its own products (for example, laptop computers in Taiwan and China sold under the brand names of global firms). After a while, the firm may engage in functional upgrading, building its own brand-presence, either in its own right (Samsung) or by acquiring the brand name of a recognised firm (Lenovo purchasing IBM computers and marketing the Thinkpad). Finally, once chain capabilities are mastered by competitors the firm may move to a new chain.

An underlying trend along this trajectory is one of growing knowledge-intensity and an increase in the share of disembodied activities. As this trajectory develops firms often move their position in the chain such that they may themselves outsource non-core assembling and then manufacturing competences to other producers as they transition into new links in the chain. This dynamic was observed for example in Taiwan apparel manufacture outsourcing to China, and now is beginning to be observed in coastal Chinese firms who, as wages rise, outsource their labour-intensive activities to firms in the interior or into neighbouring economies such as Vietnam.

---

<sup>17</sup> For example, between 2011 and 2013, the number of firms supplying batteries for the iPhone in China doubled from 8 to 16, and local firms began to produce formerly imported inputs such as acoustic components (Mishkin, 2013). Although undocumented, the value added in China in the production of the iPhone5 almost certainly is much greater than the \$6.50 incorporated in the early versions of the iPhone4.

**Figure 5: An upgrading trajectory in vertically specialised GVCs**

	Process	Product	Functional	Chain
<b>Trajectory</b>				
<b>Examples</b>	Original equipment assembly (OEA) ↓ Original equipment manufacture OEM	Original design manufacture	Original brand manufacture	Moving chains – e.g. from black and white TV tubes to computer monitors
<b>Degree of disembodied activities</b>	Disembodied content of value added increases progressively 			

Source: Kaplinsky and Morris, 2001

This upgrading trajectory, enacted at a firm-level, is often significantly enhanced by government support (at a firm, cluster, or sector level). The support includes the strengthening of the National Systems of Innovation relevant to the sector, human resource development and financial incentives to promote R&D and innovation.

#### *“Thickening” in additive GVCs*

In additive GVCs the strategic focus is on “thickening” by building linkages in order to deepen value added in the sector. This is predominantly the case in the resource sector, although as observed above, it also applies to some manufacturing sectors.

Within the resource sector there have been two contrasting approaches towards linkage development. The dominant view for some time built on the analysis provided by Singer (Singer, 1950). Singer argued that lead firms in the resource sectors had little interest in promoting linkages. This was because local capabilities in many low and middle income economies were weak, because the technological capabilities required to produce inputs into the mining sector were fundamentally different from those involved in mining itself, and because the lead firms were operating in an era of internalisation and had little interest in outsourcing any of their activities. Singer referred to this as “enclave development” and although he was referring to the mining sector, his analysis was applicable to the oil and gas sector as well.

Hirschman offered a different approach. He saw industrial development and structural change as arising from the development of linkages. In his phrase, industrial development and structural change occurred as a natural process - “One thing leads to another” (Hirschman, 1981). He identified three sets of linkages from the resource sector. The first were fiscal linkages, in which

resource rents were captured by the state and were used to promote diversification in sectors unrelated to the resource sector. The second type of linkages were consumption linkages, with industrial development being spurred by demand created by incomes generated in the resource sector. His third and final set of linkages were production linkages, backward into upstream supplying industries, and forwards into downstream processing sectors. We might add to Hirschman's production linkages a third sub-category, namely horizontal linkages, in which capabilities built in serving the needs of the resource sector find subsequent application in linking to other sectors.

Hirschman's approach was a minority view and had little policy traction except for fiscal linkages where there have been wide-ranging attempts in many countries to promote structural change by taxing resource rents and using these to promote other sectors, often following a template of sectoral targeting designed to replicate the prior experience of more industrially advanced economies (Syrquin and Chenery, 1989; Haraguchi and Rezonja, 2010; Lin and Monga, 2010). Policy instruments designed to achieve these ends include - but are not limited to – some measure of import protection to protect new domestic industries, sectoral targeting accompanied by directed investment (including by state owned enterprises), offset-agreements (where foreign-owned resource extracting firms gain access to scarce commodities in return for investing in industrial sectors, including in production linkages with the resource sector). Consumption linkages have had little traction since in the context of pervasive import liberalisation, much of the consumer demand generated in the resource sector was met through imports.

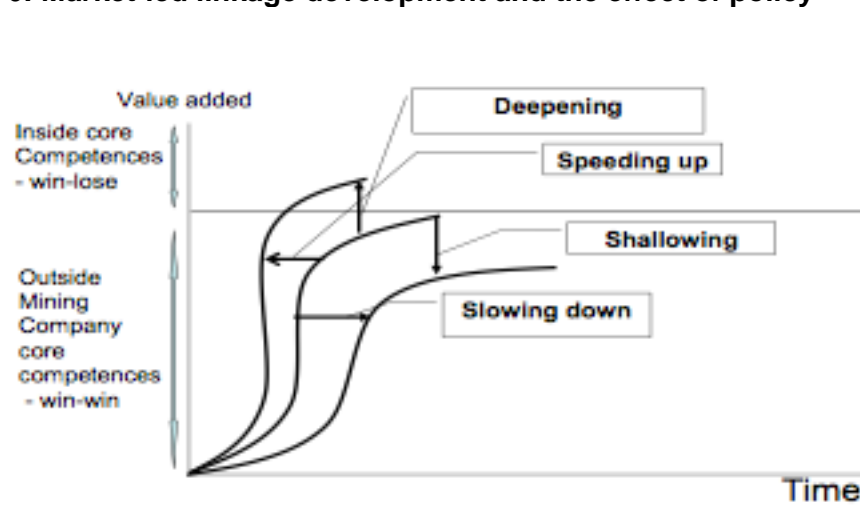
It is in Hirschman's category of production linkages that there has been a reappraisal of the conventional wisdom surrounding enclave development. In part this is because contrary to Singer's dismissal of the history of linkage development, there is in fact considerable evidence that linkages from the resource sector have played an important role in the industrial development of many now industrialised economies (Wright and Czelusta, 2004). This includes the US and Canada in the nineteenth century, Norway and the UK in the twentieth century and now the USA in the fracking era of the early 21<sup>st</sup> Century. In fact, to the extent that Singer's enclave theory was evidenced, it applied to low income economies which, at the time of his writing, possessed few technological capabilities and had virtually no local industry. This revisionism of the enclave thesis coincides with a reappraisal of the resource curse literature (Sachs and Warner, 2001). If a different measure of resource intensity is used, this over-turns the oft-cited result of the Sachs-Warner analysis that resource intensive economies have grown less rapidly than resource-poor economies (Lederman and Maloney, 2007).

Recent studies which we have concluded on production linkages in Africa's resource sector (Morris et al. 2012; Kaplinsky and Morris 2014) in fact found a considerable extent of "below the radar" linkage development, including in some rather surprising circumstances. To cite a few examples: The obvious and expected case of linkage development was in South Africa's mining equipment and services sector (Kaplan 2012). This is the only sector in which

South Africa has a positive balance of trade and it is also a sector in which it plays a prominent role in global patenting. Less expected was the Nigerian oil and gas sector, where there is evidence of high-level knowledge intensive services backwards linkages, including those provided by local firms employing engineering and IT graduates (Adewuyi and Oyejide 2012). Ghana is emerging as a West African mining services hub, replicating the role long played by South Africa in the continent's resource sector (Bloch and Owusu, 2012). Botswana is developing its diamond trading, polishing and cutting industry (Mbayi, 2013).

So, if the reality is a “below the radar” emergence of inter-sectoral linkages and intra-sectoral upgrading rather than an ossified enclave structure, what explains these developments? Here the VC framework provides important insights. First, as we have observed above, the dominant strand in corporate strategies has for some time been to outsource non-core activities. Hence the lead mining firms have an active interest in outsourcing, and if local suppliers and processors can serve their needs efficiently, this is the optimal outcome. This is a picture shown in Figure 6. On the vertical axis which reflects the build up of value added in the sector, a distinction is made between core-competence and non-core competence value added activities. On the horizontal axis is the passing of time. What can be observed is that over time there has been a market driven process of linkage development, beginning with the “easy hits” of “low hanging fruit” and then slowing as the more difficult stages are confronted. This market driven process can either be speeded up or deepened into the core-competence rent-rich territory of the lead resource firm, or be slowed down by the policy environment.

**Figure 6: Market-led linkage development and the effect of policy**



Lead firms in GVCs are the key drivers in linkage development. As observed above, there are strong economic imperatives to outsourcing and supplier development. But they also face an attack on enclave activities from civil society organisations and governments seeking to promote deeper linkages in order to foster greater developmental spin-offs and better environmental outcomes from resource exploitation. Many of these lead firms have therefore adopted Corporate Social Responsibility (CSR) supplier development

schemes in order to meet these demands from final customers. (The more progressive lead firms have increasingly begun to see CSR in a positive light as Corporate Business Development since this has the capacity to promote efficient local suppliers as well as to meet the needs of civil society). Related to this, demands for greener products in final markets have led to attempts to green supply chains, and since this requires attention to the whole value chain (with traceability a core component of green certification), this forces the lead firms into promoting capabilities along their whole supply chain, involving tiers of indirect suppliers as well as direct suppliers.

Research into linkage development in Africa's resource sector shows that these elements of GVC operations are naturally forcing through a process of linkage development in the resource sector, not just with regard to backward but also to forward and horizontal linkages (Morris et al., 2012; Kaplinsky and Morris 2014). However it also shows that there are specific policies and strategic interventions, sometimes in partnership with international agencies or lead firms, adopted towards the linkage sector which promote a greater depth of value added. These include local content policies (Nigeria and Angola), building infrastructure specifically to meet the needs of the resource sector (Botswana diamond sector), marketing institutions to support domestic processing (cocoa sector in Ghana), export taxes to force local value addition (leather in Ethiopia), building industrial zones to facilitate linkages between lead firms and local manufacturers (copper suppliers in Zambia and leather tanning and footwear manufacturers in Ethiopia), restructuring government agencies with the support of the EU to upgrade local certification to meet EureGap standards (Nile perch fish in Uganda) and introducing human resource programmes to meet the specific needs of the resource sector (Angola and Nigeria).

But the policy environment does not always have a positive impact on linkage development, and in some cases (notably Tanzania – Mjimba, 2013) can slow the process down or even reverse earlier gains (South Africa – Kaplan, 2012; Gabon – Terheggen, 2011). The point, however, is that all of these and related cases in other countries illustrate that there is a viable path to linkage development and GVC thickening. This can be aided by a series of traditional industrial policies instruments (for example, investments in general educational systems) complimented by VC specific policies such as local content programmes.

## 5. CONCLUSIONS

Drawing the threads of earlier discussion together, two important issues emerge. First, whilst it is clear that upgrading is critical for both sustained and sustainable growth, upgrading trajectories are complex and they vary across types of clusters and families of GVCs, what are the challenges involved in fostering *more inclusive* patterns of upgrading? Second, under what circumstances, if any, might it be possible to follow these complex upgrading (and inclusive upgrading) agendas simultaneously? The discussion which

follows is suggestive rather than well-worked, only seeking to identify the central elements of the analysis.

## **Promoting More Inclusive Patterns of Upgrading**

### Inclusive upgrading in clusters

Two types of clusters have been identified. The first are those which predominate in most economies. These are clusters which have emerged spontaneously as a result of agglomeration economies. In more advanced cases these clusters are characterised by various elements of collective efficiency and serve increasingly distant markets, be they in the domestic or the global economy.

In low and middle income economies, and particularly in the lower income group, many of these clusters are located in the informal sector, and those which are not, often had their roots in the informal sector. They also predominantly tend to serve low income markets. In both these senses they contribute directly to the promotion of an inclusive industrialisation growth path.

More problematic is the extent to which the upgrading trajectories in these clusters involve participation by the poor in the innovation process itself. Here there is no 'natural' outcome which takes the form 'cluster development automatically serves to promote inclusive upgrading'. This is not to say that there are no upgrading dynamics which are endogenous to these clusters, but rather than the participation of poor producers in the upgrading process is contingent on circumstances, including the nature and extent of support provided to upgrading in the clusters.

Even more problematic is the extent to which the upgrading in these clusters provides for environmentally and socially sustainable trajectories. In most cases the environmental footprint of these informal sector clusters is more adverse than production in formal-sector and non-clustered formal sector enterprises. Energy efficiency is characteristically low in these clusters, working conditions are poor (sometimes involving child labour), and effluents tend to be uncontrolled and sometimes hazardous. Therefore, in this sense these clusters may work against greater inclusion unless concrete steps are made to limit these adverse outcomes

As we have seen, there are also clusters in low and middle income which have been 'created' through public initiatives or result from the efforts of lead firms. These are beginning to emerge in Africa as a result of Chinese bilateral aid (modelled on China's experience with Special Economic Zones) and through investments by larger Chinese lead firms who seek to bring their suppliers with them. Although this is as yet an embryonic phenomenon, the evidence so far is that these 'top-down' clusters do little to promote inclusivity in terms of local ownership. In most of the zones which have emerged, the enterprises in the zones are Chinese-owned (Kaplinsky and Morris, 2014b).

The degree of imported inputs is also high. Nothing is known of the upgrading performance or potential of these Chinese-origin clusters, at least in the African case.

### Inclusive upgrading in GVCs

As observed above, we can distinguish two families of GVCs – vertically specialised GVCs, predominantly operating in the manufacturing and services sectors, and additive GVCs, predominantly operating in the resource sector.

Beginning with the vertically specialised GVCs, there is considerable scope for inclusion of the poor in the form of unskilled and semi-skilled labour in GVCs. Indeed this has been one of the major factors driving income growth in China and other East Asian economies in recent decades. This is an organisational innovation story, arising from the fracturing and global dispersion of production chains. However, as was seen in the case of the Dominican Republic EPZs in the 1990s (Section 2 above), unless the links in the chain which are located in low and middle income economies are incorporated in an upgrading path (in process or product, and perhaps in function), the sustainability of the inclusion in these chains will be eroded as competitive plants are established elsewhere. In most of these vertically specialised GVCs output is destined for (predominantly higher income) consumers abroad, but there is no intrinsic reason why there may not be product innovation when output in some of these chains is targeted at lower income consumers. Further, with regard to inclusive process innovation, recent experience suggests that competitive ‘lean production’ systems work best when they involve *kaizen* (continuous-improvement) labour processes and this is one way in which the poor might be included in vertically specialised GVCs. In terms of environmental and social inclusion, there is a strong trajectory of upgrading in those GVCs where production feeds into final markets in the north, as consumers and global buyers demand increasingly stringent environmental and labour standards. By contrast, when the final market switches to lower income consumers in the south, there is some evidence of downgrading, with adverse social and environmental outcomes for the poor.

The inclusive upgrading agenda in additive GVCs reflects in some respects the situation in vertically specialised GVC. Many of these additive chains are similarly governed by lead firms based in the north, and these lead firms place similar demands on their southern subsidiaries with regard to continuous improvement and social and environmental standards. However, additive GVCs tend to have much deeper value added operations in resource producing economies, and tend to involve a much higher degree of production by indigenously owned firms. These indigenous suppliers in many cases are less innovative than their northern counterparts, and whilst they may promote inclusion of unskilled labour and smaller scale suppliers in their chains, they may often be less likely to upgrade their production processes and to upgrade their environmental and social footprints. Inclusive upgrading in these sectors may thus be largely limited to the increasing incorporation of small scale and

indigenous firms and unskilled labour unless the state makes deliberate efforts to promote greater inclusion in upgrading trajectories.<sup>18</sup>

### **Walking on More than One Leg**

Under what circumstances might it be possible to simultaneously promote inclusive industrialisation (with a particular focus on inclusive upgrading) in each of the three categories production (clusters and vertically specialised and additive GVCs) simultaneously?

There is little conflict between the simultaneous development of cluster-based and GVC-based upgrading paths. They speak to broadly different productive communities and require broadly different forms of support so that there is little chance of a conflict of interests. Moreover, a common theme in each of these spheres is that of supply chain development and there may in some circumstances be considerable overlap between policies designed to aid upgrading in clusters and those seeking to promote more robust and innovative supply chains.

However, the actors driving these two upgrading trajectories will differ. In the case of clusters - particularly in the early stages of informal sector dominated clusters - the key drivers are likely to be in the public and NGO sector. By contrast, in the case of GVCs it is likely to be the lead firms who play the primary role, although there is of course considerable scope for the state to assist in supply chain development, and for NGOs to promote environmental and social sustainability upgrading paths.

There is more difficulty in simultaneously promoting upgrading in the two families of GVCs. Insertion into vertically specialised GVCs begins with a thinning of value added, with some subsequent thickening, whereas in additive GVCs the requirement is predominantly one of a thickening strategic agenda. Although both strategic agendas ultimately involve upgrading and the deepening of linkages and may appear to be similar in nature, their starting points (thinning and thickening) are fundamentally different, as are their final outcomes. The potential for conflict surfaces most sharply in relation to the trade regime underpinning growth and upgrading. In vertically specialised GVCs the emphasis is on what may be termed a "Washington Consensus" trade regime of open borders and trade facilitation, backed by a less-Washington-Consensus-friendly innovation and industrial policy which supports the development of inputs such as skill development, infrastructure and Research and Development which are prone to market failure. The provision of these complementary inputs is undertaken in a manner which makes them available to the GVCs without mandating their use.

By contrast, upgrading in additive GVCs is supported by a different trade regime. It is one which may limit imports of certain inputs where local

---

<sup>18</sup> The policies required to support inclusive innovation are discussed in various contribution in Dutz et al., 2014



provision is favoured, where local content may be a requirement of operation and where (as is currently the case in Indonesia) raw materials cannot be exported in unprocessed form. Thus, there may be a greater degree of compulsion and the use of financial sanctions with regard to the use of local inputs than in the case of vertically specialised GVCs.

Consequently, whereas the policy agenda adopted to promote upgrading in additive GVCs may look more like those adopted in previous eras of import substituting industrialisation, the policy agenda for vertically specialised GVCs is closer to the textbook version of export oriented growth. We use the phrase “closer to” since despite the liberalisation of the trade regime required to facilitate these GVCs, the upgrading agenda requires the adoption of many of the policy tools involved in the promotion of additive GVCs, notably with some degree of sectoral targeting, in the promotion of skills and the National System of Innovation and in the provision of infrastructure.

The extent of conflict and trade-off between these three upgrading arenas will be a function of country size and capabilities. Clearly, the larger the economy, the easier it is to walk on these diverse policy legs simultaneously. This has indeed been the case in China. There the Special Economic Zones which have dominated the export sector in the past and which are geared to facilitate trade have been insulated from policies directed towards deepening value added in industries predominantly serving the domestic market (Poon, 2014). However, in smaller economies, and economies where export volumes are not large enough to allow for the recoupment on investment, there have been attempts to allow production in the Export Processing Zones to serve both domestic markets (where duties and taxes are paid) as well as (duty and tax free) export markets. This can pose insuperable problems of governance and is often an incentive to corruption and other forms of malfeasance as was the case in the Dominican Republic in the early 1990s (Kaplinsky, 1993).

## REFERENCES

- Adewuyi, A. O. and T. A. Oyejide (2012), "Determinants of backward linkages of oil and gas industry in the Nigerian economy", Special Issue Making the Most of Commodities: The Determinants of Linkages in Africa, *Resources Policy*, Vol. 37, No. 4, pp 4512-460.
- Ageyi-Holmes, A. (2014), *Tilling the Soil in Tanzania: What Do Emerging Economies Have to Offer?*, Phd Dissertation, Milton Keynes: The Open University,.
- Attah-Ankomah, R. (2014), *China's Presence in Developing Countries. Technology Basket: The Case of Furniture Manufacturing in Kenya*, Phd Dissertation, Milton Keynes: The Open University,
- Best, M. H. (1990), *The New Competition*, Oxford: Polity Press.
- Bhalla, A. S. (ed), *Technology and Employment in Industry*, Geneva: ILO.
- Bloch, R. and G. Owusu (2012), "Linkages in Ghana's Gold Mining Industry: Challenging the Enclave Thesis, *Resources Policy*, 37(4), pp. 434-442
- Botchie, D. (2014), *Comparative Analysis of Asian Drivers and Western Garment Making Machines: A Case of the Garments Sector in Uganda*, Phd Dissertation, Milton Keynes: The Open University,
- Chandler, A. D. (1977), *The Visible Hand*, Cambridge, Cambridge, Mass.: Harvard University Press.
- Chang, H.J (2014), *Economics: The User's Guide*, London: Penguin Books.
- Cornia, G. A. (2012), *Inequality Trends and their Determinants: Latin America over 1990-2010*, WIDER Working Papers 09/2012, WIDER, Helsinki.
- Cusumano M. A. (1985), *The Japanese Automobile Industry: Technology and Management at Nissan and Toyota*, Cambridge, Mass.: Harvard University Press.
- Dobbs, R., J. Oppenheim, F. Thompson, M. Brinkman and M. Zornes (2011), *Resource Revolution: Meeting the world's Energy, Materials, Food and Water Needs*, London: McKinsey Global Institute, McKinsey and Co.
- Dutz, M.A., Y. Kuznetsov, E. Lasagabaster and D. Pilat (eds), *Making Innovation Policy Work: Learning from Experimentation*, Paris and New York: OECD and The World Bank.
- Enright, M. J., E. E. Scott and K-M Chang (2005), *Regional Powerhouse: The Greater Pearl River Delta and the Rise of China*, Singapore: John Wiley and Sons.
- Farooki, M. and R. Kaplinsky (2012), *The Impact of China on Global Commodity Prices: The Global Reshaping of the Resource Sector*, London, UK: Routledge.
- Feenstra, R. E. and G. Hamilton (2006), *Emergent Economies, Divergent Paths: Economic Organization and International Trade in South Korea and Taiwan* New York: Cambridge University Press.
- Fessehaie, J. (2012), "What determines the breadth and depth of Zambia's backward linkages to copper mining? The role of public policy and value chain dynamics", *Resources Policy*, Vol 37. No 4, pp. 443-451.

- Fessehaie, J and M. Morris (2013), "Value Chain Dynamics of Chinese Copper Mining in Zambia: Enclave or Linkage Development?", *The European Journal of Development Research*, **25**, 537–556.
- Foster, C. and R. Heeks (2013), "Innovation and scaling of ICT for the bottom-of-the-pyramid", *Journal of Information Technology*, Vol. 28, Issue 4, pp. 296-315
- Gereffi, G. (1999), "International Trade and Industrial Upgrading in the Apparel Commodity Chain", *Journal of International Economics*, Vol. 48, No. 1, pp 37-70.
- Gereffi, G. (2014), *A Global Value Chain Perspective on Industrial Policy and Development in Emerging Markets*, mimeo, Raleigh" Duke University.
- Gereffi, G., M. Korzeniewicz and R. P. Korzeniewicz (1994), "Introduction", in G. Gereffi and M. Korzeniewicz (eds), *Commodity Chains and Global Capitalism*, London: Praeger.
- Gereffi G., T. Sturgeon and J. Humphrey (2005), "The Governance of Global Value Chains", *Review of International Political Economy*, Vol. 12 No. 1, pp 78-104.
- Gibbon, P. and S. Ponte (2005), *Trading Down: Africa, Value Chains and Global Capitalism*, Philadelphia: Temple University Press.
- Hamel, G. and C. K. Prahalad (1994), *Competing for the Future*, Cambridge: Harvard Business School Press.
- Haraguchi N. and Rezonja (2010), *In Search of General Patterns of Manufacturing Development*, Working Paper 02/2010, Vienna, UNIDO.
- Hirschman, A. O. (1981), *Essays in Trespassing: Economics to Politics and Beyond*, New York: Cambridge University Press.
- Humphrey J. and H. Schmitz (2000), *Global Governance and Upgrading: Linking Industrial Cluster and Global Value Chain Research*, IDS Working Paper 120, Brighton: Institute of Development Studies
- Humphrey, J., R. Kaplinsky and P. Saraph (1998), *Corporate Restructuring: Crompton Greaves and the Challenge of Globalisation*, N. Delhi: Sage Publications Ltd.
- Kaplan, D. (2012), "South African Mining Equipment and Specialist Services: Technological Capacity, Export Performance and Policy", *Resources Policy*, Volume 37, Issue 4, December, pp. 425-433
- Kaplinsky R. (1993), "Export Processing Zones in the Dominican Republic: Transforming Manufactures into Commodities", *World Development*, Vol. 21, No. 11, pp. 1851-1865.
- Kaplinsky, R. (2010), *The Role of Standards in Global Value Chains and their Impact on Economic and Social Upgrading*, Policy Research Working Paper 5396, Washington: World Bank,
- Kaplinsky, R. and M. Morris (1999), "Trade Policy Reform and the Competitive Response in Kwazulu Natal Province, South Africa", *World Development*, Vol. 27, No. 4., pp. 717-737.
- Kaplinsky, R. and M. Morris (2001), *A Handbook for Value Chain Research*, [http://asiandrivers.open.ac.uk/documents/Value\\_chain\\_Handbook\\_RKMM\\_No\\_v\\_2001.pdf](http://asiandrivers.open.ac.uk/documents/Value_chain_Handbook_RKMM_No_v_2001.pdf)
- Kaplinsky, R., M. Morris and J. Readman (2002), "The Globalisation of Product Markets and Immiserising Growth: Lessons from the South African Furniture

- Industry”, *World Development*, Vol. 30, No. 7, pp. 1159-1178
- Kaplinsky, R., A. Terheggen and J. P. Tijaja (2011), “China as a Final Market: The Gabon Timber and Thai Cassava Value Chains”, *World Development*, Vol. 39, No. 7, pp. 1177-1190.
- Kaplinsky, R. and M. Morris (2014a), *Developing Industrial Clusters and Supply Chains to Support Diversification and Sustainable Development of Exports in Africa*, Report for the AfrEximBank.
- Kaplinsky, R. and M. Morris, (2014b), *Thinning and Thickening: Productive Sector Policies in the Era of Global Value Chains*, IKD Discussion Paper No. 74, Milton Keynes, Open University
- Lederman, D. & W.F. Maloney (2007), “Trade Structure and Growth”, in D. Lederman and W.F. Maloney (eds), *Natural Resources: Neither Curse nor Destiny*. Washington, DC: Stanford University Press and The World Bank, 15-39
- Lin, J. and C. Monga (2010), *Growth Identification and Facilitation: The Role of the State in the Dynamics of Structural Change*, Policy Research Working Paper 5313, Washington: The World Bank.
- Marshall, A. (1919), *Industry and Trade*, London: Macmillan.
- Mazzucato, M. (2013), *The Entrepreneurial State*, London: Demos.
- Mbayi, L. (2011), *Linkages in Botswana’s Diamond Cutting and Polishing Industry*, MMCP Discussion Paper No 6, Cape Town, the University of Cape Town, and Milton Keynes, the Open University.
- Milanovic, B. (2005), *World Apart: Measuring International and Global Inequality*, Princeton: Princeton University Press.
- Mjimba, V. (2011), *The Nature and Determinants of Linkages in Emerging Minerals Commodity Sectors: A Case Study of Gold Mining in Tanzania*, MMCP Discussion Paper No 7, Cape Town, the University of Cape Town, and Milton Keynes, the Open University
- Morris, M and J. Fessehaie, (2012), *Making the Most of Africa’s Commodities: Linkage Development, Value Addition and Industrialisation*, Report for the United Nations Economic Commission Economic Report on Africa
- Morris, M., R. Kaplinsky and D. Kaplan (2012), *One Thing Leads to Another: Promoting Industrialisation by Making the Most of Commodities in Sub Sahara Africa*, [www.Lulu.com](http://www.Lulu.com) or <http://tinyurl.com/CommoditiesBook>
- Morris, M. and C. Staritz (2014), “Industrialisation trajectories in Madagascar’s export apparel industry: Ownership, embeddedness, markets, and upgrading”, *World Development*, Volume 56, April 2014, pp. 243–257.
- OECD (2012), *Mapping Global Value Chains*, Paris: OECD Development Centre.
- OECD (2014), *African Economic Outlook 2014*, Paris: OECD.
- Piore M. J. and C. Sabel (1984), *The Second Industrial Divide: Possibilities for Prosperity*, N. York: Basic Books.
- Poon, D. (2014), *China and South-South “Self-Sustaining Growth”: An Opening for Industrial Policy and Catch-up Development*, <http://www.tips.org.za/publication/china-and-south-south-self-sustaining-growth-opening-industrial-policy-and-catch-develop>
- Porter M.E (1985), *Competitive Advantage: Creating and Sustaining Superior*

- Performance*, New York: The Free Press.
- Porter, M. E. (1990), *The Competitive Advantage of Nations*, New York: The Free Press.
- Ricardo, D. (1817), *The Principles of Political Economy and Taxation*, London: Dent (Reprinted 1973).
- Rabellotti, R., A. Carabelli and G. Hirsch (2009), "Italian Industrial Districts on the Move: Where Are They Going?", *European Planning Studies*, 17(1), 19 — 41.
- Rodrik, D (2004), *Industrial Policy for the Twenty-First Century*, RWP04-047, Kennedy School of Government Research Working Paper, Harvard University, Cambridge.
- Sachs, J. D. and A. M. Warner (2001), "The Curse of Natural Resources", *European Economic Review*, 45: 827-838.
- Schmitz, H. (1995a), "Collective Efficiency: Growth Path for Small-Scale Industry", *Journal of Development Studies*, Vol. 31, No. 4.
- Schmitz, H. (1995b), "Small Shoemakers and Fordist Giants: Tales of a Supercluster", *World Development*, Vol. 23 No. 1, pp. 9-28.
- Schmitz, H. and K. Nadvi (2000), "Clustering and Industrialization: Introduction", *World Development Special Issue on Industrial Clusters in Developing Countries*, Vol. 27, No. 9, pp. 1503-1514.
- Singer, H. W. (1950), "The Distribution of Gains between Investing and Borrowing Countries", *American Economic Review*, 15, pp. 473-85.
- Smith, A. (1776). *An Enquiry into the Nature and Cause of The Wealth of Nations*, (4<sup>th</sup> Edition), republished in 1976 by Oxford University Press, and edited by R. H. Campbell and A. S Skinner.
- Staritz, C and M. Morris (2014), "Global Value Chains in Apparel: Still a Path for Industrial Development?", (forthcoming) in M. Tribe and J. Weiss (eds), *Handbook on Industrial Development*, London: Routledge.
- Sturgeon, T. and O. Memedovic (2010), *Mapping Global Value Chains: Intermediate Goods Trade and Structural Change*, Development Policy and Strategic Research Branch, Working Paper 05/2010, Vienna, UNIDO.
- Syrquin M and Chenery H (1989), *Patterns of Development: 1953 to 1983*, World Bank Discussion Paper No 41, Washington, IBRD.
- Terheggen, A. (2011), *The Tropical Timber Industry in Gabon: A Forward Linkages Approach*, MMCP Discussion Paper No 10, Cape Town, the University of Cape Town, and Milton Keynes, the Open University
- UNCTAD (2013), *Trade and Development Report*, Geneva: United Nations.
- US Census Bureau (2013), "A Profile of U.S. Importing and Exporting Firms", U.S. Census Bureau News, April 5, 2013, Washington: US Dept. of Commerce..
- Von Hippel, E. (2005), *Democratizing Innovation*, Boston: MIT Press.
- Wang, J. and L. Mei (2009), *Dynamics of Labour-intensive Clusters in China: Relying on Low Labour Costs or Cultivating Innovation?*, International Institute for Labour Studies Discussion Paper No. 195.
- Wilkins, M. (1974), *The Maturing of Multinational Enterprise: American Business Abroad from 1914 to 1970*, Cambridge, Mass: Harvard University Press.
- Williamson, O. E. (1985), *The Economic Institutions of Capitalism: Firms, Markets and Relational Contracting*, New York: Praeger

- Wright, G. and J. Czelusta (2004), "The Myth of the Resource Curse", *Challenge*, Vol. 47, No. 2, pp. 6-38.
- Xing, Y., and N. Detert (2010). *How the iPhone Widens the United States Trade Deficit with the People's Republic of China*. ADBI Working Paper 257, Tokyo: Asian Development Bank Institute.
- Zhihua, D. (2014), *China's Special Economic Zones and Industrial Clusters: Success and Challenges*. Retrieved 6 February 2014, from <http://blogs.worldbank.org/developmenttalk>

## The UNU-MERIT WORKING Paper Series

- 2015-01 *How does firms' perceived competition affect technological innovation in Luxembourg?* by Wladimir Raymond and Tatiana Plotnikova
- 2015-02 *The effect of supplementation with locally available foods on stunting. A review of theory and evidence* by Mutinta Nseluke Hambayi, Wim Groot and Nyasha Tirivayi
- 2015-03 *Ethnic divisions, political institutions and the duration of declines: A political economy theory of delayed recovery* Richard Bluhm and Kaj Thomsson
- 2015-04 *Offshoring of medium-skill jobs, polarization, and productivity effect: Implications for wages and low-skill unemployment* by Ehsan Vallizadeh, Joan Muysken and Thomas Zieseemer
- 2015-05 *Risk preference or financial literacy? Behavioural experiment on index insurance demand* by Yesuf M. Awel and Théophile T. Azomahou
- 2015-06 *Poverty persistence and informal risk management: Micro evidence from urban Ethiopia* by Théophile T. Azomahou and Eleni A. Yitbarek
- 2015-07 *Research joint ventures in an R&D driven market with evolving consumer preferences: An evolutionary multi-agent based modelling approach* by Salih Çevikarslan
- 2015-08 *The effects of remittances on support for democracy in Africa: Are remittances a curse or a blessing?* by Maty Konte
- 2015-09 *The location strategies of multinationals from emerging countries in the EU regions* by Riccardo Crescenzi, Carlo Pietrobelli and Roberta Rabellotti
- 2015-10 *North-South FDI and Bilateral Investment Treaties* by Rod Falvey and Neil Foster-McGregor
- 2015-11 *Evolutionary convergence of the patterns of international research collaborations across scientific fields* by Mario Coccia and Lili Wang
- 2015-12 *Innovation and productivity in services and manufacturing: The role of ICT investment* by Diego Aboal and Ezequiel Tacsir
- 2015-13 *Human capital, innovation and the distribution of firm growth rates* by Micheline Goedhuys and Leo Sleuwaegen
- 2015-14 *Inside the Black Box: Contributions to the discussion on official development assistance* Editors: Ian Freeman, Tamara A. Kool, Charles Low, Sam Salsal and Emilia Toczydlowska
- 2015-15 *Innovation in natural resources: New opportunities and new challenges. The case of the Argentinian seed industry* by Anabel Marin and Lilia Stubrin
- 2015-16 *Technology foresight and industrial strategy in developing countries* by Carlo Pietrobelli and Fernanda Puppato
- 2015-17 *The impact of the regional environment on the knowledge transfer outcomes of public research organisations: preliminary results for Europe* by Nordine Es-Sadki and Anthony Arundel
- 2015-18 *HIV disease severity and employment outcomes in affected households in Zambia* by Nyasha Tirivayi and John R Koethe
- 2015-19 *Higher education and fertility: Evidence from a natural experiment in Ethiopia* by Miron Tequame and Nyasha Tirivayi
- 2015-20 *Optimal education in times of ageing: The dependency ratio in the Uzawa-Lucas growth model* by Anne Edle von Gaessler and Thomas Zieseemer

- 2015-21 *Impact of electricity prices on foreign direct investment: Evidence from the European Union* by Eva Barteková and Thomas H. W. Zieseemer
- 2015-22 *Local innovation and global value chains in developing countries* by Valentina De Marchi, Elisa Giuliani and Roberta Rabellotti
- 2015-23 *Effective research and innovation (R&I) policy in the EU-28: A causal and configurational analysis of political governance determinants* by Serdar Türkeli and René Kemp
- 2015-24 *Global Value Chains in Africa* by Neil Foster-McGregor, Florian Kaulich and Robert Stehrer
- 2015-25 *Precolonial centralisation, foreign aid and modern state capacity in Africa* by Tobias Broich, Adam Szirmai and Kaj Thomsson
- 2015-26 *The impact of unemployment insurance savings accounts on subsequent employment quality* by Paula Nagler
- 2015-27 *Technological upgrading in global value chains and clusters and their contribution to sustaining economic growth in low and middle income economies* by Raphael Kaplinsky





UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION

Vienna International Centre · P.O. Box 300 9 · 1400 Vienna · Austria  
Tel.: (+43-1) 26026-0 · E-mail: [info@unido.org](mailto:info@unido.org)  
[www.unido.org](http://www.unido.org)