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Clusters, Poverty and Rural Off-grid Elctrification

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Abstract

This paper explores the the relationship between rural off-grid electrification and small enterprises. It explains the concept of clusters and suggests that clustering can support rural development, contribute to poverty reduction and provide a platform for growth and competitiveness. Off-grid electricity supply should therefore consider careful targeting of such off-grid electrical supply projects to ensure the greatest impact.

Key words: Clusters, poverty, off-grid electrification

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1.0 Introduction

This paper considers the relationship between rural off-grid electrification and small enterprises. In doing so the paper raises two questions pertaining to this relationship. First, in what ways might the availability of off-grid electricity facilitate income and employment growth in rural communities? Second, in what ways might local forms of collective organisation help in the construction and implementation of local off-grid rural electricity supply projects? In addressing both questions this paper draws heavily on the concept of small firm clusters. Clusters are defined as geographically specific agglomeration of firms and ancillary units engaged in similar activities and located in close proximity to each other. The concept of clusters has gained wide currency in the academic literature and policy community focusing on small enterprise development. As this paper will show, the concept also has implications for poor rural settings, and offers a potentially important plank for strategies geared towards poverty reduction. Clusters can provide a platform to promote growth and competitiveness for inter-linked small producers in ways that would be infeasible were such producers to be located in isolation to each other.

Small firm clusters can generate various potential benefits for local clustered firms – these include agglomeration advantages including economies of scale and scope that emerge from the presence of a critical mass of actors engaged in similar activities and sectors. It can also provide an opportunity for local joint action – between local small enterprises and through local collective action institutions. These combined benefits – of agglomeration externalities and joint action benefits – have been described as the collective efficiency gains that clustering potentially offers (Schmitz 1995, Nadvi 1999a, Schmitz and Nadvi 1999). As the paper will show, these benefits, and the underlying principles behind the cluster concept can be relevant to a study on the implications from and for off-grid rural electrification in India.

The paper is structured as follows. The following section outlines the concept of small firm clusters. This discusses the prevalence of clusters, and their core economic and social underpinnings. Section 3 considers the links between clusters and poverty – outlining how clusters may mitigate poverty effects, as well as providing illustrative case examples. Section 4 discusses the two main questions pertaining to the focus of this paper – namely in what ways may rural electrification impact on incomes and employment, and also how might collective action efforts help in the implementation of such initiatives. The concluding section considers some of the issues and questions that arise for further research on the rural electrification-clustering relationship.

2. Small Firm Clusters – an outline of the concept and its relevance

2.1 Clustering – the concept and its prominence

The concept of small firm clusters was initially popularised through the work of Michael Porter. Porter described clusters as "a geographically proximate group of inter-connected companies and associated institutions in a particular field, linked by commonalities and complementarities" (Porter 2000:254). Porter's work drew on evidence of growth clusters across North America, with the most famous examples of successful clustering coming from the IT cluster in Silicon Valley, California and the medical equipment and pharmaceuticals cluster near Boston, Massachusetts (see also Saxenian 1994). Further evidence of the growth and competitiveness of small and medium enterprises (SMEs) when located in sector specific industrial clusters was observed across Western Europe, particularly in northeastern Italy, (see Goodman and Bamford, 1989; Pyke et. al., 1990; Pyke and Sengenberger, 1992). The connection between clustering, growth and competitiveness attracted attention from several disciplines, including regional science and economic geography (Garofoli, 1992; Scott and Storper, 1992; Scott, 1995), business economics (Porter, 1990) and even mainstream economics (Krugman, 1991, 1995). The consensus that emerged was that the explanation for competitiveness and growth of small firm clusters was not to be found solely within the confines of the individual firm but at the collective level, and that cluster-based inter-firm relationships mattered.

There is now substantial evidence on the presence of small firm clusters in the developing world, including globally competitive clusters, across a range of sectors and regions (Nadvi & Schmitz, 1994; Schmitz and Nadvi 1999). In India alone there are detailed accounts of export competitive small firm clusters to be found in the Tirippur knitwear sector (De Neve 2009), the Ludhiana knitwear sector (Tewari 2001), the Agra footwear sector (Knorringa 1996, 1999), the Bangalore IT industry (Nadvi 1999b) and the sports goods cluster of Jalandhar (Lund-Thomsen and Nadvi 2010). According to the Micro and Small and Medium Enterprise Foundation (MSME) in India there are now over 600 documented industrial clusters in India as well as a further 6000 smaller artisanal and rural based clusters in the country (www.msmefoundation.org/Cluster_India.aspx).

Much of the most substantive policy interventions in support of small firm clusters is also to be found in the Indian context. The United Nations Industrial Development Organisation (UNIDO) maintained a decade long programme of cluster-based intervention and cluster promotion in India, working directly with over forty clusters (Russo et al, 2000; UNIDO 2002); and encouraging the Government of India to take a pro-active role in cluster development and cluster promotion as a central plank in its employment generation and economic growth strategy. The Government of India is now currently in the process of launching an ambitious US$ 1.2 billion programme aimed at promoting the competitiveness of over 1200 clusters within the country, including many rural and artisanal clusters (MSME foundation). This policy context makes the links between off-grid rural electrification and rural and artisanal clusters all the more relevant.

2.2 Collective Efficiency and the Economic Gains of Clustering

Clustering generates agglomeration economies and facilitates vertical and horizontal linkages between local agents. This enhances possibilities for local co-operation and raises the prospect of cluster-wide gains. Marshall was one of the first to take note of the potential benefits of agglomeration. He introduced external economies to represent advantages arising from 'the concentration of many small businesses of a similar character in particular localities' (Marshall, 1920: 221). While mainstream economists have come to view external economies as an example of market failure, wherein prices fail to fully capture social costs (or gains), Marshall emphasised the *enabling* function of such benefits, particularly for small firms. In his view, economies external to the firm but internal to the locality could arise from:

- local and specialised labour market;
- division of labour leading to firm specialisation and encouraging core competence;
- presence of numerous allied and subsidiary sectors, providing cheap and readily available supply of specialist inputs, machinery, transport, and services;
- easy access to specialised trade and technical knowledge and the rapid dissemination of information.

Marshall (1920: 225-6) viewed such external economies as the 'chief cause of continued growth' of industrial districts in late nineteenth century Britain and France. They effectively lowered factor prices, generated economies of scale and scope, raised private profits, and, through knowledge flows, enhanced prospects for technical progress. If external economies were the centrepiece of the earlier Marshallian view, current interest on the subject has centred on the possibilities that clustering provides of deliberate joint action by local agents. This includes:

- Joint action within vertical linkages, including backward ties with suppliers and subcontractors (Lazerson, 1988, 1990) and forward ties with traders or buyers (Knorringa, 1996). This requires what Lall (1992) calls a 'linkage capability', that is the ability to absorb and transmit skills and knowledge within vertical production chains. This can lead to 'learning-by-interaction' where knowledge is gained and improvements brought about through user-producer feedback and dialogue at the level of dyadic ties (Lundvall, 1988,1993; Dore, 1992), and within wider networked linkages (Johanson and Mattson, 1987). Moreover, as Pack and Westphal (1986) and Stewart and Ghani (1991) note, such ties can generate significant technological externalities.

- Joint action within bilateral horizontal linkages between two or more local producers. This can include joint marketing of products, joint purchase of input, sharing of capacity, common use of specialist equipment, joint product development, and exchanging know-how and trade information.

- Joint action at the level of multilateral horizontal linkages among large numbers of local producers, particularly through cluster-wide institutions. This includes co-operation in trade associations, trade fairs, and technology and producer services centres (Brusco, 1992; Pyke, 1993; Nadvi 1999b). Such bodies can represent the sector's collective interests, enforce industry-wide norms, provide channels for obtaining market information and technical know-how, and supply producer services and infrastructure crucial to the cluster's growth.

Agglomeration economies accrue passively, by virtue of location, to cluster-based firms. In contrast, joint action gains require active and deliberate inter-firm co-operation. The notion

of 'passive' and 'active' captures the distinctive nature of inter-firm ties that bring about external economies and joint action gains respectively (Nadvi, 1999a). No pejorative meaning is attached to 'passivity'. Quite the opposite, 'passive gains of clustering', arising from the presence of numerous specialist suppliers, inter-firm division of labour and a localised concentration of skills, can be critical to SMEs. However, active and deliberate co-operation between local agents raises the prospect of further gains for clustered producers. As Rabellotti (1997) notes, while both components of collective efficiency can have static (efficiency) and dynamic (growth) effects, joint action is particularly important for the latter. It can promote competitiveness, accelerate innovation and enhance prospects of growth for the cluster as a whole. It can also improve the ability of the cluster to respond rapidly and collectively to exogenous pressures and capitalise on new opportunities.

The word 'can' is important because these improvements do not necessarily follow. Nevertheless, the potential for obtaining such gains is enhanced by the proximity which clustering offers. Collective efficiency can thus be viewed as follows:

	Collective Efficiency	
Type of component gains	External Economies	Joint Action Gains
Nature of inter-firm ties	Passive	Active
Type of effect	Largely static, some dynamic	Static and dynamic

Understanding whether external economies are sufficient for competitiveness or whether joint action is necessary is contextual and requires empirical analysis. In addition, which firms manage to develop active inter-firm ties, and thus access joint action gains, needs to be studied. Not all firms are in a position to enter into joint action. However, the co-operation of some may well generate important externality gains to others in the cluster. Such external economies of joint action can be especially significant for smaller firms. This also raises the problem of free riders, particularly where local rivalry is intense. This could serve as a disincentive to local co-operation. However, where the gains of co-operation are sufficient to offset the costs of free riders, spillover benefits for the cluster as a whole can

become important. Hence it is the *combination* of external economies and joint action gains, and the interactions between them, captured in the concept of collective efficiency that can bring about substantial competitive advantages for clustered producers.

2.3 Clusters and Social Networks

Inter-firm co-operation, at both vertical and horizontal levels, is central to production organisation within the industrial clusters. Specialised division of labour facilitates vertical subcontracting, while SMEs can also collaborate bilaterally (through, for example, consortia) and multilaterally (through trade associations). Such vertical and horizontal co-operation generates significant potential benefits to local producers. One of the paradoxes of clusters is that while there may be extensive local collaboration, clusters are also marked by intense local competition. According to Porter, local competition can be a critical driver behind growth and competitiveness. However, mediating between the potentially divisive tendencies of local competition and local co-operation requires some forms of institutional governance, or local co-ordination. This can either be through the market; via a set of authority relations; or involve a more 'egalitarian' basis of co-ordination. If the last option is pursued, mechanisms for building confidence between agents become necessary to offset the threat of the transaction costs arising from insufficient information, the fear of adverse selection, moral hazards and opportunistic behaviour.

Confidence can develop when agents engage in long-term and recurring contracts and become familiar with each other. Networks offer an organisational form, distinct from Williamson's construct of markets and the integrated firm, where opportunism can be mitigated. At the heart of network relations is interdependency, with long-term, reciprocal, and mutually supportive relationships (Powell, 1990). This requires a high degree of 'mutual orientation' between networked agents (Johanson and Mattson, 1987). Interdependence also implies that opportunism may be diminished by the sanction of reciprocity. The fact that contracts are recurring, and long-term, provides insurance against 'malfeasance'. The reputation of each party is continuously and consistently at stake in each transaction with other actors in the cluster.

Goodwill, reciprocity, and reputation are the basis on which long-term interdependent ties are built, and the grounds on which trust takes shape between cooperating parties within a network. However, acquiring mutual knowledge and building reputation takes time. Network ties that are grounded in existing social relationships, wherein economic reputation is socially influenced, minimise such costs.[1] In long-term contracts, trust and reputation effects are constructed on ties that are economic and business-like as well as personalised and social. Economic agents are individuals who are also connected through social ties. The importance of the social embeddedness approach is that it provides a basis for addressing how co-operation can be achieved, and the fear of opportunism minimised by local agents. Socio-cultural identities and characteristics influence, and are influenced by, intra and inter-firm relations within the cluster. Production networks in clusters are embedded in local social networks that carry with them various forms of social capital. These include socialised value sets, rules and mores which directly and indirectly influence the way in which production organisation is organised, and socially constructed technical and community 'knowledge banks' which affect how the cluster operates and develops.

The embeddedness approach does not, however, imply social or cultural determinism. Social ties and social norms are not fixed in time. Quite the opposite, they are evolving processes. Constantly and consistently being shaped by economic and technical developments upon which they are themselves acting (Granovetter, 1992: 57). At the same time socio-cultural value sets do not necessarily act in a predictable or homogeneous fashion on all segments of the cluster. They can legitimise exploitative practices, hinder co-operation between different segments of a cluster, and reinforce existing power asymmetries. By acting as barriers to entry of outsiders, social networks can also intensify prevalent social and regional inequities. If the cluster is not sufficiently large, restricting outsiders can also potentially limit cluster growth by limiting the pool of skills and capital that could be drawn upon. Finally, local social values and historically sedimented traditional

[1]The classic example is the gem trade, where community, ethnic, religious and family ties often provide the key mechanisms to minimise security costs and the threat of opportunistic behaviour (see Ben-Porath 1980; Coleman 1988; Raub and Weesie 1991, Scott 1995).

technical knowledge can hinder and restrict the spread of new ideas from the outside. Thus, an inward-looking and homogeneous culture can make local agents more vulnerable to exogenous pressures, and 'strongly embedded regional networks [can] insidiously turn from ties that bind to ties that blind' (Grabher, 1993: 24).

In the industrial clusters literature, social ties are multiple and varied. They form around notions of family, caste, ethnic, racial, religious, educational, political or corporate backgrounds. In the industrial districts of northeastern Italy, the family, the church and local political affiliations are said to provide a basis for social ties (Becattini, 1990; Trigilia, 1990). Where they have been observed in the South, notions of community shaped by religion, ethnicity, language, occupational caste or regional background have tended to be the primary form of local social identity.[2] However, there is also evidence of more 'modern' social networks, based on shared educational or business experience (Holmström, 1993, 1994; Schmitz, 1995; Nadvi 1999c).

Thus, what we know from the existing literature is that social embeddedness can influence the workings of a district and its institutional framework in three ways. First, through the 'sedimentation of specific and interrelated historical, social and cultural factors in local areas which generate significantly different processes of development directly due to local specifications' (Garofoli, 1992: 3). This includes local religious and/or cultural attitudes that influence the the dominant work ethos, and support intra and inter-firm relations.

Second, through social ties and socialised production relations that lower transaction costs by providing a basis for trust, social reputation, and reciprocity in inter-firm relations. Being socially embedded within a community provides a basis for the social provisioning of market-related information, and generates an implicit code of behaviour, incorporating rules and sanctions, that regulate both social and production relations within the cluster. Hence, a regulatory mechanism for inter-firm relations emerges from within community

[2]See Nadvi and Schmitz 1994 for a review of the material on social ties in Southern industrial districts.

and socio-cultural identities. Sanctions enforce the limits of socially accepted commercial behaviour within firms and between firms. The ultimate sanction implies social exclusion from the community.[3] A less draconian, yet effective, sanction in business relations is loss of reputation. A reputation for honesty and fairness in business transactions is highly valued and is constructed over an extensive period of time. Such a reputation is also zealously guarded. Where the social and commercial 'exit costs' (a la Hirschman) incurred from breaking a commitment are sufficiently high, reputational effects can serve to reinforce inter-firm co-operation.

Third, through the social milieu which influences, and is itself influenced by, innovation and technological change. In the industrial district perspective, technology is endogenized, or related directly to the social fabric in which it is located. This has two important implications. First, clusters of small firms carry with them an element of 'tacit knowledge' regarding technology, skills, products and processes that is often specific to that community and usually accumulates over an extended historical period. Second, innovation and technical progress is an incremental and 'systemic' (as opposed to 'atomistic') process which builds upon interactions between users and producers (Lundvall, 1988). Such interactive technical co-operation requires commonly accepted codes of behaviour, channels of information, and mutual trust (Lundvall, 1988: 352-4).

3. Clusters and Poverty

3.1 Introduction

Given the challenge to meet the UN's Millenium Development Goals (MDGs) by 2015, there is increasing interest amongst the research and policy community working with small enterprises on the potential role that small firm clusters and networks can play in reducing poverty. Despite this interest, however, poverty reduction has not been a central element of mainstream cluster development research or policy work.

[3]As Marshall (1919:164) stated 'business trust and confidence...were indeed enforced within each group by the social penalty of ostracism: an offender against his neighbours became an outcast, often without refuge.'

The cluster literature and cluster development strategies have historically tended to focus on issues relating to the competitiveness of firms, and the role that clusters and networks can play to raise competitive advantages. This is understandable given the relative success of small firm industrial districts in many parts of the developed, and the developing world to compete with larger enterprises and in local and global markets. Much of the focus on competitiveness has centred on the economic advantages that clusters and networks potentially engender, and the ways in which local institutions and local governance can add to these advantages through joint action by local actors. This discussion on cluster competitiveness has also begun to acknowledge that competitiveness does not hinge solely on internal, or local, linkages within cluster, recognising the importance of understanding linkages with actors external to clusters. Thus, there is now growing awareness of the need to understand ties that cluster-based actors, especially producers, have with global buyers, and to analyse the structure and organisation of global value chains (GVC) into which local clustered firms may be inserted. This emergent discussion has thrown new light to the competitiveness agenda by focusing on how issues of upgrading and technological improvement in clustered and networked firms are influenced by GVC ties, as well as underlining potential conflicts between global governance, as experienced through pressures from ties within the global value chain, and local governance. A number of studies indicate that global value chain governance can weaken local 'territorial' or cluster and network governance.

What tends to be neglected in the policy and research focus on the competitiveness-upgrading nexus is the fact that in many cases small firm clusters cater to, or provide employment for, the poor. The cluster-poverty relationship has only recently been discussed, although a number of studies have highlighted what various authors have describe as 'artisanal' clusters, 'dormant' clusters, 'nascent' clusters, 'incipient' clusters and 'survival' clusters. As some of these studies indicate, there are various ways in which small firm clusters can influence poverty concerns. This raises various questions:

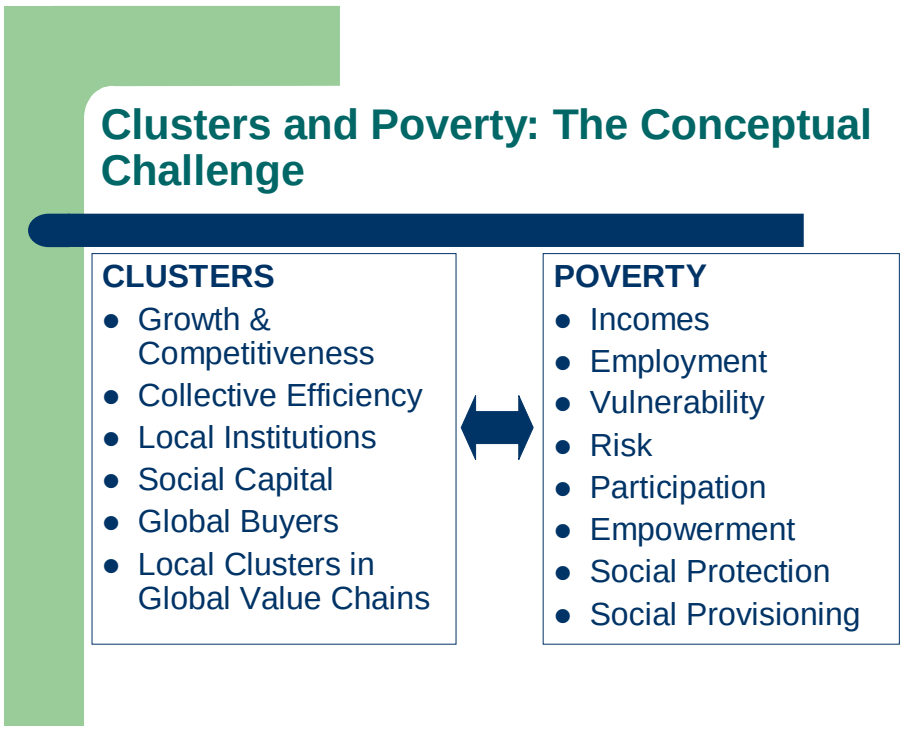
- To what extent can clusters offer an avenue for small scale and poor producers to effectively undertake manufacturing activities geared to external markets?
- To what extent does the potential for local joint action strengthen the capacity of such producers to work collaboratively and raise their incomes?
- To what extent do global pressures to comply with internationally accepted labour standards and corporate social responsibility norms improve outcomes in terms of employment, incomes and working conditions for entrepreneurs and workers located in such types of clusters?
- In what (if any) ways can attempts to promote cluster development also address wider social sector concerns, particularly on education and health?

These examples show how in different ways cluster-based activities, including local joint action as well as linkages with actors within the global value chain, can influence the ability of clusters to address wider poverty and social concerns. This includes local joint action articulated through Self Help Groups (SHGs), Co-Operative Networks, and locally based Multi Stakeholder Initiatives (MSIs). As the emerging evidence indicates, such different forms of 'collectivities' articulated through distinct local institutional forms within clusters and networks can potentially lead to positive pro-poor outcomes. These outcomes not only address how clusters or networks of poor small producers can raise employment and improve incomes, but also how they may positively impact on more marginalised segments of the community or labour force (especially women workers) as well as address wider concerns on social sector provisioning such as health and education, as well as infrastructure provisioning. In some cases, initiatives of this kind can enhance the nature of local territorial advantage, and provide a wider developmental identity to territorial competitiveness. However, such initiatives often have to be worked out in terrains where outcomes are differentiated, and where different interests groups within the local cluster or network and the global value chain can (and do) potentially undermine pro-poor gains.

3.2 Clusters and Poverty – What's the connection?

Conceptually, the cluster literature has primarily focused on the issues set out on the left side of the box below. Namely on issues of growth and competitiveness; on the components

of collective efficiency – namely local agglomeration economies and joint action gains; on the role of local institutions (such as business associations, chambers of commerce, enterprise clubs, technical and research bodies, universities, business development service providers etc.); the influence of social capital (observed in various forms) in promoting local co-operation and mediating competition; and finally, the influence of actors external to the cluster, such as global buyers and global lead firms, who not only link local producers to global markets but also provide a framework for understanding how local clusters are inserted into global value chains, and what implications does this have for local clusters to upgrade.



In contrast, the poverty literature, has had quite different sets of concerns. These have grown from an initial concern with incomes and employment to also take on a wider set of poverty-related concerns such as vulnerability, risks, participation and empowerment. Many of these aspects of a poverty concern reflect the ways in which Amartya Sen's notion of human capabilities has come to inform the poverty alleviation debate, emphasising issues

that are neglected in simple income-consumption poverty measures as well as underlining the needs of marginalised and vulnerable groups within society (children, women, the elderly, the disabled, migrants, ethnic minorities and so on). This wider framework on poverty has also now taken on concerns around social protection, and how that is brought about – both formally and informally, and on social provisioning – especially of social sector concerns that are critically linked to poverty alleviation such as access to basic needs (such as food, potable water, adequate shelter) as well as health and education.

The challenge in developing a framework for understanding the nexus between cluster development and poverty reduction is to get the two sides of the box above to 'talk' to each other. That is to say, to link the conceptual concerns within clusters – such as competitiveness, collective efficiency, social capital and local institutions - to link to poverty concerns – on incomes, employment, vulnerability, participation and social protection/provisioning.

As Nadvi and Barrientos (2004) state, this is no easy task. Yet, one can see how the cluster model might raise critical questions for poverty reduction. These include:

- Does clustering raise employment for the poor?
    - Does this provide employment for particularly marginalized groups within society (women, migrants, etc.)?
- Does clustering reduce vulnerability and risk for firms *and* labour?
    - And if so, which categories of workers?
- Does cluster-based upgrading have positive outcomes for the poor?
- Does clustering enhance skills? Is this pro-poor?
- Can social capital strengthen pro-poor initiatives?
- What is the relationship between local cluster governance and global value chain governance, and in what ways can this strengthen/weaken pro-poor outcomes?
- Can clusters promote compliance with labour, social, environmental standards and corporate social responsibility (CSR) norms?

- Can clusters build territorial advantages around compliance with labour standards and social sector provisioning?

The Nadvi and Barrientos (2004) study argued that conceptually certain cluster features, cluster processes (namely agglomeration economies and forms of joint action) and cluster dynamics (growth within clusters, differentiation over time) could impact on local 'poverty nodes', or groups of poor workers and small producers. The study argued that applying a poverty lens to cluster analysis and cluster promotion could help to identify better the winners and losers from cluster development as well as provide a basis to embed poverty and social impact assessment into on-going cluster interventions.

Thus, in terms of cluster features, particular characteristics may identify developing country clusters where the poor predominate. This include, for example, rural-based locations, low income urban and peri-urban settings; clusters engaged in labour intensive production and service activities; and clusters that tend to employ relatively unskilled, as opposed to skilled, labour. In addition, specific processes associated with clustering could influence poverty concerns. Agglomeration economies could lower costs in such a way that relatively poor entrepreneurs and workers are able to survive. Similarly, co-operative joint action amongst such producers may allow them to obtain economies of scale and scope, and to reduce the constraints of small size and limited resources. Co-operation may also assist such producers and workers to confront vulnerabilities arising from volatilities, risks and shocks in markets. Finally, social capital within the cluster may provide the basis for shared social provisioning of key resources, from credit to knowledge, as well as providing socially based support mechanisms. However, as Nadvi and Barrientos note, cluster dynamics can result in differentiated gains within clusters, differentiated according to firms as well as categories of workers. Thus, as clusters and networks expand, smaller players may be at greater risks of being squeezed while more marginal categories of workers (migrants, and women for example) may run the risk of being marginalised in the process of skill upgrading within the cluster. As their study indicates, the empirical evidence is replete with cluster features,

processes and dynamics impacting on poverty concerns, and resulting in highly differentiated gains.

In light of this, the Nadvi and Barrientos (2004) study suggested that a 'value chain to poverty' mapping could be used to identify particular 'poverty nodes' within clusters and networks, and consider how such 'poverty nodes' would be affected by cluster dynamics as well as policy interventions. Poverty 'nodes' being those categories of workers (and in some cases entrepreneurs as well) who appear especially vulnerable to poverty, or for whom dynamics within the cluster, network and/or value chain could negatively impact upon their livelihoods.

The conclusion that emerges from this earlier work indicates that a pro-poor focus can be incorporated in to cluster and network development strategies, but that this requires a very explicit policy attention to poverty concerns. Thus, Nadvi and Barrientos emphasise the need to incorporate poverty considerations at the outset in developing effective pro-poor cluster and network development strategies, and adopting an on-going 'improving' impact approach in poverty and social impact assessment.

3.3 Clusters and Poverty – what is the international evidence?

There are numerous examples of small firm clusters engaged in labour intensive sectors and employing unskilled and low-skilled workers across the world. Some of the most compelling evidence comes from India (Gulati 1997). Many such clusters are in poor rural locations and in within the urban informal economy, generating incomes and employment for the working poor and often the very poor. These are often households whose income levels place them on or below the poverty line, or who are acutely vulnerable in the face of exogenous shocks to fall into poverty. Examples of clusters providing employment and livelihoods for the poor are to found in Latin America (see Altenburg and Meyer-Stamer 1999), sub-Saharan Africa

(van Dijk and Rabellotti 1997, McCormick 1999), and across Asia (Weijland 1999, Gulati 1997, Saith 2001).

Nadvi and Barrientos (2004) give a detailed overview of the empirical evidence on clusters and poverty. The key points to note on this are the following. First, incipient clusters in poor localities are common and widespread. Second, in many such clusters there is systematic evidence of substantial employment growth over time. Third, that in such clusters there is often significant employment of the more marginalised segments of the labour force, especially of women and rural migrants. Fourth, while poverty clusters survive and create jobs for the poor, evidence on income growth is rare. Where incomes do rise, it appears to be more significant in advanced clusters where it is associated with productivity growth. However, what is critical is that in the few studies that assess the counterfactual (see Sandee 2002 for Indonesia and Visser 1999 for Peru), wages for those working in poor clusters tend to be higher than wage levels found amongst similar non-clustered producers and workers. This implies that such cluster based producers and workers are better off than similarly poor households located outside clusters.

The rationale for this goes back to collective efficiency gains, especially externality benefits. As Weijland (1999) observed from her review of rural clusters in Indonesia, clusters generate critical search and reach economies bringing traders that link producers to dispersed markets. The division of labour also promotes process specialisation, accelerates the flow of information within the cluster and facilitates the sharing of labour and orders. In certain sectors, such as garment production, she found that external economies were critical to the ability of local clustered producers to survive and compete. McCormick (1999) also substantiates this from evidence on nascent rural and urban informal clusters in parts of Africa, while Visser (1999) argues that localised external economies were critical to the success of the garment cluster of Gamarra in Lima, Peru. Such externalities reduced costs for clustered producers, and for those who worked for them. These efficiency gains allowed poor producers with limited capabilities to compete alongside larger firms and other, more dispersed, producers who were often better placed in terms of access to key resources.

The evidence on collaborative joint action within poor clusters is more uneven, but not uncommon. McCormick (1999) cites examples from Nairobi's clusters of poor and informal garment producers and metalworkers coming together to undertake joint marketing and in some cases new product development. Similarly, Sandee (2002) found evidence of collective investment and technological development in the rural roof tiles clusters in central Java, Indonesia, while Weijland (1999) reported that state intervention in support of joint action within rural clusters in Indonesia had led to some gains. Nevertheless, the best cases of joint action are found in the more mature clusters where business associations and other local collective institutions exist and are active. In such relatively advanced clusters, joint action between firms led to innovation and new product development (see Rabellotti 1999 for the Mexican shoe cluster of Guadalajara and Schmitz 1999 for the Brazilian footwear cluster), and allowed local producers to confront common external challenges (see Kennedy 1999 for the leather tanning cluster of the Palar Valley in India and Nadvi 1999d for the surgical instruments cluster of Sialkot in Pakistan).

In sum, the international evidence strongly supports the conceptual argument that geographical clusters of actors engaged in the same sector can generate important economic gains for small producers. The economies of scale and scope and the externalities in the markets for inputs, labour and information that clusters bring about can be critical for the survival and growth of poor producers and their workforce. Clusters also create spaces for local joint action which can become critical to the ability of local clusters to face exogenous challenges and grow. The evidence on the presence of poverty clusters is extensive. It underlines the critical nature of externalities in enhancing efficiency gains for poor small producers. However, joint action within incipient clusters is less common. Moreover, the evidence suggests that the growth dynamics of clusters result in a differential distribution of gains. Particular categories of workers and producers win, and others lose, access to employment and income gains.

These findings point to a range of distinct policy considerations. First, is the recognition that the failure of clustered actors to engage in local co-operation requires intervention by external policy agents to leverage joint action. Second, is the realisation that policy interventions also create winners and losers, and attention needs to be paid to who wins and who loses. This implies the need to understand the position of particular groups of workers and entrepreneurs such as women, migrants and the unskilled. Third, policy interventions are more successful where they come about through a 'light touch' that help local actors develop their capabilities, that work at the speed of the cluster and that do not swamp the abilities of the cluster. This implies a participatory approach based on direct engagement of those in the cluster. This also makes such policy interventions relatively unpredictable and uncertain in terms of outcomes and in terms of the speed with which returns are realised. Fourth, that for policies to be truly sustainable they need to be demand-led. This implies taking on board the concerns of consumers and buyers, promoting collective initiatives and processes that widen the range of potential beneficiaries, and adopting strategies that are cumulative in nature (Humphrey and Schmitz 1996). Thus, the policy agenda highlights the importance of promoting joint action by strengthening local cluster institutions, supporting the provision of business development services to clustered producers, helping clustered firms to make links with external traders and with wider global markets and assisting clusters to upgrade their technical capacities by improving their products, their processes, their organisation of production, and enhancing the range of functions that clustered firms can undertake. This may require the promotion of network initiatives, particularly business development actors and institutions that provide critical services to clustered firms.

3.4 Clusters and Poverty – the policy experience

UNIDO in particular has been one of the most influential actors in formulating international best practice for promoting cluster development. The UNIDO approach on promoting clusters and networks hinges on three distinct areas of intervention: promoting enterprise development, promoting business linkages, and promoting local governance. The strategy

seeks to promote clusters through the identification and provision of critical business development services. It also encourages networking amongst local firms to address issues of marketing and institutional development. These actions are often undertaken through interventions by network brokers who work with actors in the cluster to promote joint action. To be effective, this requires a participatory approach whereby local actors define a consensus on the shared objectives of the cluster, shape the policy process to achieve such objectives and the speed at which such policy initiatives develop (UNIDO 2001). Given this broad policy framework, the next section considers briefly the evidence emerging from UNIDO's recent initiatives on mainstreaming pro-poor concerns into its cluster and network development approach.

Since the Nadvi and Barrientos (2004) study was undertaken for UNIDO, a pro-poor agenda has been part of a number of cluster and network promotion initiatives undertaken by UNIDO and other agencies. Thus, UNIDO assistance has helped the milk processing cluster in Chontales, Nicaragua to not only develop supply networks that connect local producers to global buyers, but has also been able to bring poor producers on board. The Atuntaqui garment cluster initiative in Ecuador has not only managed to improve health and safety concerns within the cluster, reduce incidents of child labour and raise wages through productivity based incentives, it has also allowed the local producers to capitalise on unique design skills associated with the local community. In Ethiopia, the Gullele handloom cluster initiative has raised incomes for poor weavers and their households through strengthened marketing initiatives and the co-operative sharing of equipment and facilities.

Even more pronounced then these examples emerging from UNIDO interventions (albeit documented by UNIDO and not independent sources), is the evidence of UNIDO pro-poor cluster strategies adopted in India. A number of earlier UNIDO programmes in India had concentrated on clusters that catered to poor entrepreneurs – such as, for example, the successful intervention to support the development of the Jaipur handblock cluster which through UNIDO-led interventions was able to competitively expand, generating more incomes and employment and strengthening the presence of the cluster in fashion

conscious and design intensive domestic and international markets. Similarly, the UNIDO programme in support of the Ludhiana knitwear cluster took as one of its objectives the need to strengthen the skills, and thereby improve employability and incomes, for women workers through specific training programmes.

In contrast to these earlier initiatives where poverty concerns were 'latched-on' to more mainstream cluster development work, an explicit poverty reduction focus has driven UNIDO's interventions in the cashew picking/processing cluster of Sindhuderg (Maharashtra) and handloom weaving cluster of Chanderi (Madhya Pradesh). In both clusters, participatory poverty assessments were an integral part of the initial cluster diagnostics studies. Based on that experience, UNIDO sought to work with poor, and in some cases quite marginalised, entrepreneurs, workers and households.

Thus, in the case of Chanderi, the UNIDO strategy sought to assist a highly skilled artisanal, but minority and thus quite marginalised, community Muslim weavers to not only improve their ability to negotiate more effectively with local Hindu traders, but also through the formation of self-help groups to pool common resources and funds that could assist them to improve marketing activities. In addition, an explicit objective of the strategy was to address concerns of particular vulnerable groups within the community through a range of parallel initiatives such as improving literacy levels among, and health delivery for, women weavers and their households. Thus, recent UNIDO data suggests that as a result of the pro-poor cluster development initiative average wages in the cluster have risen by 10-15%, the cluster had a total turnover in 2005 of US$ 200,000 and 600 poor weavers had been organised into 150 self help groups (SHGs). By organising into SHGs such weavers were able to pool resources, take on larger orders and undertake joint marketing. Being part of SHGs also improved their access to formal sector credit and strengthened their position with traders. In addition, a number of women's SHGs had also formed with 186 women weavers being part of SHGs. A women's literacy programme was training 61 women weavers while the cluster initiative was also working to provide improved access to health care services to local women. Thus, the cluster programme had worked to not only develop local enterprises

(mainly single weaver households) through collective SHGs, thereby improving their ability to compete in demanding domestic markets where 'Chanderi saris' carry a unique quality and geographically specific cache, but also address a range of poverty and social provisioning concerns.

This 'pro-poor' cluster focus is especially pronounced in UNIDO's recent work in Orissa. Orissa, is alongwith neighbouring Bihar, one of the two poorest states in the Indian Union. Nearly half the state's population live below the poverty line and poverty is especially high for scheduled tribes and castes within the state, as well as being acute in many rural locations.

The UNIDO programme in Orissa suggests that an explicit poverty focus can sit alongside more widely accepted notions of developing successful clusters and networks whereby local producers can improve their competitive positions within local and external markets not only through the 'passive' gains of agglomeration economies but through very specific forms of 'active' collaboration and joint action. This has been done through interventions with extremely poor rural communities of off-farm artisanal weavers, as well as urban and peri-urban clusters of artisanal stonemasons and brassware producers. One of the strengths of the Orissa example has been to see how local capital, often in the form of specific high quality artisanal skills, designs and crafts, can be developed to access wider markets, and to acquire benefits of geographical uniqueness, and thus a basis for potentially obtaining rents associated with geographical indication.

Clearly, these explicitly pro-poor initiatives undertaken by UNIDO, such as those cited above from India, need to be independently assessed to see not only how they have addressed the concerns of local poor people and improved their livelihoods, but also how they have fared in terms of more accepted criteria of success for cluster development programmes (growth, competitiveness, market shares, efficiency and productivity gains etc.). As such, to the best of our knowledge, such independent evaluations have yet to be carried out. The need for

such an evaluation is especially critical given the ambitious manner in which the Government of India proposes to build on UNIDO's in conjunction with the newly formed Micro and Small and Medium Enterprise Foundation (MSME Foundation). As Gulati's presentation at the IADB/MIF/UNIDO meeting in Washington D.C. suggests, the Indian Government plans to spend close to US$200 million on developing over 1200 clusters across the country, of which the vast majority, roughly 1000 clusters, will be 'poor' artisanal clusters. This is a hugely significant national policy initiative, funded not by international donors but through central government resources. It also raises the expectation that a 'pro-poor' element if not central would certainly need to be a core element of such a strategy. This again underlines the need for a thorough and independent evaluation of existing initiatives that have been undertaken in this regard to draw out lessons, both positive and negative.

4. Pro-poor Rural Clusters and Rural Off-Grid Electrification

The discussion above has gone into some length to provide an understanding of the concept of small firm clusters and their relevance not only to a developing country context, but more specifically to a pro-poor environment. Historically the focus of research and policy on clusters has been on promoting growth and competitiveness of SMEs through the presence of agglomeration gains and via joint action. Yet, as the discussion in the previous section has outlined, the concept of clustering can have implications for poverty reduction as well. There is now extensive evidence of clusters within rural artisanal communities, where local agglomeration benefits are important and where there are various forms of joint action. This is most clearly seen through the evidence from parts of rural India where UNIDO's pro-poor cluster development strategies have been active.

If rural clusters are significant, as I would argue, and they provide a venue through which policy can more effectively intervene to generate employment and incomes, what then is the link with electrification, and more specifically with off-grid electricity supply?

Access to electrical power can be a critical constraint in many rural clusters. The limited availability of electrical power reduces the capacity of many such rural clusters to acquire

new forms of mechanised tools and technologies and to thus raise productivity and incomes. Consequently, many poor communities are marked by the prevalence of outdated and highly labour intensive tools and forms of work organisation. This reduces output and also does not allow for better standardisation of products. Thus, both quality and productivity are lowered. Access to electrical power is often a key constraint that rural off farm production needs to overcome.

Availability of off-grid power can thus enhance the ability of local producers to improve their earning potential by raising outputs and being able to take on tasks that were previously impossible for them. In some sectors, availability of power may only result in the possibility of longer working hours – allowing production to take place in darkness by virtue of the light emanating from an electric bulb. In terms of off-farm artisanal production the potential gains from electrical power may go further. It may imply the mechanisation of particular aspects of the production process that help to raise quality and improve productivity. It may also result in better standardisation of products and processes of production that lead to lower levels of rejects and higher levels of quality. Finally, the availability of electrical power may make it feasible for new products to be developed and produced which were previously beyond the scope of hand tools and non-mechanised production. Consequently the availability of electrical power in rural artisanal settings could result in improvements in income and employment if it allows clustered artisans to individually and collectively invest in new mechanised tools that raise productivity and improve quality.

If off grid electricity may be significant for rural artisanal clusters, why might clusters be important to off grid electricity? There are two issues that arise from this. First, given that clusters are usually marked by a division of labour in terms of production processes, the availability of electrical power may result in the mechanisation of a particular process. However the costs entailed in acquiring such technology may well be prohibitive for individual artisanal entrepreneurs. By virtue of being located in a cluster, as opposed to operating in isolation, such artisans may be able to collaborate by undertaking a joint purchase of such technology and sharing this within the cluster. There is evidence from a number of clusters – both urban and rural, where collective management of shared machinery has allowed local producers and artisans to improve production processes and upgrade their products.

The second aspect of collective action that arise by virtue of the cluster, is that clustered actors may be in a position to collectively invest in and/or collectively manage the off-grid electrical facility. Investment in off-grid electricity supply can be substantive, while

operating off-grid electricity also implies costs. Cluster-based collective action could facilitate this process. There is evidence from a number of South Asian clusters where collective investments by local entrepreneurs resulted in gains spread across the cluster – for example, the small firm clusters in Sialkot, Pakistan invested in the development of a 'dry port' in order to reduce the logistical constraints that they faced in dealing with customs and shipping officials at the distant sea-port of Karachi. The presence of a dry port significantly reduced shipping costs and allowed customs formalities to be handled at close hand to the cluster (Nadvi 1999d). Similarly, the evidence of tannery clusters in Tamil Nadu indicated how cluster based firms were willing to engage in the collective construction and management of common effluent treatment plants to offset waste water discharges and thus comply with the environmental demands of European buyers (Kennedy 1999).

One of the key arenas of collective action in rural India is to be found in the widespread presence of Self Help Groups (SHGs). SHGs have been widely adopted in the micro-credit environment as an institution for promoting group based lending. SHGs are also relevant to the pro-poor cluster strategy and were effectively used to channel strategy to promote cluster based actors in rural Orissa. The concept of SHGs, which are well known across India, and which are particularly well structured when linked with artisanal clusters, could provide an effective institutional framework to help in the collective management and related cost sharing associated with rural off-grid electricity supply.

5. Conclusions and Research and Policy Challenges

This paper has sought to explore the relationship between off-grid electricity and clusters, in particular rural artisanal clusters. Access to electrical power is a critical infrastructural constraint in many parts of the developing world. This is further compounded with the declining availability of networked grid electricity, high levels of power leakages, and the rising costs of electricity generation and distribution. For many poor rural communities, off grid electricity is the only feasible option in terms of power generation. For many small firm rural clusters lack of electricity acts as a significant constraint on growth – limiting the ability of smaller artisanal producers to increase outputs, employ more efficient equipment and technologies, limit the capacity of firms to upgrade and improve their products, raise product quality and reduce levels of rejects.

Electricity generation can have a significant impact in improving employment, raising incomes and reducing poverty. This paper has sought to argue that these effects are likely to be amplified where the focus is on agglomerations of small producers. The notion of clusters and clustering has had a substantial impact on the employment and SME policy world, indicating that where agglomerations of firms and artisanal producers are to be found there may be greater potential for growth. The paper has set out to show what the cluster concept implies, how prevalent it is, and the potential economic gains and social underpinnings of small firm clusters. The paper has then gone on to discuss how the concept can be of relevance to a poverty context, identifying how cluster features, cluster processes and cluster dynamics can all have poverty mitigating effects. Evidence of such clusters are to be found across the developing world. Some of the most compelling case studies of rural artisanal clusters are to be found from India – from the handloom weavers of Chanderi in Madhya Pradesh, the cashew processing cluster of Sindhuderg in Mahrashtra, to the handloom weaving clusters and the handicrafts clusters of Orissa. At the same time, the Government of India is currently engaged in an ambitious agenda of cluster promotion, including rural artisanal clusters.

What does this then imply in terms of a research agenda for off-grid rural electrification? In my view, clusters not only matter to the poverty reduction agenda, they are a potentially key policy plank for poverty reducing and sustainable employment generation in rural communities that are often marked severe constraints in terms of access to energy and electrical power supplies. Availability of off-grid electricity can help offset such constraints and leverage employment and income gains.

A research and policy strategy for off-grid electricity supply should therefore consider careful targeting of where such off-grid electrical supply projects could have the greatest impact. As this paper suggests, this is likely to be most substantial in settings where artisanal off-farm employment is present and where there is an agglomeration of micro and small producers. The presence of an agglomeration implies that the employment and income effects are likely to be most widespread, and to generate gains that are unlikely to be available for only isolated producers are to be found. Furthermore, the presence of an agglomeration suggests that collective action around the management and implementation of off-grid power projects may be feasible. Again, this is not likely to emerge in settings where isolated producers are present. The availability of electrical power could enhance productivity and efficiency within rural clusters, thus promoting cluster competitiveness, as well as work to reduce poverty. To be effective, however, a number of issues need to be considered. These include the following:

First, programmes need to be clearly focused. They need to identify at the outset where the 'poverty nodes' are within clusters and networks and then consider how off-grid power generation interventions are likely to impact upon such groups of entrepreneurs and workers. This then implies an approach that focuses in terms of pro-poor outcomes on targeting beneficiaries within these poverty nodes, and working specifically to ensure that incomes, employment and livelihoods for such groups are enhanced, that vulnerability for such groups are reduced, and that through the intervention these poverty nodes are 'empowered' in ways that improve their capabilities. This then implies actively considering who the poverty nodes are and what kinds of pro-poor employment and off-grid power generation strategies can work for them.

Second, building on some of the core principle of cluster development, pro-poor off-grid power generation strategies should work to develop collective capabilities, focusing on areas where common needs are clearly identified and where interventions can support the widest range of cluster members. The notion of collective capabilities thus needs to be further strengthened, and seen as a basis for the cluster to confront new competitive challenges and to reduce their vulnerability to external shocks.

Third, generation of off-grid power on its own is unlikely to result in positive income and employment gains without a proper consideration of the kinds of constraints that such power might relieve. Thus, there needs to be further thought given to the local engineering and production-related activities which might benefit from electrical power. What processes could be mechanised, and what kinds of technologies could be used? Who would acquire such technologies, and how would these gains be spread across the local rural community.

Finally, working with and building collective capabilities requires supporting local joint action within local 'collectivities'. In mature clusters, such 'collectivities' are found within business associations, exporters clubs and chambers of commerce. In poor clusters where pro-poor power generation strategies need to be developed, such 'collectivities' may well be less formal, smaller and less well organised. These include small Self Help Groups (SHGs) seen all over India. The SHG model has been central to the organisation and 'success' of pro-poor strategies adopted by UNIDO in various parts of India, from Chanderi's weavers to artisanal craft clusters in Orissa. It is also central to the rapid expansion of pro-poor artisanal cluster development work being proposed by the central Government in India. SHGs appear to provide manageable groupings that are workable, representative and participatory. Such co-operative endeavours do not always work, but where they are rooted in local social

norms and social groupings they are more likely to be sustainable and to have sufficient buy-in by their members to succeed. The presence of such forms of local collective action provides a basis on which collective mobilisation and organisation of rural off-grid electrical power might be possible and effective.

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Disclaimer

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OASYS South Asia project

The Off-grid Access Systems for South Asia (or OASYS South Asia) is a research project funded by the Engineering and Physical Sciences Research Council of UK and the Department for International Development, UK. This research is investigating off-grid electrification in South Asia from a multi-dimensional perspective, considering techno-economic, governance, socio-political and environmental dimensions. A consortium of universities and research institutes led by De Montfort University (originally by University of Dundee until end of August 2012) is carrying out this research. The partner teams include Edinburgh Napier University, University of Manchester, the Energy and Resources Institute (TERI) and TERI University (India).

The project has carried out a detailed review of status of off-grid electrification in the region and around the world. It has also considered the financial challenges, participatory models and governance issues. Based on these, an edited book titled "Rural Electrification through Decentralised Off-grid Systems in Developing Countries" was published in 2013 (Springer-Verlag, UK). As opposed to individual systems for off-grid electrification, such as solar home systems, the research under this project is focusing on enabling income generating activities through electrification and accordingly, investing decentralised mini-grids as a solution. Various local level solutions for the region have been looked into, including husk-based power, micro-hydro, solar PV-based mini-grids and hybrid systems. The project is also carrying out demonstration projects using alternative business models (community-based, private led and local government led) and technologies to develop a better understanding of the challenges. It is also looking at replication and scale-up challenges and options and will provide policy recommendations based on the research.

More details about the project and its outputs can be obtained from www.oasyssouthasia.dmu.ac.uk or by contacting the principal investigator Prof. Subhes Bhattacharyya (subhesb@dmu.ac.uk).

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