Fluid Capitalism at the Bottom of the Pyramid:

A Study of the Off-Grid Solar Power Market in Uttar Pradesh, India

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Abstract

This thesis examines 'Bottom of the Pyramid' (BoP) capitalism through an empirical study of the off-grid solar power market in the North Indian state of Uttar Pradesh. Over the last three decades, the extension and neoliberalisation of capitalism across the Global South has gathered pace. In many countries, including India, there has been a proliferation of businesses serving low-income populations following economic liberalisation, and a resulting growth in what is increasingly been theorised as 'BoP capitalism'; primarily in a literature produced by economics, business, and development scholars. In this literature, the development of capitalism at the bottom of the pyramid through the Global South is predominantly being theorised as a free market story, of formal, regularised businesses succeeding by selling good quality, branded but value-conscious, innovative, and frugal goods and services. Furthermore, the argument is being made that this is 'social capitalism', that formal businesses entering BoP markets can deliver developmental and environmental benefits to low-income populations.

New markets for off-grid solar power products that are growing in multiple countries in the Global South provide one significant example of BoP capitalism. Within India, an off-grid solar power market has been developing since the 1990s within a newly liberalised market context. A body of research reports that private businesses are selling good quality and value-conscious solar goods and services to India's poor. This market has been framed as highlighting the potential of BoP capitalism to bring energy and light to India's poor, while also delivering developmental benefits.

The contribution of this thesis is to challenge the existing body of literature on BoP capitalism, which tells a story of BoP capitalism through the Global South being developed by formal businesses, according to market dynamics, and sees no place for

informal businesses as formal ones develop. Based on ten months of qualitative fieldwork in 2013-2014 in the state of Uttar Pradesh, looking comparatively at formal, regularised and commercialised solar shops and dealerships and at informal, small-scale solar shops, this thesis explores BoP capitalism in the Indian context.

This thesis has several main findings. Firstly, it shows how a new group of formal solar shops and dealerships selling good quality, branded, and standardised products, and providing an installation service, after-sales servicing, and formal bank financing are developing the BoP solar market in Uttar Pradesh in a fashion familiar to the wider literature on BoP capitalism. Secondly, it shows how the success of these solar shops and dealerships was not a free market story, but how they are being shaped and supported through state and non-state resources and patronage, and that their growth was often dependent upon informal relationships with rural development banks, which opened-up bank financing options for solar customers and access to government subsidies. Thirdly, it looks at how informal solar shops were successfully selling off-grid solar products, adopting distinctly different business practices to formal solar businesses, and developing the market in a distinctly different way. I trace how informal businesses were not just successful because they were selling cheap and substandard goods, but were also thriving because they were the site of improvised and what I term '*jugaad*' products and business practices. *Jugaad* is a Hindi term, referring to improvised and ingenious innovation and action. This thesis highlights a context of fluid capitalism at the BoP in India, where formal and informal solar businesses are developing the BoP solar market in distinctly different ways, and where state and non-state actors are shaping the market.

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The work contained in this thesis is my own. All photographs and maps published in this thesis are copyright of the author, unless otherwise stated. All those who are visible in the pictures contained within this thesis have given their oral permission for these pictures to be used. The maps within this thesis were drawn by myself. Cartographic data was obtained from Natural Earth.

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This thesis is for my Father

Jeffrey Balls, 1949 - 2015

Thesis Contents

Abstract **1**

Acknowledgements **3**

Thesis Contents **7**

Tables, Figures, Maps, and Pictures **11**

Abbreviations **13**

Chapter 1: Introduction **15**

1.1: Thesis Outline *38*

Chapter 2: Theory **42**

2.1: Introduction *42*

2.2: Neoliberal Capitalism *43*

2.3: The State, State Patronage, Brokerage, and Corruption *47*

2.4: Informality, Improvisation, and Jugaad *53*

2.5: Bottom of the Pyramid Capitalism *57*

2.6: Complicating the BoP Capitalism Narrative *67*

2.7: Marketization *74*

2.8: State, Society, and Market Relations in India *78*

2.9: Bottom of the Billion Capitalism in India *81*

2.10: Complicating the Narrative of BoP Capitalism in India *86*

2.11: Informality, Improvisation, and Jugaad at the BoP in India *91*

2.12: The Significance of Caste, Class, Gender, and Religion *96*

2.13: The BoP Off-Grid Solar Market in India *101*

2.14: Research Questions *103*

Chapter 3: Methodology **104**

3. 1: Introduction *104*

3.2: Deciding to Research the Off-Grid Solar Power Market in India *104*

3.3: A Qualitative Case Study Based Methodology *108*

3.4: Interviewing *121*

3.5: Hanging-out and Participant Observation *128*

3.6: Recruiting Informants *129*

3.7: Fieldwork Practicalities and Language *133*

3.8: Ethics *135*

3.9: Starting Fieldwork, Locating Myself *136*

3.10: Building Relationships *137*

3.11: Recording Interviews, Taking Notes, and Using a Field Journal *141*

3.12: Analysis and Writing *141*

Chapter 4: Situating the Off-Grid Solar Power Market 143

4.1: Introduction *143*

4.2 Situating the Off-Grid Solar Power Market within India *143*

4.3: Situating the Off-Grid Solar Power Market within Uttar Pradesh *148*

4.4: The State of Energy and Electricity Provision in India *149*

4.5: Solar Power in India and Uttar Pradesh *159*

4.6: A Nascent Liberalised Off-Grid Solar Power Market *162*

4.7: An Off-Grid Solar Market for Good Quality Solar Home Systems and Lanterns *165*

4.8: The Off-Grid Solar Power Market in Uttar Pradesh *169*

4.9: TATA Solar Power *173*

4.10: Boond *176*

4.11: TERI Shops *178*

4.12: Akshay Urjaa Shops *180*

4.13: Informal Solar Shops *182*

Chapter 5: Succeeding by Selling Good Quality, Value-Conscious Products 184

5.1: Introduction 184

5.2: Building a Market by Selling Good Quality, Standardised Products and Services 188

5.3: A Market Based on Trust and Confidence 195

5.4: The Role of Training and Top-Down Business Ideas 201

5.5: Selling 'Branded Products' ('Branded Wala') 205

5.6: Providers of Solar Home Systems and an Installation Service 212

5.7: Providing Warranties, Guarantees, and After-Sales Servicing 218

5.8: Financing Loans for Customers 225

5.9: Conclusion 231

Chapter 6: Formal Business at the Bottom of the Pyramid, Shaped and Supported by State Patronage, Brokerage, and Extra-Legal Payments 236

6.1: Introduction 236

6.2: State Subsidising and Shaping of Formal Businesses 240

6.3: Selective State Patronage 243

6.4: The State Shaping BoP Capitalism 246

6.5: Uncertain and Unpredictable State Support 249

6.6: A Key Role for State and Non-State Subsidies and Patronage 252

6.7: Working with Rural Development Banks to Grow the BoP Solar Market 253

6.8: Signing MOUs with Banks 255

6.9: Building and Maintaining Relationships in Bank Branches 259

6.10: Local Bank Branches as a Route to Customers 270

6.11: Extra-Legal Payments 273

6.12: Fragile and Uncertain Support to Formal Businesses 275

6.13: Conclusion 277

Chapter 7: Informal Solar Businesses at the Bottom of the Pyramid 282

7.1: Introduction *282*

7.2: The Growth of Informal Solar Business *286*

7.3: Cheap and Inferior Quality Goods *293*

7.4: Jugaad within Informal shops *297*

7.5: Substitution, Twinning, and Altering Goods *300*

7.6: Incremental Purchasing *312*

7.7: Repair Work *315*

7.8: Extra-Legal, Deceptive, and Opportunistic Business *322*

7.9: Conclusion *330*

Chapter 8: Conclusion **335**

8.1: Introduction *335*

8.2: Growing BoP Capitalism by Selling Good Quality, Value-Conscious Goods *338*

8.3: The State, State Patronage, Brokerage, and Corruption *340*

8.3: The Informal Sector *343*

8.4: Theorising BoP Capitalism and Neoliberal Capitalism in India *345*

8.5: The Future of Energy Provision in India *349*

8.6: Structural Inequalities and the Shop Space *353*

8.7: Limitations *355*

8.8: Future Research *356*

References **359**

Appendix A: Example Participant Consent Form **379**

Appendix B: Copy of Interview Questions **380**

Appendix C: Sample of Hindi Interview Questions **391**

Appendix D: List of Codes Used in Analaysis **397**

Tables, Figures, Maps, and Pictures

Picture 1: Solar lanterns and modules on display in a shop 25

Picture 2: Example 20-Watt SHS package 26

Figure 1: A representation of the Bottom of the Pyramid (source: Prahalad and Hart, 2002:4) 58

Map 1: India, showing Uttar Pradesh highlighted 115

Map 2: Map of Uttar Pradesh 116

Table 1: Range of businesses and business approaches within the off-grid solar power market in Uttar Pradesh 118

Table 2: Breakdown of interviews conducted 122

Map 3: Map of Uttar Pradesh, with districts highlighted within which shops and dealerships included in this research were located 132

Table 3: Renewable technologies by type installed in India as of 2014 (Source: Central Statistics Office, 2015:20) 152

Picture 3: Example small solar module and light 170

Picture 4: Solar streetlight 171

Picture 5: Examples of solar modules on sale in a shop 172

Picture 6: TATA Solar Power shop 174

Picture 7: TATA Solar Power SHS being installed 175

Picture 8: Boond shop 177

Picture 9: Boond SHS mock-up 177

Picture 10: TERI shop 179

Picture 11: Akshay Urjaa shop 181

Picture 12: Example of a typical informal shop 183

Picture 13: Sticker stating that: 'Chinese items don't come with a warranty or a guarantee. Please don't waste your precious time or mine in arguing over this' . 198

Picture 14: Boond training session, demonstration of how a solar module works 204

Picture 15: Example of a fake TATA Solar Power module. Module in the middle on the left hand side of the picture 208

Picture 16: TERI shop branding 211

Picture 17: Informal shop, where batteries are assembled 303

Picture 18: Battery assembly in an informal shop 304

Picture 19: New battery being installed in an unbranded light 306

Picture 20: Informal electrical repair business 321

Picture 21: Example warranty card in informal shop 324

Abbreviations

BPL - Below Poverty Line

BRICS - Brazil, Russia, India, China, South Africa

DDUGJY - Deen Dayal Upadhyaya Gram Jyoti Yojana

DFID - Department for International Development

BoP - Bottom of the Pyramid / Base of the Pyramid

GEF – The World Bank 'General Environment Facility'

GBA - Gramin Bank of Aryavart

IEA - International Energy Agency

IFC - International Finance Corporation

ILO – International Labour Organization

IMF - International Monetary Fund

JNNSM - Jawaharlal Nehru National Solar Mission

LABL – The TERI 'Lighting a Billion Lives' Program

MFI – Microfinance Institution

MNC - Multi National Corporation

MNRE - Ministry of New and Renewable Energy

NABARD - National Bank for Agriculture and Rural Development

NREGA - National Rural Employment Guarantee Act

RGGVY - Rajiv Gandhi Grameen Vidyutikaran Yojana

RVEP - Remote Village Electrification Programme

SAPs - Structural Adjustment Programs

SABs - State Electricity Boards

SHS - Solar home system

TERI - The Energy and Resources Institute

UP - Uttar Pradesh

UP NEDA - The Uttar Pradesh New and Renewable Energy Department Agency

Chapter 1: Introduction

The last thirty years has seen an acceleration of globalisation and the geographical spread and deepening of neoliberal capitalism. In countries around the world there has been a move towards economic liberalisation, a freeing of the flow of capital, and a shift towards neoliberal state governance (Harvey, 2005, Hall and Soskice, 2001). This period has seen a rapid expansion in the numbers of businesses selling goods and services to low-income populations in the Global South. New markets for consumer goods, from ice cream to shampoo, and for essential goods and services, such as microfinance, medical services, and solar power, have been rapidly growing. In past decades, low-income populations had been theorised to be existing beyond the reach of formal businesses, and were not served by capitalist markets. They were theorised as only able to buy basic goods and services from informal markets and by non-market means, and as requiring the development and aid assistance of governments and NGOs (Elyachar, 2012).

A body of literature has grown in this context of change, theorising new markets for goods and services catering to low-income populations in the Global South as 'Bottom of the Pyramid' or 'Base of the Pyramid' (BoP) markets, and talking about the growth of distinct BoP capitalism through the Global South. This increasingly influential literature has most notably been developed by business, economic, and development scholars. The business scholar Coimbatore Prahalad's work first popularised this area of research. He argued that the more than one billion people in the world living on less than $2.5 dollars a day constituted a BoP market. This was, he said, a large untapped market, within which there was a 'fortune' to be made (Prahalad, 2005). The figure of $2 dollars or less per day has since more commonly been used in defining the BoP, and it is the

figure used in this thesis. The majority of the literature on BoP capitalism, which has expanded following Prahalad's work on the topic, has been of several types. Part is focused on studying empirical examples of businesses selling to low-income populations, their business practices, and new BoP markets (see Hammond et al., 2007, Hart, 2005). Other work, drawing on theory about BoP capitalism, outlines 'how-to' guides for companies looking to enter BoP markets (see Agnihotri, 2013).

Several key ideas have been developed within this literature, and have become widely influential. Firstly, markets providing goods and services to low-income consumers throughout the Global South have been homogenously categorised and framed as being BoP markets, which are imagined as the site of new capitalist opportunity (Karnani, 2007a). Secondly, the development of BoP markets over the last two decades, and growth of BoP capitalism, have been theorised as most importantly driven by formal, regularised, and commercialised businesses, which are understood to be developing capitalism in a distinctive manner. The literature on BoP markets, often based on empirical case studies, has focused on how multi-national corporations (MNCs) and smaller formal businesses are entering and growing newly liberalised BoP markets in multiple countries around the Global South. Businesses are said to be successfully doing this by adopting the approach of selling good quality, branded, but value-conscious, innovative, and frugal products and services, and the idea has been established that this is crucial for BoP capitalism to grow (London, 2008, Prahalad, 2005, Prahalad and Hammond, 2002). The contention is commonly made that BoP consumers are choosing the goods and services of formal businesses, when they become available, over what they had been buying from informal business and in the informal economy, and that therefore BoP capitalism will be grown in the coming years by

formal businesses. Thirdly, it is argued that the growth of new BoP markets can deliver developmental and environmental benefits, as a result of the investment, jobs, innovation, and choice of goods and services that they bring (Elyachar, 2002).

In this literature, a standard story of the extension of free-market neoliberal capitalism at the BoP throughout the Global South is being told, that draws from neo-classical understandings of markets and capitalism. Businesses are understood to be operating within markets, and markets developing, much like is the case with business and markets elsewhere higher-up the notional global pyramid of capitalism in the West or Global South; but at the bottom of the pyramid, businesses must develop radically new business models to meet the demands of a value-conscious population.

Theory on BoP capitalism has been particularly powerful when empirically tracing and theorising the growth of BoP markets for essential goods and services, such as for banking, health care, clean water, or for lighting. The work of Roy (2012a), Elyachar (2012), and Cross and Street (2009) makes the point that theory on BoP capitalism, or what has been termed 'pro-poor capitalism' (Roy, 2012a) or 'social capitalism' (Cross and Street, 2009) has been so attractive because of the marrying of markets, profit, development, and environmental sustainability. The promise that private businesses can profitably and efficiently provide essential goods and services to the BoP on a large scale, discussed within much of the existing literature on BoP capitalism, is seductive. This is particularly the case when framed against the clear failure to date of governments and NGOs to adequately provide large parts of the world's population with such goods and services (Elyachar, 2002).

In the policy documents and discourse of international organisations and institutions, such as the World Bank and Asian Development Bank (ADB), there is now a focus on

promoting BoP capitalism in order to reduce poverty and accelerate economic growth. Multiple programs have been designed to develop BoP markets and to support businesses seeking to sell into them (Jha and Jain, 2012, Miller and Hope, 2000, World Bank, 2004, World Bank, 2015a, World Bank, 2015b). International development organisations, including the UK's Department for International Development (DFID), are also increasingly supporting BoP markets in the Global South as a development strategy. This contrasts with the approach of previous decades, when aid agencies provided aid money to NGOs and the governments of developing countries, who would then carry out development work (Mawdsley, 2015). Promoting markets at the BoP, as a way of fighting poverty, has also become the strategy of governments in the Global South (Elyachar, 2012). Crucially, the promotion of BoP markets by these actors, as a route to development, is framed by the idea from literature on BoP capitalism that BoP markets around the world are being grown by formal businesses adopting the approach of selling good quality, branded, value-conscious, innovative, and frugal products and services. Theory on BoP capitalism appears to be performative (Berndt and Boeckler, 2011, Callon, 1998a), influencing how marketization is being promoted in the Global South. Support is being targeted to formal businesses. It is difficult to find examples in the literature of support being directed to informal businesses, from which the majority of low-income people in the Global South currently access goods and services (Harriss-White, 2003). The focus on promoting markets that has developed over recent years pays little attention to the potential of the private sector to exploit low-income populations, or to fail to provide to the poorest (Simon, 2010, Varman et al., 2012).

Markets for microfinance services which have proliferated in the Global South over the last two decades are most commonly written about as markets where formal businesses

adopting innovative new business approaches are growing BoP capitalism. The work of Roy (2010), Young (2010a) and Weber (2001) explores how new markets for microfinance and micro-credit lending have been framed as the successful result of formal businesses profitably providing good quality regularised financial services. Their work outlines how new microfinance markets have been understood to be delivering developmental benefits to low-income communities. Collectively, their work demonstrates how microfinance businesses, the development literature, and governments have developed the powerful argument that including low-income communities in new BoP financial markets frees them from local money lenders, and provides them the means to lift themselves out of poverty through investing in enterprise, education, and other productive ends. Their work shows, however, how developmental benefits are often elusive in practice when the effects of microfinance lending are empirically examined. Markets for water-purifying devices and hygiene products (Cross and Street, 2009, Sharma and Iyer, 2012), beauty products (Karnani, 2007b), IT services (Rashid and Rahman, 2009), and off-grid solar power products (Bairiganjan et al., 2010) are other notable markets that have been spoken of as highlighting the development and potential of BoP markets in the Global South; and as markets where formal businesses have begun to profitably sell goods and services while delivering developmental benefits. Redfield's (2013) work shows how even humanitarian items have in recent years been framed and theorised as best delivered to low-income populations through BoP capitalism.

The existing literature on BoP capitalism has predominantly focused on formal businesses or MNCs, and has theorised BoP capitalism from neo-classical economics and neoliberal economics perspectives. There is a disconnect between this work and

social sciences research on the persistence of informal economic activity in the Global South. Indeed, a line of thinking, picked up on in writing on BoP capitalism, is that informal business, from which the majority of low-income people access goods and services, are pre-capitalist or proto-capitalist, highlighting market and government failure (De Soto, 2000, Prahalad, 2005).

The contribution of this thesis is to interrogate and challenge the increasingly influential idea that formal businesses, operating according to free market dynamics, are driving the growth of new BoP markets throughout the Global South, and that BoP capitalism around the world is developing towards a neo-classical economics text book model of neoliberal capitalism. Based on an empirical case study of the off-grid solar power market in Uttar Pradesh, North India, I elaborate on how in the state, a fluid context of BoP capitalism was evident, with both formal and informal businesses thriving, and state and non-state actor involvement shaping the market.

This thesis works with three main areas of literature and theory from geography and the social sciences. Firstly, on neoliberal capitalism. Secondly, on the state, and on state patronage, brokerage, and corruption. Thirdly, on informal economic activity, improvisation, and the Indian concept of '*jugaad'*. Theory from the social sciences and from geography provides a productive avenue to challenge existing literature on BoP capitalism, which has predominantly come from economics, business, and development scholars, and to contribute to theory on BoP capitalism. At a broad level, empirical and theoretical work from the social sciences and from geographers shows how capitalism around the world is rarely structured or operates solely according to free market principles. A geographical approach, in particular, is distinctive in showing how when you look at economies *in situ*, it is possible to see variegated forms of capitalism, but

also inter-connections between capitalist systems and common dynamics and trajectories in capitalist and market development (Brenner et al., 2010, Harvey, 2005, Peck and Tickell, 2002, Peck and Theodore, 2007). Geographical research is distinctive in applying qualitative and ethnographic methods to look at business and markets, and for studying the social, political, economic, and geographical dynamics that shape and structure markets and capitalism in different spaces and places around the world (Coe et al., 2007, Gill, 2010, Harvey, 2005, Harriss-White, 2003, Mitchell, 2002). Attention to how BoP capitalism is developing differently within different social, political, and economic contexts is lacking in existing research theorising BoP capitalism. This thesis, therefore, provides a timely intervention on the topic.

There is existing work from the social sciences and geography that has challenged the developmental claims often made about BoP capitalism (for example, see Kuriyan and Ray, 2009, Roy, 2010, Varman et al., 2012, Weber, 2001). Further, there is also a lot of work on informal business in low-income contexts in the Global South (see Gidwani, 2015, Gill, 2010, Harriss-White, 2003). Geographers and social scientists, however, have largely not engaged directly with the literature and theory, primarily from economics, business, and development scholar, that BoP capitalism is a story of formal businesses, operating according to market rationalities. With the growing influence of theory on BoP capitalism, and of the promise of BoP capitalism, it is theoretically and politically important that they do.

Drawing on what is known from existing literature and theory from the social sciences and geography on neoliberal capitalism suggests the need to further investigate whether formal companies, adopting the approach of selling good quality but value-conscious products are driving the development of BoP capitalism, and a need to explore whether

they are doing so while operating according to market dynamics. Literature on state activity in markets, on brokerage, state patronage, and corruption highlights how in economically liberalised contexts in the Global South, markets and business are likely to be shaped by state institutions, state patronage, brokerage, and corruption (Harriss-White, 2003, Jeffrey, 2002, Simon, 2009). Further, recent research has shown that informal economic activity is in many instances thriving in neoliberal contexts in the Global South (for example, see Gill, 2010, Sanyal, 2007). This suggests a need to further investigate the role of informal business within newly liberalised BoP markets in the Global South. In this thesis I therefore address three main research areas:

- the extent to which formal businesses selling good quality but value-conscious products are driving the development of BoP markets in the Global South;
- the extent to which new formal businesses in BoP markets are growing according to free market dynamics;
- whether informal businesses are growing within BoP markets, and are competing with formal businesses in new BoP markets.

Choosing India as a case study country was important for the questions of this thesis. In India, 59 per cent of the population lives on less than $2 dollars a day, adjusted for purchasing power parity (PPP), and so can be classified as BoP (World Bank, 2015d). In the wake of economic liberalisation over the last three decades, there has been a rapid proliferation of businesses selling goods and services to low-income Indians (Corbridge et al., 2012). The resulting markets are increasingly being theorised according to the wider theory on BoP capitalism in the Global South (for example, see Balakrishna and Sidharth, 2004, Prahalad, 2012, Ramani et al., 2012, Rashid and Rahman, 2009,

Tarafdar et al., 2012). A growing number of case studies look at formal businesses entering India's BoP markets, selling good quality but value-conscious goods and services. Such companies are being framed as driving the growth of BoP capitalism, and as having the potential to effectively and efficiently provide essential goods and services, and to bring developmental benefits to hundreds of millions of poor Indians (Balakrishna and Sidharth, 2004, Govindrajan, 2010, Prahalad, 2012, Ray and Ray, 2010, Varman et al., 2012). The microfinance sector (Young, 2010a), the growing markets for hygiene products (Cross and Street, 2009), and the market for off-grid solar power (Bairiganjan et al., 2010, Miller, 2009) are all examples where the entrance of new formal businesses into BoP markets for essential goods and services has been seen. In India, where state institutions are being reformed and neoliberal governance is increasingly evident (Ferguson and Gupta, 2002), the private sector is often seen as a partner to the state, or an alternative to the state, for delivering essential goods and services (Varman et al., 2012). India is a key country in which to study BoP capitalism.

The choice of studying an off-grid solar power market was also crucial for this thesis. In multiple countries in the Global South over the last fifteen years, commercial markets for off-grid solar power products and associated goods such as lights, lanterns, fans and batteries have been growing. In east and west Africa, where millions live without access to an electricity connection, off-grid solar products are increasingly popular and are being commercially sold (Jacobson, 2007, Wamukonya, 2007). Similar expansions of new commercial markets have been seen in Bangladesh (Wimmer, 2012), in parts of South-East Asia (Martinot et al., 2001), in Nepal (Mainali and Silveira, 2011), and in India (Miller, 2009).

Solar lanterns and solar home systems (SHSs) are the two products most associated with this market. Solar lanterns are typically simple small plastic products that have one light, or a cluster of LED lights, and an integrated or separate solar module and battery. Some have a connection point so that they can be used to charge mobile phones. Prices for solar lanterns range from as little as £1 for cheap, substandard, locally manufactured ones to over £20 for large, branded lanterns. Several international companies sell branded lanterns across Africa and in a number of Asian countries. D.Light and SunKing are two well-known examples, whose standard lanterns sell for between £5-15. Picture 1 shows a range of solar lanterns on display in a shop in Uttar Pradesh, India. SHS packages usually include a solar module, several lights, a battery, a charge controller, and the wiring to connect the system. With bigger systems, more lights and accessories, such as fans or radios, are included. In India, in 2014, a good quality 40-Watt SHS cost approximately £140. Picture 2 shows a small SHS set-up, which includes a solar module, lights, battery, and fan.

SHSs and solar lanterns are products designed to be used independently from an electricity grid, hence are known as ‘off-grid’ solar products. They are usually designed for use by low-income communities, who have very little disposable income. Cross’s (2013) work for example explores how the solar company D.Light has a design process that focuses on developing good quality, value-conscious products that will be durable within harsh environments. Similarly, Mukerji and Jose (2011) outline how the Indian solar company SELCO designed their SHSs to provide a reliable and affordable basic energy service to low-income households.



Picture 1: Solar lanterns and modules on display in a shop



Picture 2: Example 20-Watt SHS package

Within research literature, the policy documents of governments and international organisations, and in the discourse of solar companies, off-grid solar power markets are being imagined and theorised as BoP markets with great potential. The expansion of private business within off-grid solar markets is being framed as heralding a 'win-win' future in terms of business potential, the environment, and development (for example, see Bairiganjan et al., 2010, Miller, 2009). The cost of solar technology has been steadily falling, there have been advances in technology, and new products have been developed. In this context, a body of literature has looked at how new formal, regularised and commercialised solar businesses have begun to sell good quality, branded, but value-conscious and frugal products to low-income communities (for example, see Bairiganjan et al., 2010, Miller, 2009, Wimmer, 2012, World Bank, 2015a, World Bank, 2015b). Solar products are said to provide an environmentally friendly, clean, reliable, and affordable energy option to communities who currently rely upon dirty and hazardous alternatives, such as kerosene or firewood (Dhingra et al., 2008). A link has been made within some research between access to solar power products and developmental gains brought about because individuals with light are able to work longer and more safely, cook more safely, access information and government services, and because children can read at night (for example, see Dhingra et al., 2008, Miller, 2009, Parikh et al., 2012, Wamukonya, 2007, Wimmer, 2012). Hiremath et al. (2009) argue that decentralised renewables provide a better alternative to centralised renewables for rural electrification.

Off-grid solar power businesses around the world have attracted support in recent years. The World Bank, through their General Environment Facility (GEF) fund and then later through the International Finance Corporation (IFC) and its 'Lighting Africa' and

'Lighting Asia' programs, has channelled money into off-grid solar market promotion (Cabraal et al., 1999, Martinot et al., 2001, World Bank, 2015a, World Bank, 2015b). The Asian Development Bank (ADB) has recently done the same through the Asia Solar Energy Initiative (ADB, 2016). Importantly, this support appears to be on the basis of an understanding that it is formal businesses and social enterprises selling good quality but value-conscious products that are, and should be, developing BoP solar markets throughout the Global South. Support has been provided in all cases that I have seen to formal businesses or social enterprises, selling the combination of good quality, branded, but value-conscious products and services. Attention to off-grid solar markets got a boost when 2012 was declared the 'International Year of Sustainable Energy for All' by the UN (UN, 2012).

In India, a BoP solar market has grown rapidly over the last fifteen years. Over one million SHSs, solar lanterns, and other off-grid solar power products had been sold by 2011, according to official statistics (Central Statistics Office, 2011:21). While in 2001 it was reported that 522,561 Indian households were using solar power as a main source of lighting, by 2011 this number had doubled to 1,086,893 (Census of India, 2011). In 2011, 33 per cent of households had no access to the grid (Census of India, 2011), and approximately 350 million people were using kerosene for lighting (Rao, 2012). Bairiganjan et al. (2010:2) have estimated the potential BoP market for clean energy consumer products and services in India to be USD $2.11 billion per year. India clearly has a large potential market for off-grid solar products. For a large number of low-income people who have been failed by the conventional energy political economy of the last 50 years, off-grid solar appears to offer an affordable alternative to kerosene and other traditional fuels (Chaurey and Kandpal, 2010, Shrimali and Rohra, 2012).

Additional benefits that have been highlighted include new industry jobs and enterprise opportunities, as well as the possibility of solar power one day taking some of the strain off India's creaking energy infrastructure (Economic Intelligence Unit, 2012, Harriss-White et al., 2009).

In the North Indian state of Uttar Pradesh, where the empirical focus of this thesis lies, a number of solar businesses have started operations in recent years, including for-profit businesses, social enterprises, and local, informal shops. The state provides a good environment for a market to grow. It has an extremely low rate of electrification, with only 36.8 per cent of households having an electricity connection, relative to a national average of 67.3 per cent (Census of India, 2011). Uttar Pradesh further has a large rural population which is predominantly BoP in terms of income, scoring significantly worse than the national average on GDP per capita and on economic growth rates over recent decades (Drèze and Sen, 2013).

Numerous academic studies have focused on the off-grid solar power market in India over recent years. However, they have predominantly looked at the technology involved, at business models being adopted by companies, and at how markets are performing. Further, the focus of existing literature has been on formal, regularised and commercialised businesses, social enterprises, and NGOs, selling SHSs and solar lanterns. Notable examples include the work of Chaurey et al. (2010), Martinet et al. (2002), Miller (2009) and Palit (2013). In all of these studies, the focus has been on such businesses selling good quality, value-conscious, and serviced products, often with financing to make them affordable. Studies have not interrogated the character of BoP capitalism, or the role of informal businesses.

This research involved the selection of analytical groups of both formal solar shops and dealerships and informal, non-government-recognised, solar shops, to look at BoP capitalism in Uttar Pradesh. The Ministry for New and Renewable Energy (MNRE) is the government department overseeing the solar power sector in India, and runs subsidy programs to support market development and the diffusion of solar power technology. At the time of this research, they had a list of government-recognised and approved solar shops and dealerships for the purposes of the distribution of the Jawaharlal Nehru National Solar Mission (JNNSM) subsidy. For my research, I counted solar shops and dealerships that were approved for purposes of the JNNSM subsidy as formal. Determining whether to identify a solar business as formal or informal was in some instances challenging. For example, many TERI shops were not MNRE-approved for the JNNSM. Yet they were regularised businesses, which are primarily selling government-approved products and regularly receive government tenders, that I determined should be considered within the category of formal rather than informal. The solar shops and dealerships that I classified as formal were all government-recognised, were part of a larger national business, or were supported by government or non-government funding and expertise. Many of the businesses that I classify as formal, advertised that they were 'government approved' businesses in their marketing literature, and regularly did the same verbally to customers. I wanted to compare such businesses with informal solar businesses. I therefore choose a second analytical group of solar shops that were not registered as MNRE-approved for the JNNSM subsidy, and were local, small-scale, non-regularised solar outlets.

Theorising in strict binary terms about formal and informal businesses and business activity has been critiqued, as distinctions are not always clear and there are regularly

inter-connections between the two (for more on this, see Gidwani, 2015, Gill, 2010). For this research, however, distinguishing between formal and informal solar businesses was analytically useful for exploring the different business approaches being followed by the two, and the distinctly different ways in which they were growing the BoP solar market in Uttar Pradesh. In this thesis, I elaborate on how the divide between formal and informal solar businesses was not always stark, and how most formal solar businesses used informal business practices to build relationships with banks and to sell. In India, the formality of a business is often defined by whether it is registered under The Factories Act of 1948. This is not a definition used in this thesis. I am not proposing any clear distinction between a formal and informal economy.

The empirical focus of this study is on solar businesses selling off-grid solar power goods and services through shop or dealership retail spaces. Existing research looking at new BoP markets through the Global South highlights how businesses and MNCs entering bottom of the pyramid markets have been adopting a variety of different models to distribute and sell their goods and services. Some businesses are adopting the traditional business approach of selling through retail outlets, or supplying to existing shops through a distribution network. This is commonly seen with solar power companies in the Global South (Miller, 2009, Mukerji and Jose, 2011, Wimmer, 2012). However, many businesses and MNCs have sought to bypass retail spaces. Dolan and Scott (2009) note that MNCs have in recent years increasingly built relationships with women's informal exchange networks, community organisations, and NGOs to distribute goods and services. Their case study looks at how Avon has done this in South Africa. Existing research shows how such new models of selling are often crucial to businesses trying to profitably operate within BoP markets. For example, the work of

Rangan and Rajan (2005) and Cross and Street (2009) shows this in case studies looking at how Unilver operates in BoP markets in India. Similarly, the work of Cross (2013) shows how the solar company DLight, which operates in India and Africa, as well as selling through shops has developed a distribution network, through partnering with community-based organisations, NGOs, and microfinance institutions. For microfinance businesses selling to the BoP, models that use both retail spaces and work with local organisations and NGOs have been important (Roy, 2010, Young, 2010a).

I focus on researching in shops and dealerships for several reasons. Having this focus allowed for a clear comparison to be set up between formal and informal solar shops and dealerships, which were offering very different propositions to their customers. The formal and informal shops and dealerships studied in this research were usually in close proximity. Further, in this thesis I was centrally focused on exploring the idea that it is formal businesses, selling good quality but value-conscious products, according to market dynamics, that are primarily growing the BoP solar market. In India, such solar companies nearly always sell through shops and dealerships. It is also to businesses operating out of shops and dealerships that the Government of India has recently been channelling support. While shops and dealerships are physical spaces of BoP capitalism, and productive space to enter as a researcher, further research would be needed to look at the extent to which the findings of this thesis apply to solar businesses not selling through traditional retail spaces. The shops and dealerships within which I was researching were all run by men, with one to three people typically working within them alongside the owner or manager.

The first main finding that I elaborate on in this thesis is that a new group of formal solar shops and dealerships were selling good quality, value-conscious, installed,

serviced, and sometimes financed off-grid solar power products and associated accessories. By associated products I mean lights, batteries, charge controllers, wiring, fans, and other products often sold in conjunction with solar modules. I argue that these shops, on the basis of their business practices, were developing BoP capitalism in Uttar Pradesh in a distinctive manner, that corresponds to how the wider literature on BoP capitalism has been theorising the development of BoP capitalism in the Global South. Moreover, I look at how ideas of quality, brand, standardisation, and expertise, which are so prevalent in the literature on BoP capitalism, were ideas that were also deeply held by people within formal solar shops and dealerships. This finding supports the literature stating that throughout the Global South there is a proliferation of formal businesses selling good quality but value-conscious products in the wake of economic liberalisation.

The second main finding of this research is that the state as well as some non-state organisations were subsidising and shaping what formal solar businesses were doing, and that informal brokerage and at times corruption were important to their success. In much of the existing literature on BoP capitalism the state is theorised as a neutral support and regulator at the bottom of the pyramid; state patronage, brokerage, and corruption is largely not considered. I argue that the importance of state patronage, brokerage, and corruption challenges ideas of BoP capitalism developing according to market rationalities in India.

The third main finding outlined in this thesis is that a growing number of informal shops are selling off-grid solar power goods and associated products. I look at how these shops were selling cheap and often sub-standard goods, which corresponds to characterisations in the literature on informal business within the informal economy (De

Soto, 2000, Prahalad, 2012). But I also explore how the success of informal shops could be explained by improvisation, and in particular by the improvised and what I characterise as *jugaad* products and practices seen within them. *Jugaad* is a Hindi term, referring to improvised and ingenious innovation and action (Jeffrey and Young, 2014, Radjou et al., 2012). The success of informal shops, which were developing the BoP solar market in a distinctly different way to formal solar businesses, and practices within informal shops, shows the need for new theorisations of BoP capitalism that do not assume that BoP capitalism through the Global South is on a path towards textbook neoliberal capitalism. Findings from this research on improvisation and *jugaad* in the context of a liberalised BoP market also take forward thinking on *jugaad*, which has become popular in recent years.

The findings of this thesis challenge the way the development of BoP capitalism has been theorised to date, primarily by economics, business, and development scholars, and highlight the need to think in terms of fluid capitalism at the BoP. In the case of the off-grid solar market in Uttar Pradesh, BoP capitalism was not a pure neoliberal story of formal businesses developing according to free market dynamics. This thesis contributes to theory on BoP capitalism by showing that while the BoP solar market in Uttar Pradesh highlighted features common to other BoP markets through the Global South, most notably the growth of new formalised business, it was also distinctive to the Indian context. It shows that more focus is needed on how state and non-state actors are enabling and shaping formal business, and on whether the parallel growth of formal and informal businesses adopting different approaches is a widespread structural tendency in liberalised BoP market contexts. The importance of informal practices such as

brokerage and corruption for formal business also raises questions for the existing literature.

This thesis further contributes to understanding of neoliberal capitalism in India, and the role of the state in regards to markets. A body of literature from social scientists and geographers has in recent years highlighted how neoliberal capitalism takes different forms in different spatial and socio-historical contexts, but how there are also common trends to the direction in which capitalism is developing around the world, and how capitalist systems are inter-dependent (Ferguson, 2009, Harvey, 2005, Peck and Tickell, 2002, Peck and Theodore, 2007, Peck and Theodore, 2015). In the Indian context, research has looked at how a distinctively Indian formal of neoliberal capitalism is evident. Markets have been liberalised in many instances, the state has withdrawn from directly running parts of the economy, and the delivery of many goods and services and government programs have seen greater private sector involvement. But the state has remained involved in many markets, and still runs large social programs (Chandrasekhar and Ghosh, 2002, Harriss-White, 2003, Corbridge et al., 2012). Work has looked at how there has been the rise neoliberal capitalism in certain sectors, such as IT, and there has been a growth of new formal businesses and regularised economic activity. At the same time, informal economic activity has continued, and formal economic activity is often interlinked and interdependent with informal economic activity in India (Gidwani, 2015, Gill, 2010, Sanyal, 2007).

The case of the BoP solar market in Uttar Pradesh suggests that in a post-liberalisation context, capitalism at the BoP is characterised by two-tiers of business operating side-by-side, adopting very different approaches. A new group of outwardly formal businesses are developing, providing a new range of goods and services to customers,

regularised warranties and servicing, and formal financing; but which are shaped and enabled by state and by non-state actors. At the same time, informal businesses, employing a very different business approach, are developing the market in a very different way. Capitalism at the bottom of the pyramid was fluid in Uttar Pradesh, with the distinctions between formal and informal businesses at times blurred. There was no evidence of formal business replacing or outcompeting informal business through time.

The findings of this thesis have implications for understanding how Indians are accessing essential goods and services. A strong narrative exists around the potential of formal companies within BoP markets to deliver developmental and environmental benefits. In India and around the world, there is a move to the private sector delivery of essential goods and services (Sangameswaran, 2009, Varman et al., 2012). The delivery of essential goods and services like solar power by private companies is often being framed in comparison to a perceived failure of the state in India to do so. This study challenges the idea that profitable formal businesses delivering essential goods and services, such as light to low-income populations can be expected to prosper according to market rationalities, and challenges the idea that they can be automatically assumed as the best option for supplying to the poorest in India.

The off-grid solar power industry has also importantly been understood as an industry that holds the promise of delivering environmentally sustainable forms of energy to people in the Global South, who often have little access to clean, efficient, and reliable forms of energy (Brar et al., 2008, Harriss-White et al., 2009, Miller, 2009). There is a wide literature that looks at the issue of environmental sustainability and sustainable development, for which this thesis is relevant (for example, see Goodland, 1995, Srivastava and Rehman, 2006, Peet and Watts, 1993). Within the literature on BoP

capitalism several authors have made strong claims that BoP capitalism can herald an era of environmentally sustainable capitalism (for example, see Prahalad, 2005). This thesis does not empirically or theoretically focus on the environmental issues raised by off-grid solar power market development. However, the results of this research do raise issues that are important to environmental debates, and in the conclusion, I point to several questions and specific avenues of future research around environmental issues.

Literature on the economy and on society in South Asia (for example, see Corbridge et al., 2012, Harriss-White, 2003, Harriss-White, 1999, Jodhka, 2010) shows that class, caste, religion, and gender are likely to be important structural inequalities shaping BoP capitalism and how business at the bottom of the pyramid work. In India caste, class, religion, and gender shape society and the economy. They often determine the access that people have to services, resources, and markets (Jeffrey, 2002, Corbridge et al., 2012). Some existing scholarship on BoP markets in India has looked at the role of structural inequalities. Taylor's (2011) work on the microfinance industry shows how BoP capitalism is shaped by power relations, based on caste and gender. He outlines how new formal microfinance services in India have become intermeshed with prevailing power relations of different social classes, castes, and genders, re-enforcing them in many instances. In their study of a project to provide internet information centres to BoP consumers in India, Varman et al. (2012) found that entrepreneurs running centres tended to be higher caste and more powerful, and concluded that in practice caste-based hierarchies act as a hindrance to BoP capitalism leading to social transformation. In his work on the micro-finance sector in Andhra Pradesh, Young shows how new jobs in the micro-finance sector are predominantly taken by young, middle-class and caste men, and that this is linked to the perception of their natural

abilities to be mobile, to adapt to new technologies, and to embody 'fiscal responsibility' (Young, 2010a:608).

This thesis does not empirically address the effects of caste, class, religion, and gender in the case of the off-grid solar power market in Uttar Pradesh. At an early stage in this study, I hoped to look on the role of caste in shaping the development of solar businesses. However, when I asked questions about caste and class during interviews I elicited short responses, and respondents were very reluctant to engage in these questions. Because my other key empirical question areas were proving productive, caste shifted away from being a focus. When hanging-out in shops and dealerships, I was not able to ascertain caste as an important dynamic within day-to-day business interactions between customers and shop keepers or dealers. Most of the shop keepers and dealers I interviewed were from higher castes. A further carefully focused study would be required to address the significance of caste, religion, and gender in the case of the off-grid solar power market. In particular, an important line of future research would be to explore the role of caste, class, and religion in enabling and shaping the brokerage practices that this thesis found were crucial to the development of formal solar businesses.

1.1: Thesis Outline

This thesis consists of eight chapters. In Chapter Two, I outline the theoretical framework within which this research is set. Three main bodies of literature shape this thesis: scholarship on neoliberal capitalism; on the state, state patronage, brokerage, and corruption; and on informal economic activity, improvisation, and *jugaad*. From these literatures I introduce key debates that intersect and orient my empirical chapters; and I

introduce the key arguments pivotal to this research. In Chapter Three, I cover the qualitative, case study-based methodology adopted. I introduce the businesses and interview participants included in my case study, and I elaborate upon my positionality in regards to this research, and on my experience of conducting research.

The first half of Chapter Four outlines the contextual background to the off-grid solar power market in India. I introduce India's economic, social, and political context, and its energy situation, which explains why off-grid solar power has such potential within the country. In the second half of the chapter, I look at the history of solar power in India, and of the commercial off-grid solar power market. I outline how a narrative of formal companies selling high quality, value-conscious, installed, serviced, and financed off-grid solar power products has emerged, which mirrors theory from the wider literature on BoP capitalism. I end by introducing the companies included in the empirical case study for this research.

Chapter Five is the first substantive empirical chapter. In this chapter I explore how a new group of formal solar shops and dealerships are developing the BoP market for off-grid solar power in a distinctive manner, that mirrors how new BoP markets are being spoken about in the wider literature. I focus on how the practices and claims of formal businesses in regards to quality, value, authenticity, brand, expertise, around their provision of after-sales service, and on being able to offer finance and a state subsidy to their customers was developing the BoP market in a distinctive manner. I examine how the practices and approach of formal businesses was being defined in opposition to what informal solar businesses were doing. I explore how some formal solar businesses were less successful in distinguishing themselves from informal solar businesses.

In Chapter Six, I trace how state involvement and state patronage, brokerage, and corruption explains the success of most formal solar businesses, but also the instability of these businesses and the fragility of the distinctive way in which they were growing the BoP solar market. I start by outlining how the central government, through the Jawaharlal Nehru National Solar Mission (JNNSM) Scheme, was shaping and supporting, but also destabilising, formal solar shops and dealerships. I look at how many formal businesses were brokering and maintaining *ad hoc* and improvised relationships with local rural development banks, the success of which were crucial to their continued sales. I look at how the payment of commissions was sometimes necessary for them, 'oiling the wheels of business'. I conclude that in the case of the off-grid solar market in Uttar Pradesh, even following liberalisation the state plays a crucial role, as do non-market practices of brokerage and corruption. Based on these findings, I outline how the BoP capitalism evident in the case of the off-grid solar market does not correspond with theories in the existing literature.

I turn to look at informal solar shops in Chapter Seven, outlining how a growing number of informal solar shops have been entering the off-grid solar power market in Uttar Pradesh, and are growing rapidly, often outcompeting their formal competitors. This chapter examines how the approach of these businesses is characterised not only by the sale of cheap and substandard products, but also by improvised products and business practices, and what I characterise as *jugaad* products and practices. I argue that research on BoP capitalism needs to better account for the continuing vitality of informal businesses, to their approaches to business, and the distinctive manner in which they are developing BoP markets.

I conclude in Chapter Eight by outlining the key contributions of this research to understanding on BoP capitalism. I make the argument that the off-grid solar power market presents a more complicated and nuanced picture of fluid capitalism at the BoP than is allowed for within existing theory on BoP capitalism. I argue that this in turn raises questions around the social vision of capitalism in the existing literature, which is based upon the idea of BoP capitalism being a story of formal businesses delivering goods and services to BoP populations in the Global South. I also outline the limitations of this study, and point to future directions for research.

Chapter 2: Theory

2.1: Introduction

In this chapter I outline the theory informing this thesis and introduce the research questions that are addressed in the empirical study. Focused on Bottom of the Pyramid (BoP) capitalism in India, this thesis is set within and works with three main fields of theory. Firstly, scholarship on neoliberal capitalism; secondly, work on the state and on state patronage, on brokerage, and on corruption; and thirdly research on informality, on improvisation and on the Indian concept of '*jugaad'*.

In the first part of this chapter I introduce these three areas of theory, and the debates within them that I work with in this thesis. I then focus in on the topic of BoP capitalism, outlining how a new body of theory has developed that has focused on the character and promise of BoP capitalism in the Global South. I look at how this theory has been applied, before turning to outline how it can be critiqued and challenged from the perspective of the three areas of theory used in this thesis, and I introduce the primary questions that I argue are still outstanding. I further review the sociological and geographical literature on marketization, which has significance for thinking about BoP market making. In the second half of this chapter, I start with an overview of the Indian context where this study is set, of state, society, and market relations, and of recent economic liberalisation in the country. I look at how BoP capitalism is being theorised in the Indian context, showing how the case study of India's new off-grid solar power market fits into this. I outline existing critiques of the current theory on BoP capitalism from the social sciences, and, drawing on understanding from the three areas of theory of this thesis, I present the outstanding research questions in regards to BoP capitalism in India that are explored in this thesis.

2.2: Neoliberal Capitalism

Scholarship on neoliberal capitalism is the first body of theory that this thesis works with. Neoliberalism is a concept that includes a set of ideas about how best to organise and promote capitalism (Hall and Soskice, 2001). David Harvey (2005:2) defines neoliberalism as "a theory of political economic practices that proposes that human well-being can best be advanced by liberating individual entrepreneurial freedoms and skills within an institutional framework characterized by strong private property rights, free markets, and free trade". The role of the state, according to neoliberal theory, he says, is to: "create and preserve an institutional framework appropriate to such practices." Neoliberal theory and discourse rose to prominence in the 1980's, promoted most notably by economists from the Chicago School (Gregory et al., 2009), and theoretically supported by scholars such as Friedman (2009) and Hayek (1979).

A body of scholarship from geography and the social sciences explores how neoliberal ideas and practices have spread over the last thirty years, leading to transformations in capitalism, state structures and institutions, and in society around the world. Research has outlined the advance of a new set of neoliberal capitalist rationalities and practices globally (for example, see Hall and Soskice, 2001, Harvey, 2005, Peck, 2010, Peet, 2007, Watts, 1994). The push to economic liberalisation, privatisation and global free trade, as well as state retrenchment, reform and new forms of governance has been explored and theorised in research on neoliberalism (Bakker, 2005, Brenner and Theodore, 2002, Castree, 2008, Cypher and Dietz, 2008, Duménil and Lévy, 2004, Larner and Laurie, 2010, Mansfield, 2009, Peck, 2004). Research has also explored the influence of neoliberal ideas and practice in areas including development discourse and practice (Peet and Watts, 1993, Rankin, 2001, Roy, 2010, Roberts, 2014), in

environmental discourse and policy (Goldman, 2001, Goldman, 2006), and in the growing influence of ideas of individualism, self-responsibility, and entrepreneurialism (Chang, 2010, Harvey, 2005).

A key focus of early scholarship was tracking the rise of neoliberal politics and economics in Western countries, notably the USA and UK, and in Western institutions such as the World Bank and IMF. Research tracked the move away from the post-war Bretton Woods global order, Welfare state models, and Keynesian economic policy, towards economic liberalisation, privatisation, commercialisation, and a 'roll-back' of state activity. The role of Thatcherism and Reaganism in promoting neoliberalism in the UK, USA, and beyond was chronicled (Harvey, 2005, Harvey, 2007, Peet, 2007). Early research further focused on how neoliberal politics and economics was being 'exported' from Western countries, often backed by coercive measures, to Latin American and African states during the 1980s and 1990s (Bandy, 2000, Gwynne and Kay, 2000, Morton, 2003), and to Russia and former Soviet Bloc states at the end of the Cold War (Job, 2001). At this time, the so-called 'Washington Consensus' prevailed, which saw multiple countries in debt crises forced to adopt Structural Adjustment Programs (SAPs). These typically involved neoliberal policies in the form of privatisation, state roll-back, and a removal of trade barriers and public subsidies, and were a condition for financial support from the IMF and World Bank (Peet, 2003).

While early scholarship theorising neoliberal capitalism around the world continues to be an important base to current research, it has been critiqued for being essentialist and structuralist. Larner (2003) argued convincingly that the tendency in much research, to theorise neoliberalism as an economic logic and as a set of practices being exported from Western 'heartlands' to the rest of the world in a uniform way, was limiting and

problematic. Her work tracing the intellectual, policy, and practitioner networks that underpin the global spread of neoliberalism has been important in highlighting the variable and often hybrid manifestations of neoliberal logics and practices. Theorising on neoliberal capitalism has also been critiqued by feminist geographers and Post-Structuralists, for being deterministic and for discounting non-capitalist social, economic, and political practices and structures that shape the way capitalism operates (for example see Gibson-Graham, 1996, Larner and Walters, 2004).

Recent work has moved away from accounts describing the homogenous spread of neoliberal capitalism and neoliberal state forms around the world, as well as from claims that neoliberalism is inherently contradictory and will be short lived. Instead, a focus has come on how neoliberal ideology and logics are reinvented and evolve as they travel from place to place, and are adopted in different political and economic contexts. For example, introducing the idea of variegated neoliberalism, Peck and Tickell (2002) argued that neoliberalism, as an economic and political project, takes shape and works in variegated ways depending on context. They traced how, while neoliberalism initially involved the 'rolling-back' of the state in Western countries and 'jungle law' in the Global South, when state institutions were scaled-back, neoliberal ideology, discourse and practice has since evolved, with forms of 'roll-out' neoliberalism and 'market rule' evident in varying iterations around the world. Recent work from geographers has focused on studying forms of neoliberalism as they are empirically found in-situ (Brenner and Theodore, 2002), on detailing the spread of neoliberal policy, practitioners, and ideas, and on how neoliberal forms travel, and vary as they do so (Larner and Laurie, 2010, McCann, 2008, Peck and Theodore, 2015, Ward, 2006). Research has highlighted distinct forms of neoliberal capitalism, state institutions,

governance and society in different states in the Global North and the Global South (Hall and Soskice, 2001).

The global financial crisis of 2008 was a moment of crisis for neoliberal capitalism, as financial markets around the world faced collapse, and large-scale bail-outs of financial institutions were required. Following the financial crisis, there has been academic and popular debate around whether neoliberal capitalism has entered an existential crisis that it will be unable to recover from, and whether we might be in the process of transitioning to a new era of post-neoliberal global capitalism (Comaroff, 2011, Peck et al., 2010). The suggestion has been made in some work that developing countries in particular might move towards capitalism with much greater state involvement (for example, see Bremmer, 2009, Nayyar, 2011). To date, however, there is little evidence of governments around the world moving to fundamentally challenge or alter neoliberal market-based capitalism or neoliberal governance approaches (Peck et al., 2010).

The growth of bottom of the pyramid markets in the Global South has taken place in a context of economic liberalisation and the extension of neoliberal capitalism through most of the Global South. Much of the existing body of literature on BoP capitalism, primarily from economics, business, and development scholars, is basing its characterisations of newly liberalised BoP markets and of BoP capitalism on neo-classical and neoliberal economics theory. Thus, it views BoP capitalism as being on a trajectory towards a regime where formal private companies operate within regularised markets, largely free from state involvement. The developmental promise and narrative attributed to BoP capitalism is dependent on this.

Theory from economic geographers and social scientists focuses on how, in practice, capitalism around the world varies, and is shaped by the political, economic, and social

contexts within which it takes place. Drawing on this theory, the suggestion would be that while there may be common factors to BoP capitalism throughout the Global South, it should be expected to vary in different contexts. I draw on theory on neoliberal capitalism to develop a series of question around whether formal businesses, working according to market rationalities, do characterise BoP capitalism in India. The findings of my empirical study contribute to understanding on neoliberal capitalism in India, showing a context of BoP capitalism in India were formal and informal businesses were developing side by side, resulting in two tiers of business, with state and non-state actors selectively shaping the market.

2.3: The State, State Patronage, Brokerage, and Corruption

Scholarship on the state and research on state patronage, on brokerage, and on corruption is the second body of theory this thesis works with.

The state has conventionally been defined as a set of institutions facilitating coercive power and governing capabilities over a territory (Gregory et al., 2009:722). Scholarship in Western contexts theorises the state as a set of institutions that are separate from society and the market, with sovereign power. State institutions are said to set the rules governing society and the economy, having an embedded autonomy from society (Brenner et al., 2008, Van Creveld, 1999). Research theorising states in the Global South has however challenged the idea that this model can be straightforwardly applied outside the Global North. This work has theorised the heterogeneity of state institutions and actors within many Global South countries, and has outlined how states are not simply functional bureaucratic entities, but are also the site of symbolic and cultural production (Corbridge et al., 2005, Fuller and Harriss, 2000, Gupta, 1995,

Gupta, 2012). State institutions and actors have historically played a key role in shaping, supporting and developing their economies and society. They have been understood to increase their strength and reach, and to gain legitimacy, through providing social services and infrastructure (Mann, 1984), and through making legible and known their populations (Scott, 1998).

Over the last thirty years, a body of research within the social sciences has been tracing on-going transformations in state institutions and state governance that have been evident in countries around the world. Research has focused on how state institutions are being reformed in the Global North and the Global South, to respond to new realities of globalisation and economic change, but also importantly because of the influence of neoliberal theory that promotes the role of the state as to enforce and support markets (Harvey, 2005). In the West, state retrenchment, the reform of Welfare provision, and the neoliberalisation of state institutions has been recorded (Larner, 1997, Prasad, 2006). In countries that have never had Welfare states, state retrenchment has often been enacted as the condition for IMF or World Bank financial support (Peet, 2003), and reforms leading to the development of neoliberal state institutions, regulations, and forms of governance have been recorded (Ferguson and Gupta, 2002). In the Global South, the role of the state has increasingly come to be spoken of in terms of providing 'good governance' (Hydén and Mease, 2004).

Empirical research has shown, however, that states around the world are rarely being transformed into pure neoliberal entities, where state institutions and actors only regulate and enforce free markets from a distance with a neutral stance (Chatterjee, 2004, Ferguson and Gupta, 2002, Harriss-White, 2003, Weiss, 2003). In countries where economic liberalisation has been carried-out, state institutions continue to involve

themselves within, and to shape, markets and capitalism (Harriss-White, 2003). Structural, contextual, civil society, cultural, and historical factors shape the workings of states, leading to state, society, and market configurations in countries around the world that do not fit Western or neoliberal theoretical ideals on how a state should be structured (Chatterjee, 2004). For example, brokerage, patron-client relationships, and corruption in many instances characterise the way state institutions operate, even following neoliberal reforms (Bardhan, 1997, Khan, 2005, Wade, 1982). Theory on the state shows that pure neoliberal states are rarely seen, much like theory on neoliberal capitalism shows that pure neoliberal capitalism is difficult to find in practice.

I work with theory on the state in this thesis to interrogate the role of state institutions and actors in shaping BoP capitalism in the Global South, challenging the absence of the role of the state in existing research on BoP capitalism. Empirical research from the social sciences, looking at states and state practices in the Global South, introduces doubt to the understanding in much of the existing literature on BoP capitalism that newly liberalised markets for goods and services catering to low-income consumers are being largely free from state support and influence. I identify questions around the role of state actors and institutions in supporting BoP markets, and companies selling goods and services within them, that this thesis explores. This thesis provides an empirical account of state involvement in a newly liberalised BoP market that is of importance to theory on the state in contemporary India, because it points to a new context in India where, following market liberalisation, state institutions and actors are continuing to be intimately involved in shaping a BoP market and businesses within it.

As well as seeing only a limited role played by state actors and institutions in new BoP markets, in the existing literature on BoP capitalism there has been little focus on the

role of state patronage and informal practices such as brokerage and corruption within new BoP markets. I work with literature from the social sciences on state patronage, on brokerage, and on corruption, outlining why such these practices can be expected to be important for businesses in BoP markets in much of the Global South. I show how in the case of the off-grid BoP solar market in Uttar Pradesh, India, state patronage, brokerage and corruption were important for formal solar businesses, which were usually not growing simply according to market dynamics. I argue that state patronage, and informal relationships with local development banks was allowing formal solar businesses to grow beyond a base level.

Brokerage is the arranging of a transaction or agreement between two parties. Brokers, also referred to as fixers and middlemen, are third party individuals who carry out brokerage (Manor, 2000, Reddy and Haragopal, 1985). A relatively small body of research explores how, in many Global South contexts, brokers play an important role in connecting states and NGOs to citizens. This is particularly the case in situations where governments or NGOs are involved in development work in areas where state institutions have little formal reach. Brokers also often connect local populations to external state and NGO resources, acting as gatekeepers (Bierschenk et al., 2001, Bierschenk et al., 2002, Krishna, 2002, Lewis and Mosse, 2006, Manor, 2000, Reddy and Haragopal, 1985). While the position of the broker is sometimes formal, more often it is informal, with the broker taking a commission for their work. Within markets in the Global South, brokerage regularly facilitates agreements between parties, and is practiced by businesses looking to access resources from states (Khanna, 2007, Rust and Hall, 2002, Simon, 2009, Sud, 2014a, Watanabe, 2006).

Patronage has conventionally been understood as a practice that involves the provision of resources from a patron to a client, usually in return for political support. A body of research focuses on how within the Global South, state actors and institutions often act as patrons to their citizens, interest groups, and businesses (Chabal and Daloz, 1999, De Sardan, 1999, Khan, 2000, Krueger, 1974, Rudolph and Rudolph, 1987). Khan's (2005) work showed how patron-client networks are of central importance to the operation of many democratic developing states. In political situations the assumption is that the patron is able to deliver resources when they access political power and hence public resources (Khan, 2005:714). Research has focused on how the ability of interest groups, businesses, or citizens to capture resources from the state is often dependent upon their political and economic power, their relationships to state institutions and actors, and their ability to broker relationships. The capturing of state resources is often at the expense of others (Jeffrey, 2002, Rowley, 2000, Simon, 2009). Patron-client networks are often associated with corruption (Khan, 1996). Berman (1998), in his work in Africa, traces both pre-colonial and colonial roots to patron-client relations. In India, patron-client relations are often structured along caste, class and religious lines (Jeffrey, 2002).

Corruption has conventionally been defined in terms of behaviour that deviates from official duties, and which is done for private financial or status gains, or for influence. This can include bribery, nepotism, and misappropriation (Nye, 1967:419). A body of literature examines corruption within states, markets, and society in the Global South (Bardhan, 1997, Bayart et al., 1999, Gupta, 2012, Jeffrey, 2002, Rose-Ackerman, 1999, Wade, 1982). Historical research on corruption has predominantly taken a normatively negative position on its practice. Corruption was said to violate boundaries between

public and private, legal and illegal, procedural and arbitrary (Jauregui, 2014:77), and has been understood to threaten development, lead to poorly functioning states and markets, and to social inequity (Jeffrey, 2002, Theobald, 1994). However, a body of more recent work has moved away from a normatively critical, Weberian view of corruption, and in instances also away from speaking in terms of corruption, to focus on understanding the institutional and social contexts where bribery, nepotism, and misappropriation takes places (for example, see Bayart, 1993, Chabal and Daloz, 1999, Jauregui, 2014). Chabal and Daloz (1999) make the case that modern forms of corruption often have their roots in historical cultural and social structures and practices.

Conventional economic and state theory takes the view that where there are well functioning markets, strong state institutions, and a well-developed civil society, brokerage, patronage, and corruption are practices that will be greatly reduced (Coe et al., 2007, Cypher and Dietz, 2008). Research from the social sciences shows, however, that within states that have moved towards neoliberal market-based models, and within liberalised markets, brokerage, corruption and patronage are often still evident (Harriss-White, 1996, Jeffrey, 2002, Khan, 2005, Simon, 2009). The lack of attention to the significance of state patronage, brokerage, and corruption in BoP markets within the existing literature on the topic is problematic, as such practices are often crucial to how formal and informal businesses have been shown to work in India and other countries in the Global South. In this thesis, based on evidence from the off-grid solar power market in Uttar Pradesh, India, I show how these practices help to explain the growth of formal solar businesses. This challenges accounts that suggest the development of BoP capitalism throughout the Global South towards a pure formal of neoliberal capitalism.

2.4: Informality, Improvisation, and Jugaad

Literature on the informal economy, informal business, and on improvisation and '*jugaad'* provides the third main area of theory that this thesis works with.

The idea of the 'informal economy' was first outlined by Keith Hart in 1973, in his study of Ghana's economy. He distinguished a formal economy, of wage labour, from an informal economy, of self-employment, which was not enumerated and which often had very low-productivity (Hart, 1973). In the same year, an International Labour Organization (ILO) (1973) report further sought to theorise the informal economy, through looking at informal business, defined as unregulated, unrecorded, and small-scale business activity. The informal economy is now commonly spoken of as the part of the economy that is unrecorded, untaxed or illegal (Harriss-White, 2003). Subsistence agriculture is sometimes classified within it (Breman, 1996). There has been controversy over how to define and study the informal economy. The idea that it is possible to draw a strict divide between the formal and informal economy has now been comprehensively rejected (Breman, 2001, ILO, 2002). Some research has worked with the idea of an intermediate sector, not formal or informal, sitting between the two (Steel, 1977). How and whether to distinguish a shadow economy, of extra-legal activity, further clouds clear distinction (Schneider and Enste, 2000).

A body of literature has developed focusing on informal business and informal business practices. This research has brought into focus how in the Global South a majority of business activity is informal, with informal, non-registered and non-regulated businesses providing the majority of goods and services purchased, while also employing the majority of workers (Breman, 1996, Charmes, 2000, Collins et al., 2009, De Soto, 2000, Harriss-White, 2003, Xiang, 2005). Research has shown how in the

West too, informal economic activity is often extensive (Vosko, 2006). Informal business has been linked at times to economic precariousness and to illegal activity (Harriss-White, 2003), and it is regularly women, children, migrants, and the disadvantaged who live and work within the informal economy (Ehrenreich and Hochschild, 2003, Gill, 2010, Vosko, 2006). Informal economic activity has conventionally been understood to be less capital intensive, to produce less tax, and to generate lower wages for workers (Gerxhani, 2004).

The reformist view, seen particularly in work from economics, is that informal economic activity is pre-capitalist and involves the inefficient use of resources, labour, and capital. Institutionalists instead see the informal economy as resulting from inappropriate state regulation of markets and crisis, while the neo-Marxist perspective is that it is subordinate to formal capitalism, necessarily existing for a pool of reserve labour that exists outside of formal capitalism (Yeboah, 1998). According to the reformist perspective, markets served by informal businesses are the site of potential for formal businesses and capitalist development. It is argued that market development and the advancement of formal capitalism is required, and will lead to informal businesses and labour being superseded (De Soto, 2000, Farrel, 2004). This position informs much of the existing literature on BoP capitalism, which does not see a role for informal businesses within developed, well-regulated capitalist systems.

Research from the social sciences has shown, however, that following economic liberalisation in many instances in the Global South, informal business activity has flourished (Drèze and Sen, 2013, Gerxhani, 2004, Gidwani, 2015, Meagher, 1995, Owusu, 2001, Wells, 2007, Xiao, 2015). The argument has been convincingly made that informal labour is a characteristic of neoliberal capitalism in the Global South (Gooptu,

2007, Mezzadri, 2010). Sanyal (2007), Gidwani (2015), Gill (2010), Owusu (2001) and others have shown how formal and informal economic activity and value creation are often deeply intertwined and interdependent within modern capitalist economies. The need for research to look seriously at the position of the informal economy within the global economy, and its links to the formal economy is highlighted by Phillips (2011). Yeboah (1998) argues that seeing a dichotomy of formal versus informal, and believing that the formal economy will supersede the informal economy is wrong. Webster and Fidler (1996) found that the informal economy in Africa has been more efficient than the formal economy at times, in terms of better market services accessibility and capital intensive production. Work on the informal economy and informal business from the social sciences and geography highlights a very different theoretical account of neoliberal capitalism in the Global South from that of neo-classical economists.

I work with this body of literature and theory, challenging the lack of attention that has been given to the role of informal business operating alongside formal businesses in liberalised BoP market contexts within the current literature on BoP capitalism. In much of the existing literature, primarily from business, economics and development scholars, informal economic activity is presented as pre-capitalist. It is argued that consumers at the BoP will choose goods and services from formal businesses when given the choice, and that therefore formal businesses will supersede informal ones (Prahalad, 2005). I show how, in the case of the BoP solar market in Uttar Pradesh, informal businesses were thriving alongside formal solar businesses, and were often outcompeting them.

I further work with theory on improvisation, and with the India-specific theory on *jugaad*, in looking at informal solar businesses, using this theory to understand the reasons for their success. A small body of research explores the topic of improvisation.

One stream of work on improvisation has focused on the practice of adhocism, where objects are invented or created through frugal and innovative means, often relying on materials to hand (for example, see the work of Jencks and Silver, 2013). A further stream of research has been looking at improvisation within informal markets, as well as within informal living contexts. This form of improvisation has been productively theorised and understood as a common everyday practice throughout the Global South, involving at different times material, social, and political actions (Young & Jeffrey 2012; Jeffrey & Young 2014). It has been framed as contextual, local, and often informal (Roy, 2011). Research has shown how within everyday life and in business, material improvisation is often practiced in order to create, invent, and access goods and services (Jeffrey and Young, 2014). Within urban informal settlements improvisation is often evident, deployed within challenging development or economic contexts (McFarlane, 2011, Vasudevan, 2014). Improvisation has been celebrated as demonstrating entrepreneurship (Roy, 2011, 2014). However, it is not just practiced by poorer people, and its practice is not democratic (Young and Jeffrey, 2012). Roy (2011) has for example looked at elite improvisation, while Jeffrey and Young (2014) speak of how those who have a 'feel for the game' are often better able to improvise. Importantly, improvisation is often done within situations of economic precariousness, highlighting material stress (Birtchnell, 2011).

Improvisation has been understood and theorised in terms of local concepts in a number of countries. In India, the Hindi term *jugaad* speaks of improvisation, in material, social and political contexts. In Zimbabwe, Jones (2010) describes how during a period of economic crisis, youth entrepreneurs had begun to engage in new capitalist endeavour and creative improvisation, described by the term '*kukiya kiya*'. Other concepts

speaking of improvisation include the term '*jeitinho'* in Brazil (Duarte, 2006), '*dregging'* in Sierra Leone (Hoffman, 2004) or '*bricolage'* in France (Strauss, 1962).

In this thesis I show how the persistence and success of informal businesses within the BoP solar market in Uttar Pradesh, and the distinctive way in which they are developing the market, can be productively explained in terms of improvisation and *jugaad*. I talk about how what I characterise as improvised and *jugaad* products and practices distinguished what informal businesses were doing compared to formal solar businesses. In doing so, I also present a critique of the way that *jugaad* has recently been used in the Indian context to talk about improvisation and frugal innovation.

2.5: Bottom of the Pyramid Capitalism

Over the last two decades, in the wake of economic liberalisation having taken place through much of the Global South, there has been a proliferation in businesses selling goods and services to low-income populations through the Global South, and a resulting expansion of markets. A body of literature has developed in response, focused on reporting, understanding, and theorising these markets, and so-called BoP capitalism. This thesis draws on the three areas of literature outlined above, to interrogate and to empirically contribute to understanding on BoP capitalism; and through an empirical case study of BoP capitalism, aims to contribute back to the above three areas of theory.

The idea of the BoP market, and theory on BoP capitalism, was first developed within business schools. Prahalad and Hart (2002:3) coined the term, defining the BoP as a distinct market of the four billion people around the world living on less than $1,500 dollars per year, based on purchasing power parity in US dollars. They introduced the

visualisation of a pyramid of global capitalism which presented wealthy Western consumers at the tip, the middle classes in the West and the Global South at the level below, and a large majority of poor people at the base (see Figure 1).

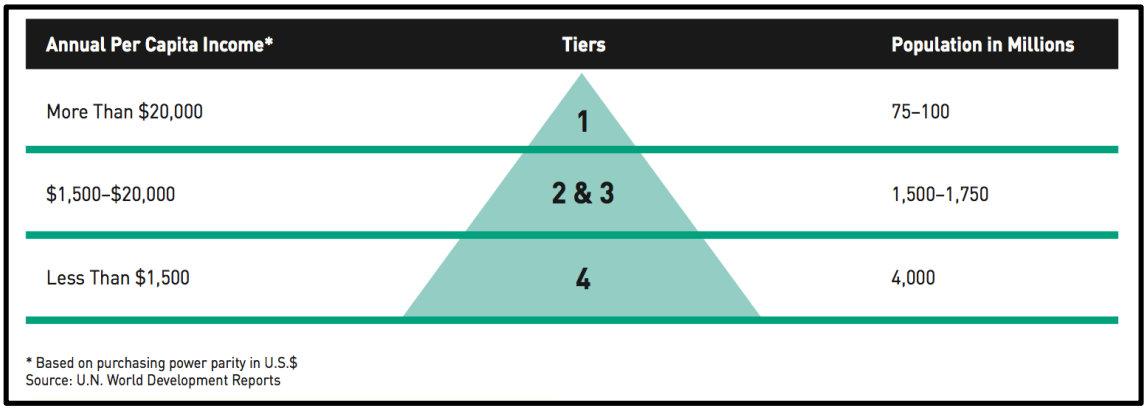


Figure 1: A representation of the Bottom of the Pyramid (source: Prahalad and Hart, 2002:4)

Prahalad and Hart's (2002) saw the need to focus on BoP capitalism because of the economic transformations being seen around the world as a result of globalisation and economic liberalisation. They looked at how, following the end of the Cold War, formerly closed markets in the Global South and ex-Soviet satellite states were being opened to foreign investment and to multi-national corporations (MNCs). This, they argued, was increasingly meaning that while the rich and emerging middle classes in these countries offered a market opportunity, a much bigger potential source of opportunity and profit was the billions of 'aspiring poor' in these countries.

In his book '*The Fortune at the Bottom of the Pyramid*', Prahalad (2005) popularised theorising on BoP capitalism. He focused on the BoP as a latent market, arguing that it offered great potential for profit-seeking companies and for capitalism. According to

Prahalad, BoP markets, which had been ignored by MNCs and private companies for decades, could be successfully entered and developed if companies radically innovated on technology and their business models. His focus was on formal businesses. He argued that BoP capitalism could grow, if private companies provided good quality, branded but value-conscious products. Prahalad believed that BoP capitalism held the promise of 'inclusive capitalism'; that companies offering good quality products could ensure socially inclusive and environmentally sustainable models of capitalism. In his book, Prahalad called for an end to 'thinking of the poor as victims', to instead see them as 'resilient and creative entrepreneurs and value-conscious consumers'. He contended that private-sector competition at the BoP would bring new choices to people, formerly forced to rely on what was available within their villages (Prahalad, 2005:5).

A body of literature, primarily from business, economic, and development scholars has since taken forward theorising on BoP capitalism in the Global South, in situations where economic liberalisation has occurred. This literature has made a number of significant contributions, and has become more widely influential.

Firstly, low-income populations throughout the Global South have been framed and imagined as constituting a homogenous BoP population. People living on less than $2.5, or in some literature, less than $2 dollar per day have been defined as part of the BoP (Prahalad, 2005, Warnholz, 2007). This population has then been theorised to be a distinct market, but within the overall global framework of capitalism (Maurer, 2012:590). The BoP market, of people who primarily continue to live and transact within the informal economy, has been represented as a new frontier of capitalism holding great potential; a market to be intervened in and developed through time

(Agnihotri, 2013, Pitta et al., 2008). Hammond (2007:3) estimated the BoP to be a $5 trillion global consumer market.

Secondly, in the context of the on-going economic liberalisation, and marketization throughout the Global South, the idea has been established that it is formal, regularised businesses which are developing BoP markets, and that business and markets are not different than further up the notional pyramid of capitalism, except that businesses in BoP markets must offer good quality, but value-conscious products and services. Within multiple articles and books, the entrance of formal businesses into BoP markets has been studied (Agnihotri, 2013, Dolan and Scott, 2009, Hart, 2005, London and Hart, 2004, Pitta et al., 2008, Rangan and Rajan, 2005). It has been argued that they have been successful in doing so when they have innovated, in terms of the technology they use, their products and services, and their business practices (Anderson, 2006, Prahalad, 2012, Ray and Ray, 2010). Similarly, it is reported that formal businesses have been necessarily focused on offering good quality, branded, but value-conscious and frugal products; and that doing this has been essential to their success in growing BoP capitalism. If companies do this, then it is argued that they can make a fortune at the BoP (for example, see Hart, 2005, Hammond et al., 2007, London and Hart, 2004, London, 2008, Prahalad, 2012).

Informal businesses, from which the majority of low-income people living in the Global South currently access their goods and services, have not been the focus of this new literature. Instead, informal business and the informal economy has been theorised in leading texts on BoP capitalism as pre-capitalist (for example, see Hammond et al., 2007, Prahalad, 2012). It is argued that the development of BoP capitalism, by formal businesses, will lead to informal business being superseded or formalised. Prahalad

(2005, 2012) for examples argued that BoP customers will choose good quality, branded and value-conscious products if they are made available over what is available from informal businesses. Within this literature, BoP markets are understood in technocratic terms and according to neo-classical theory, as entities that can be developed and made to work better through time for the purposes of capitalist development and accumulation.

Theory from a number of economists working on informal economic activity and informal business in the Global South informs the literature on BoP capitalism. Elyachar (2012) outlines how work highlighting the myriad of enterprise and innovation occurring within the informal economy from economists has been influential for the development of ideas about the potential for BoP capitalism in the Global South, and about the process of capitalist development at the bottom of the pyramid. Hernando de Soto's (1990, 2000) work documenting the high levels of entrepreneurship and economic activity within informal markets around the world is particularly significant. The poor, he argued, are asset rich but capital poor. What keeps people poor is their inability to realise or transfer their assets, or to formalise their businesses and enterprise. Appropriate governance and markets are required to bring latent enterprise and private property into formal circuits of capitalism. Similar accounts that focus on the enterprising poor and on the vitality of informal economic activity have come from Collins et. al. (2009) and from Viswanathan et al. (2012). This work makes the case that there is an ability and willingness amongst BoP populations to pay for goods and services. Further, it suggests that if formal businesses provide good quality products that people can afford, then they can successfully enter BoP markets, which in turn will develop into regularised capitalist markets.

Thirdly, within the existing literature on BoP capitalism, the influential idea has been established that formal businesses selling good quality, affordable, and frugal goods and services into BoP markets can deliver development benefits, poverty reduction, and environmental sustainability. Indeed, more widely within academic literature and within development circles, supporting BoP markets is increasingly being presented as the best way to bring development to BoP populations in the Global South. Rashid (2009) describes how the non-integration of low-income populations into the global market economy has been framed as a primary problem in recent years. He outlines how the argument has become established that fostering BoP markets for goods and services such as banking, communication, water, and sanitation has been understood as the best way to fight poverty in developing countries.

Over the last two decades, traditional aid based development policies where money is paid to governments or NGOs, and big 'D' planned development projects are supported, have fallen out of favour (Elyachar, 2012, Hart, 2005). Elyachar (2012) speaks of how from the late 1980s this growing critique of development paved the way for thinking in terms of BoP markets. This thinking rejected seeing the state or NGOs as the best actors to reduce poverty, and rejected thinking about the BoP in terms of charity.

Easterly's (2006b) work, for example, speaks of the potential of pro-poor markets needing to be realised, arguing that while the West has markets, the poor have bureaucrats. Large-scale planned development spending, he says, has never been associated with a developing country taking off economically (Easterly, 2006a, Easterly, 2012). Introducing the idea of 'dead aid', Moyo (2009) argues that traditional aid money had largely been wasted, and that instead a focus on markets and giving people access to capital is necessary. In their book *Poor Economics*, while taking a less

ideological view, Banerjee et al. (2011) focus on the role of enterprise and capitalism in delivering development outcomes. Rashid (2009) reports how the UN, the World Bank, NGOs, governments and MNCs are now increasingly promoting markets as a way to achieve development. Mawdsley (2015) traces the turn towards market promotion by national development organisations. New market-based approaches reject the big push approach to development, most notably supported by Sachs (2007). Instead, the poor are seen as latent entrepreneurs who should be supported, and formal capitalist markets are seen as key to any long-term solutions to poverty (De Soto, 2000, Prahalad and Hart, 2002). The state is seen as best when it is a facilitator and a regulator, rather than a direct agent of development (Easterly, 2006b).

Roy (2010:66) describes this trend of free markets being repackaged as pro-poor markets as a new Washington consensus on poverty. The 'bottom billion', argues Roy (2012a), are the focus of both development and profit and accumulation in a post-development world. Weber (2001) speaks of there being a new global effort at poverty reduction, based on a global development architecture which pushes markets and liberalisation as a solution to development. According to Roy (2012a), the extension of markets to serve low-income populations crucially relies upon the ethicalisation of market rule, to mask the potentially exploitative character of bottom billion capitalism. Cross and Street (2009:4) argue that there is a social narrative and vision of capitalism that has been developed, with the well-being of poor people becoming a rich seam for global business as a result. Elyachar (2012) speaks of an end of traditional development, replaced by a new BoP market approach to poverty relief.

The existing literature theorising BoP capitalism has largely focused on formal businesses in BoP markets, where the state is said to only play a limited regulatory role.

Elyachar (2012) has made the case that recent thinking on BoP capitalism involves a rejection of seeing the state or NGOs as the only actors with the necessary knowledge to provide public goods and infrastructure. Similarly, the existing literature does not focus on brokerage, state patronage, and corruption as practices shaping business at the bottom of the pyramid. Instead, these practices are spoken of as the reason why formal businesses developing in BoP markets will outcompete informal businesses (De Soto, 1990, De Soto, 2000, Prahalad, 2005). Finally, within the existing literature on BoP capitalism there is little focus on informal businesses, which currently serve low-income populations throughout the Global South. Informal businesses are regularly presented as inefficient and corrupt, and as supplying cheap and inferior quality products (Prahalad, 2012). There is little discussion of informal businesses thriving or surviving once formal businesses are offering alternatives. The literature on BoP capitalism mostly takes a conventional neo-classical economics view of capitalist development at the BoP.

Empirical studies of various consumer products being sold to BoP populations by formal businesses populate the existing literature on BoP capitalism. For example, Prahalad (2005) speaks about the success that Unilever has had selling to low-income consumers when they developed single-use shampoo sachets, that were affordable to customers at the BoP. Multiple reports from business schools and consultancies, drawing on the examples of various consumer products, talk about companies that have in recent years developed new business models and innovated to successfully sell into BoP markets (Bloom, 2009, Hammond et al., 2007, Hystra Hybrid Strategies Consulting, 2013, Govindrajan, 2010, Pitta et al., 2008). A strand of literature has looked at how businesses and MNCs have sought to bypass retail spaces, instead

building relationships with NGOs, community organisations, women's groups and other local networks in order to distribute to the BoP (see Dolan and Scott, 2009, 2005).

Research looking at BoP markets for essential goods and services has been particularly significant for the emergence of broader claims about BoP capitalism and its potential to deliver developmental and environmental benefits. Most notably, new markets for microfinance that have been growing throughout the Global South over the last two decades are regularly theorised as showing the development and potential of BoP capitalism. In *Poverty Capital*, Roy (2010) outlines how since the 1990s a range of new financial tools and products were developed by businesses in order to lend to poor consumers, formerly seen as being beyond the realm of capitalism. The resulting markets have been understood as showing the advance of BoP capitalism, delivering development benefits to customers who have purchased microfinance services. For example, the establishment and success of the Grameen Bank in Bangladesh by Muhammad Yunus is reported around the world (Roy, 2010). The framing of new microfinance markets as BoP markets, where capitalism is able to deliver developmental benefits has been written about by Young (2010a), Weber (2001), Rankin (2008), and Elyachar (2012).

Cross and Street (2009) have looked at how markets for medical products and devices have been framed as 'fruitful' sites for BoP capitalism. They report how the sale of sanitary towels, contraceptive devices, nutritional supplements, cataract removal services, spectacles, and hygiene products by global companies has been linked with delivering international public health goals (Cross and Street, 2009:5). Markets for water-purifying devices (Sharma and Iyer, 2012), soap and hygiene products (Sharma and Iyer, 2012), and beauty products (Karnani, 2007b) have similarly been understood

as examples of developing BoP markets, where developmental benefits are being delivered by formal businesses which over recent years have started to enter such markets. The growth of IT services in the Global South targeted towards low-income populations have been framed in terms of BoP capitalism promising win-wins for business and development (Kuriyan et al., 2008, Maurer, 2012, Murphy et al., 2014, Tarafdar et al., 2012, Rashid and Rahman, 2009). While not using the language of BoP capitalism, Redfield (2013) shows how humanitarian goods, defined as goods and services intended for places where the state, markets, and forms of civil society fail, and an ethical intervention for populations is needed, are being framed as potentially best delivered by markets. Redfield reports how commercial interventions are being seen as best suited to reaching the maximum number of people sustainably. His examples include the case of the Vestergaard Frandsen clean water filtration system, and of the business Peepople, which sells disposable sanitary bags to be used where there is no access to toilets.

New markets for off-grid solar power in the Global South are a further important market for essential goods and services being theorised as an example of the development of BoP capitalism. Numerous articles report that private companies are selling good quality, value-conscious solar solutions to low-income populations, delivering developmental benefits in the process (Cabraal et al., 1999, Martinot et al., 2002). Formal off-grid solar power markets have been developing in parts of Africa (Wamukonya, 2007), in Bangladesh (Wimmer, 2012), in India (Miller, 2009), as well as in other Global South countries. Cross's (2013) work has highlighted how the emergence of BoP solar lantern markets in the Global South is being framed as

promising significant developmental gains for low-income populations. The focus of this literature has been on formal businesses and social enterprises.

The effects of the global financial crisis of 2008, and the ensuing economic downturn on BoP capitalism has seen little research to date. Some work has looked at how new microfinance markets in the Global South were negatively affected by the financial crisis. The work of Di Bella (2011) and of Wagner and Winkler (2013) shows how microfinance institutions faced a more constrained borrowing environment in the years following the crisis, and the profitability of loans they were providing were also negatively impacted (Di Bella, 2011, Wagner and Winkler, 2013). There is no research that has looked more widely at whether BoP markets for other goods and services have stalled or have been altered as a result of changes since the financial crisis.

2.6: Complicating the BoP Capitalism Narrative

The literature on BoP capitalism, primarily coming from economics, business and development scholars, does important work in highlighting the proliferation of new businesses selling goods and services to people in the Global South living on low incomes, which has been possible as economies have been opened to competition and markets liberalised through the Global South. There has been a globalisation of capital and capitalism. Economies and state institutions are being reformed, and intervention in markets is changing. While the new body of literature on BoP capitalism has made a significant contribution to theorising how BoP markets are developing in numerous countries throughout the Global South, it has theorised such markets predominantly in terms of neo-classical understandings of capitalism. The resulting theory can be critiqued on several fronts.

The idea that there is a large, homogenous BoP market ready to be exploited and developed by formal businesses has been criticised by business and economics scholars. Karnani (2007a) argues that it is an illusion to see the BoP as a latent consumer market with money to spare, or to believe that low-income people will choose quality products from formal businesses when provided. Rashid and Rahmen (2009) and Wanholz (2007) outline similar arguments. The idea of a global BoP market, however, remains popular and influential.

Empirical work from the social sciences has critiqued claims that BoP capitalism is seeing formal businesses profitably deliver environmental and developmental benefits. Research has challenged the idea that the microfinance sector is seeing good quality financial services delivered to low-income populations, and that developmental gains are being seen (Rankin, 2008, Roy, 2010, Weber, 2001, Young, 2010a). Sinclair (2012) identifies numerous examples of microfinance companies charging extremely high levels of interest to BoP customers, providing the kind of exploitative service that is little different from the informal money lenders that formal BoP businesses are said to provide an alternative to. Similarly, Roodman (2012) and Batemen (2010) argue that there is no evidence that microfinance has an impact on poverty, pointing to the finding that loans are generally used for unsustainable consumption, and that microfinance can often create a poverty trap. Bateman and Chang (2012) argue that microfinance services the neoliberal and globalisation agenda, and that while a lucky few may benefit, the majority will not. A recent DFID funded study of microfinance found no clear evidence for developmental gains as a result of new microfinance markets developing in the Global South (Duvendack et al., 2011:2).

In his research on the market for humanitarian goods, Redfield (2013) calls into question the narrative that new formal businesses selling good quality, value-conscious products are delivering developmental and environmental benefits better than the state or an NGO could. Simon's (2010) work on the BoP market for cookstoves in Maharashtra, India, found that while marketization led to more choice for customers, prices also rose, and companies had less imperative to widely supply cookstoves to the poorest. Jacobson (2007) and Wamukonya (2007) challenge the idea that the growth of off-grid solar power markets in Africa have resulted in developmental gains. In a study of an HP e-Inclusion IT project at the BoP in Costa Rica, Schwittay (2011) found that the structural drivers of poverty were not altered. In his work on Africa, Carmody (2012) challenges the idea that ICT and mobile phone markets at the BoP are bringing straightforward developmental gains, arguing that new markets often reinforce dynamics of uneven development.

Several studies have looked at case studies of BoP markets, highlighting BoP capitalism that was more complex than free market neoliberal capitalism. Cross and Street (2009), in a study of Hindustan Unilever selling soap into BoP markets in India, highlight how the alignment of the interests of marketing executives, scientists, state actors, school-children, and women was important, with Unilever's success coming because of the association of their soap with science, health, and public aims. Rashid and Rahman's (2009) study of a village phone program run by a Norwegian company in alliance with the Grameen Bank showed how successful project implementation was not just about the right product, value, and distribution, but was dependent upon the use of the existing local infrastructure of the Grameen Bank and on a social marketing approach. The paper argues that BoP markets can only be successfully developed when companies take into

account the local socio-economic context within which they operate. Maurer's (2012) work, looking at the M-PESA's mobile money service in Kenya found that it was not possible to speak of a homogenous BoP consumer market. He found people adapting and modifying the service beyond the parameters for which it was designed. He found that there was heterogeneity and agency at the BoP, and that the poor were innovators in the sets of relations holding together production and consumption.

More broadly, work from the social sciences has highlighted how throughout the Global South, the privatisation of essential services delivery, such as for water, often leads to reduced access for the poor, and can often have extremely inequitable outcomes (Bakker, 2002, Cupples, 2011, Shiva, 2002, Green, 2003). This research casts doubt on the idea that formal businesses selling into BoP markets will always deliver good quality products and services, especially to the poorest.

The departure point for this thesis is the analysis of BoP capitalism according to technocratic and neo-classical economics theory, and the assumption that BoP capitalism through the Global South is developing towards a textbook style form of pure neoliberal capitalism. Firstly, drawing on understanding from the literature and theory on neoliberal capitalism introduces the suggestion that BoP capitalism in the Global South is unlikely to be a homogenous story of formal businesses selling good quality, but value-conscious products to low-income consumers, according to free market dynamics. Theory on neoliberal capitalism highlights how, while the liberalisation and neoliberalisation of capitalism has been a common theme in most countries globally over recent decades, capitalist systems vary around the world. Markets develop in distinct ways in different contexts, as they are shaped according to the political, social and economic spaces where they are (Ferguson, 2009, Peck and

Tickell, 2002). Places and populations are integrated into or excluded from global capitalism in dynamic and varying ways, and markets are socially and culturally constituted, maintained, and reproduced (Berndt and Boeckler, 2011, Harvey, 2005). In the existing literature on BoP capitalism, little attention has been paid to theorising BoP capitalism that differs from a pure model of neoliberal capitalism. There is a strong undertone of modernisation theory in the literature. Yet, theory on neoliberal capitalism suggests that regularised neoliberal markets, within which formal businesses operate according to market dynamics, cannot be assumed to be the inevitable story of BoP markets throughout the Global South. Social sciences and geographical theory on neoliberal capitalism suggests the need for research that explore how BoP markets are growing and being shaped in different state, society, and market contexts.

Secondly, drawing on theory on the state, and on the role of state institutions and actors in markets throughout the Global South raises questions around the limited attention in the existing theory on BoP capitalism to the role of the state in shaping newly liberalised BoP markets. Much of the existing research on BoP capitalism has focused on private businesses developing within liberalised markets, according to market dynamics. The role of the state has been presented in terms of governance, and at times as a neutral partner that can support and work with private businesses (Hammond et al., 2007, Prahalad, 2005). However, studies on the role of state institutions and actors within markets and in society suggest that in contexts of economic liberalisation and state neoliberalisation, the state has rarely withdrawn to a simple role of neutral market regulation. New forms of state involvement usually replace old forms (Corbridge et al., 2005, Gupta and Sivaramakrishnan, 2011, Harriss-White, 2003). Further, states in the Global South have been shown to be disaggregate and heterogeneous, with state

institutions and actors often important in everyday market and social contexts (Gupta, 1995, Gupta, 2012). In the work of Young (2010a), Weber (2001), and Rankin (2008) looking at a number of BoP microfinance markets through the Global South, the state is shown to be important in supporting BoP markets. Cross and Street (2009), in their work looking at BoP markets for soap, similarly highlight the crucial relationships between companies and state institutions and actors. In his study of the BoP market for cookstoves in Maharashtra, India, Simon (2009) found businesses mediating with state institutions to access latent state resources, transforming strict market distribution mechanisms as a result. Literature from the social sciences suggests that the role state institutions and actors might play in shaping and supporting BoP capitalism in the Global South needs to be better studied, a task which this thesis takes up.

Research on state patronage, brokerage, and corruption provides a further a body of theory that raises outstanding questions about the character of BoP capitalism that are not adequately addressed to date. The literature on BoP capitalism largely focuses on formal businesses that run according to market rationalities. Yet research on state patronage, on brokerage, and on corruption suggests that in the Global South such practices shape markets and capitalism on a day-to-day basis, and are often important for businesses (Gupta, 2012, Jeffrey, 2002, Khan, 2005). Simon (2010) found that networks of restitution, favouritism, and corruption were shaping market-based programs for cookstove distribution in Maharashtra, India. Based on the evidence of the importance of these practices throughout the Global South, in this thesis I draw on this area of theory to explore the importance of such practices in the case of the off-grid solar market in Uttar Pradesh.

Thirdly, theory from the social sciences on informal economic activity suggests that informal business will continue to be important within liberalised BoP markets, challenging the lack of attention to informal business within the existing literature on BoP capitalism. Work on informality and improvisation challenges the idea that informal economic activity will end as formal businesses enter BoP markets in the Global South (Gerxhani, 2004, Harriss-White, 2003, Sanyal and Bhattacharyya, 2009, Yeboah, 1998). Empirical studies from the Global South highlight how informal economic activity continues within liberalised market contexts, can grow, and is often intricately interlinked with formal economic activity (Agarwal et al., 2005, Gidwani, 2015, Gill, 2010, Xiao, 2015). The idea that formal businesses will be the whole story of developing BoP markets throughout the Global South seems unlikely. Questions around the role of informal businesses in the story of BoP capitalism are the final outstanding empirical research focus that this thesis has.

If BoP capitalism is not straightforwardly a story of formal businesses selling good quality, branded, and value-conscious goods into BoP markets throughout the Global South, this in turn calls into question the developmental and environmental benefits of BoP capitalism as described in the existing literature. Theory on BoP capitalism has become increasingly influential over the last decade, and is clearly fulfilling a purpose in drawing attention to newly liberalised markets for goods and services for low-income populations around the world. Geographers have not engaged widely on the topic, but it is theoretically and politically important to do so, given the influence of the existing body of theory on BoP capitalism, which is being used to frame BoP populations and BoP capitalism in particular ways, and to propose development and governance interventions on this basis. Through focusing on BoP markets within specific spatial,

political, economic and social, contexts, a geographical perspective offers a distinctive approach to researching and theorising BoP capitalism.

2.7: Marketization

A rich body of sociological and economic geography literature focuses on markets and marketization. Berndt and Boeckler (2012:2) outline an introduction to markets. In basic terms, they note, "markets come into being with the buying and selling of goods and services by persons or organizations." Markets, they write, can refer to a "physical place for gathering to conduct some form of regulated selling and buying", or, following the rise of neo-classical economics, ideas of marginalism and equilibrium theory, markets "turned into empirically empty conceptualizations of exchange, an arena for perfectly competitive transactions between many rational buyers and sellers sharing complete information (on price, quality of goods etc.)." (Berndt and Boeckler, 2012:2).

Within economic theory, the market is held as an ideal entity, within which prices are set and rational individuals operate to maximise their own interests. In a perfect market, when full information is available to all actors, an equilibrium should be reached (Berndt and Boeckler, 2012). Work from sociologists and geographers has challenged the idea of the *homo economicus*, and the idea that all markets around the world operate and are structured according to textbook neo-classical economics theory. This work makes the point that markets are often taken as a black box, and are poorly theorised. In framing his work theorising markets, for example, Callon (1998a:1) draws attention to North's (1977) point that: "It is a peculiar fact that the literature on economics . . . contains so little discussion of the central institution that underlies neo-classical economics - the market". Economic geographers in particular have done important work

in highlighting how geographically different institutional, political, and economic contexts lead to different markets (Clark et al., 2000, Peck, 2005). Work from sociologists and economic geographers on markets draws from the theoretical insights of Polanyi. In *The Great Transformation*, Polanyi argued that the modern market economy and the modern national state are both produced, and that the self-regulating market is a myth. He argued that distribution being structured through market exchange, and the social being seen as an appendix of the market, differentiates market societies from previous economies based on redistribution and reciprocity. He developed the theory that the creation of market economies had altered humankind's economic mentality, and produced the self-interested, rational individual (Polanyi, 1944).

One line of research has focused on the social embeddedness of markets, looking at the social and cultural contexts of existing markets (Berndt and Boeckler, 2012). The argument elaborated in this literature is that market exchange involves uncertainties around value, exchange, and competition. To overcome this, markets require socially agreed institutions to provide stability (Berndt and Boeckler, 2012, White, 2005). Another line of research has focused on institutional aspects. Institutionalists have focused on the role of formal institutions in stabilising markets, arguing that market exchange depends on institutional rule-setting and enforcement (Berndt and Boeckler, 2012, Fligstein and Dauter, 2007).

In recent years, a number of scholars have focused on theorising markets, and the process of marketization, or market making. The work of Callon (1998a, 1998b, 2007), Mitchell (2002, 2005, Mitchell, 2009), and MacKenzie (2001, 2004, 2007, 2011) is particularly notable. In his work, Callon (2007) introduces the idea that markets can be conceived of as socio-technical 'agencements', arrangements of people, things, and

socio-technical devices that format products, prices, competition, places of exchange, and mechanisms of control. He sees marketization as a process that is driven by arrangements of heterogeneous elements, such as rules, technical devices, calculating systems, discourses, which organise the circulate of goods. He argues that agency should be understood as distributed. The work of Callon looks at how particular arrangements allow markets to become stabilised, and to function. Callon (1998a, 1998b) argues that the *homo economicus* of economic theory actually exists, but rather than being a pre-given natural human, it is the result a process of configuration.

MacKenzie, Callon, Mitchell, and others make the case that mainstream economics is not explaining the world from a distance, but that it is performative, and that economics theories and projects transform the worlds that economics say that they describe. Callon (1998a:2) states his argument as: "maintaining that economics, in the broad sense of the term, performs, shapes and formats the economy, rather than observing how it functions". MacKenzie (2004:303) distinguishes two forms of the performativity of economics: "'generic' performativity, according to which markets and other economic relations are not to be taken as given, but as performed by economic practices; and 'Austinian' performativity, in which economics brings into being the relationships it describes." Scholars have looked at how as well as human agents, market devices, such as pricing models, trading protocols, or computer screens have agency in the framing of markets, and contribute to creating the economic realities described by neo-classical theory (for example, see Muniesa et al., 2007).

Various case studies have been used to demonstrate this theory. MacKenzie's work (2001, 2004, 2011) has looked at how financial markets are shaped and made real by economics theory and devices. Mitchell's (2002) work has highlighted how material

objects were crucial to the performance of the Egyptian economy in the late 19th- and early 20th-century, outlining how surveyors but also accurate measuring tools made possible the production of accurate land property maps for the constructing of markets. The work of Barnes (2008) and of Berndt and Boeckler (2012) provide a useful overview of work in this area. Barnes (2002) has also outlined the performativity of economic geography theory. Notably, MacKenzie (2004:328) cautions against over-emphasising performativity, arguing that the notion of performativity as applied to financial markets has its limitations.

This body of work on markets and marketization is useful in thinking about the active process of marketization that is on-going globally. It draws attention to how different concrete markets are being brought into existence, and stabilised. It highlights how markets are practical accomplishments, never fully completed assemblages of heterogeneous elements (Berndt and Boeckler, 2011). This body of literature provides a productive lens when brought to consider marketization at the bottom of the pyramid. It draws attention to the need to look at the way that markets are being created in practice at the bottom of the pyramid; to look at the arrangements of people, things, and socio-technical devices that are enabling the formation of markets. Further, moving with the idea that economics theory and market devices are performative, it is notable that an important part of the literature on bottom of the pyramid markets outlines practical 'how-to accounts' for businesses at the bottom of the pyramid.

Theorising BoP markets from the perspective of marketization theory is revealing. For example, Cross (2013) argues that the conceptual vocabulary of markets introduced by Callon is productive in theorising emerging markets for technologies designed to be sold to low-income populations, such as the portable solar lantern. In his work, looking

at the Nova S200 solar lantern, Cross highlights a process of market making, where there was the association of qualities to the Nova S200, such as battery life, recharge speed, energy efficiency, and light quality, and qualities of use and consumption, such as the capacity of a solar powered lamp to replace kerosene, improve health, or promote educational outcomes. This, he argues, allowed the solidification of ideas of ethical concerns and commercial interests, and the creation of a market for the Nova S200 (Cross and Street, 2009). Outstanding questions clearly exist around the role of new businesses, actors, and market devices in market building at the bottom of the pyramid. This thesis has not set out to look at the detailed process of marketization from the perspective of sociological literature on market formation. However, the practices of formal and informal solar businesses, outlined empirically in this research, viewed from the perspective of theory on marketization, is revealing. More work could productively look at how the practices of formal and informal businesses in BoP markets is forging marketization, and look at how theory on BoP capitalism is influencing marketization.

2.8: State, Society, and Market Relations in India

In this section I outline the political, economic and social context of post-independence India, introducing its recent shift to market liberalisation and the neoliberalisation of state institutions and governance that has been seen. I look at how these changes have been framed as a transition to neoliberal capitalism. In this context, BoP capitalism is growing within India, which I focus on in the following section.

After winning its independence in 1947, India saw several decades of state-led development and nation building, with the Government of India following central five-year development plans. The first of these were heavily focused on industrialisation,

import-substitution, and agricultural development (Corbridge et al., 2012). In the early years following independence, private companies operated with a high degree of freedom in some sectors of the economy. Most Indians, however, were living in subsistence agrarian conditions. Following Indira Gandhi's rise to power, key sectors of the economy were nationalised, and for the next decades the state would exercise direct control over much of the economy (Banerjee and Somanathan, 2007). Markets for goods and services were highly regulated and controlled, imported goods and services attracted high levels of tax and duties, and private companies operated within an environment of extensive and complicated permits and permissions. India was popularly spoken of as having a 'Licence Raj' system. State institutions, both central and state level, directly managed industry, and publicly ran and financed services such as schools, hospitals, electricity, and water (Corbridge et al., 2005, Harriss-White, 2003).

Over recent decades, India's economy has been liberalised and state governance has been reformed. McCartney (2009) outlines how under the rule of Rajiv Gandhi in the 1980s initial moves were made towards economic liberalisation. It was then in 1991 that India firmly shifted away from a state-controlled towards a liberalised economy, when a balance of payments crisis led the government to seek support from the IMF, and to implement a string of economic liberalisation measures (Chandrasekhar and Ghosh, 2002, Corbridge et al., 2012). Successive governments in New Delhi have since re-affirmed and deepened a neoliberal policy agenda, shifting India into a new paradigm of state, society, and market relations (Chandrasekhar and Ghosh, 2002, Jenkins, 1999). Reforms have been aimed at opening the economy and markets to foreign investment, to private companies, and entrepreneurialism, with areas such as the investment regime,

trade policy, and the tax system for the financial sector seeing reform (Corbridge et al., 2012, Jenkins, 1999).

The liberalisation of India's economy has been understood in terms of enabling the unleashing of the forces of capitalism and of entrepreneurialism. An argument has been that Indians have for decades been held back from being entrepreneurs and capitalists (Corbridge et al., 2012). With liberalisation, there has been a flourishing of private businesses selling goods and services, and a shift to relying upon the private sector to drive economic growth (Drèze and Sen, 2013). Sectors of the economy, such as IT and financial services have seen significant growth (Fuller and Narasimhan, 2007, James and Vira, 2012). The private sector is being involved in the delivery of public goods and services in an increasing number of cases, and the state has been reducing its day-to-day control over aspects of education, healthcare, public infrastructure, urban planning, and ensuring employment (Birkenholtz, 2009, Corbridge et al., 2012, Dubash, 2002). The rise of a new aspiring and educated middle class has been reported on (Fernandes, 2006, Jeffrey, 2010, Scrase and Ganguly-Scrase, 2008). India has been framed as on the path towards being a modern liberal democracy, with neoliberal capitalism (Drèze and Sen, 2013, Jenkins, 1999). In this context, there has been a proliferation of private companies selling goods and services to India's BoP population, and the resulting growth of BoP capitalism has been drawing research attention.

The global financial crisis negatively impacted India's economy. While the financial sector was relatively sheltered from the international financial system, and did not crash, growth rates were reduced in the years following the crisis, exports fell, there was currency depreciation, capital flight, and a reduction in foreign direct investment (Bajpai, 2011, Naudé, 2009, Schmalz and Ebenau, 2012). Poverty increased as a result

of lower growth rates (Shrinivasan, 2010), and research has highlighted that the informal economy was also negatively affected (Mohanakumar and Singh, 2011). The Government of India responded with several fiscal stimulus measures, and growth rates had recovered by the turn of the century (Bajpai, 2011). In the years since 2008, two successive governments in Delhi have maintained an approach of supporting the continued liberalisation of the economy and the deepening of the countries ties to the global economy (Schmalz and Ebenau, 2012, Varman et al., 2012). Schmalz and Ebenau (2012:496) argue that the response to the crisis seen in India reflects the stability of a dominant coalition of state actors, business elites, and middle classes who support economic liberalisation and modernisation. The state has not reversed private sector involvement in the delivery of welfare programmes.

2.9: Bottom of the Billion Capitalism in India

With 59 per cent of Indians living on less than $2 dollars per day, adjusted for purchasing power parity (PPP), India has a BoP population of hundreds of millions of people (World Bank, 2015c). In the decades following Independence, when the sale of goods and services by private companies was tightly controlled, this population was largely unavailable as a capitalist market (Banerjee and Somanathan, 2007, Corbridge et al., 2012). Goods and services were, however, circulating in the informal economy and the black market (Breman, 1996, Harriss-White, 2003). Since the 1990s a wide array of consumer goods have become available (Corbridge et al., 2012), a growing number of which are targeted to low-income consumers (Cross and Street, 2009). Advertising and branding is making consumers goods and services newly visible to people at the BoP (Mazzarella, 2003). However, while the BoP population in India represents a large

market, the purchasing power of BoP individuals is low, and therefore the goods and services that individuals can afford to buy is limited (Drèze and Sen, 2013).

In India, theorising newly liberalised low-income markets as BoP markets, and the capitalism that is growing within them as BoP capitalism has become increasingly common. Again, research on the topic most notably comes from economics, business and development scholars. In this section, I outline how BoP capitalism in India has been theorised and empirically studied to date. In the following section, I then outline how this theory can be challenged, by drawing on theory on neoliberal capitalism, on the state and on brokerage, state patronage and corruption, and on informality, improvisation, and '*jugaad'*.

The literature on BoP markets and capitalism in India predominantly takes a very similar economics perspective as the wider literature on BoP capitalism in the Global South. The focus of research has predominantly been on formal businesses selling to low-income Indians. The bottom of the pyramid has been framed as a distinct and homogenous market, which is the site of opportunity for formal profit seeking companies and neoliberal capitalism (Balakrishna and Sidharth, 2004, Prahalad, 2012, Radjou et al., 2012, Tarafdar et al., 2012). Informal businesses, from which most BoP consumers currently access goods and services, are framed as enterprising and innovative, but BoP capitalism is still written about as a story of new formal businesses entering BoP markets, replacing the need for informal businesses (Prahalad, 2012, Radjou et al., 2012, Viswanathan et al., 2012). Prahalad (2012), for example, argues customers at the BoP will choose the products of formal companies selling good quality, value-conscious products, when they have the choice to do so. The BoP is presented as a frontier of capitalism, to be modernised. Development and environmental

benefits are said to be achievable through BoP market promotion (Agnihotri, 2013, Kuriyan et al., 2008, Varman et al., 2012). Varman (2012) reports on how state actors, institutions, and NGOs are being increasingly understood as not best-placed to directly reduce poverty and provide essential services.

Research to date has focused on various new markets where BoP capitalism is said to be developing in India. New microfinance markets have in particular been the focus of study (Srinivasan, 2010, Taylor, 2011, Young, 2010a). The market for mobiles phones has highlighted the massive growth potential and large capitalisations that companies can achieve in a short period of time at the BoP in India (Prahalad, 2012, Ray and Ray, 2010). Markets for sanitation (Ramani et al., 2012), education (Mozelius and Roy, 2012), ICT (Tarafdar et al., 2012), and for healthcare and medical goods and services (Cross and Street, 2009, Govindrajan, 2010) have all been said to show a story of formal business growing BoP markets. In these markets, the potential for profitable business as well as developmental benefits is being heralded.

The work of Prahalad (2012), looking at a commercial attempt to sell improved smokeless cookstoves to BoP customers in India, highlights clearly the standard narrative of advancing BoP capitalism, where formal businesses provide good quality but value-conscious products and services. Prahalad speaks of how this project sought to offer customers modern, smokeless and easy to use cookstoves that met aspirational needs, were aesthetically 'fashionable', and met global safety standards. The goal was that the business would also be scalable and the products affordable, and that a rural ecosystem to distribute to rural households would be built. Prahalad reports that by early 2009, 400,000 cookstoves had been sold, showing that the project has been successful. In appraising the project, Prahalad argued that: "This market is currently

served by the unorganized sector that is often inefficient and controlled by local monopolies, such as money lenders and middlemen. The challenge is to convert the unorganized and fragmented markets to an organized, private sector market." (Prahalad, 2012:6).

A line of research has focused on how innovation is important to the success of formal businesses within BoP markets (Bhatti et al., 2013, Ray and Ray, 2010, Rao, 2013, Zerriffi, 2011). Ray and Ray (2010) speak about how resource-constrained innovation has allowed companies to develop affordable, locally sustainable products in the telecommunications sector. Ray and Ray (2011) argue that affordability, acceptability, and availability is essential in BoP markets, but difficult to achieve. They argue that products from MNCs are often too expensive, over-engineered, and not robust enough to meet ground realities such as heat, dust, and humidity, or are not able to be repaired and maintained locally.

In popular culture and politics, the potential of BoP capitalism is being discussed. Balakrishna and Sidharth (2004) argue that: “The Indian rural market with its vast size and demand base offers a huge opportunity that MNCs cannot afford to ignore. With 128 million households, the rural population is nearly three times the urban.” Numerous newspaper articles, blogs and institutional and governmental policy papers are promoting the potential of BoP capitalism in India (for example, see Agnihotri, 2013, Balakrishna and Sidharth, 2004, Saraf, 2009). While some of this is focused on informal businesses and enterprises, the bulk is concerned with the potential for formal businesses to sell good quality, but value-conscious and innovative goods and services.

The off-grid solar power sector in India has been framed as a BoP market, where formal businesses are having great success in selling to low-income populations. This framing

is seen within academic literature, and in the literature and discourse from international institutions, NGOs and the state (for example, see Bairiganjan et al., 2010, Chaurey et al., 2012, Kumar et al., 2010, Miller, 2009). Advances in technology mean that off-grid solar products offer an affordable, reliable, environmentally sustainable, and competitive energy option (Miller, 2009). Solar technology is said to be suited to rural and semi-urban areas, where the electricity grid currently does not reach or is unreliable (Erickson and Chapman, 1995). For low-income people living in such areas, who have been largely failed by the conventional energy political economy of the last 50 years, off-grid solar appears as offering an affordable alternative to kerosene and other traditional fuels (Chaurey and Kandpal, 2010, Hiremath et al., 2009, Shrimali and Rohra, 2012). An additional benefit is the possibility of solar power one day taking some of the strain of India's struggling energy infrastructure (EIU, 2012; Harriss-White et al., 2009).

Several studies have promised that where off-grid solar power is introduced to un-electrified households, educational, income earning, and health benefits are achievable (Chaurey et al., 2012, Dhingra et al., 2008, Parikh et al., 2012). For such reasons, the Indian government, NGOs and international institutions and donors are promoting off-grid solar (Jha and Jain, 2012, Shrimali and Rohra, 2012). Academic attention has also focused around potential entrepreneurial and economic opportunities; laying out how if various economic and innovation diffusion elements are technically met, than economic, social, and environmental benefits will be achieved (for example, see Martinot et al., 2002, Miller, 2009). The carbon abatement potential of solar power has further been highlighted (Chaurey and Kandpal, 2010, Mahapatra et al., 2009). These arguments point to compelling win-wins between profit, environmental sustainability,

and local economic and developmental benefits. The fact that access to electricity has been theorised as essential to development (Kale, 2014) is to the advantage of making the case for the benefits of solar power.

Numerous articles look at how formal companies are growing in India, profitably selling good quality and value-conscious solar power products (for example, see Bhushan and Kumar, 2012, Miller, 2009, Palit, 2013). In a *World Resources Institute Report* it is stated that there are 114 million households which spend less than US $475 a month on goods and services in India who could benefit from decentralised renewables, and represent a potential market for clean energy products and services of USD $2.11 billion per year (Bairiganjan et al., 2010:2). Mukerji et al. (2011), in an empirical report on SELCO, reports on the necessity of breaking the myth that the poor cannot afford and maintain technology, and that it is not possible to run a commercial venture that fulfils a social objective. Similarly, Palit (2013) reports on how TERI, the Delhi based research institute, is supporting a pro-poor public-private partnership model to develop solar power markets, and to enhance energy access for the base of the pyramid population, bringing together local government, business, community groups, and NGOs. An assessment of the focus on the off-grid solar power market in India shows that attention is nearly always on formal solar businesses.

2.10: Complicating the Narrative of BoP Capitalism in India

The existing literature on BoP capitalism has been productive in outlining how formal businesses are succeeding in BoP markets in India. The expansion of businesses in BoP markets, such as for microfinance, over the last two decades has been striking. A number of existing studies from social scientists, however, raise questions around the

idea that BoP capitalism in India is a story of formal companies selling good quality products, working according to market rationalities, while delivering developmental gains.

Simon (2010) found that marketization in the case of the cookstoves market in Maharashtra, India, while resulting in more choice for customers, did lead to higher prices, and companies were less likely to be selling to the poorest. Varman et al.'s (2012) study of the e-Choupal BoP ITC project in India to deliver internet access in rural areas found that profit and poverty alleviation were in conflict. They concluded that in a neoliberal context, where there was a lack of state regulation and governance, wealthier people were benefiting from the scheme, but the disadvantaged losing out. In a study of Unilever's sale of Fair and Lovely cream at the BoP, Karnani (2007b) argues that companies doing well, are not necessarily doing good at the BoP. In an empirical study, Taylor (2011) looks at how while there is the neoliberal idea that the poor are entrepreneurial subjects who need to be integrated into formal financial systems in order to escape poverty, in Andhra Pradesh the formal microfinance sector that has developed has not tackled poverty.

In this thesis, I build on this work, interrogating and challenging the idea that formal businesses, shaped only by market rationalities, are the prime actors developing BoP markets. Theory from social scientists and geographers on neoliberal capitalism suggests that BoP capitalism in India is unlikely to be only a story of formal business. Studies of capitalism in India have shown capitalism to be shaped by the political, social, and economic context of the country. They have shown formal and informal economic activity to be intricately inter-dependent and inter-mixed (for example, see Harriss-White, 2003, Sanyal, 2007).

The effects of the global financial crisis of 2008 and the ensuing economic downturn on BoP capitalism are not well studied. However, some research has looked at how new microfinance markets in the Global South were negatively affected. The work of Di Bella (2011) and of Wagner and Winkler (2013) shows how microfinance institutions faced a more constrained borrowing environment in the years following the crisis, and the profitability of loans they were providing were also negatively impacted. The market for off-grid solar power had not taken off in Uttar Pradesh at the time of the financial crisis. However, the development of the solar power market in India over the last decade does highlight that the trend towards the delivery of essential goods and services by private markets is continuing in India, and that there has not been a turn away from neoliberal capitalism.

In existing research on BoP capitalism in India, there is little focus on the role of the state. Yet, literature on the state in India highlights how economic liberalisation has not meant a straightforward withdrawal of the state to a role of simply being a market regulator. In some instances, the state has withdrawn, but more often the terms in which state institutions and actors engage with markets and society has changed (Fuller and Benei, 2009, Gupta, 2012, Harriss-White, 2003, Jenkins, 1999). Further, theorising the state solely as a regulator of markets is at odds with research that theorises the Indian state as being constituted of heterogeneous institutions and actors, not clearly separate from markets and society. Gupta (1995) critiques the conceptualisation of the state as a monolithic and unitary entity. He looks at how the state materialises in time and space, maintaining that the Indian State is decentralised and disaggregated, and ubiquitous in the minutiae of everyday social life. He contends that it materialises through multiple agencies, organisations, levels, agendas, and centres; but also through public culture and

discourse at the level of everyday practice where people come into contact with state entities. A number of researchers have focused on the pervasiveness of the state in the day-to-day ways in which people gain access to services and other material benefits and opportunities (Corbridge et al., 2012, Shah, 2009). Ferguson and Gupta (2002) argue that neoliberal globalisation has challenged traditional state power conceptions, opening space for new trans-nationalised connections and networks of actors, and for new modes of governance. Research from the social sciences on the state suggests that there is an outstanding need to look carefully at the role that state institutions and actors might continue to play within a liberalised economic context in influencing and shaping the development of BoP capitalism in India.

Further, the way in which the federal set-up of India works in practice means that there is a large variance between states in the way that state institutions and actors govern, and the ways in which they intervene in markets and society (Sinha, 2005). While the whole of India has seen economic liberalisation over the last thirty years, differing political contexts between states means that state institutions and actors have seen varying degrees of change towards neoliberal approaches of governance. For example, the state government in Gujarat has supported a market environment where capitalism has grown rapidly, while in West Bengal and Uttar Pradesh state involvement in markets and society has been less conducive to capitalism (Jeffrey, 2002, Kohli, 2012, Sud, 2014b).

Some research has already focused on the involvement of state institutions and actors in liberalised BoP markets in India, beyond a regulatory role. In a study looking at state funded, private delivery BoP ICT projects in Kerala and Andhra Pradesh, Kuriyan and Ray (2009) found that while the projects were private sector led, and the state was

associating itself with a liberal market approach, in reality companies were operating within a context of state influence, and relied upon associating themselves with providing a state service. Simon's (2010) empirical study of the clean cookstove sector in Maharashtra showed how the state continued to subsidise and shape business within a commercial market. The work of Young (2010b) shows how the state has been involved in the new commercial microfinance sector in Andhra Pradesh. Overall, however, there is a need for further research to look more carefully at the role of state institutions and actors in shaping BoP markets and business.

Within the existing literature on the growth of BoP capitalism in the Global South, and in India, state patronage, brokerage, and corruption are practices that have not been identified as important for the success of formal businesses. Instead, these practices are associated with the informal economy (De Soto, 2000, Prahalad, 2005). Research on the significance and extent of these practices in India, however, shows that this is likely to be too simplistic a story. Khan writes on how patronage is at the heart of the Indian political economy, and that this has not changed with liberalisation (Khan, 2005). Where services are being delivered by the private sector, patronage has also been seen. In a study of privatised water management in Rajasthan, O'Reilly (2010) similarly found that while a privatised water system had been established, in practice relations of dependency and patronage were being established between providers and customers. The role of brokers in India has been highlighted in political contexts (Inbanathan and Gopalappa, 2002, Manor, 2000, Reddy and Haragopal, 1985), and in development and social contexts (Kaushik, 2005, Lewis and Mosse, 2006, Williams et al., 2003). Brokerage has continued to be seen since economic liberalisation in the 1990s. Glyn et al. (2003), for example, outline the role of local power brokers in India's Employment

Assurance Scheme, which operated in the 1990s. Sud (2014a) highlights the role of state and market brokerage in land dealing in Gujarat, a state that is widely held as symbolising the successes of a liberalising India. Brokerage has further been identified in post-liberalisation market contexts (Simon, 2009). Gupta (2012), Jeffrey (2002) and Jauregui (2014) all highlight the role of corruption in India in recent work.

In terms of BoP capitalism, the importance of these practices is relatively under-studied. Research on the microfinance sector by Young (2010b, 2010a) and on the clean cookstove sector by Simon (2009) shows brokerage being important to how these markets were operating in India. Corruption was also seen in instances in both of these sectors. Young (2010b, 2010a) outlines how local histories and local context worked to shape the practices of new formal microfinance companies. Kuriyan and Ray (2009) found that in the case of the BoP ICT projects in Kerala and Andhra Pradesh that they were studying, development benefits were mainly being captured by the semi-rural emerging middle classes. Looking at microfinance in Andhra Pradesh, Taylor (2011) touches on the occurrence of elite capture and corruption with social lending programs. Access to goods and services is often structured according to caste and class in India (Kuriyan and Ray, 2009, Jeffrey, 2002). Drawing on the wider literature on state patronage, brokerage, and corruption suggests that further research is needed into the importance of such practices for BoP markets and business.

2.11: Informality, Improvisation, and Jugaad at the BoP in India

Research on the informal economy, on informal economic activity, and on informality within India, raises important further questions in regards to informal businesses growing BoP markets alongside formal ones, not addressed in the existing literature.

Further, theory on improvisation and on '*jugaad'*, I argue, provides a productive new way in thinking about the success of informal businesses in BoP markets in India.

Within the literature on BoP capitalism in India it is argued that as formal businesses enter newly liberalised BoP markets, consumers will choose the products and services that they provide above what is currently offered by informal businesses (Prahalad, 2012). Yet a majority of economic activity within India takes place within the informal economy. Ninety per cent of India's workforce is involved in low-income informal economic activity (Drèze and Sen, 2013:31-32). It is estimated that two-thirds of overall GDP, and ninety per cent of rural GDP is produced within the informal economy, when agriculture is included (Harriss-White, 2003:5,246). Following liberalisation, there has been an informalisation of jobs in manufacturing and in textiles (Breman, 2001, Gooptu, 2007, Marjit and Kar, 2004, Mezzadri, 2010). India's overall economy remains informal in terms of work (Drèze and Sen, 2013, Harriss-White, 2003), and millions of Indians live in informal settlements (McFarlane, 2011, Roy, 2009). In many sectors, the formal sector is subcontracting to the informal sector (Maiti and Marjit, 2008). There is some evidence, contrary to classical economics theory, that in India the formal sector is not always more efficient than the informal sector (Sahoo and Ten Raa, 2009). Women, and people from poorer backgrounds, and who are lower caste are particularly likely to be involved in the informal economy (Bairagya, 2012). Working in the informal economy is often a long-term survival strategy (Chikarmane and Narayan, 2000). Research suggests that regularised capitalism, like that seen in Western countries, cannot be assumed to be the future of capitalism in India. Indeed, Sanyal (2007) has argued that within India a regime of capitalism is in place where the formal advanced capitalist economy is fundamentally interlinked with and dependent upon an informal,

pre-capitalist economy. Breman's (2001) work too points to strong connections between the informal and formal economy in India.

In numerous studies from social scientists of the economic activity of low-income Indians, informality has been shown to remain in place, and the literature suggests this is can be expected to continue. Gill's (2010), Agarwal et al.'s (2005) and Gidwani's (2015) work on the waste economy in India outlines the persistence and vitality of informal businesses within liberalised market contexts. Some work on BoP markets has looked at informal business. Taylor's (2001) work on the microfinance industry in the state of Andhra Pradesh found that informal money lending businesses were not being replaced. The fact that informal businesses have been shown to continue to thrive within liberalised market contexts in India is significant, and highlights a large outstanding research gap in terms of the lack of attention to informal business in the current literature on BoP capitalism, particularly to informal businesses working in the same markets as formal ones.

In looking at the role informal businesses have in newly liberalised BoP markets in India, I argue that drawing on theory on improvisation, and in particular theory on *jugaad* introduces a productive avenue of inquiry. The term *jugaad* is common in everyday conversation in India, describing a wide array of material, social, and political situations where innovation, ingenuity, and resourcefulness is demonstrated in creating or getting something done (Jauregui, 2014, Jeffrey and Young, 2014, Radjou et al., 2012). At times *jugaad* refers to material things that have been created, fixed or put together in an improvised manner, showing ingenuity, and using materials available to hand. But *jugaad* is also used as a verb, to refer to people 'doing *jugaad*'. Certain kinds of social or political work, where people use connections, relationships, or skills in

innovative ways to achieve work, is spoken about using the term *jugaad*. For example, fixers and brokers are often considered to do jugaad (Jauregui, 2014, Jeffrey and Young, 2014).

The use of the term *jugaad* has become popular over recent years. One way in which the term is being used is to describe the ingenuity and creativeness seen in Indian BoP markets. A number of books and articles have been written on the topic which argue that *jugaad* is crucial to enterprise and innovation in BoP markets in India. In their book *Jugaad Innovation*, Radjou et al. (2012) argue that within developing countries, like India, where there is resource scarcity, a large base of poor and value-focused consumers, and challenges in infrastructure, health and education: businesses have to do *jugaad* to succeed and innovate. They outline six principles of *jugaad*: seek opportunity in adversity, do more with less, think and act flexibly, keep it simple, include the margin, and follow your heart (Radjou et al., 2012). A *jugaad* mindset is seen to exist in India, from the grassroots innovation of people seeking to overcome challenges and meet their needs, through to MNCs needing a *jugaad* mindset in order to successfully innovate for the Indian market.

The importance of *jugaad* in BoP markets has more widely been reported in academic literature and popular and political discourse. Aiyar (2010) cites a survey finding that 81 per cent of Indian businessmen said *jugaad* was the key reason for their success. He argues that while in the West innovation and R&D is done by scientists using expensive equipment, in India is it "done by every housewife, farmer, transporter, trader and industrialist", simply using creativity and imagination. Saraf (2009) speaks of *jugaad* as being India's ingenious innovation. He argues that while China can manufacturer for cheap, Indians can innovate around a budget and manoeuvre past whatever constraints

arise. Talukdar (2004) writes that while in India *jugaad* is taken for granted, it allows people to meet their needs at the resource-starved grassroots. Jeffrey and Young (2014) report how within government the idea that India needs a million *jugaads* to succeed economically has been voiced. While Prahalad and Mashelkar (2010) argue that the term *jugaad* refers to second-best solutions, they speak of Indians being innovative with few resources to hand. They argue that frugal innovation is crucial for globalisation and capitalism going forward, as billions of new consumers need affordable and environmentally sustainable goods. Radjou et al. (2012) and others have done much to forward a conceptualisation of *jugaad*, such that *jugaad* is seen as a non-political practice that characterises innovation in general at the BoP in India. *Jugaad* has been characterised as partly explaining the growth and success of buisnesses in BoP markets in India.

However, *jugaad* can also be theorised in terms of poor quality solutions, and in terms of opportunistic and illegal practices. Birtchnell (2011) has spoken of jugaad in terms of systematic risk, arguing that it is a product of widespread poverty, and underpins path dependency stemming from dilapidated infrastructure, unsafe transport practices, and scarce resources. The practicing of *jugaad* is often done in situations of economic precariousness, and can involve illegally action. Jeffrey and Young (2014), looking at underemployed male youth in a university in Uttar Pradesh, outline how a group of youth 'fixers', employing methods of shrewd improvisation, or *jugaad*, have become important in everyday society and the landscape of education. Jauregui's (2014) ethnography of police work within Uttar Pradesh brings a nuanced account to the use of *jugaad* within the police force.

Drawing-on the literatures on improvisation and on *jugaad*, and in particular borrowing from the work of Jeffrey (2014) and Jauregui (2014), I argue that there is an outstanding research gap to look at the importance of improvisation and *jugaad* for informal businesses within liberalised BoP markets in India. I argue that it is useful to theorise both *jugaad* products and *jugaad* business practices being important in informal solar shops.

2.12: The Significance of Caste, Class, Gender, and Religion

In India caste, class, religion, and gender shape society and economic activity and structures. Caste is a system of stratification that is determined by *varna,* the Hindi hierarchy of Brahmins, Kshatriyas (warriers), Vaisyas (merchants), Sudras, and Dalits, and by *jati,* caste 'groups' that are historically associated with occupations (for an overview of caste within India, see Jeffrey and Harriss, 2014, Corbridge et al., 2012).

Access to the state and to services and resources in India is regularly mediated and determined by caste, class, religion, and gender (Corbridge et al., 2012, Harriss-White, 2003, Jodhka, 2010, Lerche and Jeffrey, 2000). State programs designed to channel benefits to the poor are often captured by elites, or do not reach their intended targets (Jeffrey, 2002). Brokerage between communities and the state, to enable the flow of resources and program benefits is often shaped, structured, and enabled by caste and class dynamics (Corbridge et al., 2005, Manor, 2000). In *India Working*, Harriss-White (2003) provided a comprehensive account of how the Indian economy and its structures of accumulation are based not only around labour, capital, and the state, but also in local markets around gender, religion, and caste. Women are almost always lower paid and in less secure jobs. Work and pay are also stratified by caste. In terms of class, she argues

that an intermediate class dominates the rural economy, what she calls an oligopolistic elite (Harriss-White, 2003:51). Harriss-White's work shows that the informal economy is also regulated by social and political codes. Occupations and economic activity are at times shaped by religion. For example, William's (2015) ethnography in the city of Varanasi details how roles within the weaving industry are structuring by religion. Muslims in contemporary India often find themselves economically disadvantaged (Sachar, 2006, Van der Veer, 1994). The work of Munshi (2016) highlights caste networks supporting economic activity and mobility, both historically and currently within India. Munshi argues that caste networks are often crucial in supporting the movement of people into new occupations and businesses in the contemporary economy. Damodaran (2008) similarly finds that certain caste groups have been much better able to enter India's new managerial capitalist classes. Thorat and Newman (2007) show quantitatively how there is discrimination in hiring, wages, and working conditions based on caste in the urban labour markets of India. In their work on the IT sector in Chennai, Fuller and Narasimhan (2007) find that upper-middle class and higher caste employees dominate. In a study of the agricultural sector in Uttar Pradesh, Jeffrey (1992) shows how the workings of state sugarcane mills had been captured by higher-caste *Jat* farmers, who were monopolising the economic advantages to be gained from control of the working of these mills, at the expense of other lower caste and Muslim farmers. Rural insurance networks in India have been shown to be organised along caste lines (Munshi and Rosenzweig, 2013). In politics, caste is a crucial dynamic. For example, Michelutti's (2008) work in Uttar Pradesh shows the growing importance of caste in politics and society in Uttar Pradesh since the 1990s.

Over recent years, lower caste groups have managed to enter business and take part in new spheres of economic activity, and in large cities in particular the role of caste has weakened (Corbridge et al., 2012). Jaffrelot (2003) has spoken of a 'silent revolution', arguing that on the ground power relations are shifting, with an elite of Dalits entering business and gaining greater influence. He says that while this is not a transformation, Dalits are proving able to capture private-sector employment opportunities in the wake of liberalisation. Kohli (2001) has spoken of a Dalit Revolution starting in the 1990s; while Jodhka's (2010) work on Dalit entrepreneurs has further shown that lower castes are finding private sector opportunities. Gupta (2005) argues that between the 1960s and 2000s caste has become less important, with caste less likely to reflect occupation, and urbanisation and commercialisation having allowed lower castes to escape caste restraints. Reservations have been important for the upward mobility of lower castes, and in de-linking caste and occupation (Corbridge et al., 2012).

However, change has been often limited. Drawing on research in Uttar Pradesh, for example, Jeffrey et al. (2008) challenge the idea that a 'Dalit Revolution' is occurring in North India. Looking at social and economic aspects, they say that while a new generation of local Dalit political activists have emerged, they have not been able to affect broader structural change, in terms of the distribution of economic, social, and political opportunities in rural Uttar Pradesh. They see the continuing importance of caste dominance in the reproduction of social inequality, with the caveat that some lower caste people have been successful in certain respects at capturing resources and opportunities. In a review of caste in contemporary India, Corbridge et al. (2012) conclude that existing research shows how modernisation and democratisation have not

decoupled caste from the market. Recent research highlights how while caste-based structural inequalities are being broken-down in instances in India, they often remain.

Some research on BoP capitalism has shown how developing BoP markets and business in India are shaped by dynamics of caste and class. Particularly significantly, this research has shown that in some instances caste and class have shaped BoP markets and business in India to the detriment of the poorest, which challenges and complicates the idea that BoP capitalism acts as a technocratic and non-political solution to poverty in low-income areas throughout the Global South. In his study of the micro-finance sector in India, Taylor (2011) traces how the allocation of new formal microfinance services at the BoP was being shaped according to the pre-existing power relations of different social classes, castes, and genders, and was in-turn re-enforcing them in many instances. They outline how while some borrowers did use finance to support consumption and diversify their livelihoods, others found themselves in debt traps (Taylor, 2011:485). Varman et al. (2012) looked at a project where internet information centres were being set-up to provide to BoP consumers in India. They found that entrepreneurs running these centres tended to be higher caste, and concluded that in practice caste-based hierarchies act as a hindrance to BoP capitalism leading to social transformation. The argued that a gulf exists between policy making and implementation, and between the discourses of profit seeking and poverty alleviation in the case of the BoP project they were studying (Varman, 2012:19). Similarly, in their work looking at public-private telecentres to support the poor being set-up in Kerala and Andhra Pradash, Kuriyan and Ray (2009) found that the middle classes rather than the poor were benefiting most. In the woodstove market in Maharashtra Simon (2009) shows such structural inequalities shaping business. Young (2010a) shows how higher castes of young men tended to

dominate the microfinance sector in Karnataka, overseeing female lending circles. This was linked to the perception of their natural abilities to be mobile, to adapt to new technologies, and to embody 'fiscal responsibility' (Young, 2010a:608).

Existing studies highlight multiple examples showing that in India not all segments of society have benefited equally from rapidly developing BoP markets. In the case of microfinance, woodstove, and IT businesses, access to services have been shaped by caste. Employment opportunities are more readily accessed by higher caste men in BoP businesses. New businesses enter contexts of existing local social structures and inequalities. It is highly likely that caste and other structural inequalities will be important dynamics shaping the off-grid solar market. Further, it is likely that any brokerage taking place will be shaped by structural inequalities (Jeffrey, 2002).

This thesis does not empirically focus on caste, and other structural inequalities. When I first started fieldwork, my intention had been to focus on these issues. However, when asking questions about caste and other structural inequalities I found that shop keepers and solar dealers did not want to engage in them. Because the other questions that I was focusing on were productive, and due to the time limits I had in visiting multiple shops repeatedly over the period of my fieldwork, I did not pursue questions on structural inequalities. However, the finding that most formal solar businesses were run by higher caste people, and that informal relationships with bank managers was crucial to their operation, does suggest that further research is needed to look at the role of caste and class in the BoP solar market. On the shop floor, during day-to-day transactions, I did not find caste and class to be key factors shaping business interactions. Again, however, a future research project might involve a methodology carefully designed to understand

whether particular communities visit only certain solar businesses, and whether caste and class affect the ability of shop keepers to win customers.

2.13: The BoP Off-Grid Solar Market in India

In this theory chapter I have outlined a number of outstanding questions around BoP capitalism in the Global South. There is an outstanding question around whether formal businesses characterise the development of BoP markets in the Global South. There are outstanding questions around the role of the state in BoP capitalism and of brokerage, state patronage, and corruption. Finally, there are outstanding questions around the role of informal businesses within new BoP markets. The off-grid solar power market makes a good case study to examine these questions. Existing research has shown how formal businesses, selling good quality, branded and value-conscious products, are selling off-grid solar power goods and services to BoP consumers throughout the Global South. The off-grid solar power sector is a newly liberalised market in India. While prior to the 1990s all energy provision within India was nationalised, since then the sector has undergone several stages of liberalisation (Chatterjee, 2009, Kale, 2014). It is possible for private businesses to freely sell solar goods and services. Numerous companies have started selling solar power products, directly targeted to low-income BoP customers in India (Bhushan and Kumar, 2012, Miller, 2009).

The research to date on the solar power market in India, and beyond, has mainly focused on the technology involved, on business models, and on technology diffusion theory. This literature largely depoliticises off-grid solar power BoP capitalism, and adopts the framing of the BoP literature in terms of seeing solar power markets as necessarily developing on the basis of formal companies delivering quality, value,

servicing, and bank finance. This is framed as the way in which the BoP market can effectively and efficiently get energy and lighting, and in an environmentally friendly way, with development benefits expected to follow. This literature frames a view of BoP solar markets that reflects neo-classical economics theory. It focuses on formal businesses operating freely in well-regulated market contexts. It assumes that companies will and should develop business models that combine value-conscious products with financing and after-sales servicing.

Viewing BoP capitalism from the perspective of the literature on the sociology of markets, important questions clearly exist around the performativity of the existing theory on BoP capitalism in shaping what businesses do at the BoP, and how markets are developing. For example, as I have outlined above, there is a wide literature on how solar markets can be successfully developed through the Global South, which often involves detailed accounts of which business models are most appropriate, and which products are best suited to BoP markets. There are important questions that can be asked around the role of literature on BoP solar markets and of government and non-governmental funding in shaping marketization.

2.14: Research Questions

The aim of this thesis is to explore the developing market for off-grid household solar power products in Uttar Pradesh as a lens through which to theorise BoP capitalism. This study focuses on the following key objectives:

To look at the extent to which the liberalised market for off-grid solar power is characterised by formal solar businesses, providing good quality and value-conscious goods and services to low-income populations. I do this working with theory on neoliberal capitalism.

To investigate how the existing political economy in India, and in particular state involvement, state patronage, brokerage, and corruption is shaping formal solar businesses. I ask whether the state is simply a neutral regulator of the off-grid solar market at a distance, challenging the relegation of this matter to a technical issue in much of the existing literature. I look at whether brokerage, patronage, and corruption are further shaping the market for off-grid solar goods away from one of pure market rationalities.

To assess the role informal businesses in the off-grid solar power market, and to look at the significance of improvisation and *jugaad* for these businesses. In doing this, I challenge the lack of attention that has been given to the role of informal businesses operating alongside formal businesses in BoP markets in the Global South.

Chapter 3: Methodology

3. 1: Introduction

This research project is the outcome of more than four years of work, during which time my interest and focus in regards to Bottom of the Pyramid (BoP) capitalism and the market for off-grid solar power has evolved. The chapter therefore starts with an explanation of why I decided to study the off-grid solar power sector in India, and how the focus of this research project developed. I then move on to introduce the qualitative, case study-based methodological approach adopted to address the research questions of this thesis. I lay out the decisions I made, and the challenges I faced, with interview-based data collection, hanging-out and participant observation, the choice of case study, and the recruitment of research participants; and I talk about the practical, ethical, positionality, and language issues of this research. Methodological questions, decisions and challenges were a day-to-day part of fieldwork, and so I also use this chapter to discuss how my fieldwork unfolded. The chapter concludes with a discussion of the process of analysis followed for this research.

3.2: Deciding to Research the Off-Grid Solar Power Market in India

My decision to do research on the market for off-grid solar power in India initially grew out of the concern that I have in global prospects for sustainable living in the 21st century. I am interested in how solar power technologies might offer a sustainable, reliable, and affordable source of energy and light for billions of people around the world, and in whether private markets could be a mechanism to accelerate solar technology diffusion.

When I was starting my graduate studies, commercial off-grid solar power markets were beginning to develop in a number of countries in the Global South. The price of solar power technology was falling rapidly and solar module and lighting technology was improving yearly. Solar lanterns and solar home system (SHS) packages were being creatively designed specifically for low-income communities, providing small amounts of light and electricity. Within academic literature, an increasingly influential account was that it was possible for private companies and social enterprises to profitably sell affordable, good quality, but value-conscious solar products to low-income households in the Global South who did not have access to reliable electricity (for example, see the work of Cabraal et al., 1998, Chaurey and Kandpal, 2010, Martinot et al., 2002). From Bangladesh, Wimmer (2012) had reported on how the Grameen Shakti company had successfully scaled-up a commercial business and had sold nearly one million SHS units. Miller's (2009) work had explored how companies in India, Sri Lanka, and Nepal were successfully selling off-grid solar goods to low-income, mainly rural consumers. In West and East African countries similar stories of new markets could be read (Jacobson, 2007, Wamukonya, 2007).

A key hurdle slowing off-grid solar power market growth was reported to be that low-income communities in the Global South, who did not have access to reliable electricity and so might be expected to buy solar power products, could not afford to pay for them up-front, and could not access financing options (Miller, 2009, Zerriffi, 2011). My MSc thesis focused on this issue. I spent one month researching the relationships being developed between off-grid solar companies and microfinance institutions (MFIs) in the south Indian state of Karnataka. This was a qualitative study, for which I was interviewing managers in off-grid solar businesses, banks and MFIs. I chose to conduct

the research in India because the country had an established off-grid solar market, and was considered to have a big potential market on the basis of the large number of people in the country without access to reliable electricity.

From this research, I learnt that banks and MFIs were sceptical of off-grid solar power in Karnataka. They were concerned about the quality and durability of solar technology, about after-sales servicing arrangements for products, and whether they could make enough profit to out-weigh the cost of processing paperwork for the small loans involved. In a number of instances, where a working relationship had been developed between a solar company and a bank or MFI, a limited number of loans for customers to buy solar products were being given. I found, however, that a complex improvised set-up was in place where relationships between solar companies and finance bodies were being informally brokered and were in need of continual maintenance, otherwise finance would not be made available to customers in practice. Managers in solar companies were spending long periods of time initiating and maintaining relationships with managers in banks and MFIs. At a branch level, individual loans were only being given to customers when good personal relationships existed between solar branch managers and local bank branch managers. My research further showed how central government support for the off-grid solar power market, through the Jawaharlal Nehru National Solar Mission (JNNSM) subsidy, which was launched in 2010, was placing a significant administrative burden on solar companies, and had been responsible for falling sales in the year since it had been introduced (Balls, 2012).

The development of my DPhil research was guided by my findings from Karnataka. In particular, I was interested in further exploring the way the government was involved in the off-grid solar market in India, and in the role brokerage played in the market. In

developing my thesis research project, I was at the same time also guided by new ideas coming from further reading, and from developments being seen in off-grid solar power markets across the Global South. I found it very significant that off-grid solar power markets were increasingly being framed in literature and in wider public discourse in terms of BoP capitalism (for example, see Bairiganjan et al., 2010, Miller, 2009). I found it interesting that a narrative had emerged that solar companies operating within liberalised solar markets were 'doing good' by delivering developmental benefits and 'doing well' in terms of being profitable (for more on this, see Cross, 2013).

During the first year of my DPhil, my research evolved to focus on questions around whether the story of off-grid solar power markets really was one of liberalised BoP markets being grown by private businesses acting according to market dynamics. I was interested in whether markets were characterised solely by businesses selling good quality products, and delivering developmental benefits. I saw open questions around what role the state might have beyond regulation, and on what role practices such as brokerage and corruption might play in markets. These questions were not accounted for in the increasingly powerful discourse heard about the 'win-win' potential of private off-grid solar markets.

The focus of this study evolved considerably through the course of my DPhil, as my understanding of the off-grid solar power market in India developed. During a pilot trip in April 2013, and then during my main fieldwork starting in September 2013, I was regularly surprised by what I was seeing and learning, and needed to adapt my focus and methodology accordingly. In particular, after first arriving in Uttar Pradesh, I had found that informal, small-scale, non-commercialised, and non-regularised shops, selling off-grid solar power products were a large part of the solar market in the state. I

had not realised this before, and had not planned on studying such shops. Instead, I had believed that formal solar shops and dealerships characterised the entirety of the market. Including a comparative element between formal shops and dealerships and informal shops within the case study for this research proved to be the biggest single change made. Smaller changes were made during the research to which shops were included in the case study, and to the questions being asked.

Whatmore (2003) writes of how good research is often a co-production between the researcher and those being researched. This was my experience. In the first months of my fieldwork starting, in particular, I found that my understanding of the off-grid solar power sector and my research questions was being added to, altered, and challenged on a weekly basis. I had to be open to changing my questions and focus in areas. To begin with this was often a difficult experience, as I felt the need to stick firmly to the methodology and questions I had developed prior to starting fieldwork. Accepting and incorporating new understanding into an existing framework of research is not easy. I believe that being open to my questions developing and to experiences in the field, being self-reflexive as fieldwork progressed, while balancing the need to have a rigorous methodology that addressed the questions I was interrogating, was crucial to the success of this research.

3.3: A Qualitative Case Study Based Methodology

A qualitative case study methodology was adopted for this research. Semi-structured and open interviews were the primary method of data collection used, while a secondary approach of 'hanging-out' with informants over extended periods of time coupled with participant observation was adopted. The empirical questions addressed by this thesis

are qualitative, substantive, and subjective: regarding business practices; the character of capitalism; the role of the state, of state patronage, brokerage, and corruption; and of informality, improvisation, and *jugaad*. I determined that adopting a qualitative methodology focused on exploring the knowledge, experiences, and understandings of people working within solar businesses day-to-day would be a productive approach to addressing such questions. The intention was to build context-specific, situated knowledge (Longhurst, 2009, Haraway, 1988).

Mason (2002) describes qualitative research as an 'interpretivist' approach for studying complex social worlds. I chose to use a qualitative interview-based methodology because it allowed this research to focus on people's knowledge, views, understandings, interpretations, experiences, and interactions within their social context (Mason, 2002). A qualitative approach was well-suited to the research questions being addressed in this thesis, because it is an approach that sees the socially constructed nature of reality, understanding social life as produced through human and non-human agency. It is a methodology approach that involves seeking rich descriptions, and it takes into account the value-laden nature of inquiry. Qualitative research can involve the employment of various interpretive approaches, including semiotics, narrative, content, discourse, archival, and phonemic analysis, and usually has a post-positivist or post-structural view of discovery and verification (Denzin and Lincoln, 2011). Kvale (2006:481) outlines that: "In qualitative interviews, social scientists investigate varieties of human experience. They attempt to understand the world from the subjects' points of view and to unfold the meaning of their lived world."

Qualitative research methodologies have been critiqued for lacking objectivity, as being subjective narrative that is not scientific (for more on this, see Crang, 2002, Denzin and

Lincoln, 2011). Such critiques are rebutted in multiple books, such as from Mason (2002) and Denzin and Lincoln (2011). Maintaining academic rigour, however, is a significant issue. Mason (2002) outlines how qualitative research must be systematically and rigorously designed and conduced, must be accountable for the quality of claims it makes, must be strategically conducted, should produce explanations and analysis that is generalisable, and should be a moral practice in regards to political context. McDowell (1992) speaks of her qualitative research aiming to produce committed, passionate, positioned, partial, but critical knowledge. Having adopted a qualitative approach, it was crucial for me to ensure the robustness of my case study choice, data collection methods, recruitment of interviewees, and selection of questions. The following pages address how my methodology does this.

A large corpus of social sciences qualitative research done in India, and more widely, working in the same theoretical fields as this research and using similar methods of empirical inquiry, supports and informs the qualitative approach chosen for this research. In particularly, I drew methodologically from the work of Simon (2010), on the clean cookstove market in Maharashtra, and of Young (2010b), on the microfinance sector in Andhra Pradesh. The work of both authors looks at BoP markets in India, where rich qualitative findings were built out of an interview base of informants working day-to-day in those respective sectors. An approach of shadowing and hanging-out with interviewees was also used by both researchers. These studies revealingly explored substantive questions on the state, brokerage, gender, caste, structural inequalities, and corruption. Qualitative interview-based methodologies have been successfully used to look at the state in India, notably by Gupta (1995, 2012) and Corbridge et al. (2005), and to look at corruption, patronage, and brokerage in India,

such as by Jeffrey (2002), Khan (2005) and Manor (2000). When deciding to adopt the ethnographic methods of hanging-out and carrying out participant observation, I drew from some of the above works, but also from the research of Gill (2010) on waste scavengers in Delhi, and Jeffrey (2010) on underemployed youth in Meerut, Uttar Pradesh. These studies showed the advantages of data of hanging-out and participant observation in conjunction with interviewing in exploring substantive questions in-depth over longer periods of fieldwork.

A body of research has already focused on studying off-grid solar power markets in India and in other parts of the Global South. These have predominantly adopted quantitative methodologies, and have been focused on business models, sales models and technology diffusion theory and practice. Notable examples include work from Miller (2009), Wimmer (2012) Keane (2014), Martinot et al. (2002), Chaurey et al. (2012) and Palit (2013). These works do not explore in-depth qualitative questions on the day-to-day role of the state, on the occurrence of state patronage, brokerage or corruption, or look at informal solar businesses. The research questions of this thesis could not be satisfactorily addressed by methodologically following these works.

This thesis adopted a case study approach, set to include five groups of off-grid solar power shops and dealerships that are situated within the state of Uttar Pradesh, North India. A case studies approach involves looking at a process or complex set of processes in context, in order to theorise a social world (Gregory et al., 2009). Early use of this research approach is associated with urban sociologists, in particular with the Chicago school and studies of urban social life. A case study approach is often linked with a grounded theory epistemology, and with a Weberian approach of looking at phenomena in context (Gregory et al., 2009).

Flyvbjerg (2006:216) outlines how there are what he describes as five common misunderstandings of taking a case study approach, which are the basis of critiques of this approach. These are that: theoretical knowledge is more valuable than practical knowledge; that one cannot generalise from a single case; that the case study is most useful for generating hypotheses, not testing hypotheses or theory building; that the case study contains a bias toward verification; and that it is often difficult to summarise specific case studies. The responses that have been given from Flyvbjerg and others (see also for example Ragin and Becker, 1992, Stake, 1995) provide a convincing methodologically and theoretically defence of case studies. A case study approach offers the opportunity to develop concrete contextual knowledge and theory. While generalisability from an individual case study is not always possible, a strategically chosen case study can offer the possibility of findings that may allow for wider generalisations. For example, a case study might be chosen on the basis of being exceptional, extreme, paradigmatic or comparative. The use of a negative hypothesis or falsification can disprove a set assumption, or provide social understanding that can be the basis for wider theory building or a challenge to set theory. Case studies importantly provide the opportunity to explore social life as it unfolds in practice, including its complexities and contradictions.

A more difficult criticism is that a case study approach leads to social worlds being objectified and explained by external 'experts', often to further their own careers (Chari, 2003). The question of whether and how the subaltern can speak in research is much debated (Spivak, 1988). In this thesis, and in my academic work, through self-reflexivity, being attentive to co-production and its possibilities, and through seeking to

build long-term and reciprocal relationships with research subjects, I seek to respond to these challenges.

I decided that the questions posed in this thesis would best be explored in a single case study focused within one state. I wanted to focus in-depth on the off-grid solar power market within one regulatory and socio-economic context. Similar approaches of focusing on one state were successfully adopted by Young (2010a) and Simon (2010) in their studies on microfinance and clean cookstove markets in India, respectively. The advantage of a multi-sited case study would have been the possibility of exploring questions in the context of different states within India, which could have introduced a potentially productive comparative element. In existing studies, the off-grid solar markets described in different Indian states differ significantly, reflecting varying levels of purchasing power across the country (for example, see Miller, 2009). I quickly realised, however, that I would not be able to do such a study using in-depth qualitative methods of data collection, as such methods are time consuming and do not easily fit with spending short periods of time in different research sites. Another approach would have been to focus on just one company or on one place, adopting an in-depth ethnographic methodology. I did not choose this approach as I believed that having a wider interview base, and adding a comparative element between different businesses, would be important for gaining a wide and verifiable data set on the questions being explored in this study.

I choose Uttar Pradesh as the case study for this research for several reasons. Firstly, it has an extremely low rate of electrification, with only 36.8 per cent of households having an electricity connection relative to a national average of 67.3 per cent of households, according to the 2011 India Census statistics (Census of India, 2011).

Secondly, on socio-economic indicators of income, education and health it consistently lags behind other states in India (Drèze and Sen, 2013). Thirdly, a number of solar companies have been starting operations in Uttar Pradesh in recent years, including formal for-profit businesses and social enterprises, and local non-commercialised informal shops. In discussions with people prior to starting this research and during my pilot trip, I commonly heard that the state is considered a test case market, where companies are keen to prove their business models. Fourthly, Uttar Pradesh is a place where the government has been shown to be deeply involved in markets and society, and where brokerage, corruption, and patronage are practices that are often evident within state, market, and social institutions and organisations, and where formal businesses often act in informal ways (Jeffrey, 2002). The first two points suggested that there should be a large potential BoP market demand for cheap, small-scale solar products, making it a standout case study for this research. The third point further suggested this is the case. The fourth point shows that Uttar Pradesh is an extreme case in terms of studying the question areas of this research in regards to the state, brokerage, state patronage, and corruption. Map 1 shows the position of Uttar Pradesh within India, while Map 2 shows a detailed map of Uttar Pradesh.



Map 1: India, showing Uttar Pradesh highlighted



Map 2: Map of Uttar Pradesh

The choice of state in this research was very important. In India, there are large economic and social differences between states. An alternative case study choice would have been Karnataka, in South India. Karnataka was the home of much early off-grid solar activity in India, has several large formal solar companies operating within it, and was the site of my MSc research. It is, however, per capita much richer than Uttar Pradesh and has much higher rates of electrification, and so would not have provided the same opportunity to study BoP capitalism. Further, when doing MSc research in Karnataka, I had found that solar companies in the state had already been well researched, and that companies in the state were reluctant to allow researchers to independently visit their shops and dealerships.

It was challenging to identify, define, and set the bounds of this case study, and to ensure that it was appropriate both as an empirical and a theoretical case for the research being done. It was challenging to decide what constituted an off-grid solar business, and then to select which individual groups of solar shops and dealerships to include within the case study. Before starting fieldwork, and during my pilot trip in India, I identified various models of for-profit, formal, commercial businesses and social enterprises operating within Uttar Pradesh. Businesses within the off-grid solar market differed significantly in terms of whether they were self-sufficient private companies, whether they received grant money or international aid money, and on whether they were involved in non-commercial social work or projects. I also found that companies varied in terms of whether they only focused on certain solar power products, whether they sold a mix of products, or whether they sold solar products alongside other goods. Businesses also differed on whether they sold products, or instead rented a lighting service to households. Table 1 shows the different company types, finance models,

business approaches, business structures, and sales models of off-grid solar power businesses that I identified in Uttar Pradesh.

Business Types	Finance behind businesses	Business approach	Business structures	Sales model
Commercial large business Social enterprise Formal, commercial single shop business Informal, non-commercial business	Privately financed Part or fully supported through grants or loans from national and/ or international development organisations, or NGOs Part or fully supported through government support	Commercial sale of goods and services Part commercial, part subsidised sale of goods and services Fully subsidised sale of goods and services	Multiple company owned and run shops Dealership model Single shop or single dealership Distributor model	Selling Solar Home System (SHS) and solar lanterns Selling individual products and components Running and/ or selling micro-grids Renting lanterns and/ or battery packs Renting SHS with a 'pay-as-you-go' model

Table 1: Range of businesses and business approaches within the off-grid solar power market in Uttar Pradesh

The businesses included in the case study were decided on, following a review that I conducted of the companies operating in Uttar Pradesh, and following initial interviews with managers in multiple solar businesses and with people involved in the off-grid solar power sector during my pilot trip to Uttar Pradesh and early in my fieldwork. I selected five groups of off-grid solar power shops and dealerships that were operating within Uttar Pradesh for this research.

1) Authorised TATA Solar Power dealerships. TATA dealerships are for-profit commercial businesses, run as franchises.

2) TERI solar shops. These shops are run by individual entrepreneurs, who had been supported by TERI (The Energy and Resources Institute), the Delhi-based research institute, under their Lighting a Billion Lives (LaBL) program to promote off-grid market development in India. These are for-profit businesses, but had received grant support in being set-up.

3) Shops run by Boond, a for-profit social enterprise. Boond directly operates shop in Uttar Pradesh, from which it sells off-grid solar power products.

4) Akshay Urjaa shops. These are independent shops that were supported by the Ministry of New and Renewable Energy (MNRE) under the MNRE Akshay Urjaa Program to support solar power diffusion in India. One shop in each district was supported within Uttar Pradesh. While the program is now finished, most shops remain open.

5) Informal shops. Shops included in this study in the group of ‘informal shops’ were all independently run businesses, that were not part of any larger business or market development program.

These shops and dealerships were chosen so that this study would be comparative between formal and informal solar businesses. The first four groups of shops and dealerships selected were formal shops or dealerships. They were all also part of, or associated with, either a non-local commercial business or brand, or had been supported under a non-local market development program. I selected several groups of formal shops and dealerships so that I would have enough businesses be able to cross-check and compare my findings between them. The fifth group of shops were informal shops. By informal, I mean that they were not registered with the MNRE as approved solar outlets, and were all non-commercial, small-scale businesses, that were selling non-branded, non-standardised goods. The informal shops were selected individually on the basis of their proximity to one or more of the formal businesses which were included in this study.

While the bounds of the case study were set at the start of my fieldwork, throughout the research I often found myself questioning what constituted the field space, and what were the legitimate or most appropriate businesses to study and people to talk to. During fieldwork I regularly came into contact with people who were involved in the sector, but who were not working for a company or organisation included in my case study. These meetings enriched my understanding, and so form a part of the data upon which this thesis is based.

3.4: Interviewing

The primary data collection method adopted was semi-structured and open interviewing. Overall, I interviewed 56 people within 50 solar shops and dealerships, and 6 managers overseeing or supporting these solar shops and dealerships. I additionally conducted 20 formal interviews with people working in non-case study off-grid solar companies, managers in banks working with solar companies, and with individuals in NGOs and development institutions supporting the off-grid solar power sector. Table 2 shows the breakdown of interviews conducted.

Primarily I was looking to interview people working within solar shops and dealerships, who had everyday experience of the developing off-grid solar power market. Therefore, within each shop or dealership, I recruited the main person running that business on a day-to-day basis as an interviewee. In all cases, these individuals were working with a large degree of autonomy in day-to-day sales and decision making, or were working completely independently from any higher management or company structures. All shops and dealerships were run by one person, with one to three other employees working within them. Identifying the main person in charge within a shop or dealership was straightforward in all cases.

Category	No. of interviewees	No. of interviewees with whom 'hanging-out'
TERI shops	15	4
TATA Solar Power	10	2
Boond shops	6	2
Akshay Shops	6	0
Informal shops	25	7
Total interviewees from case study businesses	**62**	**15**
Others (managers, bankers, NGO and institutional interviewees involved with off-grid solar power in Uttar Pradesh)	19	0
Total	**83**	**15**

Table 2: Breakdown of interviews conducted

I further wanted to interview key managers at a higher level within the businesses or organisations running or supporting the shops and dealerships included in this study, where such a management structure existed. I was also open to interviews with people in organisations, banks and government departments supporting or working with the off-grid solar power shops and dealerships at which I was interviewing. The purpose of such key informant interviews was to access a level of knowledge about the off-grid solar sector and information on practice from a different perspective to those I was interviewing who were working in shops and dealerships. In these interviews I covered many of the same questions as in interviews in solar shops and dealerships, but I also had discussions reflecting on broader issues about market and business development.

During initial meetings with all interviewees, semi-structured interviews were conducted. The advantage of semi-structured interviews is that pre-determined questions can be addressed in the interview while at the same time there is space for a conversation to unfold along lines of relevance, in a flexible manner (Denzin and Lincoln, 2011, Mason, 2002). Semi-structured interviews were important for this research, as I had a broad set of themed questions for which I was seeking to gather comparable data across different interviews, but I also required the flexibility to conduct conversations with individual interviewees that explored their experiences, knowledge, and understandings beyond the limits of set questions.

Following a first semi-structured interview with each interviewee, on any future visits I would conduct open interviews or participate in open conversations. These conversations would at times go back to some of the themes previously discussed in semi-structured interviews, but would often be open discussions about the shops or dealership that I was visiting, the market for off-grid solar power in that area, or would

be discussions that were structured according to customers coming into shops, and what they were buying or requesting. By taking an approach of open conversations in follow-up meetings, this research was open to being moulded by research participants through the research process (Latour, 1997), and to being a co-production (Whatmore, 2003). I found that the discussions I had in follow-up meetings with interviewees were extremely productive for raising and covering the question themes of this research.

The questions being addressed in my semi-structured interviews were determined in part from my literature review and the theoretical questions that I wanted to explore. Some were based upon my findings from the MSc research project that I conducted on the off-grid solar power sector in Karnataka. I further added new questions, and edited existing questions, based upon what I learnt about the solar power sector during my pilot trip to Uttar Pradesh. Mills and Morton (2013:9) discuss how during the research process questions evolve, from the researcher starting with an overall research question or questions, through developing a research design, to when they collect and analyse data. As this research project progressed, I came to understand my initial research questions better, based on the reflections and responses of interviewees. I found that certain questions proved unproductive, others much more important than I had anticipated, and that during the course of conversations it became apparent that other new questions would be important for the areas of theory I was exploring. For example, I found that when I asked general questions about the role the state was playing in the off-grid sector I received poor responses, while questions about the role of subsidies elicited strong responses. Questions were also changed on the basis of linguistic comprehension, as I often discovered that questions which were clear in English did not have straightforward translations into Hindi.

When conducting interviews, choice bias in questions can be a problem, and it is therefore important to carefully select hypothesis and questions that do not simply set-up the research for a result that is already presumed (Chamberlin, 1965). I designed questions so that they would elicit discussion around my theory areas. Some questions supported the hypotheses I had developed about the role of formal solar businesses selling good quality, branded, but value-conscious products, on the role of the state, of brokerage, state patronage, and corruption, and on the role of informal business. Others cast doubt on my hypotheses. This proved to be a successful approach, with interviewees often responding to questions that cast doubt or agreed with a proposition by strongly disagreeing or agreeing with the question. In designing my questions, and then conducting my interviews I was in particular reflective of the need for rigour and methodological objectivity (Mason, 2002), and of the need to avoid the research becoming second-hand uncritical narrative (Latour, 1997). I therefore ensured that I asked a standard set of questions to all participants. In future interviews I often returned to questions discussed before with an interviewee to further explore the answers given. I cross-checked answers between different interviews where interviewees might be expected to have had similar experiences, or where interviewees were geographically closely located. Some of the questions for this study were structured, factual questions about businesses at which I was interviewing. The majority of questions were leading questions, designed to elicit conversations on the issues I wanted to address in order to answer the hypothesis addressed by this study. An outline of the interview questions used in this study can be found in Appendix B. See Appendix C for questions translated into Hindi.

Building rapport and trust through time with interviewees was key to the success of this research. Researchers must take into account the relationship they have with an interviewee when asking substantive questions, as this will affect the kind of information that is likely to be given (Kauffman, 1994, Mason, 2002, O'reilly, 2012). McDowell (1992, 1998) argues that dynamic positionalities must be recognised in research, as well as the embodied and limited nature of knowledge production. In initial interviews I had to work hard to build relationships. I structured and scheduled interviews so that certain more probing questions would come towards the end of interviews, or if an interviewee was not responding to certain questions, would be left to a later meeting. I was keenly aware that in initial interviews it regularly felt like answers to questions on some themes were short and limited, whereas once I knew an interviewee better, answers to the same questions would be much more extensive. Being self-reflexive about this in my research, and considering the effects it might have on my data, was important. Having adopted an interviewing approach, I was also aware of the need not to be co-opted by interviewees, or to simply interview where it is easiest, or where an interviewee is keen to befriend the researcher (Flick, 2007, Mills and Morton, 2013).

It was essential for me to be self-reflexive about the power relations in this research and about my positionality. Baker (2004) speaks of how interviews involve the active generation of social reality and identities, and so are inherently subjective. The relationship and power relations between interviewer and interviewee influence the interview and the data. Shurmer-Smith (2002) and Kvale (2006) argue that the recognition of power dynamics in interviews is necessary for rigorous and ethical research. Denzin and Lincoln (2011) talk of how the researchers gaze is always filtered

through the lens of language, gender, social class, race, and ethnicity. Objective observation is impossible in the sense understood in hard sciences. As a white researcher, working in an elite university, coming from a country with a colonial history in India, I had a loaded researcher identity. I was also clearly positioned as an outsider in this research (Forster, 2012, Kauffman, 1994, Kerstetter, 2012, Kusow, 2003). Numerous scholars have written about the challenges involved in such a positionality, and the need to be aware and self-reflexive of how this impacts any qualitative research done, and how work may need to be adjusted as a result (Kauffman, 1994, Robson and Willis, 1994). I also came to this research with aspects of shared interest and identity to those I was researching. Most of those interviewed were of a similar age to me. Many shared my passion for solar power, and its potential for the coming years. This helped with building relationships.

Elwood and Martin (2000) discuss the importance of the physical location where the interview is held. For this research, interviews were held in nearly every instance within the shop or dealership of the interviewee. This proved to be very productive, as interviewees often referred to products within their shops in talking about issues. In approaching interviews with higher-level managers, I was aware that very different positionalities between interviewer and interviewee were likely. Power relations within interviews with elite managers are very different from those with interviewees in rural shops and dealerships (Harvey, 2011, McDowell, 1998).

3.5: Hanging-out and Participant Observation

The secondary methods adopted for this research were 'hanging-out' and conducting participant observation in solar businesses. This was done with 15 interviewees, from both formal and informal shops and dealerships. I wanted to engage a smaller group of interviewees in much greater depth, on the themes of this research. This was done over the full period of this research, involving multiple trips to their shops and dealerships. In using these methods, I wanted to allow new constellations of actors, issues and networks to be identified which might not so obviously have emerged in semi-structured, pre-planned interviews (Latour, 1997). These proved to be extremely successful methods for exploring my questions areas and the themes of this research.

Hanging-out is a research method that involves spending longer periods of time with research participants, or at a research site, during which the researcher does not structure their time according to a pre-set questionnaire or intended survey. Instead, time is spent observing practices and activities taking place, engaging in conversation, and building relationships. Through such a non-structured engagement with participants and a site, the intention is that the researcher will learn about issues that are important, and how they are important, as those issues are naturally raised in conversation (Madden, 2010, Agar, 1996). I spent several full, non-consecutive days hanging-out with each of the 15 interviewees included in this part of the study, shadowing them as they went about their daily activities, and participating in their activities. Much of this time was spent sitting in shops or dealerships talking. Some of it was spent engaging with customers, and some visiting villages or installing and servicing solar power products. During these periods, I learnt about the products and services being sold in off-grid solar power shops. I learnt about how to wire a solar module, and connect a

SHS. I experienced sale pitches to customers in different shops, and saw what people were buying, and what products were breaking.

I also conducted some participant observation, to learn about how solar business worked on a day-to-day basis, and about the practices of my research subjects. Gregory et al. (2009:519) describe participant observation as: "A research method in which the researcher aims to participate in the process under study so as to gain intimate knowledge of subjects and their habits, which insiders to a realm of practice might not otherwise reveal - or be able to reveal - in contrived situations such as interviews." Malinowski spoke about this as seeking to grasp the 'native's' point of view and vision of the world (Malinowsky, 1961). Participant observation allows one to gain knowledge that may be non-universal, non-scientific, and within the ethnographic context (Raffles, 2003). Bernard (2011) writes that participant observation is a way to understand the internal logic of an organisation, a cultural system, or other social dynamic.

3.6: Recruiting Informants

Carefully choosing my informants, so that they would be representative of the businesses I was looking at, and appropriate for the questions I was asking, was essential for the rigour of this research (Mason, 2002). I sought to recruit a sample of interviewees with a geographical spread across Uttar Pradesh, ensuring that I recruited multiple interviewees from each of the five groups of shops and dealerships included in my case study.

While I had set the case study to include interviewees from TATA Solar Power dealerships, TERI shops, Boond shops, Akshay shops and informal shops, recruiting

interviewees in individual shops and dealerships was difficult. The off-grid solar power market in Uttar Pradesh is new and rapidly developing, and gaining information about where shops and dealerships were located, and then getting contact details or introductions to them took a significant amount of time. Once I had gained contact details, I had to explain my work, build individual relationships, and gain approval to conduct interviews in every shop and dealership.

To recruit informants, I used a snowballing strategy. Snowballing is: "A technique used by the researchers whereby one contact, or participant, is used to help recruit another, who in turn puts the researcher in touch with another." (Longhurst, 2009:580). I found that this was a very successful way of recruiting interviewees, as interviewees in solar businesses could usually introduce me to several other businesses. I would usually be introduced to a new contact through an existing contact who that person trusted, which meant that in many instances building relationships and gaining the trust and acceptance of interviewees happened more rapidly.

In the case of Boond, TERI, and TATA Solar Power, I made contact with management to initially negotiate access to shops and dealerships. Through a process of introductions to shops and dealerships, and then snowballing, I expanded my interview base. After being introduced to a potential interviewee, I would arrange a time and date to visit. Overall I interviewed at the majority of TATA Solar Power dealerships, TERI shops, and in all Boond shops in Uttar Pradesh. I did not have an access route into Akshay shops or informal shops through higher-level managers. I sourced a list of Akshay shops and their contact details from the MNRE website. I contacted shops by phone, asking whether it would be possible for me to visit to conduct an interview. I interviewed in close to 10 per cent of Akshay shops in Uttar Pradesh. There was no way to access

details for informal shops from any database. I therefore used the approach of visiting informal shops in the towns where I was already interviewing in a Boond, TERI, TATA, or Akshay shop or dealership. When I identified a shop, I would visit in person to explain my research, and ask whether it would be possible to arrange to come back at a later date to conduct an interview. It is not possible to say what percentage of informal solar shops in Uttar Pradesh that were included in my sample, as there are no lists to refer to. Map 3 highlights all of the districts within Uttar Pradesh within which there was at least one shop or dealerships where I conducted an interview.

After the first month of fieldwork, I began to identify the shops and dealerships at which I would engage in hanging-out and participant observation. These were chosen on the basis of my having developed good relationships with the people I had interviewed in them, for a geographic spread, and for a spread of the five groups of shops and dealerships included in my case study.

Where possible, when I identified a manager at a higher level within one of the organisations or businesses that were supporting or running the shops and dealerships where I was working, I would seek to interview that person. I further sought interviewees with managers at banks working with interviewees in solar businesses.



Map 3: Map of Uttar Pradesh, with districts highlighted within which shops and dealerships included in this research were located

Overall, the interviewee recruitment process worked well. I made sure that in most towns where I was interviewing at a business, I would be interviewing in several different shops across the five groups of shops and dealerships in my case study, and in particular both formal and informal businesses. This added a level of rigour and comparability to this study, and allowed me to triangulate information from businesses close to each other. The lack of a full geographical spread through Uttar Pradesh could be seen as one limitation of this study. The majority of my interviewees were focused in the districts surrounding Lucknow. Limitations of time and my need to focus in-depth on a number of shops and dealerships made it impossible to spend long periods of time in businesses over a wider geographical spread.

3.7: Fieldwork Practicalities and Language

The fieldwork for this research was broken into two phases: a preliminary pilot filed trip in April 2013, for one month, and a main phase of fieldwork from September 2013 to June 2014. While in India, I was affiliated to the Institute of Economic Growth, Delhi University.

During the pilot trip, I was based in Delhi, and used my time to meet with managers from multiple off-grid solar companies, that I was considering including in my case study. I also met with people working in organisations or institutions supporting or connected with the off-grid solar sector. I conducted a number of initial pilot interviews that included my planned questions, to test responses. I also asked the individuals I was meeting with what they thought the important issues to study, and questions to ask were in regards to the off-grid solar power sector in India, which proved to be a productive way to develop my question areas. The pilot trip was extremely important in giving me

exposure to the off-grid solar power market in North India, and helped my understanding of what would be an appropriate and realistic study.

It was necessary for me to learn, and be able to speak Hindi for this research. In North India, people working in the off-grid solar power sector at a management level usually spoke fluent English, however, in shops and dealerships very few people did. Language commonality is important for building trust, rapport, and long-term relationships with research informants. The potential for bias in translation when using translators with qualitative work is significant (Gade, 2001). During the year prior to going to India I took lessons in Hindi at Oxford University. I also attended a six-week Hindi course upon arriving in India in July 2013. When I started my main fieldwork, my Hindi was still limited. Asking questions and understanding responses was difficult. In the first months of fieldwork I hired an assistant, who accompanied me as I conducted interviews. While an assistant meant that someone was present who understood everything that was said, I found that it had a detrimental effect on my efforts to form relationships with interviewees, and that it made the process of hanging-out in shops and dealerships more difficult. Once I was confident to go to interviews alone, it was easier to form relationships, to hang-out, and to gain the trust of informants. Indeed, people responded positively to my efforts to learn Hindi, and my language skills were an aid to gaining legitimacy and acceptance within the field. During the course of fieldwork, nearly all interviews conducted were in Hindi. Nearly all semi-structured and some open interviews were recorded. I was therefore able to re-listen to sections of interviews when I had not understood something.

I conducted eight months of fieldwork. When planning my research, I decided that this amount of time would be sufficient to interview in a large number of shops and

dealerships, and to make multiple visits over a longer period of time to a smaller number of them. It was also a length of time that I hoped would allow me to become familiar with the social world of off-grid solar power in Uttar Pradesh, and to build longer-term relationships with research participants. Overall eight months proved to be an adequate amount of time. In the last few months of fieldwork I found increasingly during interviews that my questions areas had been exhausted, and that I was not hearing fresh information. When spending time in shops and dealerships, the day-to-day activities I was seeing, and conversations I was engaged in, were repeating regularly.

3.8: Ethics

This research followed both the Oxford University CUREC and the ESRC ethical guidelines. Before conducting research, I gained full ethical clearance from the University of Oxford. This checked that my research involved informed and willing consent and did not in any way endanger or negatively impact my research subjects. For each interview, approval was carried out verbally or on paper. All interviewees are anonymised in my writing, except for several managers in solar companies and banks, and several TATA Solar Power dealers, who approved the use of their name. See Appendix A for an example ethical clearance form. All transcripts were kept private, and were not passed on to any third party. Where sensitive issues were talked about in interviews, such as around corruption, I have ensured that such details cannot be associated with a particular shop or person.

Whatmore (2003) talks about the ethical encounter as something that continues throughout research. I found this to be the case. I was regularly reminded of my positionality and position of relative power as a researcher during my fieldwork period,

and I was self-reflexive about the impacts this had on my research. Ethical considerations continue beyond the period of fieldwork (Thrift, 2003). I believe that it is essential for social scientists doing qualitative research to have a long-term commitment to their research topic and subjects, and for there to be mutual benefits of any research. I aim to build long-term mutual relationships with those who are involved in my research. I also share back the output of my research to those who were involved.

3.9: Starting Fieldwork, Locating Myself

During my time in India I was located in Lucknow, the state capital of Uttar Pradesh. The city is situated centrally in Uttar Pradesh, with good road access to districts surrounding the city, and to districts further away, making it a good base for this research. The majority of the solar businesses where I was interviewing were located in the surrounding districts to the city. Typically, I would travel by bus to solar shops or dealerships for interviews, returning to Lucknow the same day. Often I would be travelling by bus for two to three hours, or longer, to reach a solar business. This was hard work, and because of bus schedules I was often limited in the amount of time I was then able to spend with an interviewee. At times I would hire a taxi for the day, when the shop or dealership was not on a reliable bus route. On such trips I could spend more time in shops and dealerships, and visit several during a day. Arriving at an interview in a taxi, however, often added an awkward social element, as many interviewees made explicit mention of the high cost of hiring a taxi. I made several multi-day trips to districts further away from Lucknow, typically trying to visit several districts on each such trip. There were parts of Uttar Pradesh that I was unable to visit at all, and some parts that I only visited briefly. I had to strike a balance between recruiting a breadth of

interviewees, both geographically and in terms of numbers, and spending time engaged in in-depth ethnographic work at solar businesses.

In practice it was necessary to choose shops and dealerships in the districts surrounding Lucknow for my sample of businesses where I was hanging-out and conducting participant observation. The long distances required to reach many districts in Uttar Pradesh made it very difficult to spend significant amounts of time in those places, or to carry out repeat trips that would have been necessary for developing in-depth relationships.

Every one or two months I would visit Delhi, usually staying for around one week. Many off-grid solar power companies have their headquarters in the city, as do organisations and NGOs supporting or involved in off-grid solar power market development, and so I spent time in the city in order to interview these people. Relationships with these people were also necessary to get access and introductions to solar shops and dealerships in Uttar Pradesh.

3.10: Building Relationships

Getting access to interviewees was in certain instances difficult. I found that a number of individuals at a management level who had gatekeeper status in the businesses where I was seeking to interview were reluctant to grant access in the early months of fieldwork. Many foreign researchers have been researching the Indian off-grid solar power sector in recent years, with some paying for research access. As a result, several solar businesses now have a policy of only giving research access for a fee. After several months, however, my ability to gain access improved, and I was able to

successfully build relationships. My long-term presence in the field helped in building my legitimacy. Other researchers were typically visiting for a short trip, and through time people differentiated my work as a result. Nevertheless, several businesses that might have been good inclusions in my case study had to be ruled out at an early stage, because I would have been unable to gain access from gatekeepers. I was also unable to interview anyone within a government department responsible for supporting the off-grid solar power market, as all requests were ignored or declined. However, as such interviews were not the focus of this study, I did not spend a significant amount of time trying to secure such interviewees.

Getting research access at the shop and dealership level was much more straightforward. For example, once I had received contact details for TERI shops, which took some time, I found that personal introductions through a snowballing approach was a quick way of getting access into new shops. Entrepreneurs in TERI shops who I approached were all happy for me to interview them, and for me to spend longer periods of time in their shops when requested. I had similar experiences in TATA Solar Power and Boond shops and dealerships. When I first introduced myself in local informal shops, people were at times sceptical of my intentions, believing that I was visiting from a company that might have commercial interests in selling solar power. Yet when visiting for the second time, interviewees were in all cases welcoming, and were engaged in the questions that I was asking.

When conducting an interview for the first time, I visited a shop or dealership for half a day or a full day. In a majority of cases I visited more than once. Having conducted an initial semi-structured interview, any further time with interviewees was taken up with open interviews, and with unstructured conversations that naturally occurred through

the course of the day. Usually based within the shop or dealership of the interviewee, conversations were rich in detail, and during the course of a day it would be possible to speak to customers and other employees working in shops and dealerships other than my main interviewees. When initially meeting an interviewee, once I had conducted an interview there was often a period of awkwardness over how to remain for a longer period of time within the shop or dealership. Interviewees were often unclear about the idea of 'hanging-out'. I found that it was important to break down the idea that I was a distant researcher, with a set of fixed formal questions to ask. Many interviewees had been interviewed before, and their experiences had been of researchers who asked a set of questions and then left.

Cheng (2014) speaks of the transformative and embodied experience of doing fieldwork in an urban setting where walking is a way of learning about, exploring, and engaging with place. I found that sitting within shops and dealerships, experiencing and engaging in day-to-day activities shaped my understanding and knowledge. Often hanging out involved long-periods of boredom, as Jeffrey (2010) has described when talking about his experiences of research. At times I would spend four or five hours in a shop, with only one or two customers visiting. Conversations in shops most of the time had very little to do with solar power, or the question areas that I was interested in exploring for this research.

In early interviews, research participants generally spoke positively about their businesses, in response to questions I was asking them. Further, interviewees were often reluctant to talk about issues around brokerage and corruption. It was often only after several months of visiting a research participant that they began to speak more freely about their business, or would begin to discuss topics such as brokerage and corruption.

This was however not always the case, with some interviewees keen to talk about these issues from the start. This experience highlights both the need to build trust and rapport, and the necessity of longer-term qualitative research when asking the kind of questions addressed in this research. When people were not willing to talk about certain issues, but I thought that they might be important, through a process of triangulation I sought to explore how truthful interviewees were being through asking other interviewees in the surrounding areas about how such issues were important in the area. I found that interviewees in a number of shops and dealerships were more interested in befriending me, then in answering any interview questions. This is an issue flagged by Mills and Morton (2013), who speak of how the ethnographer can easily become co-opted as a result, and by Flick (2007), who argues that it is important to avoid becoming 'captured' by the first people what take an interest in ones work.

Language was an on-going challenge. But learning Hindi was invaluable for then being able to hang-out, build rapport, and to gain acceptance. I found that in interview contexts, my efforts to speak in Hindi and the mistakes I would make were commented on, joked about, and were the basis for valuable longer-term relationship building. My positionality was often a challenge in interview contexts, with power relation differences and cultural difference at times being very evident. Coming from a rich foreign country, being able to travel with ease, and having a much higher socio-economic position, felt very evident at times. In many instances, interviewees were keen to discuss the colonial legacy of the UK.

3.11: Recording Interviews, Taking Notes, and Using a Field Journal

After interviews I took notes reflecting on the interview, and on the shop or dealership that I had been visiting. I also took broader notes reflecting on fieldwork, on my questions, and on issues that were being raised as my fieldwork progressed. During interviews and when hanging-out, I wrote down jottings (Emerson et al., 1995) of conversations, and of places visited and activities that had been taking place. Goody (1977) describes field notes as allowing the researcher a powerful way of documenting sensory experiences and their changing understandings. They were important for this research, because they provided both a way to create a distance and to make sense of raw aspects of research. I made voice recordings of nearly all interviews conducted. I also recorded at times the interaction between interviewees and customers. Interviewees were at times unhappy to be recorded. Sometimes I judged that interviewees were giving guarded or short answers when being recorded. I therefore limited the use of my recorder at times, or purposefully held certain questions, to ask at a later stage when I was not recording.

3.12: Analysis and Writing

The data gathered for this thesis was in the form of interview notes, recordings, and journal reflections. I used NVIVO software to initially review and code data. Cope (2009:350) defines coding as: "The process of identifying, assigning, and analyzing codes based on inductive review of transcripts and other data for the purpose of revealing commonalities and disjunctures, investigating patterns and themes, and producing new knowledge and insight." I partly coded on the basis of predetermined themes from my research questions, but I was also allowing for codes to emerge from

expressions, terms and ideas used by interviewees. In doing this, I was followed the work of Silverman (2004) Kitchin and Tate (2000) and Cope (2009) on coding.

Crang (2005) speaks of three approaches to analysis: developing grounded theory, analysing the formal structure of the text or transcript or image, or reading qualitative data as narrative. I broadly adopted the first approach. A number of the codes used in analysis were deductively reached, from questions and themes that this research focused on. Others were inductively chosen, on the basis of themes that were emerging as I read through interviews and listened to transcripts. During analysis, certain codes were deleted, new ones added, and some codes were merged or divided into more specific codes. See Appendix D for a list of codes. McDowell's discussion on interview analysis was useful as I went through the coding and analysis process. She speaks of an initial process of repeatedly mining her data for plot, and then for representations of 'self' (McDowell, 1998). I adopted this idea, as I went through my data, looking for plot, and for issues and themes in the early stages of analysis.

Writing a qualitative thesis, however, cannot be a straightforward process of following a particular objective methodology. McFarlane and Jazeel (2010) discuss the theatrical and political issues raised by the researcher representing the subaltern in post-colonial knowledge production. They speak of how the researcher inevitably ends up speaking for the subaltern, and the challenges this raises. When writing-up my research, I was keenly aware of the need to be self-reflexive about this.

Chapter 4: Situating the Off-Grid Solar Power Market

4.1: Introduction

In this chapter I outline the Indian context within which the off-gird solar power market studied in this thesis is situated, the history and current position of the market, and its framing in terms of Bottom of the Pyramid (BoP) capitalism. I start the chapter by looking at the political, economic, and social position of India and of Uttar Pradesh, and at the state of India's energy sector and its electrification efforts. I then introduce how the Government of India has recently started to actively promote renewable energy. This context highlights an environment within which a commercial off-grid solar power market has been able to grow over recent years. In the second half of this chapter I move on to look at how the state has governed off-grid solar power diffusion and market development in India. I trace the development of a commercial market, starting in the 1990s, and highlight how a narrative has emerged, stating this market is being developed by formal solar businesses selling good quality, value-conscious, installed, serviced, and sometimes bank financed solar home systems (SHSs). I end this chapter by introducing the companies empirically studied in this thesis.

4.2 Situating the Off-Grid Solar Power Market within India

India is the world's second most populous nation, with a population second only to China and still growing rapidly. In 2011 it stood at 1,211 million, with 69 per cent of Indians living rurally and 31 per cent in urban centres (Census of India, 2011). Based on its economy and its performance in terms of human development indicators, India is classified as a developing country. While it has the world's seventh biggest economy,

with a GDP of US$ 2,048,517 in 2014, India's estimated GDP per capita adjusted for Purchasing Power Parity (PPP) was only $5,707 (World Bank, 2015d). There is a large agrarian base to India's economy. In 2013, agriculture made up 18 per cent of GDP, industry 30 per cent, and services 53 per cent. However, 50 per cent of Indian's were employed in agriculture, with only 22 per cent in industry and 29 per cent in services (World Bank, 2015d). As the economy has been liberalised over recent decades and the percentage of GDP produced by agriculture has shrunk, the number of Indian's working in agriculture has notably not declined at the same pace (Corbridge et al., 2012:85).

Since gaining its Independence in 1947, the Government of India has worked to develop and industrialise the country (Corbridge et al., 2012). Between 1961-2011 India had an average annual growth rate of GDP of 3.1 per cent. But this has varied significantly decade-to-decade. Between 1961-70 the rate was 1.8 per cent, 1970-80 0.9 per cent, 1980-90 3.3 per cent, 1990-2000 3.6 per cent, and 2000-11 5.5 per cent. (Drèze and Sen, 2013). The rate of growth until the 1990s fluctuated significantly within each decade, sometimes achieving high levels (McCartney, 2009), but since the 1980s there has been a significant upward shift in growth. From 2003 the rate of economic growth again rose (Drèze and Sen, 2013). During the 1990's India underwent a period of rapid economic liberalisation, which led to this acceleration of growth rates. Foreign direct investment, formerly tightly controlled, increased rapidly. The flow of goods and services into and out of India, and within India, also grew fast. Service and professional sectors, such as IT, have witnessed dramatic growth rates since the 1990s (Chandrasekhar and Ghosh, 2002, Kotwal et al., 2011).

Millions of Indians have seen their income and living standards rise rapidly over the last two decades (for example, see Fernandes, 2006 on India's new middle classes). For the

majority of Indians, however, change has been much slower. Between 1993-4 and 2009-10 average per capita expenditure in rural areas only rose one per cent per year. In urban areas the figure was two per cent per year, which is still relatively low (Drèze and Sen, 2013:29). Within India there is a large divide between urban and rural populations in terms of income. While real agricultural wages were growing at five per cent per year in the 1980s, they grew at close to two per cent in the 1990s and close to zero in the 2000s. More recently, following implementation of the National Rural Employment Guarantee Act (NREGA) in 2006, wages have picked up again. Average daily earnings of casual labourers in India in 2009-10 per day was rupees 102 [£1.02] for men and 69 [£0.69] for women in rural India, and rupees 132 [£1.32] for men and 77 [£0.77] for women in Urban India (Drèze and Sen, 2013:326-7). Drèze and Sen (2013:32) highlight how economic growth in recent years has been driven mainly by services, with people employed in this sector benefiting hugely. They argue that the majority of India's population, however, remains marooned in low-productivity and low-income sectors such as agriculture and in informal work, where little has changed. Within India, a majority of economic activity takes place within the informal economy, and a majority of Indians are employed informally. In 2004-5 a total of 430.7 million people, or 92.3 per cent of the workforce, were estimated to be working informally. Since the 1990s there has been little growth of formal employment (NCEUS, 2009:IV,23).

Continuing high levels of poverty and poor performance on a range of human development indicators presents a severe challenge for India. Based on the Tendulkar poverty line, of rupees 32 [£0.32] per day in urban areas and 26 [£0.26] in rural areas, the percentage of Indians living below the poverty line in 2011-12 was 21.9 per cent, down from 37.2 per cent in 2004-5, and 45.3 per cent in 1993-4. The figure for rural

India was 25.7 per cent and for urban India was 13.7 per cent (Government of India, 2013a). Figures on India's poverty level are however hotly debated. For example, based on the higher international poverty line of PPP $2/ day, in 2010 68.7 per cent of Indian's were estimated to be below the poverty line (Drèze and Sen, 2013:292).

India faces numerous challenges on health, nutrition, and education. Life expectancy at birth in 2013 was 66.5 years (World Bank, 2015d). Yet only 39.5 per cent of Indians had access to improved sanitation facilities, and 94.1 per cent to improved water sources in 2014 (World Bank, 2015d). Disease remains a serious killer, immunisation levels are low, and the proportion of children under the age of five who were malnourished in 2005-6 (weight-for-age) was 43.5 per cent. The adult literacy rate (age 15+) in 2010 for women was 51 per cent, and for men 75 per cent (Drèze and Sen, 2013:312). This low figure, however, hides the fact that children in India often receive extremely poor quality educations (Corbridge et al., 2012, Jeffrey, 2010). Drèze and Sen (2013:52-53) highlight how in terms of nutrition, education, and health, India fares worse than most other low-income countries, and has declined relative to other South Asian countries, except Pakistan, over recent decades.

India has a secular, democratic, and federal state system. At the national level it has a parliamentary democratic system. Financial and legislative power is divided between the central and the individual state level. Within each state in India, there is an elected legislative chamber, where a Chief Minister holds political power. Below the state level, administrate power and institutional work is done at the district and block levels. In 1993, the Panchayat Raj system was reformed in India, bringing about a strengthening of village level democracy, and devolving more financial and administrative powers to the village level (for more information on India's political and institutional structure see

Adeney and Wyatt, 2010). India's democracy following Independence has been widely spoken of as a procedural democracy, where a small elite controlled the state and its development agenda (Corbridge et al., 2012). In recent decades, however, India has seen a deepening of democracy. Democratic and state institutions in India are now more extensively engaged with the general population and interest groups. India has seen the rise of Hindu nationalist politics, and of regional, communal, and demand politics (Corbridge and Harriss, 2013, Hansen, 1999, Rudolph and Rudolph, 1987, Varshney, 2000).

A body of work has traced how state, society, and market relations and structures have changed over the last fifty years in India, and has looked at how the state engages with, and is engaged by, society. This work has highlighted how a turn towards patronage politics took place during Indira Gandhi's time as Prime Minister, and how corruption within the state grew (Rudolph and Rudolph, 1987). Work has outlined how certain groups, such as farmers groups, became politically powerful within India in the decades following independence (Banerjee and Somanathan, 2007, Varshney, 1998). Some have seen corruption as making the state ungovernable (Kohli, 1990, Pritchett, 2009). A turn towards a pro-business state in recent years has been highlighted (Kohli, 2012).

Structural inequalities, including on the grounds of caste, gender, and religion structure society in India, and opportunities to access education, jobs, and state resources. Caste is a particularly important structural inequality, which historically has disadvantaged large numbers of Indians. Over recent decades caste hierarchies have been diminished in some regards, as lower-caste groups have gained some economic and political power (Gupta, 2005, Jaffrelot, 2003). Dalits have been shown to be increasingly able to enter business (Jodhka, 2010). The introduction of reserved education places and public

sector jobs for lower-caste groups has been important for this (Corbridge et al., 2012). However, caste structures remain, in many instances being reinvented as society and India's economy change (Jaffrelot, 2003).

This background economics, political, and social context provides the environment within which the off-grid solar power market is developing. In India there is a large rural, largely agrarian, population and a large urban poor population, which forms a potential BoP market for off-grid solar business. Economic liberalisation has in recent years opened up this population as a potential market for private companies. However, within the political economy and the social context of India, capitalism is not straightforward. Brokerage, patronage, and corruption intersect business, as do structural inequalities on the basis of caste, class, gender, and religion.

4.3: Situating the Off-Grid Solar Power Market within Uttar Pradesh

Uttar Pradesh is the most populous state in India, with a population in 2011 of nearly 200 million. 78 per cent of its population is rural and 22 per cent is urban (Census of India, 2011). The economy of Uttar Pradesh is less developed than the average for India, and per capita its population is poorer (Drèze and Sen, 2013:298-299). The economy of Uttar Pradesh is predominantly agrarian (Drèze and Sen, 2013). Informal economic activity and labour dominates the economy in the state (NCEUS, 2009). Economic growth in Uttar Pradesh has been much slower than in India as a whole over the last thirty years. The growth rate of per capita state domestic product between 2000-1 and 2010-11 in India was 5.9 per cent, while for Uttar Pradesh the figure was 3.9 per cent (Drèze and Sen, 2013:296-97).

Human development indicators in Uttar Pradesh are in most cases significantly worse than the average for India. In the state 29.4 per cent of people were living below the poverty line in 2011-12, based on the Tendulkar Poverty Index (Government of India, 2013a). The proportion of children under the age of 5 who were malnourished in 2005-6 (weight-for-age) was 42.4 per cent in Uttar Pradesh (Drèze and Sen, 2013:312). At a state level, there are four main parties who dominate politics: the Congress Party, the BJP, the BSP and the Samajwadi Party. The latter two are regional parties. Within Uttar Pradesh, political corruption and administrative mismanagement are ongoing problems, and are associated with the state's failure to attract the levels of investment and economic growth that other parts of India have seen. Within politics, markets, and society within Uttar Pradesh, patronage, brokerage, and corruption are often evident (Jauregui, 2014, Jeffrey, 2002).

Uttar Pradesh mirrors the broad picture in India in terms of having a large rural and agrarian population, which constitutes a significant potential BoP market for off-grid solar power. The politics of Uttar Pradesh and a more complicated and difficult business environment make it a more challenging state for solar business to operate within.

4.4: The State of Energy and Electricity Provision in India

The demand for energy and electricity in India has been rapidly growing over recent decades. India's electricity demand in 2013 was 897 TWh (terawatt-hours), and has been increasing at a rate of 6.9 per cent per year since 2000, meaning it has almost doubled over the period (IEA, 2015:432, 428). However, India does not produce enough electricity to supply its demand. During April-September 2015, the country's power supply deficit was 2.4 per cent. Peak demand over the same period recorded a deficit of

3.2 per cent (Government of India, 2015). Despite having an electricity supply deficit, much of India's generation capacity is not utilised fully. Coal-fired power plants were only utilised to 64 per cent of their capacity in 2014. Gas-fired power plants ran for less than a fourth of the time on average in 2014 (IEA, 2015:435). This is because of a failure to source sufficient fuel for plants, and because some generating plants are geographically stranded or lack the transmission infrastructure to supply to where electricity is required.

The majority of India's electricity is fossil-fuel generated. In 2014, India had a total installed capacity for electricity generation of 284,634 MW (mega-watts). Thermal power plants, the vast majority of which run off coal, accounted for 70 per cent of this, nuclear energy 17 per cent, and hydro power 14 per cent. The total installed capacity of grid interactive renewable power in 2014 was 31692 MW. Wind power accounted for 67 per cent of this, biomass power 13 per cent, small-scale hydropower 12 per cent, and other technologies 8 per cent (Central Statistics Office, 2015:10,12). India is heavily dependent upon coal, which accounts for 44 per cent of its primary energy mix (IEA, 2015:430-431).

India is not energy self-sufficient, importing large quantities of coal and oil. Net coal imports over 2013-14 were 166.29 million tons, an increase from 36.60 million tons during 2005-06 (Central Statistics Office, 2015:22,30). India was the world's third biggest importer of crude oil 2014, although it does export large quantities of refined oil products (IEA, 2015:427). Net imports of crude oil increased from 99.41 million tons in 2005-06 to 189.24 million tons in 2013-14 (Central Statistics Office, 2015:22,30). Energy independence is an issue that attracts much attention in the energy policy dialogue in India (Madan, 2006). Reliance upon imported energy has been perceived as

a threat to national security (Pachauri, 2006), and contributes significantly to India's balance of payment deficit with the rest of the world.

The installed capacity of solar power reached 3.7 GW (giga-watts) in 2014. According to the 2011 Census, 1,086,893 households were using solar lighting as a main source of light, up from 522,561 in 2001 (Census of India, 2011). Table 1 shows the official statistics from the Government of India on the installation of off-grid renewable energy sources in India, as of 2014. These figures are however likely to be a large underestimate in the case of off-grid solar power, as they only record units sold with a subsidy, at the manufacturing or retail level, or through programs, and not units that have been sold without subsidies.

Table 2.6 : Installation of Off-grid / Decentralised Renewable Energy Systems/ Devices as on 31.03.2014

Sl. No.	State/UT	Biogas Plants (Nos. in Lakh)	Biomass Gasifiers (Rural+ Industrial) (KW)	Biomass (non-bagasse) (MW)	Water Pumping/ Wind Mills# (Nos.)	SPV Pumps (Nos.)	Solar Photovoltaic			
							SLS (Nos. in Lakh)	HLS (Nos. in Lakh)	SL (Nos. in Lakh)	PP (KWP)
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	Andhra Pradesh	5.2	22914	75.4	6	613	0.1	0.2	0.4	1263.6
2	Arunachal Pradesh	0.0	750	0.0	0	18	0.0	0.2	0.1	217.1
3	Assam	1.1	2933	0.0	3	45	0.0	0.1	0.0	910.0
4	Bihar	1.3	10924	8.2	46	139	0.0	0.1	0.5	775.6
5	Chhattisgarh	0.5	1210	2.5	1	240	0.0	0.1	0.0	14616.7
6	Goa	0.0	0	0.0	0	15	0.0	0.0	0.0	1.7
7	Gujarat	4.3	21530	0.0	945	85	0.0	0.1	0.3	9452.6
8	Haryana	0.6	2503	35.9	0	469	0.2	0.6	0.9	864.3
9	Himachal Pradesh	0.5	0	7.2	0	6	0.1	0.2	0.2	1208.5
10	Jammu & Kashmir	0.0	200	0.0	0	39	0.1	0.7	0.4	3430.9
11	Jharkhand	0.1	500	1.2	0	0	0.0	0.1	0.2	480.9
12	Karnataka	4.7	7447	15.2	28	551	0.0	0.5	0.1	1596.4
13	Kerala	1.4	0	0.7	79	810	0.0	0.3	0.5	214.4
14	Madhya Pradesh	3.5	10258	12.4	0	87	0.1	0.0	0.1	1983.0
15	Maharashtra	8.6	7150	16.4	26	239	0.1	0.0	0.7	913.7
16	Manipur	0.0	0	0.0	0	40	0.0	0.0	0.0	456.0
17	Meghalaya	0.1	250	13.8	0	19	0.0	0.1	0.2	173.5
18	Mizoram	0.0	250	0.0	0	37	0.0	0.1	0.1	241.0
19	Nagaland	0.1	2100	0.0	0	3	0.0	0.0	0.1	1050.0
20	Odisha	2.6	270	2.9	0	56	0.1	0.1	0.1	84.5
21	Punjab	1.6	0	110.7	0	1857	0.1	0.1	0.2	663.0
22	Rajasthan	0.7	2464	2.0	222	4501	0.1	1.4	0.0	8625.0
23	Sikkim	0.1	0	0.0	0	0	0.0	0.2	0.2	680.0
24	Tamil Nadu	2.2	16262	16.6	60	829	0.3	0.6	0.2	4006.6
25	Tripura	0.0	1050	0.0	0	151	0.0	0.3	0.6	365.0
26	Uttar Pradesh	4.4	23702	150.9	0	575	1.2	2.4	0.6	3491.5
27	Uttarakhand	0.2	2150	42.5	0	26	0.1	0.9	0.8	280.0
28	West Bengal	3.7	26168	17.4	0	48	0.1	1.5	0.2	889.0
29	Andaman & Nicobar	0.0	0	0.0	2	5	0.0	0.0	0.1	167.0
30	Chandigarh	0.0	0	0.0	0	12	0.0	0.0	0.0	730.0
31	Dadar & Nagar Haveli	0.0	0	0.0	0	0	0.0	0.0	0.0	0.0
32	Daman & Diu	0.0	0	0.0	0	0	0.0	0.0	0.0	0.0
33	Delhi	0.0	0	0.0	0	90	0.0	0.0	0.0	332.0
34	Lakshadweep	0.0	250	0.0	0	0	0.0	0.0	0.1	1090.0
35	Puducherry	0.0	0	0.0	0	21	0.0	0.0	0.0	0.0
36	Others*	0.1	0	0.0	0	0	0.1	0.2	1.3	23885.0
	Total	**47.5**	**163235**	**531.8**	**1418**	**11626**	**2.7**	**11.0**	**9.6**	**85138.4**

Source : Ministry of New and Renewable Energy

* Others includes installations through NGOs/IREDA in different states

SLS = Street Lighting System; HLS = Home Lighting System; SL = Solar Lantern; PP = Power Plants; SPV = Solar Photovoltaic; SHP = Small Hydro Power; MW = Mega Watt; KWP = Kilowatt peak;

Table 3: Renewable technologies by type installed in India as of 2014 (Source: Central Statistics Office, 2015:20)

The electricity and energy situation in Uttar Pradesh is significantly worse than in India as a whole. In 2014 in Uttar Pradesh there was a total installed generating capacity of electricity, by utilities, of 9.12 GW. This was a decline of 2.52 per cent on the previous year. In the same year, India's generating capacity as a whole increased by 9.81 per cent. The installed capacity of grid interactive renewable power in 2014 was 827.26 MW, an increase of 0.45 per cent on the previous year (Central Statistics Office, 2015:17, 19). During April-September 2015 Uttar Pradesh had a power supply deficit of 13.5 per cent. Peak demand over the same period saw a deficit of 20.4 per cent (Government of India, 2015).

The International Energy Agency (IEA) projects that energy demand in India will more than double, from under 300 GW today to over 1,000 GW by 2040. This is based on the scenario that India's economy will be five times larger in 2040 and that a demographic boom will have occurred (IEA, 2015:463,464). A big question exists around how India can increase the supply of energy and electricity over the coming decades. The Government of India plans to increase coal based electricity generation significantly (Roston, 2015), but it will be practically and politically difficult for it to do so. Coal is a cheap energy option, and India has the third-largest coal reserves in the world (IEA, 2015:439). Yet these coal deposits are of a low quality, and over the last decades India has struggled to increase production, coal permit allocations have been mired in corruption (Mallet and Crabtree, 2012), and coal deposits are primarily in politically unstable parts of the country. Over recent years India has been importing growing quantities of coal. With building pressure on the world and on India to act to limit climate change, coal is, however, an increasingly difficult political choice. Renewables

are an alternative source of energy to power India's future, and the country is adopting high targets for the deployment of renewable energy.

Alongside the question of how to power its growing economy in the coming decades, India also faces the challenge of providing universal electricity access to its population. In 2011 67.3 per cent of households had access to the grid, 31.4 per cent used kerosene, 0.4 per cent used solar lighting systems, and 0.5 per cent had no access to any energy source for lighting. In rural India, 55.3 per cent of people had access to the grid (Census of India, 2011). There are highly varying estimates of the number of Indians without access to electricity. The IEA gives a figure of 240 million, a number which they say has halved since 2000. Almost two-thirds of these people live in Uttar Pradesh and Bihar (IEA, 2015:436). Kale (2014) states a much higher figure of 400 million Indians without electricity. Per capita Indian's only consume around one-third of the world average of energy, lower than the per capita average for Africa as a whole (IEA, 2015:428). India only consumes 5.7 per cent of global energy, while having 18 per cent of the world's population (IEA, 2015:428). In Uttar Pradesh, in 2011, 36.8 per cent of households had access to electricity, while 0.7 per cent of households, 164,261, used solar power as a main source of lighting (Census of India, 2011).

Extending access to electricity to all Indian's has been a key state policy since Independence. Providing reliable and affordable electricity has been recognised as key to improving livelihoods, and has been linked to development and economic growth (Andreas, 2006, Pachauri et al., 2004). Sen speaks of energy as essential for human capabilities to be achieved (Sen, 1997). India's first Prime Minister Jawaharlal Nehru wrote that: "Electricity is perhaps the most necessary and the most revolutionary thing which you can take into the rural areas. The moment you take electricity, all kinds of

things begin to move." (Kale, 2014:1). Following India gaining its Independence, the country embarked on a project of mass central state-led electrification and expansion of power generation capacity (Kale, 2014). The Electricity (Supply) Act 1948 created large nationalised State Electricity Boards (SEBs), with the authority to generate and distribute electricity (Kale, 2014).

Within India's federal system, multiple state bodies now hold responsibility for electrification at different levels and across ministries. At a national level, The Ministry of Rural Development, The Ministry of Power, and the Ministry of New and Renewable Energy (MNRE) hold responsibilities. Further responsibilities for implementing electrification exist at a state level, with this managed differently between states (for more information, see Bhushan and Kumar, 2012, Kale, 2014). Individual states can set electricity prices, subsidy levels, and carry out any cross-subsidisation (IEA, 2015).

The politicisation of the energy sector is one key reason why India continues to face challenges supplying its population with energy. Over the last decades, central and state governments, often during election periods, have given various groups, such as farmers, the right to free or highly subsidised electricity. Such promises have not been fully funded by governments, and as a result utilities have little incentive to provide reliable electricity. This is the case for rural areas, where many people pay little or nothing for electricity, if they have access to it at all. In order to recoup losses, SEBs have charged other consumers, such as industry, higher tariffs (Andreas, 2006). Large annual generation losses are faced by most utilities, a number of whom are effectively insolvent (Joseph, 2010). In 2013-14, 23.04 per cent of electricity generated was lost in transmission (Central Statistics Office, 2015). Large numbers of people make illegal electricity connections, or do not pay the bills they owe (Andreas, 2006). Because

hundreds of millions of Indians have little or no disposable income, lack of affordability would make it difficult for the government to maintain a non-subsidised, private electricity network which provided all Indian's with reliable electricity (Barnes and Foley, 2004).

An urban-rural divide in access to electricity has existed for a long time in India. Kale (2014) argues that a regional divide in electricity is also significant, and that it is necessary to look at the individual state level to understand the electricity situation in India. She argues that during the years of Nehruvian central planning, varying entrenched political interests came to drive and run the electricity sector. With varied and uneven political power at a state level across India, various interest groups, particularly farmers, drove varying regional trajectories. The IEA notes how there are wide differences in performance between states in terms of progress towards universal access, levels of theft, non-billing, and non-payment, as well as in electricity losses during transmission and distribution (IEA, 2015:434).

Until the 1990s energy in India was vertically integrated and publicly owned and operated. Starting in the 1990s, various reforms have been made in the direction of liberalising and modernising the energy sector. Dubash and Rao (2008:322) outline how initially a focus was made on opening up the generation sector to private investment. In 1992, for example, the American company Enron agreed to invest in building a power plant in the western Indian state of Maharashtra (Joseph, 2010). Dubash and Rao (2008) highlight how from the mid-1990s there was a shift in focus to reforming the distribution sector. This was, they argue, due to the falling quality of supply, rising financial losses, high levels of theft, a drying up of finance by donor agencies, a global move to private ownership and market competition, and a growing internal fiscal crisis.

They outline how the World Bank was brought in to help, and independent regulation became a key part of electricity reform. In the Electricity Regulatory Commissions Act (1998), regulatory bodies were set-up to oversee state-owned energy utilities, with the aim of creating an apolitical regulatory sphere. The Electricity Act (2003) retained and extended this approach, seeking to further create a market for electricity in India. Kale (2014) speaks of how reforms since the 1990s have sought to normalise the governance of electricity between states, and have adopted a technocratic approach.

While reform has led to some private sector involvement in the energy sector, the Government of India and individual states are still directly involved in much of India's energy generation and transmission. Furthermore, the Government of India has continued to push for universal access, and to subsidise electricity, diesel, gas, petrol and kerosene. The Electricity Act 2003 states the state's obligation to supply electricity to all villages and hamlets in India. An 'electrified village' was defined as one where more than 10 per cent of households had an electricity connection (Ministry of Power, 2003).

The Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY) was launched in 2005, the latest of a number of a government programs for electrification. Its aim was a final coherent push for universal electrification, with the goal of electrifying all villages with 100 or more inhabitants. It also had the goal of supplying free electricity to people classified as BPL (Below Poverty Line). Government figures say that by 2011, Rs. 25,913 crore [£2.75 billion] had been spend under the RGGVY, and 58.8 million households had gained access to electricity (Bhushan and Kumar, 2012:5). In 2015, the RGGVY was replaced by the Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY),

which has introduced changes to how the electricity sector is organised, but continues the central government drive to universal electrification.

Many Indians without access to reliable electricity continue to use kerosene and other traditional fuels. Kerosene is heavily subsidised (Clarke, 2014). Approximately 350 million people use kerosene for lighting, and millions more rely upon it for lighting during power outages (Rao, 2012).

In recent years, promoting renewable energy has become a central policy of the government. In 2006, The Planning Commission's set out an agenda for completing some rural electrification through renewable energy (Government of India, 2006). India's 12th Five-Year Plan (2012-2017), speaks of promoting 'faster, sustainable, more inclusive growth' (Government of India, 2013b:2). The RGGVY proposed that decentralised distributed generation systems, some using non-conventional energy sources, be used where providing a grid connection is not feasible or cost-effective. Promoting renewable energy has been linked with sustainable development, economic growth, and meeting basic human needs (Casillas and Kammen, 2010, Najam and Cleveland, 2003).

In 2008 the government launched the National Action Plan on Climate Change, which set out the goal to significantly increase the share of renewables in the energy mix in India. Since then the government has launched the Jawaharlal Nehru National Solar Mission (JNNSM) for solar power, and other policies promoting renewable energy, which have set out more ambitious targets for renewable energy. As well as the Government of India promoting renewable energy development, state-level policies and regulatory support determine the pace of renewable energy deployment in practice. Forward-thinking states, in particular Gujarat, have been much faster at rolling-out

renewables than other states, such as Uttar Pradesh. Harriss-White et al. (2009) argue that the development of renewables have been hampered by the lack of political influence that the renewables lobby has institutionally in India, relative to the coal lobby. India has a target of 175 GW of renewables capacity by 2022, excluding large hydropower. Currently the level is 37 GW (IEA, 2015:427). India began a push to solar power when launching the JNNSM in 2010, and at the time set a target of 22 GW of solar power by 2022. Following the announcement of new targets for renewables in 2014, the target for solar power was increased to 100 GW by 2022 (IEA, 2015:444).

An overview of the energy and electricity situation in India shows that there should be a large potential demand and market for off-grid solar power in India. India has faced a long-term energy deficit and has failed to provide reliable and affordable electricity to its population. With rapidly rising energy demand and with concerns about climate change and energy security, the environment for off-grid solar power market development is good.

4.5: Solar Power in India and Uttar Pradesh

The responsibility for renewable energy governance and market development in India has been widely spread between central and individual state institutions and between different ministries, much like with electricity and other energy sources.

Solar power first saw support from the Government of India in the 1970s. Harriss-White et al. (2009) write about how the Department of Non-Conventional Energy Sources was established in 1976 to promote renewable energy. At this stage, traditional grid extension was the focus of government. Climate change and environmental issues were

not high on the agenda, and therefore there was little impetus behind solar power research and development. They outline how from 1992 onwards, solar energy became the responsibility of the MNRE and of Power Ministries at an individual state level. 'Non-conventional' energy was also organised under the National Solar PV Energy Programme initiated in 1980. Decentralised state level nodal agencies had responsibilities for regulation and protecting infant industries at the district level. The MNRE has pursued the development of solar technology, and has acted as a link between state, market, and users (Harriss-White et al. 2009:51). In these early years, various state and NGO projects led isolated instances of the diffusion of solar power technology. However, there was no widespread diffusion of the technology, and no commercial market of significance (Erickson and Chapman, 1995, Miller, 2009).

From the 1990s, coinciding with a wider liberalisation of the Indian economy, there was a shift towards promoting solar power market development. From 1995 the MNRE supported the establishment of Aditya Solar Shops in cities and districts throughout the country. The aim of this program was to promote the availability of solar energy products and after-sales repair services throughout the country. The MNRE website reports that while during India's 9th Plan period (1997-2002) shops were being established by nodal agencies, manufacturer's associations, and reputed NGOs, during the 10th Plan period (2002-2007), they could also be established by private entrepreneurs. At this time they were also renamed as 'Akshay Urja Shops' (MNRE, 2015).

The JNNSM was launched in 2010 to promote solar power market development. The MNRE, who run the program, state that it is aimed to promote ecologically sustainable growth, while addressing India's energy security challenge. In their guidelines they state

that: “The immediate aim of the Mission is to focus on setting up an enabling environment for solar technology penetration in the country both at a centralized and decentralized level.” (MNRE, 2010:3). Of the 22 GW goal for solar capacity by 2022 stated in the JNNSM plan, the intention was that 20 GW would come from grid-connected solar power and the remaining 2 GW from off-grid solar power. The JNNSM also set out the intention to distribute 20 million SHSs (for more information on the JNNSM see Shrimali and Rohra, 2012).

India’s off-grid solar power diffusion has also been indirectly supported over recent years by way of remote and rural electrification programs. In areas that are difficult to reach with a conventional grid, or uneconomical to reach, the Government of India has been promoting renewables instead. Under the RGGVY scheme, the MNRE had responsibility for the Remote Village Electrification Programme (RVEP). This program was to use renewable sources to electrify remote areas where grid connectivity is either not feasible or not cost-effective. Between the start of the program and 2011, the MNRE electrified 8,794 villages (Bhushan and Kumar, 2012:17). However, Bhushan and Kumar (2012) recently found that many initiatives to electrify remote areas have been unsuccessful, only working in the short-term or having had unclear results.

Within Uttar Pradesh, state level responsibility for solar power is held by The Uttar Pradesh New and Renewable Energy Department Agency (UPNEDA). They operate numerous programs for the promotion of renewable energy. The UPNEDA website lists the various solar power projects and programs that it has completed in recent years. They state that 71,970 solar lanterns have been distributed, and that up to 2008-9 91,353 SHSs had been distributed. They have also distributed solar streetlights widely (UPNEDA, 2015). Beyond such small-scale programs, while the Uttar Pradesh

government has been strong in its rhetorical support of solar power market development, it has not put in place any programs to the extent seen in some other states, such as Gujarat. At the end of 2015 there were 72 Akshay Urjaa Shop active in Uttar Pradesh (MNRE, 2015). By 2011, under the RVEP, the MNRE had electrified 184 villages using renewables in Uttar Pradesh (Bhushan and Kumar, 2012:17).

4.6: A Nascent Liberalised Off-Grid Solar Power Market

Starting in the 1990s, a new BoP commercial market for off-grid solar power has been developing in India. A number of factors explain why this market has emerged. Regulation changes in the energy sector, a pro-market approach by the government, and a liberalisation of markets for goods and services in India has meant that it is possible for private companies to start selling off-grid solar power products (Harriss-White et al., 2009, Miller, 2009). Technology advances and the falling cost of solar technology has allowed a new range of viable products to be developed, designed for low-income BoP markets. The development of LED lights and other lighting technology has further meant the cost of SHSs has fallen, as lights that require less power have made it possible for smaller solar modules to be used in SHS packages (Cross, 2013, Keane, 2014, Miller, 2009).

As mentioned above, a large potential market for off-grid solar power exists, as large numbers of villages in rural India have still not been electrified, and many electrified villages have very unreliable electricity supply. Around half of Indians are still off-grid, most of whom rely upon kerosene or other traditional fuels (Bhushan and Kumar, 2012, Harriss-White et al., 2009:49). Based on a rural Indian BoP market of 114 million households that spend less than 3,453 Indian rupees [£35] on goods and services per

month, Bairiganjan et al. (2010:2) estimated that the potential market for clean energy consumer products and services in India was US $2.11 billion [£1.48 billion] per year.

In the 1990s, a small number of pioneering commercial companies, social enterprises, and NGOs began to sell off-grid solar power products. In Karnataka, the social enterprise SELCO pioneered the sale of SHSs, and has now sold hundreds of thousands of SHSs. Their focus was on getting the right mix on affordability, reliability, and service (Bhushan and Kumar, 2012, Mukerji and Jose, 2011). In Rajasthan, Barefoot Power is well-known for working to train solar technicians and in developing the market for solar power (Allen, 2011). TATA-BP, now TATA Solar Power, was an early company to commercially sell off-grid solar power products throughout rural India (Miller, 2009). In Uttarakhand, the charity Avani popularised solar power in areas where there is little or no access to electricity. They have also been involved in training village youth to install, repair and maintain systems (Bhushan and Kumar, 2012). These and other businesses, social enterprises, and NGOs have been important in fostering a nascent commercial off-grid solar power market.

Few of the early players were entirely commercially funded. Over the last two decades large amounts of money have been channelled into developing the off-grid solar power market in India from international organisations and institutions, NGOs, and through government subsidies (Cabraal et al., 1999, Miller, 2009). The World Bank, through its General Environment Facility (GEF) fund, invested millions into SELCO (Martinot, 2001). The UK's Department for International Development (DFID), Germany's GIZ development fund, and USAID have all invested in the off-grid solar power market in India.

Over the last decade, more commercial companies, social enterprises, and NGOs have entered the market, pioneering and replicating various approaches. Some have focused on selling solar power products, such as lanterns and SHSs; the same business approach which TATA-BP and SELCO pioneered. Other businesses have set up micro-grids, installing large solar systems within villages, connecting up a number of houses, and then charging houses a weekly or monthly rent for the solar power. Mara Gaon Power is the most notable example of this, charging households 35 rupees [£0.35] per week for an LED light connection and a mobile phone charging point. A slightly altered model has been to set-up one solar power station, and then to rent out charged battery packs to customers. OMC Power has been scaling up this approach within Uttar Pradesh. Simpa Networks has pioneered a pay-as-you-go business model, whereby customers are given a SHS with a locking mechanism installed. To access solar energy, a customer need to pay a sum of money through their mobile phone which unlocks their SHS, much like how a mobile phone is topped up. Once the customer has paid the full cost of their solar module and interest, the locking mechanism is removed and they own the module. A number of companies are manufacturing or importing solar modules, and then distributing them to independent shops or establishing their own network of shops.

The 2011 Census of India reported that there were 1,086,893 households using solar power as a main source of lighting. This, however, is only 0.4 per cent of India's households (Census of India, 2011). The market for off-grid solar power is therefore still small in absolute terms. There are no reliable statistics on the number of solar modules and lanterns being sold in India. Yet the market for off-grid solar power products can be estimated to be rapidly growing, on the basis of the growing number of companies entering the market, and shops selling off-grid solar power products.

Companies like SELCO and TATA Solar Power each report publically that they have sold hundreds of thousands of SHSs.

4.7: An Off-Grid Solar Market for Good Quality Solar Home Systems and Lanterns

The dominant narrative of the new off-grid solar power market in India is that it is a BoP market being developed by formal for-profit solar businesses and social enterprises. Formal businesses are understood to be building the market by selling good quality, but value-conscious products, which are sold with the promise of servicing and warranties, and where possible with the option of consumer bank financing. This narrative is evident within the talk and literature from solar power companies, policy makers, the government, international organisations such as the World Bank, and from academia.

On the websites of off-grid solar power businesses working in India, and in the literature that has looked at these companies, there is talk about how they are selling good quality, but value-conscious products. There is discussion of providing servicing, of making financing available, and of delivering social impact (for example, see Boond, 2015, Orb Energy, 2016, SELCO, 2016). Numerous newspaper articles report companies doing this (for example, see Da Costa, 2012, Economic Intelligence Unit, 2012, Palukkat, 2014). In the reports of international organisations, there is again a focus on formal companies. For example, in their report 'Rural Access to Electricity: Strategy Options for India', the World Bank promotes a normative vision of a private sector-led solar market, of high quality, financed, and serviced products (World Bank, 2004). Through the Global Environment Facility (GEF), the World Bank has invested millions in commercial solar programs in India to promote this market vision (Martinot

et al., 2001). The Asian Development Bank (ADB) does much the same, and recently invested directly in the solar company Simpa Networks, who sell off-grid products in India (ADB, 2013). Development agencies, including the Department for International Development (DFID) and Germany's GIZ, also support market development. The support that the Government of India provided to the off-grid solar power market is also directed at formal businesses. The JNNSM, the most recent regulatory regime, only provided subsidy support when consumers buy a SHS that meets specific quality criteria, is provided with after-sales servicing, and is purchased through a development bank with a loan.

Generalist books such as *Selling Solar* (Miller, 2009), *Pico-Solar Electric Systems* (Keane, 2014), or *Green Energy for a Billion Poor* (Wimmer, 2012) contain the specific and detailed accounts of case studies from various developing countries, including India, that together fit an overall narrative of private businesses steadily overcoming challenges to build a market of high-quality, value-conscious solar power solutions for the poor. Similarly, journal articles on the off-gird solar power market in India have viewed successful markets as associated with situations where companies provide quality and appropriate technology, make available financing and servicing options, and have a strong local presence and infrastructure (Chaurey and Kandpal, 2010, Martinot et al., 2002, Zerriffi, 2011).

The SHS is presented as the 'appropriate' packaged solar lighting solution for BoP households in this narrative. A SHS typically includes as core components a solar module, a battery, lights, wiring a charge controller and sometimes an inverter. Extras on top of this, such as lanterns or fans, depend on the size of the system and choices of the customer. Early companies to adopt and popularise the SHS model were SELCO in

Karnataka, the Grameen Shakti in Bangladesh, and TATA Solar Power. The packaged SHS was intended to allow both a profitable business model and also to provide a good quality and holistic lighting and energy solution to households (Mukerji and Jose, 2011). Over the last decade, the reports of international organisations and of government departments, and the policy interventions of the Government of India, have adopted the SHS to the heart of a normative future for off-grid solar markets.

Installation and servicing have come to be seen as essential for off-grid solar companies. Again, pioneering companies like SELCO in Karnataka and the Grameen Shakti in Bangladesh were the first to develop a business model where installation of the system was included as a core part of the sale (Miller, 2009, Mukerji and Jose, 2011). This was an essential part of their overall approach, alongside offering high quality products, which would be correctly installed for the customer. Within the numerous articles and reports that have looked at projects and business models implemented in previous years, a recurring theme is how servicing has been neglected, leading to communities losing faith in solar power technology, and becoming unwilling to pay for it. NGO- and government-led programs attract much criticism for generally following a model where they distribute solar products cheaply or free of charge, but then neglect to ensure that these products can be repaired (Bhushan and Kumar, 2012). Similarly, private companies face criticism for focusing only on sales and short-term profit, not ensuring that their products can be serviced and maintained by customers in future years (for example, see Bhushan and Kumar, 2012, Chaurey et al., 2012, Martinot et al., 2001, Miller, 2009).

Finally, providing consumer financing to make SHSs affordable is seen as a key way for formal businesses to unlock and develop BoP markets (Miller, 2009). Much of the focus

of reports from the Government of India, and from international organisations and institutions, has been on the potential of consumer finance options to develop the market for solar power (Miller and Hope, 2000, World Bank, 2004).

The above narrative of how the Indian off-grid solar power market is developing emerged in interviews during the course of my fieldwork. In particular, aspects of this narrative were repeatedly raised in interviews with managers in off-grid solar power companies, and in organisations associated with the off-grid solar power sector, at a level higher than shops and dealerships, such as in Boond and TERI's Delhi headquarters, and in TATA Solar Power's central offices in Lucknow. Within management circles there was a strong narrative around selling good quality products that were branded and value-conscious. The sale of such products was strongly linked to the long-term health of the off-grid solar power market. The need for solar businesses to provide good after-sales servicing and to be able to offer consumer financing in order to be successful was a key theme also raised repeatedly in meetings with managers. I was regularly given accounts of how companies seeking to build solar markets in various parts of India, and elsewhere, had failed because after-sales servicing was not provided or because adequate financing options had not been in place. I heard from the managers of several businesses how when first starting operations in a new place, customers were usually unwilling to pay for solar power because of past experiences where modules in their villages had never worked properly. In most cases these had apparently been government distributed solar modules. In discussions with managers about the business strategy and the models they were developing, long-term success and profitability would invariably be linked to maintaining good relationships with communities and a post-sales relationship with their customers.

4.8: The Off-Grid Solar Power Market in Uttar Pradesh

A large number of different companies, social enterprises, and NGOs operate a variety of business models selling off-grid solar power products and services in Uttar Pradesh. Some businesses are selling products directly within a network of shops or through a distribution network, while others are running micro-grids. A wide range of solar power products and associated goods are available for sale in the state. At the lower end, small 3-Watt or 5-Watt solar modules can be purchased for 500 rupees [£5] if lower or medium quality, and upwards of 700 rupees if higher quality [£7]. An example of a small solar module and light are shown in Picture 3. 40-Watt and 75-Watt solar modules are most commonly being used for SHSs. Lower and medium quality modules of this size are sold for upwards of 3-4000 rupees [£30-40]. Picture 5 shows a typical range of solar modules on sale in a shop. Both branded and unbranded modules are available in Uttar Pradesh. Micro-grids can be seen in many villages in the state, and solar street lighting is also commonly seen. Picture 4 shows a typical solar street light.



Picture 3: Example small solar module and light



Picture 4: Solar streetlight



Picture 5: Examples of solar modules on sale in a shop

4.9: TATA Solar Power

The first group of shops included in this research were TATA Solar Power dealerships. Originally operating under the name TATA-BP, when the business was being run as a joint venture by TATA and BP, TATA Solar Power is one of the oldest companies to have started selling off-grid solar power products in Uttar Pradesh, and operates throughout the country. The business has been running for more than 25 years (TATA Solar Power, 2016), and operates a dealership model. At the time of this research in 2013-14 they had 12 formal dealerships in Uttar Pradesh. TATA Solar Power manufactures and sells a wide range of solar power goods. In terms of their off-grid solar power operations, TATA Solar Power supplies to their dealerships, which focus on selling SHSs to customers, financed through rural development banks. More recently, TATA dealers have begun to set up branded retail shops. When purchased through a bank, a typical 40-Watt SHS from a TATA Solar Power dealership in Uttar Pradesh cost 14,000 rupees [£140] in 2013-14, before any subsidy. Following the JNNSM subsidy being accessed, such a model was being sold for 10,000 rupees [£100]. If purchased through a bank, monthly repayments for a 40-Watt system would be upwards from 200 rupees [£2], but more typically would be 300-400 rupees [£3-4]. A three-year repayment period for loans was typical. Picture 4 shows an example of a TATA Solar Power shop, while Picture 5 shows a 120-Watt TATA SHS being installed.



Picture 6: TATA Solar Power shop



Picture 7: TATA Solar Power SHS being installed

4.10: Boond

Boond shops were the second group of formal shops included in this research. Boond is a new social enterprise formed in 2010 (Boond, 2015). At the time of this research they had three branch offices within Uttar Pradesh, from which they were directly selling SHSs to customers. Boond is focused on selling SHS packages, which are installed and sold with several years of free after-sales servicing included. They do not sell stand-alone solar modules or components to customers. By the end of 2015, Boond had installed over 1500 KW of solar power, reaching over 100,000 individuals (Boond, 2015). See Picture 8 for an example of a Boond shop, and Picture 9 for a mock-up of a Boond SHS. The cost of Boond's products were similar to those of TATA Solar Power's.



Picture 8: Boond shop



Picture 9: Boond SHS mock-up

4.11: TERI Shops

TERI shops were the third group of formal shops included in this research. TERI (The Energy and Resource Institute) is a Delhi-based research institute, which has been involved in numerous projects to promote off-grid solar power technology diffusion and market development. The shops in this study came into being through the Lighting a Billion Lives (LaBL) program, run by TERI to support local entrepreneurs to establish shops. The intention of the program was that 'energy entrepreneurs' in shops would run micro-grids and charging stations, sell off-grid solar power products, and provide repairs and servicing. Within the TERI shops included in this study, in every instance at least a handful of micro-grids or charging stations were being managed. Further, solar lanterns, SHSs, and stand-alone solar modules and other associated solar goods were being sold. These shops, while receiving financial support and continued advice and training from TERI, were running as independent businesses. There were 16 TERI shops operating in Uttar Pradesh at the time of this research. Palit (2013) reports that through their LaBL program, TERI had reached 1900 villages in 22 states in India by the end of 2012, benefiting 450,000 people. Picture 10 shows a typical TERI shop in Uttar Pradesh. In TERI shops, SHSs typically cost similar amounts to those from TATA Solar Power dealerships and Boond shops; but most TERI shops also usually sell less expensive mid-quality solar modules and lanterns.



Picture 10: TERI shop

4.12: Akshay Urjaa Shops

Akshay Urjaa shops were the fourth group of formal shops included in this research. Akshay Urjaa shops have been supported to start throughout India by the MNRE as part of their efforts to promote the diffusion of solar power technology in the country. Under the MNRE Akshay Urjaa Shop scheme, registered shops received financial support, and fulfilled government tenders to supply off-grid solar power goods and services. At the time of this research, Akshay Urjaa shops were no longer receiving financial support, but were winning government tenders. By the end of 2015 there were 72 Akshay Urjaa shops registered on the MNRE's website as operating within Uttar Pradesh. In nearly every district in Uttar Pradesh there is at least one shop. All of these shops were run independently by business people, by NGOs, or by the local government. Within these shops, solar lanterns, solar modules, SHSs, and other associated goods are typically sold. The products being sold by Akshay Urjaa shops are again sold at similar prices to the previous three groups of shops and dealerships.



Picture 11: Akshay Urjaa shop

4.13: Informal Solar Shops

Numerous informal, non-commercialised solar shops, which are not registered with the MNRE as approved solar power suppliers, are selling off-grid solar power goods and services in Uttar Pradesh. Such informal shops were the fifth group included in this research. Within informal shops a range of branded and non-branded products are available, including solar modules, lanterns, lights, and other associated solar power goods. While some informal shops do sell good quality, branded solar goods, most are selling non-branded, lower-quality goods. Prices are typically much lower than those in formal businesses. At the time of this research, a 3-Watt solar module could be purchased for as little as 500 rupees [£5]. Picture 12 shows the front of one typical informal shop in Uttar Pradesh.



Picture 12: Example of a typical informal shop

Chapter 5: Succeeding by Selling Good Quality, Value-Conscious Products

5.1: Introduction

In this chapter I explore how formal solar businesses, through their approach to business, are developing the 'Bottom of the Pyramid' solar market in Uttar Pradesh in a distinctive manner. I argue that the way in which these businesses are developing the BoP solar market corresponds to how much of the wider literature on BoP capitalism describes and imagines business at the bottom of the pyramid in the Global South, and suggests in some ways the development of regularised BoP capitalism. I empirically explore the business approach and claims of multiple formal solar businesses. Firstly, in regards to the quality, value, authenticity, and branded status of their products, and the expertise that they offer. Secondly, in terms of providing an installation service and products that come with warranties and after-sales servicing. Thirdly, in terms of being able to offer bank consumer loans and a government subsidy to their customers. I outline how the business approach of formal solar businesses was distinct from that of informal solar businesses.

Within the growing body of literature on BoP capitalism, the predominant focus has been on theorising how BoP capitalism is being developed by formal, regularised and commercialised businesses and multi-national corporations (MNCs) selling good quality, branded but value-conscious, innovative, and frugal products and services (for example, see Hammond et al., 2007, Hart, 2005, Prahalad and Hart, 2002). The development of markets at the bottom of the pyramid in this way suggests that capitalism at the BoP is developing to be much the same as elsewhere up the notional

global pyramid of capitalism, except that businesses must innovate to offer good quality but value-conscious products. Much of this literature comes from a neo-classical economics and modernisation perspective, which is not attuned to the likelihood of BoP capitalism developing differently across the Global South. The development of BoP capitalism in this manner is the basis for the argument that supporting BoP markets can deliver development benefits to BoP populations (Cross and Street, 2009, Elyachar, 2012, Roy, 2012a). Cross and Street (2009) have termed this a 'social vision' of capitalism, while Elyachar (2012) speaks of a 'development vision' of capitalism.

Within the literature on BoP capitalism, empirical examples are usually of large companies or MNCs entering BoP markets, innovatively providing good quality, but value-conscious, products and services (for example, see Balakrishna and Sidharth, 2004, Karnani, 2007a). Some work from social scientists has looked at how smaller formal businesses are operating within newly liberalised BoP markets in India, selling good quality products and services. For example, this is shown in new markets for clean cookstoves (Simon, 2010), for microfinance (Young, 2010a), and for IT services (Kuriyan et al., 2008). However, this work is not focused on the practices of formal business in comparison to informal businesses, or on how they are developing BoP capitalism in a distinctive way. The development of BoP markets is not well studied in India, nor is how the approach of formal businesses differs from informal ones, and whether such differences are significant. In this chapter I take-up this issue.

The off-grid solar market in India has been understood as a new BoP market, being developed by formal businesses, much as other off-grid solar power markets in the Global South have. The dominant narrative running through academic, government, and institutional thinking is that formal for-profit businesses and social enterprises are being

successful by focusing on selling good quality but affordable solar home systems (SHSs), provided with the option of bank financing for customers and the guarantee of servicing in future years (Chaurey et al., 2012, Martinot et al., 2002, Miller, 2009). Companies and social enterprises doing this are understood as able to deliver developmental and environmental benefits to low-income populations (Martinot et al., 2002, Miller, 2009, World Bank, 2004). In using the term 'narrative' I emphasise how this is a generalised, coherent and linear account of off-grid solar power markets, which has had significant agency and power within the literature, among policy makers, and in shaping government policy and regulations (Sivaramakrishnan and Agrawal, 2003). There has, however, been little empirical research looking at the markets being constituted and developed by formal businesses.

Roy's (2012) work showed how the everyday, often mundane practices and work of practitioners at a management level in the microfinance sector led to the imagining, distinction, and constitution of new BoP microfinance markets. Taking this idea forward, in this chapter I explore how the practice and claims of formal solar businesses, some informed by top-down ideas about BoP business, were developing and shaping the BoP solar market in Uttar Pradesh in a distinctive manner at the local everyday level. I begin this chapter by looking at how there was a focus within formal businesses on selling good quality, standardised and authentic solar products. I then move on to look at the importance of the focus that these businesses had on selling branded products, on providing packaged SHSs that were installed for customers, and on giving warranties and after-sales servicing. Finally, I look at the importance these businesses placed on offering customers bank finance and a government subsidy. Markets are based on understandings and ideas of value and standards, which are

socially and culturally constructed (Bourdieu, 1984, Harriss-White, 2003, Harvey, 2005). In adopting common practices and claims, multiple formal solar shops and dealerships were distinguishing and constituting the BoP solar market in a distinctive manner, shaping BoP capitalism that is familiar to the wider literature on BoP capitalism. Further, I look at how strongly held ideas about how to do business within formal solar shops and dealerships showed how a social vision of capitalism existed at a local level, and how this was important in guiding and distinguishing the approach of these solar businesses.

Over the last decade, a body of theory on marketization has been developed by sociologists and economic geographers (see Berndt and Boeckler, 2011, Callon, 1998a, Muniesa et al., 2007, Mitchell, 2005). This work has introduced the idea that markets might be conceived of as socio-technical 'agencements'; arrangements of people, things, and socio-technical devices that format products, prices, competition, places of exchange, and mechanisms of control. While this thesis was not primarily working with this literature, theory on market making helps in thinking about the activity of formal solar shops. The focus of formal solar shops and dealerships on quality, value, authenticity, brand, the SHSs, service, warranties, and finance might be viewed as highlighting distinctive BoP market making. It is notable that some of the ideas adopted by formal businesses were top-down, showing the agency of outside theory and devices. Seemingly mundane practices, such as providing formal warranties, a standardised SHS, or claims around the authenticity of products, were crucial to formal solar shops approach.

The argument in this chapter is developed on the basis of data from semi-structured interviews and time spent hanging-out and involved in participant observation within

four groups of formal shops and dealerships in Uttar Pradesh. These were: TATA Solar Power dealerships (TATA dealerships), Boond shops, shops that had been supported by TERI (TERI shops), and shops that had been supported by the MNRE (Akshay Shops). Overall I interviewed 36 male interviewees in 26 shops and dealerships. Nearly all were from higher-castes. These businesses had not been operating for more than fifteen years, with the vast majority having opened in the last five years. They were all single-shop operations, based either out of a shop open to the public, or an office space from which solar products were supplied to customers. In every case there was one main manager or owner, with whom I was meeting to conduct interviews, and usually one or two other employees. Shops and dealerships were typically selling no more than a dozen SHSs in a week, but in some cases more.

5.2: Building a Market by Selling Good Quality, Standardised Products and Services

Practice and claims in regards to selling good quality, branded, authentic, and standardised goods and services was the first key way that formal solar shops and dealerships were materially and symbolically distinguishing their approach to business in Uttar Pradesh. The result was that these businesses were developing the BoP solar market in a distinctive manner, distinguishable from how informal solar businesses were developing the market. In much the same way, practices and claims in regards to the sale of 'Indian products', on the performance and reliability of products, and on the expertise being offered within shops and dealerships distinguished the approach of formal solar businesses, and was a further way these businesses were developing the BoP solar market in a distinctive way. Within the literature on BoP capitalism, the idea that formal businesses and MNCs throughout the Global South are developing BoP

markets by selling good quality, branded, but value-conscious products is persistent (Agnihotri, 2013, Prahalad, 2005), with many examples coming from India (Prahalad, 2012, Karnani, 2007b, Ray and Ray, 2010, Ramani et al., 2012). This research indicates small formal solar businesses, through their distinctive business approaches and claims, developing the BoP solar market in a manner familiar to this wider literature, which would suggest at the development of regularised BoP capitalism. Further, the results of this research show that ideas about the importance of developing businesses and markets through focusing on quality, generally associated with marketing talk, management circles, and large formal companies, are also evident within small-scale formal solar businesses, and are shaping what such businesses are doing.

When I first visited shops or dealerships, following initial introductions, interviewees would nearly always first want to talk about, and to show me, their products. Most formal solar shops and offices were small but well-stocked and highly visual places, with solar modules leaning against walls and with shelves stacked high with lanterns, lights, and assortments of batteries, wiring, and general components and parts. Walking around, pointing out and handling various products, or with reference to brochures and posters, I was told about the prices of solar modules and lanterns and what brands were being sold, but most regularly I would be told about the quality of products, or aspects and attributes that could be associated with quality. Interviewees were always quick to say how their solar modules were 'good quality' and that they were authentic. In most cases I was informed that products were quality-approved by the MNRE, the central government department which regulates the sector. Posters in Boond shops stated their products were: 'Recognised by the Government of India' (*bharat sarkaar dvaaraa maanyta praapt*). Many of the leaflets used for marketing by TATA dealerships and

Akshay Shops said the same. I was also regularly told how products were ‘made in India’ (*India wala*), that they were 'Indian brands', and how products being sold were durable and long-lasting, that they generate the current and output as is written on the label. ‘You can rely on them’, ‘They will last for up to 25 years’, I was informed in multiple formal shops and dealerships. Most modules had a sheet of paper taped to the reverse side, clearly advertising output and performance data, typically over a 25-year period and in the form of a long curve graph, which would be pointed out to me.

Lanterns, lights, and batteries were nearly always stocked alongside solar modules in these shops and dealerships. In a range of bright colours, a mix of different lanterns was usually available. Some were expensive and bulky lanterns, with advertising claiming that they were designed to withstand the harshest environments and uses. Also usually available were the branded and highly engineered lanterns from new companies, such as D.Light and Greenlight Planet, which distribute lanterns throughout India, and in other Global South countries. Interviewees would take various examples down from shelves, dusting them off to show me. During demonstrations, I learnt how good quality lanterns produced a strong intensity of light, usually came with a switch to alter brightness levels, and how their batteries would last several years, after which they could be replaced. The newer, branded lanterns came with visual or printed instructions, demonstrating the correct use of these products. In much the same way as with solar modules, interviewees emphasised the quality, durability, and performance of the lanterns, lights, and batteries they were selling.

During the first months of fieldwork, over the course of interviews and spending time talking in formal businesses, I was educated in detail about technical specifications, performance, warranties, and wiring. I was told about which components were

packaged together into an ideally performing SHS solution, with the various elements balanced. I learnt how certain wiring, whilst more expensive, lasted longer and led to better performance of a SHS. The correct way to install a SHS and to mount a solar module was demonstrated to me. This was done in the context of interviewees highlighting the expertise that was involved in providing a high-quality system to a customer, or being able to service products. The ideas around expertise that shopkeepers and dealers held again highlighted the emphasis on quality within their businesses.

The discussions that I was having with shopkeepers and dealers usually involved the presence of quality within formal shops and dealerships being contrasted to what I was warned was available in local markets. Interviewees frequently told me how if you go to informal shops, spoken of as ‘local shops’ (*local wala ki dukan*), then quality, performance, durability, and reliability would all be bad. Interviewees emphasised how cheap solar modules (*china wala and sasta wala*) would quickly break, or their performance would decline. The term *'china wala'* broadly translates as 'Chinese ones'. While those who used the term understood such goods as Chinese, it was rarely clear whether they actually came from China, and the term was used to generally signify poor quality goods, in a derogatory manner. The cheap lanterns increasingly available in shops were said to be 'use and throw’ quality. I was told how they could only be expected to last around six months before they would break, and that they would generate poor quality LED light that was damaging for the eyes. It was further said that such products could not be repaired. Bourdieu (1984) has spoken about how quality and value is defined and often gains its cultural and social capital in opposition and distinction to the ‘other’. In the case of the off-grid solar power market, formal shops and dealerships were not only speaking of good quality products that they were selling,

but defining such products in opposition to what others were supplying. The practical existence of cheaper goods, and the imagining of an 'other' market of cheap and inferior quality goods, was central to delineating formal solar businesses, and distinguished their approach to business.

Selling good quality products was not a quiet company policy, nor management or backroom focus, and was not a topic only discussed in interviews I was conducting. The managers and employees of formal shops and dealerships deployed claims about quality, and about the lack of quality in informal shops, in everyday sales performances with customers, and in conversations with villagers when SHSs were being installed or serviced in houses.

For Prem, the manager of a TERI shop, performances about the quality of the products he was selling and about his expertise were enacted daily, with great enthusiasm. When customers came to look at solar modules in his shop he would quickly take on a teacher-like pose and demeanour, speaking loudly to the room at large about the different quality levels of various solar products, about technical specifications such as current and voltage, and about performance and reliability. When doing so, people standing by, whether friends, customers, or passers-by, would chime in to agree with a point being made, thus adding weight to what he was saying. A favourite line of Prem's, usually reserved for older customers, was that: 'Perhaps in your lifetime [this solar module] will not fail' ('*shayad aapki zindegi me nahi khatm ho*'). Prem would carefully distinguish his products from those of his informal shop competitors. He would speak of 'Chinese products' (*china wala*) and 'cheap products' (*sasta wala*) in nearby shops, saying how they would not last, how they performed badly, and that customers would regret buying them. Such comments would be met with agreement from people standing by.

Within the public space of the solar shop, strong sales performances were an important part of the work of managers and employees, bringing to life and authenticating claims of quality, reliability, and longevity. For example, when a customer was about to buy a solar module or thinking of buying it, Ajay, who worked in a different TERI shop, would ask his assistant to connect the wires up to the module that was going to be presented. Once this had been done, Ajay or his assistant would take it out into the sun to show how the module was generating the current that it was advertised as generating, proving that there was no deception. Customers would be told that this would not be the case if they brought a Chinese or local module. 'Local' modules (*local wala*) were considered to be a different category of solar module to 'branded' Indian modules (*branded wala*), which were held in high regard. Most shops also kept a range of pamphlets from manufacturers. The detailed specifications and colourful graphs that these usually held were frequently called on when selling. In the case of interviewees who worked out of offices, sales performances were still enacted but in alternative spaces, such as within villages when solar modules were being installed or serviced, during marketing trips, or over the phone.

The process of elucidating ideas around what constituted good quality or value-conscious products and services in discussions with customers was often one of educating customers. Distinctions in quality and performance between what was sold in formal shops and dealerships compared with informal solar shops were usually unclear to customers. For example, one afternoon sitting with Ajeet in his TERI shop south of Delhi, an elderly lady entered, carrying a hemp bag inside of which was a cheap local solar module, purchased from an informal solar shop, together with a good quality solar lantern acquired from Ajeet's shop. The lantern was not charging properly, and the lady

was clearly bewildered at the situation, as the module was new. However, the problem was clear to Ajeet, who quickly connected the panel to a meter, showing the lady how it was not generating enough current to charge her lantern, and not as much as the sticker on the module said that it generated. She was told that she should have brought a good quality solar module, and while being told about how Chinese modules will not always provide the current that they advertise, she was shown an equivalent good quality branded lantern, and given a demonstration of how it performed correctly. In this instance, the lady purchased this new module before leaving the shop.

Not all formal shops were only selling good quality solar modules and associated goods, such as lanterns, lights, and batteries. Low-quality and medium quality goods were being sold in several TERI shops and Akshay shops. Therefore, there were exceptions to the focus on good quality products and services. However, even in these shops, the managers that I interviewed still distinguished themselves from other local shops in terms of quality and selling authentic products. It was striking how in all of the formal shops and dealerships where I was interviewing, in parallel very similar practice and discourse in terms of quality were evident

Roy's (2012) writes about how a microfinance BoP market space has in practice been constituted through mundane and banal practices and work by practitioners. Her argument does important work in getting to the point of how everyday work, practices and claims can through time lead to the creation distinct BoP capitalism. Her work highlights how everyday practices at a higher level, driven by discourse regarding BoP capitalism, created a new BoP market that was shaped by neoliberal ideas of capitalism at the BoP. In much the same way, but at a level of non-elite actors, through the everyday practice of selling good quality products, and in making claims and holding

the imagination to be doing so, people working within formal solar shops and dealerships in different places through Uttar Pradesh have been developing the BoP solar market in a distinctive manner. For example, in claims to the longevity or reliability of products, to their performance, or in defining the origins of authentic products as non-local, yet made in India.

Quality has been commonly theorised as a concept metaphor, with no proper body of its own, which is instead expressed only in terms of its differential (Anagnost, 2004). This is important in the case of the off-grid solar power market. By astutely claiming to be different from informal shops, where poor quality solar goods were said to be available, formal shops and dealerships were doing powerful and affective work to give meaning to what distinguished the products that they were selling, and to give meaning to the idea of their goods being good quality. Claiming to be the site of good quality products and expertise, and others to be lacking on this front, masked the fact that sometimes poor quality products were being sold in formal businesses, and that in some informal solar shops good quality products were sold.

5.3: A Market Based on Trust and Confidence

A shared understanding amongst managers in formal shops and dealerships of their businesses developing a new market, and of the need to build this market on the basis of selling good quality products and building the trust (*barosa*) and confidence (*vishvaas*) of communities in solar power technology was evident. The shops and dealerships where I spent time were geographically dispersed over hundreds of kilometres, with few day-to-day organised links and little contact between them. Yet despite this, the majority of interviewees understood themselves to be building a wider off-grid solar

power market. This wider consciousness of being part of a new market was previously been described by Young (2010a) in work looking at the new microfinance sector in India, where employees understood themselves to be part of a new modern industry. It is significant that ideas about developing this BoP market through business based on quality, trust, and confidence, which are so prevalent within the literature on BoP capitalism (Prahalad, 2012), were also evident within small-business shops and dealerships in Uttar Pradesh. It is also significant that in formal businesses, interviewees distinguished what they did from the approach of local informal solar shops.

TATA and Boond dealerships and shops differed from the TERI and Askhay shops in that the former were selling a limited range of branded company solar goods, while the latter operated their businesses independently, and therefore could choose what products to sell. But across these four groups, interviewees argued both that selling quality products was crucial for their own businesses to be successful, and in many instances further that the long-term success of the wider market depended on all companies doing likewise. At the same time, I was told that informal local shops threatened the development of the market, and the trust that people were beginning to have in off-grid solar power.

Ashoka, a 22-year old manager of a TERI shop, knew the prices of solar modules available from multiple manufacturers, the different performance, durability, and quality levels of these. In his shop he had relatively little stock, around ten to fifteen solar modules, from 10-Watts through to 120-Watts. He also had a number of good quality lanterns. His stock was priced above what could be found in local markets, but he was very dismissive of these cheaper options, which he variously spoke of as '*china wala*', '*local wala*' or '*sasta wala*'. He believed that his business would quickly fail if

he sold such products, as customers would return faulty goods and his reputation would be destroyed. Highlighting his view on the issue of quality, on his wall was a sticker stating 'Chinese items don't come with a warranty or a guarantee. Please don't waste your precious time or mine in arguing over this' (see Picture 13).

"Just sell good products. If you sell good products then you will automatically gain [people's] confidence" (*Acchaa saman beche to automatic aapko barosa mile*) I was told by Rajdev, after asking him what he did to make his business successful. Rajdev, who was running a TATA dealership on the outskirts of the town of Azamgargh, in the East of Uttar Pradesh, had been selling solar modules for a number of years when I met him in March 2014. Sitting within a shop packed with solar modules, wiring and parts, our discussion soon focused on how people brought solar modules from him because they trusted him and his products. He told me how his name (*nam*) was known in the area, and that people came to him when they needed something. The quote from Rajdev pinpoints a view held by most interviewees of the importance of trust and reputation. Building long relationships and a long-term presence in communities was seen as essential, and linked to the current and future success of the off-grid solar market in UP.



Picture 13: Sticker stating that: 'Chinese items don't come with a warranty or a guarantee. Please don't waste your precious time or mine in arguing over this'

The commercial market for off-grid solar power products is still new. Five years ago, only a few solar modules would have been present in a typical village in Uttar Pradesh. Several interviewees told me that until recent years people in villages had not had faith in solar power, and that many communities had developed a negative view of solar power technology on the basis of experiences where the government or NGOs had provided solar modules, but they had typically stopped working quickly, and could not be repaired. The need to build trust, and what was spoken of as a 'willingness to pay',

was singled out by interviewees who had been some of the early people to start solar shops and dealerships in Uttar Pradesh. For example, several TATA and Akshay shop interviewees had started their businesses between five to ten years ago, and they keenly spoke about how nobody had known about solar power then. Business had been slow, and they were only selling very small modules. Awareness and willingness to pay grew only after several years of going from village to village to educate people. Govind, a TATA Solar Power dealer in Sultanpur, put it as follows: "This business is based on trust and reputation (*Bahut izzat wala business hai*). Customers will remember. You can't sell bad ones. You have to have a good relationship and sell good quality. That is why I sell TATA products."

Ashok was interesting in that he spoke in broader terms of building the reputation of solar power within the state. In his early 20s, Ashok worked in his family's Akshay solar shop. They sold directly to customers, but also supplied other shops. He told me how they had worked hard to build trust in solar power. But he argued that other businesses and shops were abusing the trust that villagers now had, in selling cheap products. This threatened to damage the market for everyone in the coming years. Ashok's perspective was emphasised by other interviewees running more established businesses, who saw a threat to their own reputations in what other solar businesses were now doing. It highlighted clearly how interviewees in formal solar businesses saw that a new market was being developed, which depended upon selling good quality products and services, and having good long-term relationships with customers.

In interviews and when spending time in shops and dealerships, it was common for managers to talk about the growing market for 'Chinese' (*China wala*), 'local' (*local wala*) and 'cheap' (*sasta wala*) solar products. I was told demand for such products had

only begun to develop over the last three years, and that it was doing well because the products were so much cheaper than the better quality products that they were selling. When I challenged interviewees as to why they were not selling these products if they were so popular, I was told that it would damage their businesses to do so, as well as the longer-term development of the off-grid solar market. A small number of interviewees told me that they did not know of any informal shops selling solar products in their area.

An early exception in my fieldwork seemed to be Venkatesh, the manager of a TERI shop situated to the south of Lucknow. Before visiting his shop, I had been told by a local TERI manager that Venkatesh had sold cheaper, lower quality modules. However, while confirming that he had previously sold some *China wala* products, Venkatesh told me that their performance had been poor, and this had caused problems for him, with customers returning to complain about broken goods. He had decided after this to only sell good quality products.

During the course of my fieldwork, it did however become apparent that in a number of shops, where in early interviews I had been told about the importance of quality, that lower and medium quality solar modules, lanterns, and lights were being sold, usually alongside good quality ones. This was the case in several TERI shops. Once I had built good relationships with interviewees, and I questioned this, managers in three TERI shops told me that they felt some pressure from TERI to continue selling MNRE-approved products, but that they struggled to sell these in the face of tough competition from shops selling cheaper products. And whilst no one spoke to me in support of lower quality cheaper solar modules, they told me that in practice they had to offer these products alongside better ones. However, in doing so they reduced the distinction

between themselves and what was being sold within informal solar shops. This highlighted the fluidity of the market being developed.

A number of interviewees spoke about the developmental benefits that providing solar power to rural communities would achieve, and their role in doing this through building a new market. Cross and Street (2009) have written about how there is a social vision of capitalism evident in the literature on BoP capitalism, and within large companies entering BoP markets. In the focus on aspects of quality, of building the trust of communities in solar power technology, and being part of an industry that is bringing energy to rural populations, interviewees running formal solar shops and dealerships also held, and were putting into practice, a social vision of capitalism. Interviewees believed it to be necessary to 'do good' in order to 'do well'.

5.4: The Role of Training and Top-Down Business Ideas

Trainings were an important way in which a focus on quality was fostered, and at times enforced in formal businesses looked at in this study. As highlighted in Chapter Four, at a higher management level in off-grid solar power companies in India, the narrative of formal businesses selling good quality, but value-conscious products is strong. Managers working at TATA Solar Power, at Boond, and in TERI's Delhi headquarters saw it as very important that their businesses focused on quality, trust, and service. Through training events, these ideas were passed downwards.

At Boond, which directly hired its employees and exercised significant control over its branch offices, training was an important way in which a culture around quality was fostered by management. In late January 2014, a Boond training event for newly

recruited village-level agents, who are paid on a commission basis to find customers for Boond's SHSs, provided a striking insight into how this worked. The training session was a two-day program, which took place in the large concrete banquet hall of a wedding venue in the district of Unnao, Uttar Pradesh. Around thirty agents attended, alongside several Boond employees and Boond managers.

Two managers led the training, both of whom worked at the Karnataka-based off-grid solar company, SELCO, which had been providing support to Boond's management as the company established itself. A large part of the second day was given to training the agents about solar power technology, how it worked, and what products Boond was selling, with the aid of several PowerPoint presentations. Agents were taught how to distinguish the quality of different solar modules by looking at the materials they were made from. They were told how Watts and Volts are important for understanding performance. The SELCO speaker put it like this: 'You look at litres with milk, at kilograms with vegetables… panels are all about watts. Don't look at prices, look at capacity' (*Prices mat dekhna hai. Capacity kya hai?*), 'These people who are just talking about prices, they are wrong.' Cheap Chinese panels do not have the capacity that they advertise, we were told. At one stage we were all instructed to go outside by the SELCO trainer, into the weak January sun. Crowded around a large 110-Watt solar module, connected to a monitor, a demonstration was given by angling the module into the sun to show how the current reading on the meter would increase, and then shading it so that it went down. Making sure everyone had seen the numbers change and understood this, the instructor told everyone to 'Make sure you show this to customers. A solar module is like a car, if you don't have petrol going to a car it stops, and if you don't have the sun going to a solar panel it also stops'. 'Today we are learning' (*Aag*

ham sikh raha hai), he finished, before we went back inside. Picture 14 shows Boond agents being given a demonstration of how a solar module works.

Part of the day, however, was given over to providing the agents with a broader message about the social role of Boond. This was in the language of social capitalism at the BoP. After a buffet lunch, a video was shown, which spoke about the pioneering work that SELCO had been doing in Karnataka, and the benefits this was bringing to women, children, and workers in rural villages. Boond it was said was now doing the same for Uttar Pradesh. This was a motivational session, which gave a strong sense of social purpose and distinction to the business approach of Boond. The two trainers told the audience how their role was important. 'We are energy workers, therefore it is necessary that we have the knowledge... the information' (*Ham energy wala admi hai, isilie aise gyan… jankari zaruri hai')*. If they did good work the agents had the chance to better themselves, and to help their communities to get energy and lighting, the instructor continued. He then asked: 'Are you ready to work?'

The training session, one of several that Boond has run for new agents and employees, focused not only on the technical and sales details that employees would need, but also on fostering the idea that Boond was a modern company, doing development work. Before finishing, the potential agents were each presented with certificates confirming their status as 'energy agents'. A local journalist was present, and individual photos were taken of each certificate being presented. The atmosphere in the room was lively and animated. The feeling was that these were not just any agents, but agents of an important new company.



Picture 14: Boond training session, demonstration of how a solar module works

Training was important for the other groups of interviewees too. TATA Solar Power provided training to its agents. TERI regularly held training events, usually in Delhi, for its so-called 'energy entrepreneurs'. For example, Ashoka learnt about the quality of different products in the trainings that he was periodically invited to, being run by TERI. These were focused on educating 'energy entrepreneurs' about solar products, but were also used to facilitate opportunities for Ashoka and others to be introduced to manufacturers of the products that TERI had tested and approved. For example, in early 2014 having attended one such training, Ashoka had returned to his shop with a printout from a PowerPoint presentation. In this was information about batteries available on the market, and what performance, servicing, and warranties specifications it was important to think about in relation to them. Further, in all of the TERI shops there were posters

displayed prominently on walls talking about the proper way to use solar power products, reinforcing the idea of these shops as the site of expertise. Interviewees in Akshay shops told me that they did not attend external training events. However, they still held very similar views on the importance of selling good quality products to the other interviewee groups, showing that ideas about quality were not solely adopted through top-down training.

5.5: Selling 'Branded Products' ('Branded Wala')

By associating themselves with selling 'branded' goods, and cleverly using labelling, formal shops and dealerships were identifying themselves as the site of good quality products and services, and at the same time distinguishing themselves from informal shops. Much like with practices and claims around quality, this was a way in which formal solar businesses were developing the BoP solar market in a distinctive manner. The idea, that offering branded goods will allow formal businesses to grow BoP markets, is more widely taken up in the literature on BoP capitalism (Hart, 2005, Hystra Hybrid Strategies Consulting, 2013, London, 2008). Prahalad (2005) spoke about how low-income populations are brand-conscious, and will choose branded products when they are appropriately designed for the BoP market. The work of Mazzarella (2003) has highlighted the growing availability of branded goods in India following liberalisation, and the growing importance of brand identity, even within low-income rural areas. This research showed that 'brand' was crucial for formal solar shops and dealerships to successfully sell good quality products, and that it was key to their strategy to build the solar market.

Along highways and in dusty market towns, month by month while I was in Uttar Pradesh, the stickers and brand names on solar modules and accessories stacked in informal solar shops would change. In most informal shops it was common to see five or more different brands of modules being sold, and as many further brands of lanterns and lights. I was told how brands 'come and go' (*aate jaate*). While all solar modules in both informal and formal solar shops had brand labels attached, shopkeepers and customers considered cheaper ‘local’ modules in informal shops to be ‘unbranded’; and names on such products had no significance or association with quality or with a known company or origin. Such brands had an ephemeral and short-term presence. In contrast to this, the brands of higher quality products, mainly being sold in formal shops and dealerships, were consistent. In everyday discourse and discussion, such products were spoken of as ‘branded products’ (*branded wala*), and in most instances the brand would be associated with a particular company and origin. The most notable brands were TATA Solar Power and Luminous in Uttar Pradesh. Similarly, with lanterns, while D.Light and SunKing were spoken of as ‘branded’ products, and seen as good quality, the multitude of cheaper solar lanterns available in Uttar Pradesh were characterised as ‘unbranded’, even thought they would all be labelled with a brand of some sort.

By associating and defining their products as ‘branded’, formal shops and dealerships distinguished their products and businesses in terms of quality, reliability, longevity, and standardisation; and legitimised their charging of relatively higher prices compared to informal shops. The advantage of 'brand' was most notable for TATA Solar Power. During days when I was spending time in shops and dealerships, if a customer came to ask for a 'branded' solar module, the assumption was a high quality one, and TATA Solar Power was considered to be the best quality option in the vast majority of shops

and by most customers. People often entered shops asking for a 'TATA module' (*TATA wala*). While sometimes they specifically wanted a TATA module, more often they simply wanted a branded good quality one. Customers would generally be shown a TATA module first when asking for a '*branded wala*' or '*quality wala*'. In MNRE, TERI or independent shops, shopkeepers would have to work hard to convince customers that the products they were selling were of an equal quality. Within informal shops, fake TATA stickers were at times attached to cheaper modules, seeking to tap into this brand advantage. Picture 15 shows a selection of modules on display outside a formal solar shop, one of which has a fake TATA-BP label attached.



Picture 15: Example of a fake TATA Solar Power module. Module in the middle on the left hand side of the picture

When meeting with Manoj, who was a pioneer in building a market for SHSs in Uttar Pradesh, and had been selling TATA Solar Power products for 15 years, he repeatedly emphasised how the success of his dealership was dependent upon the advantage of branding and the reputation he had built up around TATA Solar Power products. For other TATA dealers too, brand was emphasised when selling to customers in villages, or when going into banks to set up bank financing arrangements for customers. On occasion in villages I would be told that a module must be good quality if it had been made by TATA.

The brand reputation of Boond was still in the process of being established, and what Boond was doing on this front was revealing. Rustam, the CEO of Boond, told me how they were actively seeking to establish a brand reputation, and that they wanted to be known locally within Uttar Pradesh as the company that offered a better service than their main competitors. He argued that if they could reach the stage where in villages people could see one or two good quality Boond systems, and if they are working well and delivering on their servicing promises, then those villagers would remember the Boond logo when going to buy a system themselves. Various top-down measures had been introduced to achieve this. When going into villages to give demonstrations, a small gazebo would be set up by Boond employees, with very prominent branding on display. Leaflets showing the SHSs being sold by Boond, along with pricing and with Boond branding would be handed out.

Building brand recognition takes time, and was being worked on in a number of cases. During one visit to a village together with a Boond village-based agent, I was told how a lack of brand identity associated with Boond was making selling SHSs difficult. ‘They don’t put labels on the modules’ Anurag told me while we were walking between

houses in the village. I asked him why this made them difficult to sell. His response was that there was nothing to distinguish them from unbranded, cheap modules. 'Boond panels are good quality. But TATA Solar Power have labels, and therefore people know that those panels are better quality'. In his experience, the premium prices that Boond charged for their products were not always understood in villages, and having a recognisable brand was a way of making people understand that these are better quality solar products. Several months later, when passing through Unnao District, where one of Boond's shops was located, I found that brand labels were now being attached to all Boond products being sold.

All of the TERI shops in Uttar Pradesh were heavily branded according to the colour scheme of the TERI's Lighting a Billion Lives (LaBL) program, and solar modules and lanterns were also in many instances similarly branded. Marketing material and leaflets in all TERI shops was branded. Picture 16 shows an example of a branded TERI shop. Towards the end of my fieldwork in Uttar Pradesh, several TATA dealers had also opened retail stores, which were heavily and consistently branded in TATA colours. Akshay solar shops were often branded, with many of the products being sold in Akshay shops labelled as 'Akshay' products, and as government-approved.



Picture 16: TERI shop branding

The advantage of brand was not always strong, and did not apply to all products. Rajdev, a neighbouring TATA dealer to Manoj, told me how while people trust and want to buy TATA Solar Power modules, he struggles to sell TATA branded batteries. While they are also considered to be good quality, he told me that people want to buy local and unbranded batteries, because they are so much cheaper. When I inquired about this elsewhere, I found that this was the case in most other formal solar shops and dealerships, although, because most customers were buying a packaged SHS, they were rarely given the option of buying a local or unbranded battery. The lack of significance attached to brand for associated products, such as batteries, showed the difficult at times for formal solar businesses trying to distinguish themselves, what they were selling.

5.6: Providers of Solar Home Systems and an Installation Service

In formal shops and dealerships, customers were required or encouraged to buy SHS packages, which would then nearly always be installed for them. It was very unusual for a customer to buy a stand-alone solar module, except in several TERI and Akshay shops. Through a focus on offering standardised SHSs to customers, which would then be correctly installed, the activity and approach of formal businesses was again developing the BoP solar market in a distinctive manner. Within the literature on off-grid solar power markets in India and beyond, the SHS is predominantly focused on. It is understood as the standardised product that can allow companies to profitably sell within BoP markets, while also delivering developmental benefits to low-income communities (Miller, 2009, Dhingra et al., 2008). This research showed that a focus on selling SHSs, and then installing them, was crucial for formal shops and dealerships.

A practical reason to focus on selling SHS packages was that the central government-run Jawaharlal Nehru National Solar Mission (JNNSM) subsidy was providing a capital subsidy for SHSs being sold, but not for individual solar modules. Under the JNNSM at the time of this research a subsidy of 40 per cent of the value of a SHS package was available, when a SHS was purchased through a loan from a rural development bank. The JNNSM subsidy was further only provided for SHSs that were MNRE-approved, which meant meeting various quality standards determined by the MNRE, and including Indian-origin components. The existence of the JNNSM subsidy provided a top-down institutional incentive for formal solar shops and dealerships to focus on selling good quality standardised SHSs.

In TATA dealerships and Boond shops, a small range of SHS packages made up the majority of sales, which were all MNRE-approved, and so could benefit from the

JNNSM subsidy. At the smallest end, for both groups of shops and dealerships, a fixed 40-Watt SHS package was sold, which included a 40-Watt module, a battery, several lights, a charge controller, and wiring. Various other packages included successively larger modules, batteries, more lights, and in some instances other accessories, such as fans. Individual solar modules were usually available for sale from TATA dealers and in TERI and Akshay shops, but the focus was nearly always on selling SHSs. Boond did not sell individual products to customers. Several interviewees believed that if they altered their approach to sell alternative products that did not qualify for the JNNSM a subsidy, then their sales would fall significantly.

I was told at Boond that selling SHSs was primarily a matter of profit margins. Rustam, the CEO of Boond, told me that they could not profitably sell stand-alone solar modules in shops, because the margins would be too low. They had to focus on selling packaged SHSs above a certain size in order to be profitable. When I enquired about this in other interviews, I was told that this was an important consideration. For example, on a 40-Watt solar module, which would sell for approximately 3,000-4,000 rupees [£30-40], there would only be a profit margin of several pounds.

The sale of SHSs could not solely be understood as a utilitarian move to access a subsidy. The JNNSM subsidy was relatively new, and many of the formal shops and dealerships at which I interviewed had been focusing on selling SHS since before the JNNSM had been launched, and had shaped their businesses around doing so. The higher margins on SHS that could be earned were important for shops and dealerships, but a focus on SHSs also highlighted the focus that shops and dealerships had to positioning themselves as providing households with reliable, comprehensive solar power solutions. Managers in shops and dealerships in interviews wanted to talk about

how it was important to properly design, put together, and install a full SHS solution for a household, that met their needs.

Day-to-day selling within formal shops and dealerships was focused on providing SHSs. Typically, when customers came into a shop, they would ask for a particular size solar module, or they would describe what ‘work’ they need to 'power', in terms of lights, a TV or other appliances. Shopkeepers would then take the approach of questioning customers about what their needs really were, before going through what several appropriate SHS options would be. Most interviewees believed that they could not be successful if they only provided an off-the-shelf product to a customer in a stand-alone transaction. In most of the TERI shops and around half of the Akshay shops, the JNNSM subsidy was not being offered with SHSs to customers, because the shops had not set up this facility or did not know how to. Not being able to offer a subsidy meant that they could not pass on a 40 per cent price reduction to their customers. However, in most of these shops there was still a focus on trying to sell SHSs to their customers.

In several TERI and Akshay shops, SHSs did not make up the majority of sales, showing some exceptions to the focus on SHSs found in this research. Instead, they were selling mostly individual solar modules and components; primarily, I was told, because competition from other informal shops selling stand-alone modules meant that they had to offer their customers these options too. However, a focus on the shops not always selling SHSs showed the significance of the SHS for formal solar businesses to successfully distinguish themselves from informal businesses, and the importance of the SHS to the distinctive way they were developing the BoP solar market. When selling individual solar modules, making the claim to be providing good quality products, an expert service, and to be selling reliable products becomes much more difficult to

maintain. The result was a blurring between these shops and informal shops, selling very similar products, but usually at lower prices. The margins on 'branded' modules were much lower than on 'unbranded' modules, and so shopkeepers struggled to be profitable with this approach. When selling stand-alone solar modules, businesses had to compete primarily on selling at the cheapest price. When simply competing on price formal businesses struggled to distinguish themselves from informal competitors. This highlighted at times a blurring between formal and informal solar businesses.

In all formal shops and dealerships an installation service was provided to customers who had brought a SHS. The installation of a SHS is not technically challenging, yet to provide this service, shops and dealership were incurring significant costs. For a typical installation, a solar technician would have to travel to the customer, in a vehicle large enough to transport the SHS, and safe enough for a fragile solar module. Often, a motorbike would not be adequate. Several trips might be required, with one trip used to scope out where a suitable installation point in a house would be and to deliver parts, and another visit to install the system. It would usually take several hours to wire and connect up a SHS, to install the mounts for the solar module(s), to place the module(s) at the correct orientation to the sun, and to install wiring and lights. This would all depend on the size of the system, and the level of installation service offered by the company. Once a system was installed, time would usually be spent teaching the customer how to properly use a system and how to protect it. It was particularly important to educate most customers on how to correctly charge and use batteries in the SHS set-up, as incorrect use can greatly reduce the life of a battery.

Much like with quality and brand, interviewees in formal shops and dealerships wanted to talk to me about the installation service that they were providing when I visited to

conduct interviews. It was an important way in which they were distinguishing their businesses, and differentiating themselves from informal shops. Providing an installation service was a further element highlighting the way that formal businesses were developing the BoP solar market in a distinctive manner. Every time I met with Raj, who was running one of Boond's Unnao shops, he was most keen to talk about the way Boond installed SHSs for their customers. When I was accompanying him on village trips he would always stop to show me examples of well-installed Boond systems inside houses. Wiring would be properly encased in protective piping, and attached neatly to walls. Lights were well positioned, and attractive bulky light switches were provided. SHSs were correctly wired, and customer had been informed about how to use and maintain them. Raj would favourably compare his work to that done by other companies, or by customers themselves. Similarly, early in 2014, when Raj, a TERI local entrepreneur, had several new micro-grid systems installed, he was quick to call me by phone, to invite me to visit and see his work. When I visited several days later, we spend several hours touring the village where the system had been installed. He was proud of the work he had done, introducing me to the households who were now benefiting from the system.

Making sure that a solar module is installed in a suitable location and that wiring and batteries are properly protected can have a big impact on the performance and durability of a SHS. The example of Boond was distinctive, in that their SHSs were all installed to a very high standard. A well-installed system justified the relatively higher cost, I was told. Rustam, the CEO of Boond, argued that there is a real benefit to being the person installing in villages, in terms of building good relationships: "I will control the installation. It is good for me because I also know that a product doesn't just sell in a

village. The relationship sells." Nearly all shops and dealerships placed a similar importance on installations, despite the costs often being high. For example, on two occasions I accompanied Rahul, a TATA dealer, as he went to villages to install SHSs. These trips involved him picking-up the components of the SHS from his office in Lucknow, in his 4X4 car, and together with his assistant driving for approximately 60 kilometres in both instances to the villages where an installation was happening. Together with an assistant, several hours were then spent installing the systems.

Several TERI shops did not focus heavily on their installation services. These were the same shops that were not likewise focused on selling SHSs, where there was a level of blurring and lack of distinction between their approach to business and that of other nearby informal solar shops. Again, when not focusing on providing an installation service, there become less that distinguished these shops from informal shops, other than the better-quality products that would usually be available, and the higher prices that were being charged.

In the context of the market for off-grid solar power products in Uttar Pradesh still being new, shopkeepers had to educate their customers about why their expertise and the provision of an installation services was important. For example, when spending time at Prem's TERI shop, the question of installation would often be part of discussions with customers and myself. Prem liked to talk about how many people installed their solar modules in bad places, with an incorrect orientation; how they did not have technical skills and did not listen to the advice he offered. When people came into the shop asking for long lengths of wiring, he would caution them that if they used wiring over a certain distance the performance of their solar module would be reduced. If a customer was buying a battery, he would question whether they knew which size

was right. He would speak about how in other shops they may sell cheaper modules, but that you did not get the advice and expertise he could offer, and that you would not receive an installation service. In formal shops and dealerships, interviewees regularly criticised the installation services provided by other businesses, and spoke about the pitfalls faced by people who ignored expert advice.

This focus in formal shops and dealerships on providing installed SHSs to their customers shows an approach to business that reflects the wider importance attached to the SHS in narratives about off-grid solar power market development in India, and in the Global South more broadly, that I outlined in Chapter Four. The provision of an installation service suggested a social vision of capitalism locally shaping business practices, much like the social vision of capitalism that many large formal businesses and MNCs working in BoP markets hold (Cross and Street, 2009).

5.7: Providing Warranties, Guarantees, and After-Sales Servicing

formal shops and dealerships were providing longer-term warranties for most solar modules, batteries, and for many lanterns being sold. They were then also providing after-sales servicing and support to their customers. This was an important element to the distinctive way in which they were developing the BoP solar market in Uttar Pradesh. The idea of providing good service to low-income consumers is a key focus in the literature on BoP capitalism; and in the literature on solar power markets in the Global South, there is a focus on service as being crucial for formal businesses to successfully sell into BoP markets (Miller, 2009, Prahalad, 2005, Wimmer, 2012). Empirical studies of the woodstove, solar, and microfinance markets, for example, have

looked at the importance new formal businesses are placing on servicing (for example, see Prahalad, 2012, Young, 2010b, Young, 2010a, Wimmer, 2012).

All solar modules I saw being sold in formal businesses came with a warranty for between fifteen and twenty-five years. Other components, such as batteries and charge controllers were supplied with shorter warranty periods, typically five years. The common claim was that authentic and trustable warranties were being provided. In sales talk, the promise of the warranty was called upon regularly, substantiating claims to quality, value, and to the long-term performance of the product a customer was buying. Paper warranties were used, on which the address and details of the customer would be added when a product was purchased. The business stamp of the shop or dealership would also be applied, giving it legitimacy and authenticity. In a smaller number of cases, a parallel entry to a computer would be made.

The provision of warranties and guarantees was not in itself exceptional in Uttar Pradesh. Warranties are usually standard in both formal and informal shops in Uttar Pradesh, but interviewees often made comparisons, both to me and in shops when talking with customers, between what they offered and what was given for cheap 'local' and 'Chinese' solar modules. These were said to come with no warranty, or to have warranties that were not reliable. Cheap local and Chinese products were said to be sold by dealers and companies who would stay in a community or region long enough to sell their product, but would not remain there for a customer to claim their warranty in the future. Such claims are difficult to substantiate, but were part of a strong local discourse that was differentiating formal solar businesses from informal ones. Given that the brand names on solar modules in informal shops changed month to month, the claim that after five years a warranty from such a company would be difficult to redeem

seems likely. For example, in one instance, I was with Salim, who sells some good quality modules, but also cheap, poor quality modules. Three farmers had been spending the last hour or so looking at various options in the shop, testing out how well they lit up the bulbs that an assistant was periodically connecting to different modules. In the end they had chosen a cheap 'unbranded' module, and having filled out an invoice, Salim stamped the warranty card. It had the brand logo in one corner, a series code, a date of manufacture, some further information, and an address. Salim waved the card at me, calling it a '*jugaad*' warranty, and telling me that it was probably not redeemable.

In all formal businesses a period of free servicing would be provided to customers; this was commonly for one to three years for SHSs, although this varied between businesses, with TATA Solar Power dealerships giving five years. After this period, customers could usually pay an annual service fee. This set-up was closely tied to SHSs, and it was unusual for free servicing packages to be provided for other purchases. In most cases problems would be responded to within several days, with the most common problems being with the performance of SHSs, batteries not charging, lights not working, and wiring failures.

The JNNSM subsidy provided an external inventive for after-sales servicing to be provided, like it incentivised the sale of SHSs, because a subsidy was only available for the sale of SHS where free after-sales servicing was included for a period of several years. A further external incentive came from banks. Many of the formal shops and dealerships included in this case study were selling SHSs to customers with loans from rural development banks, and these banks required that servicing agreements covered the period of payback on any loan given. I was told how managers in banks were

concerned that if solar modules stopped working and were not repaired, that customers would then stop repaying their loans, and so required that the full period of a loan repayment was covered within an after-sales servicing agreement.

But after-sales servicing was also a way for formal shops and dealerships to distinguish their position in the market to their customers, and was seen in terms of longer-term market building. Providing after-sales servicing was regularly contrasted to what informal shops were said to be providing. The example of Ajeet, who ran an Akshay shop, which had opened five years ago, was notable here. When first meeting with Ajeet, he told me that the first year he had opened the shop business had been difficult. "People thought that solar energy was a total failure, because solar panels were installed by the government but regular servicing was not provided, so they [solar modules] became obsolete." Ajeet told me that it took time to build trust in their products, and that the first year was difficult. When products needed repairing or replacing they would immediately do this, even if they were losing money as a result.

Boond shops were the most notable for their focus on developing a reputation that they provided quality products along with good after-sales servicing. Interviewees told me that if they become known in the districts where they are selling for high quality and quick servicing, then people would choose their relatively more expensive products over those of other businesses. Following a sale, Boond's employees would contact customers periodically to make sure that their SHSs were working well. Similarly, in Moradabad, a city in the north west of Uttar Pradesh, Satayam, a TATA Solar Power dealer, had a strong focus on after-sales servicing. He kept computer records of all his sales, and of people coming in for servicing, and which villages they were coming from. Using this information, he had two small trucks dedicated to going from village to

village, providing servicing for the SHSs he had sold. These tucks were decorated with branding and promotional messages. Satayam was running one of the biggest dealerships in Uttar Pradesh, and so his case is somewhat exceptional, with only a few other businesses able to operate at a similar scale.

Within formal shops and dealerships, customers were regularly provided with day-to-day expert after-sales servicing, and this provision was emphasised in discussions with existing and potential customers. Sitting in a cramped and dusty store, filled with multiple solar products, lights, wiring, and other parts, Ajeet would typically spend significant periods of time repairing products that customers brought into his shop. On one occasion I was particularly surprised when he spent more than one hour repairing a charge controller. Asking him why he did not charge the customer for this time-consuming job his response again was that his main motive was to provide immediate customer satisfaction, so that customers were pleased with him, and so that he would not lose out on future sales. Regularly, people would come into shops with products bought elsewhere, and still receive a maintenance service, again often free, with interviewees saying that such occasions provided opportunities for future sales and relationship-building. This often placed a burden on businesses, but all provided servicing, and often provided it cheaply or free of charge beyond the requirements of a warranty of service package.

In practice, servicing often involved responding as customers arrived at a business with a broken product, such as in Ajeet's shop. Usually shops were filled with components, spare parts, and a workstation at which to carry out repairs. But for bigger businesses, like Satayam's TATA dealership in Moradabad, servicing was a large-scale affair. When I arrived at Satayam's store on a hot summer May morning, the temperature was

already creeping into the high 30s, and yet outside his shop were around fifteen people, sitting in two rows of deckchairs facing each other, under a makeshift gazebo. Three people had large solar lanterns in their laps. One person had a hemp bag with a small 15-Watt solar module stuffed inside, a long wire messily wrapped around it. Satayam told me proudly that he ran a daily servicing set-up, much like a surgery. Anyone can come. Usually over a dozen people would be waiting to be served.

Boond employees in particular took pride in how they offered fast and comprehensive servicing. Raj put it like this: “What makes people have confidence in a company? That if there is a problem the company will straightaway come”. Continuing, he argued that local products did not give you this guarantee: “Where will you find such a mechanic [who quickly comes]? If parts go bad, where will you find them? For this reason, people will take company [branded] products. They have confidence in the company that if anything goes wrong, they will repair it. If there are any problems they will be fixed, if any parts are needed, then Boond will provide them.” The themes of speed, reliability, genuine parts, and authenticity in reference to servicing were ones I often heard in formal businesses.

In interviews, managers regularly contrasted their provision of after-sales servicing, and of warranties, to what was said to be a lack of service being provided in informal shops. Importantly, this emphasis on trust that many interviewees had was informed by their understandings that other companies had in the past failed because they did not provide good after-sales servicing, a situation which could also lead to a wider loss of faith in solar power among communities. As I outlined earlier in the thesis, this concern is common within management circles, and in wider narratives of off-grid solar power market development in India. I heard several stories from interviewees of how when

first starting operations, customers had been unwilling to pay for solar power because of past experiences where modules in their villages had never worked properly. In most cases these had apparently been government distributed solar modules. It is notable that very similar ideas about trust and confidence were circulating within formal solar shops and dealerships.

Providing a good after-sales service required a significant investment in capacity within local shops, particularly for larger businesses. The commitment that shops had to after-sales servicing was materially shaping how they developed. For single store businesses, like most of the TERI and Akshay shops, servicing was provided out of the shop of the entrepreneur. Often, additional employees, usually a young trainee worker, would do this work. For TATA Solar Power dealerships and Boond shops it was necessary to have a local network of employees in place. But workspaces or service teams within shops also reinforced appearances for any customers coming to a shop or interacting with a service team that a genuine and quality service would be received.

Not all formal solar shops and dealerships were providing a good after-sales service. When visiting shops and spending time in villages I often heard accusations that companies were not actually providing servicing. When I was accompanying interviewees to villages, people would often approach us, complaining about various problems with their SHSs. Several of the employees of businesses where I was interviewing, when trying to sell products to customers, spoke about the apparent failings of other competitor companies to provide adequate after-sales servicing. In particular, in several districts, TATA Solar Power dealers had suffered reputation damage as a result of apparently not providing servicing in practice. However, the truth of this is difficult to pinpoint, and when I spoke with those dealers against who such

accusations were made, I always heard strong defences of the after-sales servicing they offered. While knowing more about the actual quality of servicing being offered would require a new study, the importance of servicing was clearly demonstrated in the way that such accusations carried significant weight, and were a threat to the long-term reputation of formal shops and dealerships. If businesses did not provide good or timely servicing, or meet their warranty commitments, they risked being discredited. After-sales servicing was an important way in which formal solar businesses were developing the market in a distinct manner.

5.8: Financing Loans for Customers

Offering customers access to bank finance to buy SHSs, and claims around the advantages of this, was a final aspect that distinguished the approach of formal solar shops and dealerships, and was a final important way they were developing the BoP solar market in a distinctive manner familiar to the wider literature on BoP capitalism. Access to finance has been a key focus of the literature looking at BoP capitalism, with finance seen as key for new BoP markets to develop (Prahalad, 2012, Roy, 2010). Within the literature looking at off-grid solar power markets in the Global South, making financing available for customers has been seen as critical (Martinot et al., 2002, Miller and Hope, 2000). The evidence from Uttar Pradesh was that offering bank finance was important in practical terms for formal solar businesses to increase their sales. The ability to offer finance differentiated these businesses from informal ones. Not all formal shops and dealerships were, however, able to offer finance, and this highlighted the blurring of a distinctive difference between some formal and informal businesses.

In Boond shops, and in some Akshay shops and TATA dealerships, large hoardings advertised that loan financing from various rural development banks was available to buy SHSs. Posters in Boond shops stated 'banking facilities available' (*banking suvidhaa upalabdh*). In marketing leaflets being handed out by Boond and Akshay shops and by TATA dealerships, information on financing available from banks sat in a prominent position. Usually the name of a particular rural development bank, and their brand logo would be printed on leaflets. Being able to offer the option of bank finance to customers distinguished formal shops and dealerships. In Uttar Pradesh some rural development banks were providing their customers with special loans for the purchase of SHSs. The JNNSM subsidy was channelled through these banks, with the 40 per cent capital subsidy only available for SHSs brought with a loan through a bank. In practice, access to bank financing for customers, and the JNNSM as a result, was only available from formal solar shops and dealerships which had relationships with banks. Rural development banks were only offering loans for SHSs to be purchased when customers bought those SHSs from a limited number of formal shops and dealerships, and not when they were obtained from informal solar shops.

A small number of TATA dealerships were well-established businesses, where financing from banks had been available for a number of years, and was being given on a large scale. For these dealerships, finance was a key part of their business proposition. Manoj and Satyaveer, who ran the two biggest TATA dealerships, were amongst the most successful solar power dealers in Uttar Pradesh, and their businesses were examples of how well relationships with banks could work. They had both started their businesses over a decade ago. Based out of Lucknow, but operating in several districts, Manoj Gupta had a long-term relationship with the Gramin Bank of Aryavart (GBA).

Similarly, Satyaveer had a long-running relationship with Prathama Bank in Moradabad. Satyavar had sold over 100,000 SHS by 2014; of which 56,000 were financed by Prathama Bank. Over the last year alone 8,000 systems had been financed through the bank. Manoj had sold an equal number, but with an even greater percentage going through the bank. These two businesses were perhaps the best examples of formal solar businesses successfully selling good quality, branded, value-conscious, and serviced SHSs, with the option of finance. If all new solar businesses within Uttar Pradesh were developing like this, then it would be possible to speak of regularised BoP capitalism, as hypothesised in the literature on BoP capitalism, such as by Prahalad (2012).

In order to be able to offer financing to customers, solar shops and dealerships, or their parent business, first needed to sign a memorandum of understanding (MOU) with a regional development bank, or banks, to agree that the bank(s) would offer loans for the purchase of SHSs from their branches. Once an MOU was in place, they then needed to work with local bank branches, to ensure that loans were in practice sanctioned when customers wanted to buy a SHS. All of the TATA dealerships had such agreements, and were working with local bank branches to offer financing, as were the Boond branches and several of the Akshay shops.

TATA Solar Power dealerships had been particularly successful at building and maintaining strong relationships with local development banks, and this has clearly been critical to their ability to sell large numbers of SHSs in Uttar Pradesh. Each TATA Solar Power dealer was usually working in partnership with one rural development bank, selling solar power in the district(s) where that bank had branches. Some of these relationships were well over a decade long. In interviews in several TATA dealerships, I

was told how building and maintaining relationships with banks had been challenging. The banks they were working with were not simply offering loans on a standardised and regularised basis to customers, and dealers had to build individual relationships in each bank with which they wanted to work, something I will discuss in-length in Chapter Six. However, all had built relationships, and this was crucial to their business success.

At the time of this research, Boond were actively working to develop relationships with banks. Boond's management had signed an MOU with the GBA, and so the agreement was in place for Boond shops to start sending their customers to local bank branches to apply for loans to buy SHSs. Earlier in this chapter I spoke about a training session run by Boond management in late January 2014. As well as the training being organised to educate Boond agents about solar power technology and the work of Boond, it was also aimed at building the relationship that Boond employees and agents had with local bankers. During the first day of the training, Boond agents had been taught about how relationships with local rural development banks worked and how the JNNSM subsidy system worked. A culture of good relations with bankers was being developed, and the company was trying to standardise and regularise this; although it was struggling to do so, as I will look at in Chapter Six.

All of the TERI shops in which I was interviewing, and several of the Akshay shops, had not tried to develop relationships with local development banks, did not know how to, or were struggling to do so. Their failure to do so, and therefore their inability to offer customers the option of bank financing or the benefits of the JNNSM subsidy that came as a result, highlighted the fragility of seeing formal solar businesses as developing a distinct BoP market familiar to the wider literature on BoP capitalism. They were selling expensive, good quality, branded SHSs to their customers, offering

expertise in installation and after-sales servicing, but were not able to offer financing plans that practically made selling such products easier, but also distinguished themselves as providing formal financing, and as government approved.

Formal solar businesses were distinguishable on the basis of the amount of time interviewees were spending seeking to establish relationships in local bank branches. They all saw being able to offer financing as important. In interviews, when I asked about why the off-grid solar power market was not growing faster, or asked about what the challenges were, one of the most common answers was that sales were held back because of affordability. Anwer, a manager at the Gramin Bank of Aryavart (GBA), which provides special SHS loans to their customers, told me: "You see, people in rural (*grameen*) areas do not have the money at hand required to buy solar panels. They do not easily have 10 or 14 or 15 thousand to buy a solar system. For them it is a luxury." There was a strong understanding in shops and dealerships that it was important to develop options for customers to be able to finance the purchases of solar power products, and that this was necessary for wider market development to progress. When purchased through a bank, a SHS became significantly cheaper. For example, in 2013/2014 a typical 40-Watt SHS which retailed at 14,000 rupees [£140] could be purchased with a loan from a regional development bank and have a monthly repayment rate of as low as 250 rupees [£2.5]. Rates did vary between banks and according to customer circumstances. A two- to five-year loan repayment period was typical. Ashok told me how working through banks means more people can afford your products, and that it expands your market. "People can open a solar power shop and sell in the area surrounding it. But if you work through a bank then you can sell to a very big area. Your facilities will reach a lot of people."

It was often important in the context of everyday sales and conversations within formal shops and dealerships, and within villages, to be able to offer customers a loan facility from a local bank. Within many of the villages in which they were selling their products a lack of cash (*nugget*) was the ever-present issue in conversations around whether a customer would buy a solar product. In the case of formal businesses which could offer bank financing, customers would be told how they only needed to pay a small amount up-front, that they did not need to pay cash. Long discussion about the benefits and disadvantages of taking out a loan from a bank would be common in shops, and potential customers often know in detail how the loan process worked, and which of their neighbours had used such a facility.

The ability to offer a subsidy was often more important in everyday conversations, which was also dependent upon the solar business having an agreement with a bank. 'Of course the word subsidy is still a magic word in the local market when you talk to people about it', Shah Jaffa, TATA Solar Power's manager in Lucknow told me. For a large number of customers coming into the shops, or getting in contact with dealers, the subsidy is one of the first things they ask about. If a customer did not ask what subsidies were available, shopkeepers and dealers would usually be quick to inform them about the advantage of the subsidy. When going into villages and doing installations, where inquisitive neighbours would come to see what was happening, the subsidy was a central conversation point.

Being able to offer financing and a subsidy was an important way that formal shops were distinguished in practice from informal shops selling cheap 'local' or 'Chinese' products. No informal shops were able to offer formal financing from banks, or a subsidy. And while informal shops might in instances be selling similar products and be

able to source and put together a SHS comparable to that of a formal business, symbolically the differences were not only that formal shops claimed to be selling better quality products, but also that they had the possibility of relationships with banks, and access to government subsidies. Indeed, many of the formal solar business, which could claim authenticity and legitimacy from their links with banks and access to subsidies, emphasised these aspects in conversations with customers, often associating what they were doing with government work, and government approval. A large number of formal shops and dealerships were located close to local bank branches, from which financing was offered to customers. For informal solar shops selling better quality solar modules and SHSs, but unable to develop links with banks, and therefore to access the subsidy, business was difficult. As one shopkeeper in Azamgargh told me: "Sir, the subsidy that the bank is giving is so good that customers will not come to my shop. The day that the subsidy is stopped, on that day customers will come to me."

Being a shop or dealership that was the site of available finance and a potential subsidy was significant for formal businesses. With the success of several businesses in doing this, it was possible to see most clearly the market being developed in a distinctive manner. However, being able to sign an MOU with a bank, and develop the necessary banking relationships with local bankers was not an easy option for most formal solar businesses, highlighting the fragility of the distinctive way they were building the market.

5.9: Conclusion

Within the growing literature on BoP capitalism, it is theorised that where market liberalisation has taken place in the Global South, formal businesses are developing

BoP markets by profitably selling good quality but value-conscious products (Hammond et al., 2007, Hart, 2005, Prahalad, 2012). Cross and Street (2009) have spoken about how ideas about BoP capitalism where companies both 'do well' and 'do good' provide a powerful social vision of capitalism. The dominant narrative of the off-grid solar power market, in India, has been of a new BoP market being developed by formal businesses and social enterprises selling good quality SHSs (Martinot et al., 2002, Miller, 2009). Existing theory on new BoP markets, however, is largely based on ideas about the activity of MNCs or large companies, or is an elite normative narrative. There is a lack of empirical work that has focused on the practices of formal business, and on how their approach to developing BoP markets differs from that of informal businesses.

This chapter demonstrates that formal solar businesses, through their approach to business, were developing the BoP solar market in a distinctive manner, suggesting at the development of regularised BoP capitalism as imagined in the wider literature on BoP capitalism. In the formal shops and dealerships included in this research, there was a strong focus on selling good quality, standardised, authentic, value-conscious, and branded SHSs, which were then provided with an installation service, warranties, and after-sales service. Further, financing from banks was often made available to customers, to make SHSs affordable, which then also meant that SHSs were sold with a 40 per cent capital subsidy from the Indian Government. As a result of these practices the BoP solar market was being developing and constituting in a manner familiar to the wider literature on BoP capitalism. Further, in the practices and claims of managers within formal solar shops and dealerships, it was possible to see a social vision of capitalism, which was directing their approach to business.

Just as Roy (2012b) has highlighted how everyday practices and discourse amongst microfinance practitioners resulted in a microfinance BoP market coming into existence, which is framed in terms of BoP capitalism, so this research shows how the practices and claims of solar businesses was shaping a distinctive BoP market. Indeed, in formal shops and dealerships there was regularly a wider collective consciousness about developing a market. A strong narrative existed that a long-term sustainable market could only be developed by selling high quality products, and by providing a good service. Influence from management and from training was clearly informing this. But ideas about quality, value, brand and servicing were also being produced and reproduced within businesses. Crucially, the activity of formal solar shops and dealerships was distinct from that of informal solar shops.

The focus of formal solar shops and dealerships on quality, value, authenticity, brand, the SHSs, service, warranties, and finance, from the perspective of the sociological literature on market making, suggests formal businesses actively making markets. Interestingly, some of the practices and claims adopted by formal businesses were top-down, arguably showing the agency of outside theory and devices on market making. Seemingly mundane practices, such as providing formal warranties, a standardised SHS, or claims around the authenticity of products, were crucial to the markets that formal solar shops and dealerships were developing.

Objective claims could often be made by formal shops and dealerships against informal businesses to be selling better quality products, to be providing a good service, or that warranties were authentic. But claims around reliability, performance, longevity, brand, origin, authenticity, expertise, and standardisation were often symbolic. Formal shops

and dealerships were not always in practice selling different products from informal solar shops, but they still claimed to be distinct.

Practice and claims around quality, value, brand, the SHS, installation, service, warranties, finance, and the subsidy were all inter-twined in various ways. In order to be able to sell good quality but more expensive products, companies needed to convince customers that their service was better than that provided by local competitors, and often needed to be offering bank financing to make their proposition cost-effective. If offering after-sales servicing, businesses needed to be selling good quality products that are correctly installed, so that the SHS will actually last as long as the servicing agreement. To be able to reach agreements with banks to offer financing for SHSs, or to be able to access the central government subsidy, SHSs had to be installed, serviced, and come with comprehensive warranties.

While in formal shops and dealerships distinctions were being made with local informal shops, there was not a simple binary in terms of the practices and claims of 'formal' and 'informal' solar shops and dealerships. There was a blurring between the two analytical groups of businesses. Not all formal shops and dealerships were selling only good quality and branded products, and some were not providing a good installation and after-sales service. Further, some were unable to offer consumer financing. In many businesses, finance was the best example of this, where business was made challenging by the inability to offer customers the facility of a loan through a bank to buy a SHS, and the discount of a subsidy. The efforts of formal shops and dealerships to distinguish themselves from informal shops, and their struggles to do so, highlighted how the direction of the development of the BoP solar market was still fluid.

The BoP narrative of formal businesses tapping into a vast 'latent consumer demand' (Prahalad, 2005) for goods and services, through selling high quality products, and making a profit while doing so, was not easy to achieve in practice in the case of the off-grid solar power market in Uttar Pradesh. In Chapter Five, I move on to look at how, while a new group of formal businesses have started in recent years, they were not developing only according to market rationalities. The state, and state patronage, brokerage, and corruption were important for their growth. This moves this thesis on from an account of a regime of pure neoliberal capitalism being extended to the BoP, as is imagined in much of the existing literature on BoP capitalism.

Chapter 6: Formal Business at the Bottom of the Pyramid, Shaped and Supported by State Patronage, Brokerage, and Extra-Legal Payments

6.1: Introduction

In this chapter I explore how formal solar shops and dealerships, growing the Bottom of the Pyramid (BoP) solar market in Uttar Pradesh, were winning sales and expanding by tapping into state and non-state resources and programs, and through brokering relationships with public development banks. I look at how, within a nascent commercial market, the success of formal solar businesses was closely linked to their ability to access patronage opportunities, to successfully broker non-market informal arrangements and, at times, was linked to making extra-legal payments.

The literature on BoP capitalism, primarily from business, economic, and development scholars, has predominantly presented a free market neoliberal perspective of the success of formal businesses within new BoP markets in the Global South. Companies selling good quality, but value-conscious products are said to be extending BoP capitalism, while the state stands back to the position of market regulator and neutral supporter (Hammond et al., 2007, Hart, 2005, Prahalad, 2005). Elyachar (2012) reports on how the state has been framed as a market facilitator, that should ensure good governance from a distance. It is argued that state patronage, brokerage, and corruption do not have a role within well-functioning BoP markets, and that formal businesses not involved in these practices can out-compete informal businesses which are engaged in them (De Soto, 2000, Prahalad, 2012). This frames BoP business and markets as developing to be much the same as business and markets further up a notional global pyramid of capitalism.

This literature has been important in drawing attention to the proliferation of formal businesses entering BoP markets. In Chapter Five, I showed how formal solar shops and dealerships have been developing the BoP capitalism in a manner that reflects the wider literature's theorising of BoP capitalism. A social sciences and geographical perspective, however, focuses on how markets are created, shaped, and governed by institutions and actors within the social, cultural, and political contexts of different political economies (Harvey, 2005, Peck and Tickell, 2002, Peck and Theodore, 2007, Prasad, 2006). Textbook neoliberal capitalism, as theorised by economists (Hall and Soskice, 2001), cannot be expected to be developing in all places around the world.

Looking at India, capitalism is shaped by the role that state institutions and actors play, and by state patronage, brokerage, and corruption. Harriss-White (2003) has shown how, following economic liberalisation, the state in India has not been less involved in markets; rather, the way in which state actors and institutions involve themselves has altered. Gupta (1995) has highlighted how the Indian state cannot be seen as a unitary entity which acts uniformly. Rather, he shows how the apparatus of the state and state actors can be seen to operate at different scales, on different issues, and with different aims. While a neoliberalisation of the state has, in some instances, led to a government in retreat, this is not always the case. Further, research shows how state patronage continues to shape the state, markets, and society within India, even as liberalisation has progressed (Khan, 2005, O'Reilly, 2010). Similarly, while economic liberalisation has led to the emergence of new formal busineses and regularised markets, brokerage has been shown to continue to be important in such markets (Simon, 2009, Sud, 2014a), as has extra-legal activity (Gupta, 2012, Harriss-White, 1996, Jeffrey, 2002). Markets and

business are further structured by social inequalities, in particular by caste (Harriss-White, 2003, Jaffrelot, 2003, Jeffrey, 2002).

Some existing research from social scientists has shown how the state is involved beyond a regulatory role in markets catering to low-income Indians. Kuriyan et al. (2008) and Kuriyan and Ray (2009) show the state shaping new BoP IT markets. The role of the state in supporting new microfinance markets is outlined by Young (2010b). Simon's (2010) work highlights how businesses in the BoP cookstove market in Maharashtra tap into state patronage within a post-liberalisation context. Simon (2009) has also outlined how brokerage shapes this market. O'Reilly's (2014) work on a private water delivery project in Rajasthan shows how patronage and dependency had developed in the delivery of private water services to communities. In the literature on the developing off-grid solar power market in India, a focus on formal businesses and on technology and business models has dominated (Martinot et al., 2002, Miller, 2009). Attention has not been paid to the role of state patronage, beyond technical discussions of subsidies, nor to patronage, brokerage, and corruption.

In this chapter, based on empirical evidence from the off-grid solar power market in Uttar Pradesh, I challenge the central idea in the existing literature on BoP capitalism that formal BoP businesses in the Global South can be expected to develop and thrive independently of state support, and according to free market principles. I show how formal solar businesses are heavily dependent upon state patronage, informal brokerage, and extra-legal payments to sustain and facilitate their growth. I start by looking at how the state has been shaping and supporting formal solar shops and dealerships. I explore how the Jawaharlal Nehru National Solar Mission (JNNSM) subsidy has acted as an important, but selective, source of state patronage within a liberalised market,

influencing what formal businesses sell and how they develop. Taking forward the argument of Simon (2009), I make the case that, following liberalisation, the state in India can be seen to be selectively supporting formal businesses and regularised market development, but in a limited manner, and through short-term, regularly changing, and uncertain interventions. Opportunities to access state resources have opened and closed periodically in the case of the off-grid solar power market.

I then turn to look at how forming relationships with state development banks was crucial to the success of formal solar shops and dealerships, exploring how such relationships were built through informal brokerage, and were, at times, lubricated by commission payments. In theorising practices of brokerage, I build on the work of Simon (2009), arguing that brokerage and mediation is important within a liberalised market context for businessmen and employees in formal solar shops and dealerships, employed to access the benefits of relationships with banks, as well as latent state and non-state resources. Many formal businesses have been unsuccessful in accessing the JNNSM subsidy and in brokering relationships with banks. I identify how, as a result, their businesses have struggled. This complicates the story of the formal businesses and BoP capitalism as outlined in Chapter Four.

This chapter is based on interviews and time spent in four groups of formal solar shops and dealerships. Firstly, in TATA Solar Power dealerships (TATA dealerships); secondly in TERI shops; thirdly in Boond shops; and fourthly in Akshay Urjaa shops (Akshay Shops). It also draws from interviews in a number of informal shops, as well as with bankers in local development banks in Uttar Pradesh.

6.2: State Subsidising and Shaping of Formal Businesses

Several months into my fieldwork, having completed initial interviewing, I was spending much of my time shadowing interviewees and hanging-out in formal shops and dealerships. Doing this, it became apparent through time that, for most of these businesses, growing beyond a base level had been dependent upon accessing state and non-state subsidies and funding opportunities. Those businesses that were not doing so were all selling lower numbers of goods, and were struggling to make a profit. The main subsidy that they could try to tap into at the time of this research[1] was the central government-run JNNSM subsidy. Access to this subsidy allowed many of the formal businesses at which I was interviewing to profitably sell large numbers of good quality, branded solar home systems (SHSs).

This situation showed how, in a liberalised market context, the state was shaping and supporting market development, as scholars like Harriss-White (2003) have argued was to be expected, and as has been shown elsewhere, such as in the cases of the commercial cookstove market in Maharashtra (Simon, 2009), the microfinance market in Andhra Pradesh (Young, 2010a), and with new IT businesses in South India (Kuriyan and Ray, 2009). My results further showed state involvement and support that was non-uniform and partial, only available to some formal businesses, creating an uncertain context of dependency between formal businesses and the state. In a liberalised market, latent state resources (Simon, 2009) operated as patronage to businesses that could access such resources, and their business practices.

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[1] The JNNSM subsidy was suspended in 2015. No equivalent central government subsidy had replaced it as of April 2016.

The JNNSM subsidy is a central state initiated and run program that was set up in 2010 to support the development of a commercial market for solar power (MNRE, 2010). It was run from within the MNRE (Ministry of New and Renewable Energy), which is the central government department with authority over India's solar power market development (Harriss-White et al., 2009). Through this program, a 40 per cent capital subsidy was available for customers purchasing a SHS from an approved solar supplier. The subsidy money was channelled from NABARD (National Bank for Agriculture and Rural Development) through rural development banks to the customer, who could only receive the subsidy as a discount on a bank loan used to buy a SHS. Rural development banks which provide SHS loans had to submit the necessary paperwork to NABARD, which reimbursed them the due subsidy amount. Manufacturers and businesses had to apply to the MNRE to gain approval for the SHSs they were selling, and had to be listed as approved suppliers if they wanted their customers to be able to access the subsidy. All shops and dealerships also had to be accepted as approved suppliers by the MNRE, and needed to be accredited by NABARD.

The JNNSM subsidy was not directly handled by solar businesses, but if they were an approved supplier, they could offer a 40 per cent discount on SHSs to customers who brought a SHS by taking out a loan from a development bank. The formal solar businesses at which I conducted interviews fell into several distinct analytical groups in terms of their involvement with the JNNSM subsidy. All of the TATA dealerships and Boond shops were able to offer it to their customers. Higher-level company management had secured their supplier status, and only supplied approved SHSs to them. Some Akshay shops were also approved suppliers, but this was the case on an *ad*

hoc basis, depending on whether shops had individually managed to gain approved supplier status. TERI shops and some Akshay shops were not offering the subsidy.

For those businesses that were able to sell SHSs with the additional offer of a 40 per cent capital subsidy, there were significant business benefits. The JNNSM subsidy supported the sale of standardised SHSs to numerous villagers at significantly cheaper prices. For example, at the time of this research in 2013/14, the MNRE benchmark price for a 40-Watt SHS was 14,000 rupees [£140], and the cost to the customer after the subsidy had been applied was typically 10,000 rupees [£100]. TATA dealerships and Boond shops were two notable examples where many sales were gained on the basis of being able to offer the subsidy. TATA dealers had together sold hundreds of thousands of systems. Interviewees in TERI shops and Akshay shops, who were trying to sell good quality products, were at a disadvantage to businesses that were able to offer a subsidy. Rustam, the CEO at Boond, put it like this: "Because see you get a 40% advantage over the next guy. So for example if I have a 40% advantage I can go into Vijay's[2] villages and sell the same products and kill his model instantly... So people are going to jump with joy."

In existing literature to look at the JNNSM subsidy, the program has been characterised as being poorly designed and as having had a destabilising and damaging effect on solar market development, due to its inflexibility and uncertainty. Deshmukh et al. (2010) and Harriss-White et al. (2009) talk of the institutional context for solar power in India

[2] Name changed for anonymity.

holding back market development. The JNNSM subsidy was designed to only benefit formal businesses, selling good quality, standardised SHS. While the subsidy was benefiting only slightly over half of formal businesses looked at in this research, because it was difficult for them to access it, the findings of this research show that in practice, the subsidy was providing crucial support to the solar businesses who could access it. Being able to access the JNNSM, as well as other government and non-state resources and programs, was helping formal shops and dealerships to increase sales and to sell solar products profitably.

The fact that only around half of the formal shops and dealerships looked at in this research were accessing the benefits of the JNNSM subsidy could, in some instances, be seen to reflect the 'systematically arbitrary' nature of many government programs in India (Gupta, 2012), where a systematic lack of organisation and poor information mean that the benefits of state resources are not evenly distributed. But the uneven ability of formal businesses to access the JNNSM subsidy more tellingly mirrored research on how access to state resources in India is often tied to brokerage, as well as to institutional knowledge and ties (Jeffrey, 2002, Simon, 2009).

6.3: Selective State Patronage

The manner in which the JNNSM subsidy operated meant that it was in practice a selective source of patronage, with only some formal solar shops and dealerships able to access it. In nearly all shops and dealerships, a context of uncertainty surrounded 'approved supplier' status. Several TATA dealers had been involved in the process of becoming approved suppliers, knew the subsidy set-up well, and understood how the MNRE and NABARD worked. But most others did not. In Boond shops, it was only

managers in Delhi who were involved in this process. Interviewees in Akshay shops that were offering the JNNSM subsidy to their customers could tell me little on the specific details of being an approved supplier, and how they had gained this status, or what they had to do in order to maintain it. In most cases, they connected their status with having been supported under the MNRE Akshay Urjaa Scheme, which is now no longer running. When I raised the topic in shops where the subsidy was not being offered, interviewees in all cases knew that a government (*sarkarii*) subsidy existed, and that it was only available through rural development banks. However, interviewees knew little about the institutional structure and details of the subsidy, or how they might access it, even though many wanted to be able to offer the subsidy to their customers. The view of one TERI interviewee reflected this situation: 'This is a very interior area, there is not the information *(jankari nahi hai)*. [We] don't know about the subsidy'. Institutional complexity and uncertainty meant that knowledge of the state and its institutions, as well as knowledge of which products the government had approved was necessary for businesses which wanted to take advantage of the subsidy.

In practice, informal relationships had been important for several interviewees to achieve supplier status for their businesses, reflecting the findings of other research that state programs are often informal in their implementation (Harriss-White, 2003). I gained some insight into the process of becoming a registered supplier from Manoj Gupta. He was already running a TATA dealership, but was looking to start a new, independent retail based solar company, separate from his existing business. Despite having over a decade of experience as a successful solar dealer, he told me how becoming MNRE-approved and NABARD accredited would still be a lengthy process with an uncertain outcome. In particular, he was required to have his business accounts

set up in a particular way, and he had been making multiple trips over the last months to his local bank branch, requesting that the bank managers there compose various letters to the MNRE and to NABARD to show his correct status. While the rules of approval were formalised, in practice there was little clarity among interviewees on how approval was granted, or how long it would take. Manoj was calling on favours and ties within banks and beyond to help his application. This was not a process formal solar businesses could easily navigate, and accreditation was not open to informal shops. Much like Simon (2009) found in the case of the commercial cookstove market in Maharashtra, accessing state resources in the case of the off-grid solar power market required careful and nuanced knowledge of state actors and institutions.

When starting this research project, I had been expecting to find that subsidies would be supporting the sales of most solar businesses. I was surprised by how difficult it was for individual solar businesses to access the JNNSM subsidy for their customers, and the way that particular mandatory standards and requirements acted as barriers to uniform access. Effectively, the institutional set-up was such that independent formal solar businesses were unlikely to have the capacity or knowledge to access the solar subisdy, even if they were meeting all MNRE requirements. The JNNSM subsidy, which was designed to support market development in general, was in practice operating as a selective state patronage mechanism (Khan, 2005), only supporting formal solar businesses that knew the system and had a 'feel for the game' (Jeffrey and Young, 2014:188) or had a larger organisational capacity.

6.4: The State Shaping BoP Capitalism

The Government of India was shaping the development of formal solar businesses in Uttar Pradesh, and hence the BoP solar market, because the JNNSM subsidy included strict specifications detailing the SHSs which qualified for it, and the after-sales service that had to be provided with them. It was possible to see how, in formal shops and dealerships, the requirements of the JNNSM subsidy rules were influencing the products being stocked, their quality levels and origins, the configurations of SHSs being sold, and the commitments that shopkeepers made with regard to after-sales service. Formal solar shops and dealerships that were selling good quality products, and providing good after-sales service to customers, were becoming dependent upon state support for their growth and continued sales.

Gupta (1995) argued that the state is materialised in everyday moments, in interactions between villagers and state agents and institutions. While customers going into formal solar shops and dealerships were not interacting with a state body, they were encountering a configuration of products that reflected the influence and intentions of state actors and institutions, such as the MNRE. It was possible therefore, to speak of the involvement of the state in the BoP solar market beyond a regulatory role, and beyond the neutral granting of a subsidy.

To be MNRE-approved for a subsidy, SHSs had to meet a long list of quality standards, size and power specifications, and had to include components sourced from within India. Different sized SHSs had benchmark prices set, the intention being that these would reflect the cost of the system, including the cost of after-sales servicing and warranties. Sometimes these standards were complementary to the existing approach of formal shops and dealerships, which had been selling good quality, branded SHSs

together with after-sales servicing agreements since before the JNNSM subsidy was set up. But they were often problematic in purely economic and technical terms, and moved the developing solar market away from one based solely on free market dynamics. The MNRE requirement that various components in a SHSs package must be made in India de-incentivised businesses from importing alternative cheaper or better components. Similarly, a rule that CFL lights be used for SHSs was leading to shops not selling LED-based SHS, which are more efficient and cost less. In TERI shops and Akshay shops, many of the MNRE-approved products on shelves were relatively out-of-date and expensive. Newer technology was also not being introduced into TATA dealerships and Boond shops, because it would not meet government criteria. The subsidy set-up was also prescriptive in only being available for the purchase of full SHSs, in a set configuration, not allowing customers the option of a subsidised stand-alone solar module, or some other non-standard combination. Formal solar businesses were often only selling government-set configurations of SHSs.

While interviewees spoke strongly in favour of selling high quality and serviced products, it was clear that particular government determined imaginaries, not necessarily linked to market demands and products that could be sourced, were influencing this focus. The strong incentive was to sell products that qualified for a 40 per cent subsidy, even though such products were often more expensive than similar solar products which did not get any subsidy, or deployed out-dated technology. There was also little impetus for shops and dealerships, or manufacturers at a higher level, to innovate on cost, or to experiment around the MNRE established configurations for SHSs.

TERI and Akshay shops that were not able to access the JNNSM subsidy for their customers were usually still selling MNRE-approved products. When engaging with customers, shopkeepers in these businesses would often speak about how their goods were government-approved. In Akshay shops in particular, interviewees were keen to associate themselves as the suppliers of MNRE, government (*sarkarii*) approved products.

Through the working of programs like the JNNSM subsidy, the state was shaping BoP capitalism in Uttar Pradesh. While the state usually does not directly operate within the solar power market, it is engaging, intervening, and shaping formal businesses, while not supporting informal businesses. This shows the importance of not seeing the state as a unitary entity (Gupta, 1995), which simply retrenches with liberalisation, nor seeing it as a neutral regulator. New forms of state involvement in markets can be expected, and need to be theorised as crucial for shaping the development of BoP capitalism.

Further, the result of formal solar businesses shaping the products and services that they offered according to MNRE requirements was that they were becoming dependent upon the continued state support for sales. Simon (2009) has spoken about the importance of latent state resources for the nascent commercial cookstove market in Maharashtra, which is insightful in highlighting the role of the state in financially providing resources in liberalised markets. This research shows a similar context in terms of a vital role being played by state resources. But it also highlights how such assistance is potentially supporting the growth of uncertain and unstable BoP markets, because if such support is removed, formal solar businesses will likely be left selling products that the state has mandated should be sold, but which might not be able to be commercially sold in a market without subsidies.

6.5: Uncertain and Unpredictable State Support

State patronage in the form of the JNNSM subsidy was extremely uncertain. New forms of state patronage within the liberalised Indian context have been looked at by researchers, such as Simon (2009), Young (2010a), and Kuriyan and Ray (2009). Yet the uncertainty and short-term nature of new forms of state patronage, and the implications of this for businesses and for the fragility and fluidity of BoP capitalism, is not focused on. In the context of formal solar businesses having become dependent upon accessing the JNNSM subsidy for their sales, the uncertainty of this subsidy program was particularly notable. The resulting fragility and fluidity of the BoP solar market in Uttar Pradesh became visible in early 2014, in an episodic manner, when JNNSM subsidy payments suddenly became unpredictable (Barnes, 2014).

The experience of Kuldeep, a TATA Solar Power dealer, highlights this. Kuldeep sold good quality SHSs from his dealership in Reibareilly district. His customers accessed the JNNSM subsidy when they bought a SHS by way of a loan from the Baroda Uttar Pradesh Gramin Bank, with which Kuldeep had signed a Memorandum of Understanding (MOU). In my first meetings with him I had learnt that he was running a relatively small dealership, and that the vast majority of his sales in the last two years had been to customers who purchased a SHS with a loan, accessing the JNNSM subsidy. Except for complaining that the subsidy was at times unreliable, Kuldeep had been upbeat about his business. One morning in early April, however, his sense of optimism had changed dramatically. Sitting in his Mahindra Scorpio SUV, travelling south from Lucknow, with the AC turned up high, and yet still noisily failing to keep out the heat of an unusually hot April day, he was for the first time noticeably downbeat about business. For the last few months NABARD had not been paying subsidy money

to the Baroda Bank, and as a result, while some bank branches still had a number of loans they were willing to sanction, most branches in Reibareilly district were no longer offering loans for SHSs. How had this affected Kuldeep's business I asked? 'It has gone completely cold' *(Bilkul thanda ho gya)* was his response. 'Nobody wants to buy when there is no subsidy.'

On that day, I was accompanying Kuldeep to a village where he was installing a SHS, and to a local bank branch. At the bank branch Kuldeep was finalising the paper work for five large 220-Watt SHSs that the bank had approved loans for. Interestingly, the sale was being officially recorded as being for smaller panels, because the JNNSM subsidy could not be accessed for SHSs using 220-Watt panels. Here the loss of the subsidy was already having an effect. Despite the bank branch managers speaking positively to me about solar power, they told me that they had stopped receiving subsidy payments from NABARD, and so would stop approving loans for SHSs. During this conversation the branch manager turned to ask Kuldeep what the latest situation was. 'The subsidy is very difficult. What can we people do. It will be difficult until May', replied Kuldeep. The national general election was to take place in May, and Kuldeep believed that the subsidy would return to its former availability soon after this. After leaving the bank, he told me how he had 25 people living in this area covered by that bank branch who were ready to buy SHSs, but there were only five loans that could currently be approved. With the same situation across close to 100 bank branches where Kuldeep had customers, it was clear how beneficial the subsidy system could be, and how problematic its unreliability was.

While the JNNSM subsidy had allowed Kuldeep and others to profitably sell large numbers of SHSs, when it suddenly stopped, these businesses found that their sales fell.

In the first quarter of 2014, I was increasingly hearing in interviews how banks were suddenly unwilling to provide loans for SHS purchases, because they were unsure whether they would receive any subsidy money from NABARD, and customers were reluctant to pay for full-priced SHS without a subsidy. No one knew why the subsidy was not coming in, although most people believed that it would be started following the 2015 national elections, which were upcoming. When the subsidy was suspended, businesses were finding that they had unsustainably high business costs. For example, during the day on which I was with Kuldeep, we travelled approximately 200 km, in a fuel-hungry SUV. Such trips to install SHSs cannot be avoided, and visiting banks to fill out paperwork and maintain relationships was also essential for formal solar shops and dealerships.

With such complexity and uncertainty, formal solar businesses might have been expected to withdraw from taking the JNNSM subsidy. Some interviewees I spoke with were not accessing state level schemes or tenders for example, because of the perceived complexity and corruption of these. However, I was told that prices were too high to continue selling good quality, branded SHSs without the JNNSM subsidy, especially when cheaper alternatives could be purchased from informal solar shops. I heard how the poorest rural households did not have the cash available to buy a SHS without a loan, and that for richer households, SHSs were a luxury purchase. Without the subsidy, it was believed that such customers would turn to alternative sources of energy, such as generators. Further, with villagers widely aware about subsidies coming and going, interviewees repeatedly told me how people now only buy a SHS when they know that a subsidy is available. In TERI shops, where the subsidy was generally not being

offered, sales were much lower. The shops and dealerships that were most profitable were those that could tap into external resources and patronage.

6.6: A Key Role for State and Non-State Subsidies and Patronage

The importance of the JNNSM subsidy for formal shops and dealerships shows how, in the case of the off-grid solar market in Uttar Pradesh, formal businesses were not thriving according to market rationalities, with the state simply regulating. Formal businesses could develop without state involvement, and some of the formal shops and dealerships studied in this thesis were not accessing the JNNSM subsidy. The sale of high quality, serviced, and financed SHSs cannot solely be explained as a result of the JNNSM subsidy. However, state institutional involvement was usually essential for formal businesses to expand their sales beyond a low level, and to be profitable. Good quality and value-conscious products do not alone explain the success of formal solar solar shops and dealerships. However, the importance of state resources in Uttar Pradesh for businesses looked at in this research shows that formal solar business in BoP markets seems to be benefiting from, and in instances dependent upon, new configurations of state patronage, much like has been found in other work on liberalised markets catering to low-income Indians (Kuriyan et al., 2008, Kuriyan and Ray, 2009, Simon, 2009, Young, 2010a). The JNNSM subsidy was supporting pioneering formal companies, who have been opening up new markets for solar power products. Importantly however, in practice this state involvement worked as a selective state patronage, with formal businesses dependent upon subsidies in their current configurations. Bigger businesses and some shops and dealerships which had the capacity to meet MNRE requirements, and could form relationships with banks,

accessed the JNNSM subsidy to increase their sales. Smaller formal businesses and single shops usually found it difficult to do this. Informal solar shops were excluded from accessing state resources altogether.

This research focused on the JNNSM subsidy, which was the most important day-to-day source of resources for formal solar businesses at the time of this research. Yet, other government and non-state programs to support rural development and off-grid solar technology diffusion were similarly shaping what formal shops and dealerships were selling and doing, and were sources of resources and patronage. State level programs for the installation of solar powered streetlights in rural areas provided a source of tenders for many, in particular for Akshay shops. Rural electrification programs similarly provided valuable patronage opportunities for formal solar businesses able to successfully engage state institutions and actors in order to secure contracts. TERI shops regularly benefited from profitable tenders to install solar systems, secured and passed down from TERI's Delhi headquarters.

6.7: Working with Rural Development Banks to Grow the BoP Solar Market

If formal solar shops and dealerships wanted their customers to have access to bank financing for the purchase of a SHS, and to be able to get the JNNSM subsidy, then they had to be able to reach agreements and to develop working relationships with local development banks. This research showed that in Uttar Pradesh formal solar businesses were highly dependent upon developing and maintaining such relationships.

The extensive network of rural development banks in Uttar Pradesh means that there are numerous banks operating who could provide loans for SHS purchases in a regularised

manner. At the time of this research, a formalised institutional framework was in place for rural development banks to claim the JNNSM subsidy available for SHSs (Deshmukh et al., 2011). Indeed, India's rural development banks have various regulatory obligations for social lending to low-income populations; the same people to whom solar companies want to sell. In every case, however, formal solar businesses had to informally negotiate and broker relationships with development banks in an *ad hoc* manner, which required maintenance over time, if they wanted loans to be given to their customers in practice.

Corbridge et al. (2005), Reddy and Haragopal (1985), Manor (2000) and Jeffrey and Young (2014), amongst others, focus on the extensive involvement of brokerage in economic, political, and social life in India. Brokers work between the state and citizens, within markets, and within social spheres such as educational institutions. Brokerage is often shaped according to caste, class, and religion (Jeffrey, 2002, Munshi, 2016). I did not identify a clear analytical group of people acting as brokers. In his work on the cookstove market in Maharashtra, Simon (2009) describes how brokerage best describes the mediation that is done between businesses and the state in India. The brokerage engaged in by artisans, looking to access latent state resources in a new commercial market, Simon argues, reflected the political and economic activity associated with traditional brokers. In the case of the off-grid solar power market, informal brokerage was necessary for mediating with, and establishing relationships with banks and bankers.

6.8: Signing MOUs with Banks

The first hurdle for formal solar businesses looking to set up a relationship with a rural development bank was reaching an MOU agreement with that bank. In Uttar Pradesh, MOUs were being signed following individually brokered agreements between solar business and banks. In the case of some TATA dealers, these agreements had been reached by high-level managers at TATA Solar Power, and I was not able to learn much about how they were reached. At Boond, and in some of the individual Akshay shops I was told in detail about the challenges of signing MOUs. Most of the Akshay shops and most of the TERI shops had been unsuccessful in agreeing MOUs.

Several interviewees spoke to me about signing MOUs as a process of educating bankers. The former head of TATA Solar Power, Krishnappa Subramaniya told me how, because solar power loans were relatively low value, they had needed to 'educate' 'forward looking' people in banks. This had not been a bottom-up process, he told me. Throughout the country they had needed to build higher-level relationships with 15-20 banks in different states, with their expansion limited by this. Satyaveer Singh and Manoj Gupta were two TATA dealers who had been involved in making initial agreements with banks in Uttar Pradesh. Satyaveer told me how when he started his business he had worked hard to convince local bank managers and the MNRE about his approach, and that at the time no one had any faith in solar power. Manoj talked about his early engagement with banks in similar terms.

When I spoke with Rustam Sengupta, the CEO of Boond, he recounted the difficulty of reaching agreements. Sitting in Costa Coffee in New Delhi, near his company's offices, he told me that there were four potential banks that they could be partnering with in Uttar Pradesh, but that they were currently only focusing on one. "We have a very

complicated relationship with banks. Banks take a basically sceptical view of the solar power sector, and solar products. They do not trust that they would [work] and are reluctant to loan." In his view, getting sales was not the problem, but getting loans was. Many of the bankers he had to try to work with had close existing relationships with other solar power companies. "So the banks need... to change the way they are working. Mujeeb[3] [bank manager] is a very nice guy. But I have been both stick as well as carrot with him over the past years. So we started talking to him from October last year and finally... and it has been a lot of sticks, and it has been a lot of angry moments, a lot of pain." Rustam recounted that he had been in multiple meetings with the bank where he had recently signed an MOU, in the months before signing it. Boond managers had decided that, in future, they would only expand into areas of Uttar Pradesh where TATA dealerships had already built successful banking relationships, hoping that some of the groundwork would be in place in terms of brokering agreements with bankers.

Solar power technology is still relatively new within markets in India, and so educating bankers about its benefits is clearly a pressing issue, as has been identified in other research (Miller and Hope, 2000). Speaking only of the need to educate bankers, however, implies a technocratic hurdle that solar businesses must overcome. This was clearly not the case in Uttar Pradesh, with many formal solar shops, and all informal solar shops not able to broker such agreements. For TERI and Akshay shops, the need to individually convince banks to provide loans for the purchase of their solar products was a major challenge. None of the entrepreneurs in TERI shops had managed this on a regularised basis, although several did have informal arrangements with local bank

[3] Name changed to maintain anonymity.

branches for customers to be able to buy larger SHSs with loans; agreements that did not allow their customers to access the JNNSM subsidy. When I was talking with interviewees in these businesses, most did not know with whom they could speak in banks about signing an MOU.

Single entrepreneurs in smaller formal shops did not usually have the knowledge to gain access to the relevant bank managers, or to reach an agreement with a bank. When I spoke with Jitendra, a manager for TERI's Lighting a Billion Lives (LaBL) project, he told me that TERI does try to facilitate local entrepreneurs getting support from banks to expand their businesses, but acknowledged that even this was difficult. He raised the case of Ashoka, a TERI entrepreneur, as an example. 'The banks understand who we are. When Ashoka went to the bank alone, they refused [to give a loan]. OK. But then if he is asking from the direction of TERI, and we are also giving back-up, and we are also giving technical support… the bank knows their money will not go anywhere. The bank will get back its money. So then the bank was ready to give a loan.' Several of the Akshay shops did have agreements with nearby rural development bank branches for loans to be provided for the purchase of SHSs. In the cases where agreements were in place, it was because the shopkeeper had been able to effectively develop an informal relationship with local bank managers.

The four different groups of formal businesses included in this study demonstrated contrasting experiences in their ability to broker agreements with banks. Their experiences showed how informal relationships and links remain crucial within a liberalised market context. Much like has been illuminated with development projects (Corbridge et al., 2005), or in land dealings (Sud, 2014a), in the off-grid solar power market, agreements were being substantively built on the bases of *ad hoc* informal

brokerage. A feel for the game was crucial (Jeffrey and Young, 2014). In the case of the JNNSM subsidy, TATA dealers and Boond management had a feel for the game, while many TERI shops and Akshay shops did not. Those who were not successful were effectively excluded from a large potential boost to their business. They were excluded from accessing in this case a quasi-state patronage, in terms of the benefits that could be gained when agreements were in place with state run development banks.

Furthermore, while some rural development banks were signing MOUs with formal solar businesses, they were not doing so on the basis of straightforward commercial interests. Loans for a SHS were very small relative to the typical loans given out by a rural development bank, and yet the same amount of paperwork was required. Anwer at the Gramin Bank of Aryavart (GBA) told me how while a tractor loan would typically be several lakh[4] rupees, with a large profit margin for the bank, a SHS loan could be as low as 10,000 rupees [£100], with only 500 rupees [£5] of profit for the bank. With SHS loans, banks also had to submit paperwork to NABARD, if the JNNSM subsidy was being claimed. In the case of the GBA, if a customer defaulted on their loan, the cost of following up on the non-repayment of that loan was higher than the 500 rupees profit that they were making on the loan.

The bank managers at a headquarters and at a branch level with whom I spoke viewed solar power loans in terms of social work. Rural development banks had various social lending targets for rural populations, and lending for SHSs contributed to these requirements. Satyaveer Singh and Manoj Gupta, both TATA dealers, were two of the most successful dealers of SHSs in Uttar Pradesh. Yet, in both cases, the banks with

[4] 1 lakh is 100,000 rupees, or £10,000.

which they were partnered were both driven by social goals. The GBA, who provided loans for Manoj's customers, had been awarded the coveted Ashton Award for sustainable business as a result of their work. This casts doubt on the long-term sustainability and scalability of the current model of bank lending for off-grid solar power, and again challenges the idea that the solar market is being developed according to market rationalities.

6.9: Building and Maintaining Relationships in Bank Branches

Formal solar shops and dealerships were also having to mediate and build relationships with bankers in local bank branches. It was in local bank branches that applications for loans were submitted, and then accepted or rejected. Solar businesses which relied upon being able to offer their customers the option of a loan, and the JNNSM subsidy, had to rely upon local bank managers approving loans for customers. To a greater extent than with MOUs, relationships in local bank branches were informally developed, through mediation. At Boond, Rustam summed it up like this: '[T]he problem with our model is it is bank dependent. So even if I take a customer the bank has the discretion'. When spending time in TATA dealerships and Boond shops, I found that interviewees were spending large parts of their day visiting local bank branches, engaging with local bankers. For most, it was necessary to spend significant time and effort trying to convince individual bank managers, within every bank branch where they wanted loans to be available to customers, about the merits of solar power and their businesses. It was only when they did this, that loans started to be sanctioned from local bank branches in practice.

Many interviewees spoke to me about this in terms of needing to educate local bankers. Manoj Gupta, who had opened his dealership over ten years ago, told me how in past years he had toured through Uttar Pradesh to bank branches where they did not even have reliable electricity, and where he had to prove the value of solar power to a sceptical audience. While Manoj had successfully formed relationships with local bank managers in past years, and was now at a stage of mainly maintaining relationships, in most cases interviewees were actively developing relationships with bank branches. Like with MOUs, speaking of this process in terms of educating, depoliticises and masks the importance of informal brokerage for these relationships.

Satyavir, who was the most senior Boond manager, committed significant time to building relationships with bankers. A tall, strongly built, and commanding man in his late-thirties, always smartly dressed, Satyavir had started working in Boond's first shop in Unnao District, after spending time working at the offices of a trust fund for the local Congress MP. As well as managing Boond main shop in Unnao, one of his tasks was to make sure that local bank branches were sanctioning loans for customers. I would generally meet Satyavir when he was either coming or going from a bank. His phone would ring multiple times in an hour, and he appeared busy and rushed at all times. He possessed the social skills and cultural capital to be able to speak to local bank managers in the town. Satyavir told me that successfully forming working relationships with local bankers was possible only with constant work. His work, involving regular interaction with bankers, reflected the work of brokerage spoken about by Simon (2009), or the work of brokers as has been described by Sud (2014a), Manor (2000), and Jeffrey and Young (2014).

Raj, who also worked for Boond and managed their second branch in Unnao District was also, towards the end of my research period, increasingly spending time at banks to make sure that loans were being sanctioned for Boond customers. One day, sitting in his shop, he told me how 'Our main work is with the banks' *(Hamko main work to bank se hai)*. He told me how when they had first gone to the local bank branches, the bankers already had a good relationship with TATA dealers in that area. They did not know who Boond was, and did not have any confidence (*vishvash*) in Boond or its products. Indeed, they faced the problem of local bankers encouraging customers to buy SHSs from other companies when they came to bank branches wanting to access a loan to buy a Boond SHS. To overcome this, Boond provided demonstrations of their products at local bank branches. Raj recounted, again in terms of education, how in one case he had set up a demonstration for the managers to show how they were providing good quality materials, wiring, and installation. He had told the managers about how Boond had local service centres, that they had employees with technical training, and how they would provide quick servicing. He would also try to assure managers that Boond would provide customers with their company contact details, and would check on customers to make sure that they were paying their loan instalments.

By early 2014, this approach was having some success. Some Boond customers were having their loans approved in local bank branches. When I visited Raj in April 2014, he told me that they had convinced one bank manager to sanction a loan. The bank manager had wanted to see how the system worked, and Raj told me that Boond could easily sell ten more SHSs in the same village if this first loan worked well. His hope was that in the coming months, the Boond team would be able to build relationships with more local bank branches.

The contrast between TATA and Boond dealerships and shops on the one hand, and TERI and Akshay shops on the other was notable. Nearly all TERI and Akshay shops were failing to successfully broker agreements in local bank branches, preventing these businesses from accessing the quasi-state benefits of loans from rural development bank for their customers, and then the JNNSM subsidy. In TERI shops, entrepreneurs were not spending their time trying to build relationship with bankers in local bank branches. The only engagement with local bankers I encountered were in the cases of two different TERI shops where interviewees had been seeking loans from local banks to build new micro-grids. In both cases, the support of TERI's Delhi staff had been needed, before the banks would agree to provide loans.

Not being able to offer the JNNSM subsidy to their customers, yet still focusing on selling good quality SHSs and solar modules, and usually also providing an installation service and after-sales servicing, was difficult. When meeting with Pratap in his TERI shop in Kasganj district, he told me how people come to his shop and ask about the subsidy. When he cannot offer it, they then usually go to a bank, where they are given the number for other solar businesses that do have bank relationships. Similarly, in Dhanpur district, in another TERI shop, Ajay told me how the subsidy was extremely important, because solar power is still expensive for people in villages. Both these interviewees, as well as several others, told me how one reason they were not able to make relationships with local bank branches was because commission payments were being demanded by bankers, an issue that I will come to shortly.

For most TATA dealers and for Boond employees, maintaining relationships with bankers was a difficult part of everyday work. The example of a day spent with Kuldeep, who ran a TATA dealership, highlights various aspects of this. Kuldeep’s

experiences starkly highlight how relationships were mediated on a day-to-day basis, required maintenance, and could easily be threatened. His were experiences common to others. There were close to one hundred bank branches in Reibareilly District where Kuldeep operated, with which he worked. Many of his customers were villagers who had been referred to him from these banks, and his sales depended upon the details of potential customers being passed to him. Kuldeep spent much of his time visiting branch managers, to complete paperwork, but also to develop relationships with individual bank managers, so that they would pass on the information of potential customers to him. This second side to his visits had become increasing important in the last year, as competitor companies were setting up operations in the same district, trying to build their own links with the same banks. One day in January I accompanied Kuldeep on a trip that took us to five different bank branches.

At the first two bank branches that we visited that day, Kuldeep had good relationships with the bankers, which were clearly mediated and based upon non-market terms. Our first stop was at a bank branch on the main highway, heading south from Lucknow. Inside, around ten customers were sitting patiently on the shining marble floor, speaking in hushed tones, waiting their turn. Several more people were crowded around the reception area, papers in hand and watching the progress of their applications. Coming into the bank, Kuldeep walked past the waiting customers, lifting the divide into the back section of the bank, gesturing for me to follow. We were greeted warmly by those present, and were ushered into the manager's cubicle. Chai and a *numkin* snack were quickly served, and during the half-hour we spent in the bank, while some papers were signed, a casual conversation filled the time. In this branch it was quickly apparent that Kuldeep had privileged access, and had a relationship that not all solar entrepreneurs

would be able to replicate. When I had asked whether the bank was providing loans for the purchase for SHSs from the electrical store I had seen selling solar modules several kilometres up the highway, they said no, that these were poor quality panels. When I asked if they only allow loans for TATA products the manager said that they would offer them for other companies, but that quality and servicing was the main concern. Kuldeep used this turn in the conversation to talk at some length about the superior quality of TATA modules, and the servicing he provides. Other bank managers who I spoke with similarly said that a key consideration in whether to make loans for SHSs was the quality of modules being sold. I later learnt that fifteen sales had been referred to him from the managers in this first bank branch over the last few months.

While Kuldeep appeared to be on good terms with different staff members in these first bank visits, there were certain key people within each branch which whom he needed to maintain a relationship. On leaving the first bank, I commented that his relationships with the senior manager had been good. He agreed, but told me how one of the men who had appeared to be a mid-level manager was actually the person who passed on information about clients. During our trip, this manager had joined the conversation at various point, but had been clearly deferential to the senior manager and several others in the bank, and had mostly remained at his desk, working through a large ream of files. In each of the branches there were also several people who were spoken of as 'agents' or 'brokers (*dalaal*), who were middlemen between local villagers and the bank branch. They informally organised the bank business of many villagers, and Kuldeep told me that these agents, if he had a good relationship with them, encouraged villagers to buy his SHSs. These agents were not officially working for banks, but did informally have back-room access. Such people working as agents in banks were the only people I

encountered during my research who were spoken of as being brokers, in terms described by Reddy and Haragopal (1985) and Manor (2000) in their work on brokerage. I later learned that *dalals* in local bank branches were an important source of sales for a number of formal solar businesses in Uttar Pradesh.

In the third bank we visited, the fragility of brokerage-based relationships was highlighted. The branch was located of the main highway in a small village. To reach it, we had slowly progressed along a much-broken rural road, snaking with sharp turns around fields under cultivation. This time Kuldeep paused before leaving the car, telling me with a small smile that the manager here might be angry with him, as he had not visited for a few months. Getting out of the car, and walking around to open the boot of the car, Kuldeep retrieved a TATA Solar Power branded almanac from inside a box. Pointing to the large typed '2014' across the bottom of the almanac, he asked 'What use is this now?' It was late January, and the gift was clearly late. The manager greeted us warmly, but continued to work when we entered, carefully signing and checking deposit books which were being passed to him by an assistant. For the first ten minutes, the discussion was somewhat formal. Chai was again served, and if not for the distinction with other branches, this might have seemed normal. After some time, Kuldeep raised the topic of his long absence, saying with a smile that he had told me, the foreigner, that people in the bank might be upset. The manager laughed at this, denying that this was the case. But after this exchange the manager became more conversational, telling me how he believed that solar power was extremely good, but that the subsidy was not coming to his bank, causing problems. Kuldeep had no paperwork for new loans to sign here, and after some conversation we left.

Shortly before leaving Kuldeep mentioned to another manager we had been talking to that he had heard that another company had started selling in this area, asking whether it had contacted the bank. He was told that it had, but that no agreement had been reached. A few minutes of more earnest conversation followed, during which, in a noticeably concerned voice, Kuldeep spoke about how the quality of that company's products was not good, requesting that they ignore it, and phone him if the company came to the bank again. After leaving, Kuldeep asked me if I thought that the manager had been a little angry. I said that it had seemed so, and he agreed. But he went on to say that it is difficult for him to visit all branches regularly if he is not getting business from them. If each branch were selling 10-12 of his products each month, then business would be good. But he did not have the time or money to go regularly if not. By not visiting bank branches regularly, however, there is the danger that branches would preferentially call a different company.

Our final two visits were much like the first ones, with Kuldeep receiving a warm welcome. The routine in each case was chai, conversation, and the completing of some paperwork. However, on each visit, even though the conversation was rarely serious, Kuldeep would at points highlight the various advantages of the products he was offering, re-affirming his position as selling good quality, branded SHSs. At the end of the day, on our drive back to Lucknow, we stopped several times at bank branches, picking up three different managers who were travelling back to their homes in Lucknow. In the one and a half hours it takes to reach Lucknow, a lively and friendly conversation ensured, seemingly amongst friends.

The experiences of Kuldeep highlight how central it was to maintain good relationships with local bank branches. For TATA dealers, and to an extent for Boond and some

Akshay shops, sales were dependent upon local branches recommending their products to potential customers. Villagers often associated existing solar modules in their villages as 'bank ones' (*bank wala*), rather than company products, and would go to their local banks, not to a company to ask to buy a SHS. In many instances, bank branches kept the product brochures for different companies, and would pass these to customers. At times this set-up allowed solar businesses to make large numbers of sales, but it was also a situation that was insecure, resource and time-intensive, and was extremely vulnerable to competitors building competing arrangements.

At Boond shops, I was regularly told in interviews how they were trying to regularise their interactions with banks. They hoped to end the need for brokerage, and to avoid the danger of needing to pay underhand commissions. While many TATA dealerships were winning many of their sales through referrals directly from local bank branches, and therefore were vulnerable to brokerage and commission demands, within Boond shops I was told by interviewees that by going directly to villages to market and give demonstrations of their products they could avoid having to rely on relationships with local bank managers for the referral of customers. They were also recruiting agents in villages, who were given a commission for every sale won and completed.

The focus in Boond shops on trying to bypass having to be dependent on good relationships with local bank managers, but to have MOU with banks, did stand out from what most other dealers and businesses were doing. However, in their first months of operating they were facing complications with this strategy. While they could recruit customers in villages, they still had to physically accompany customers to their local bank branch to help the customer to complete the necessary paperwork, and to ensure loans were actually approved. If they did not accompany a customer to the local bank

branch, they had found that some bankers would ask the customer why they were buying a Boond SHS, and would encourage them to buy a SHS from a different company, or would not be willing to sanction a loan. Furthermore, I found that employees in Boond branches were focused on maximising the advantages of bank relationships. Raj, for example, told me on one occasion how the branch at which he was working was not in a good location, that it was too far away from the nearest bank branch, and that it should be moved. The last time I visited him, he was very excited because he had located a new potential site to set up a new branch, and was keen to convince Boond's managers to approve this. He drew a diagram for me, showing how this bank branch was located near a bank branch, and how it was on major bus routes, which meant that customers would be passing by.

In practice, formal solar shops and dealerships that wanted to have working relationships with local banks had to be able to successfully broker agreements and to maintain relationships. Again, they had to have a feel for the game (Jeffrey and Young, 2014). People within solar businesses needed to have the ability to start and maintain relationships. Interviewees I encountered could not be considered full-time brokers as described in much of the literature on brokerage (for example, see Manor, 2000, Reddy and Haragopal, 1985). Yet, similar practices of informal mediation and relationship building were evident, in order to access benefits, and to make transactions work in practice.

The TATA dealers who were most successful were those who developed strong banking links. Similarly, with Akshay shops, there was a divide between those local shopkeepers who had relationships with local banks, and those who did not. The latter were running shops which looked tired and poorly stocked, with less to distinguish them from small-

scale, low-margin informal shops. Similarly, at Boond there were several local employees in branches who were competent in engaging bankers. Indeed, Boond had hired an employee away from TATA Solar Power in 2013, bringing into their team someone who had existing relationships in a number of local bank branches, and knew how the lending process worked. When I spoke with him, he stressed that be believed it would take Boond time to build the necessary relationships in banks.

Training was a way that Boond tried to build the capacity of their employees for dealing with bankers. This again reinforced how brokerage was central for formal solar companies, even in the case of Boond, which wanted to distance itself from this. In late January, when Boond organised a two-day training event for its new agents, run by two senior employees from the Bangalore based solar company SELCO, the focus of the first day was on banking. New agents for the company were taught how the JNNSM subsidy system worked, and how the company's model of selling with loans through banks was being operated. They were also informed about their local bank branches, and about who worked there. The intention was that when these agents secured a sale in a village, they would accompany the customer to their local bank to start the loan process, equipped with the knowledge of how this worked. They would only be paid a sale commission once the loan was completed.

Several local bank managers and some senior managers from the GBA, with which Boond had signed an MOU, were invited. This was partly a chance for Boond's new agents to meet with the less senior local bankers. But it was also an important opportunity for Boond's managers to cement their relationship with the senior bank managers from the GBA. Several senior bankers had been invivted. Towards the end of the day, when these bankers arrived, a formal ceremony was held. The SELCO trainers

from Karnataka delivered a PowerPoint presentation that focused on an essential triangle between solar companies, banks, and customers. In Karnataka, it was said, SELCO had built strong relationships with rural development banks, the result of which was that customers were getting good quality products, loan repayments were high, and the banks were benefiting and bringing developmental gains to the communities they served. They told the bankers present that they were now supporting Boond to do the same in Uttar Pradesh. Rustam, the CEO of Boond, also spoke of his wish to develop strong working relationships. Once the formal presentations and speeches were concluded, sweets and drinks were served, and the event culminated in several of the bankers being awarded with gifts of shawls and certificates to thank them for their work. The local press was invited to take photographs, and one of the managers presented certificates to the newly trained Boond agents, handing them out one by one, shaking hands with every agent, pausing for a picture to be taken each time. A high level of deference was shown to the senior bankers throughout. This training event clearly highlighted the importance of building informal relationships for the success of many formal solar businesses.

6.10: Local Bank Branches as a Route to Customers

As well as being the route to accessing the JNNSM subsidy and financial support through loans for customers, banks were the gatekeepers to potential customers. Formal solar shops and dealerships were in many instances relying upon local development banks to gain customers. For example, Raj at Boond was keen to tell me about the benefits that could come through working with banks. “If you have a good relationship (acchaa sambandh) with a bank… then the bank has customers. Customers go to the

banks. If we start handing out leaflets in the bank, then customers will read these. In the bank everyday 200-300 people come, to deposit money and for taking out money. And out of these 200-300 people, 2 or 3 people will be ready to take a system [SHS]. And they already have an account with the bank, so it is easy." In contrast, the next best option for marketing is to give demonstrations in villages he told me. But if you hold one demonstration of products in a village you may have ten people who are willing to buy. But maybe only five will actually qualify for a loan and be able to demonstrate their creditworthiness. Finally, even then, it is still down to the bank manager's discretion whether the loan is sanctioned.

Many of the TATA dealers who I was interviewing had for several years been securing a majority of their sales through customer referrals from banks. In the case of Kuldeep for example, bank branches would provide the phone numbers of dealers to customers who asked about solar power. Kuldeep told me how this meant there was no need to form relationships with politicians (*netas)* or village leaders (*sarpanch*), who would have their own concerns for making money. Formally, banks were meant to give the customer the numbers of several vendors. In practice, however, they often gave the number of the formal solar business with which they had a good relationship, or of the business which was providing the biggest commission, as I will come to later. In some cases, shops and dealerships were relying almost entirely on getting their customers through bank referrals, and were not engaged in direct marketing or sales themselves.

Rural development banks themselves were often able to promote sales, and had the capacity to directly access large numbers of rural customers. For example, when I met with Anwer Husain, who was in charge of the GBA's solar power work, he told me how the bank had a network of 1,400 customer service providers, who operate between the

bank and villagers. Further, he noted that if they used their agents to incentivise villagers to buy SHSs, then they could increase demand substantially. When spending time in villages, I learnt that many customers who had purchased SHSs through a loan from a bank did not actually know the company or the dealer who they had purchased their product from. They simply knew that they had purchased a 'bank' or a 'government' (*sarkar*) SHS. Effectively, banks had considerable discretion on which solar businesses they passed on a customer's details to.

However, there were clear limits to the extent that solar companies could piggyback on the rural development banking network. Anwer also argued that companies without their own sales and distribution networks were damaging the market. He told me how they had now had multiple businesses approach them, wanting to sell their SHSs through local bank branches, but that the bank was sceptical of their commitment to provide servicing and about what quality products they would sell.

Banks had a strong position from which to broker, and they held significant power to act as the source of patronage to solar power shops and dealerships. This was having a profound effect on many of the formal solar shops and dealerships at which I was interviewing, and how they were developing. On the one hand, bank priorities of who to lend to were limiting the number of people who solar businesses could sell SHSs to. Banks had the discretion to decide whether a customer qualified for a loan or not. In practice, the discretion of banks was reducing the number of people who were getting loans approved. Typically, if a customer owned land, had an existing account or deposit in the bank, or a Kisan Credit Card (KCC)[5], then it would be much easier for them to

[5] The Kisan Credit Card is a credit card program available to farmers.

get a loan. At the GBA, Anwer told me how generally they offered to existing customers first, and that they were primarily promoting SHSs to their customers who were KCC holders or had government jobs, such as teachers. They had a base of 800,000 such people, he told me. They have a repayment record, and are known to the bank, have had due diligence done already, and so they are much better to deal with. Rajdev, a TATA dealer, told me how customers who did not have land holdings struggled to get a loan approved. As was experienced by Boond shops, the existence of complex rules and requirements for lending was also an opportunity for local bank branches to refuse loans for the purchase of SHSs from companies with whom they did not have an informal relationship.

6.11: Extra-Legal Payments

In situations where particular individuals are gatekeepers to resources or to state benefits, the literature on brokerage has shown how corruption and the need to pay bribes to get work done is likely (Gupta, 1995, Jeffrey and Young, 2014, Manor, 2000). This was also the case in the off-grid solar power market. A system of commissions had developed, where there was the regular exchange of money and gifts to facilitate relationships between solar businesses and banks, and the approval of loans. Several interviewees told me how it was necessary for them to provide under-hand commissions to bank branches if they wanted to receive the names of customers looking to buy SHSs, or if they wanted banks to approve the applications for loans from their customers. Nearly all interviewees spoke in general terms of the problem of commission payments being needed in banks. Such a system was widespread in most districts. While I did not ask any of my interviewees directly to confirm how much commission they were giving

themselves, if any at all, I was told by many that local bank branches asked for the equivalent of about 10 per cent of a SHS loan amount in commission. Sometimes this would be a cash demand, and at other times gift incentives were provided to local bank managers who approved a certain number of loans, such as TVs.

When I spoke with Anwer at the GBA, he reported how many of the new formal solar businesses coming into Uttar Pradesh go to GBA's local bank branches, and offer to give them around 500 rupees or other gifts if they sell their SHSs. In one case, I saw the solar products from one company stocked within a local bank branch, not one of GBA's. It is illegal for rural development banks to promote or stock products from a private company. Directly stocking solar modules in a bank branch was an extreme example. More common was for local bank branches to only pass on the details and brochures of one solar company to their customers. For nearly all of the TERI shops in which I was interviewing, this commission system was said to be a main reason why they could not form relationships with banks successfully. For example, in Azamgargh, Chaturvedi told me how his products are MNRE-approved, but that the bank staff required a bribe, and that he would not give one, and so he could not offer his customers a loan through a bank. While the importance of needing to give commissions cannot be discounted, even if these shops were willing to provide commission payments, they would still need to be able to broker informal relationships with banks.

By 2014 in Uttar Pradesh, competition between formal solar businesses selling SHSs had grown. In past years it had often been only one company in any one district. A new situation was emerging in some areas, where banks had to decide who they would deal with out of multiple companies, and were having to evolve their approach. In the past, while in theory competition was possible, in practice there would usually only be one

viable formal solar business with whom they could work. In this context solar businesses had to also re-engage with banks to try and shut out competition. Kuldeep told me how the new companies now starting in his area, in competition with him, were putting his business under pressure because they were offering a commission of around 10 per cent of a SHS. While the benchmark price of SHSs from all companies, set by the MNRE, are the same, in reality the quality levels of the systems were different I was told, or different levels of service or installation were provided, opening up a surplus amount that could be paid as a commission.

6.12: Fragile and Uncertain Support to Formal Businesses

Even when there was an agreement in place with banks at a branch level, the actual process of loans being sanctioned was complicated, unstable, and unpredictable, and was distorting straightforward businesses at the bottom of the pyramid. The comments of Raj, a Boond employee, highlighted this. He told me how getting a loan can be difficult, and that it takes time in terms of the need to complete applications, fill out papers, and to follow procedures. In practice, said Raj, many village people are not willing to do this. Similarly, the experience of Kuldeep, a TATA dealer, was that while loans are theoretically easily available, they require a lot of paperwork, which puts off many customers, and makes the process expensive for solar businesses.

During one interview, Rustam, the CEO of Boond, spoke about how the subsidy system makes things complicated for them. He told me how when people go for a loan from the bank: “There is a lot of paperwork to get the subsidy, and it is the same paperwork for a very small Watt system as it would be for a larger system…. and so the profits gained by a smaller system being sold simply do not cover the amount of paperwork required

to access the subsidy. And the government is regularly changing their subsidies and do not pay the banks in a timely manner. And therefore the banks are also reluctant to lend for solar products because they don't know when the government is going to be paying them the subsidy." He told me how getting a customer's loan approved was typically a six-day process, which was administratively expensive and time-consuming for the customer and for their agents locally. Once the loan was approved, the banks rarely then paid Boond for the SHS the customer had bought on time.

Further, within rural development banks employees are regularly moved between banks. Solar businesses were finding that they would build up a relationship with the bankers in a particular branch over a period of many months, only to find bank managers transferred to another state in India soon after, at which point they would have to build a new relationship with a new manager. I learnt this on one occasion, when spending the day with Raj at Boond. After visiting Boond's new branch in a small town near Unnao, Raj told me that he needed to visit the bank branch 100 meters from that shop, because a new bank manager had been transferred there. He was nervous, and said he did not know what reception he would receive. When we arrived, the bank was shut for lunch, and so we had to leave. Ashok would have to take time out on a different day to try to visit the bank branch again, and to start the process of building a relationship with a new local bank manager.

I have focused in this chapter on the importance of the JNNSM subsidy, and on the relationships with rural development banks that many formal solar shops and dealerships were developing in order to be able to access this subsidy and to sell SHSs. But there was a wider reliance of formal solar businesses on building relationship(s) and brokerage. I learnt during the course of fieldwork that various government subsidies and

programs, at a state and national level, had been the source of important contracts and work for shops and dealerships. Akshay solar shops in particular were benefiting from bigger deals and contracts from government. However, for such benefits, formal solar businesses had to broker access. For example, at the time of this research, government funds available to local village (*panchayat)* councils for the purchase of solar streetlights were an important source of work for formal solar businesses. However, to win government streetlight tenders, they usually had to pay large commissions, which in the case of streetlights I was told ranged from 20 to 40 per cent of the cost of heavily inflated tender prices for solar streetlights.

6.13: Conclusion

This chapter shows the crucial role played by state and non-state resources and patronage in supporting and shaping formal solar shops and dealerships in Uttar Pradesh, and highlights the importance of brokered informal relationships between public development banks and many formal solar shops and dealerships. In the existing literature on the growth of BoP capitalism in the Global South, the success of formal businesses in growing within BoP markets has been associated with their selling good quality, value-conscious, innovative, and frugal goods and services (London and Hart, 2004, Prahalad, 2005). The state has been theorised as best suited to be the regulator of BoP markets, within which businesses independently operate (Elyachar, 2012). Patronage, brokerage, and corruption have been framed as practices that are not needed for formal businesses at the BoP, and that not engaging in such practices will make them more attractive to consumers (Prahalad, 2012).

The case of the off-grid solar power market in Uttar Pradesh challenges these ideas. It was not possible to speak of the growth of a pure neoliberal BoP capitalist market as imagined in much of the existing literature on BoP capitalism. The state had not withdrawn to a role of regulator, with market rationalities determining the development of capitalism. The growth of formal solar shops and dealerships was clearly dependent on their ability to tap into latent state and non-state resources and patronage, within a regularly shifting and fluid state and non-state ecosystem. Their growth was also closely associated with their ability to broker informal relationships in banks, and at times their willingness to make extra-legal payments.

The idea that a pure model of neoliberal capitalism will spread around the world, as economic liberalisation and globalisation intensify, has been countered by social scientists (Larner, 2003, Peck and Tickell, 2002, Peck and Theodore, 2007). In India, following the liberalisation of parts of the economy, the state has been shown to remain involved in markets beyond a regulatory role (Harriss-White, 2003). State patronage, brokerage, and corruption also remain important for the functioning of markets (Khan, 2005, Jeffrey, 2002, Simon, 2009). This chapter adds to this literature, with findings about capitalism at the bottom of the pyramid in a liberalised market context.

The importance of state intervention in the case of the off-grid solar power market reflected the findings of some existing work on markets catering to low-income Indians, such as by Simon (2009) on the cookstove market in Maharashtra, by Young (2010a) on the microfinance market in Andhra Pradesh, and by Kuriyan and Ray (2009) on IT business in South India. In particular, the findings mirrored the idea from Simon (2009), that in a post-liberalisation context in India, the ability to access latent state resources in commercial markets is key for businesses. Importantly, findings from the off-grid solar

power sector further showed that state resources were partial, only available to formal solar businesses with a feel for the game (Jeffrey and Young, 2014), and which were able to meet state requirements. State resources were also uncertain, leading to a fragile and fluid BoP market, with formal solar businesses dependent upon state resources to maintain their sales. The failure of some formal businesses to benefit from state resources to an extent reflected Gupta's (2012) idea that the involvement and working of state programs in India is systematically arbitrary. However, thinking in these terms risks depoliticising the way in which state intervention was designed to support only particular businesses and market growth, and it downplays the way in which it was important for most formal solar businesses to be able to broker access to any state resources. The way that the state was involved in the off-grid solar power market could be characterised in terms of patronage.

The engagement by formal solar businesses of informal and extra-legal practices in order to access resources is a significant finding, which must be accounted for in theorisations of BoP capitalism in the Global South. The existing literature on brokerage in India is mainly focused on brokerage as practiced by a class of people defined as brokers or fixers (Manor, 2000, Reddy and Haragopal, 1985, Sud, 2014a, Williams et al., 2003). Similarly to the findings of Simon (2009), this thesis highlights brokerage being carried out within a liberalised commercial market, by business people who cannot be characterised as full-time brokers, but are engaging in practices usually conceptualised as those of full-time brokers.

A corpus of research has looked at how brokerage within India is shaped and mediated by caste and class. The brokerage that takes place to facilitate and shape the flow of resources dispersed by the state to communities throughout India has been shown to be

mediated by power dynamics and by caste, class, religious, and gender dynamics (Corbridge et al., 2005, Lerche and Jeffrey, 2000, Jeffrey, 2002). Work on political brokerage has further highlighted the significance of caste and structural inequalities in shaping such brokerage (Manor, 2000). In this thesis I was not able to explore the role that caste played in brokerage and in structuring extra-legal activity. However, from what is known from existing research, it is likely that caste will have shaped the ability of shopkeepers in formal solar businesses to engage in successful brokerage with bank managers. Indeed, nearly all of those I was interviewing in formal solar shops and dealerships were from higher caste groups. This is something that needs to be explored in further research. Additional research might also look at how lending by banks is shaped by caste, and at whether certain caste groups were better able to access the JNNSM.

The findings of this study are suggestive of a distinctive context of BoP capitalism developing in a post-liberalisation context in India, where formal solar businesses, developing the BoP solar market in a distinctive manner, are sustained and growing on the basis of occasional access to state as well as non-state subsidies and programs, or on the basis of relationships with quasi-state and private institutions such as rural development banks. Findings from the off-grid solar power sector showed similarities to the patchy intervention of the neoliberal Indian state seen in sectors such as education (Jeffrey, 2010) and healthcare (Cross and Street, 2009). A landscape was apparent where various state agents and institutions were intervening and shaping the market in complex, unstable, and temporary ways; with companies having different abilities to tap into fluid state and non-state resources and patronage.

The findings of this chapter challenge how the idea that there is a fortune to be made at the bottom of the pyramid by formal businesses (Prahalad, 2005) can be thought about in the Indian context. While formal solar businesses are increasingly entering BoP markets in India, their fortune was often to be made by tapping into state and non-state institutional support, and by taking advantage of brokered relationships that allowed them to operate profitably. This chapter suggests that it is necessary to interrogate further the way that different state actors and institutions intervene in BoP markets, and according to what objectives. The current support of the Government of India only for formal businesses is questionable, especially because, as I will show in Chapter Seven, informal shops were where many people were buying solar products.

Chapter 7: Informal Solar Businesses at the Bottom of the Pyramid

7.1: Introduction

This chapter focuses on the growing number of informal shops that are selling, assembling, and repairing household solar power goods and accessories in Uttar Pradesh, developing the BoP solar market in a distinctively different manner from formal solar businesses. The products are cheap, usually low or inferior quality, and are often non-standardised and locally assembled. The term informal is used here to speak of solar shops that were not registered with the MNRE (Ministry for New and Renewable Energy) as solar outlets, and were nearly all unorganised, small-scale businesses, selling non-branded and non-standardised goods.

The contention within much of the existing literature on Bottom of the Pyramid (BoP) capitalism is that informal business will decline or regularise as formal business grows in liberalised BoP markets. Prahalad (2005), for example, said that people will choose the products of formal businesses when they are available. I outline how, contrary to this, informal businesses selling off-grid solar products are growing and thriving within a liberalised market context, where alternative formal solar businesses are also operating. I empirically explore how informal solar businesses were selling cheap and substandard goods, and how informal shops were characterised by improvisation, of products and in business, and by extra-legal and opportunistic business practices. I argue that the solar goods and business practices seen in informal solar shops could in many instances be usefully theorised in terms of '*jugaad*'. *Jugaad* is a Hindi term, used to speak of ingenious innovation or shrewd improvisation, with resources to hand, of products and in social and political contexts (Jeffrey and Young, 2014). The success of

informal solar shops in Uttar Pradesh, and *jugaad* practices within them, provides an empirical case that alters how newly liberalised BoP markets in India can be theorised.

The term 'informal' is used to speak of unregulated and insecure employment (Hart, 1973), unregulated, unrecorded, and small-scale business (ILO, 1973), and illegal settlements (Roy, 2011). The informal economy has commonly been defined as that part of the economy that is unrecorded, untaxed or illegal; although there is an on-going debate on how to define and distinguish it (Gill, 2010, Harriss-White, 2003). Chatterjee (2008:57) distinguishes the informal economy from the formal in terms of non-corporate forms of capital versus corporate forms. In the decades following independence, the majority of Indians continued to work in informal jobs, and accessed the majority of their goods and services within the informal and black (illegal) economy (Corbridge et al., 2005, Corbridge et al., 2012). Approximately two-thirds of India's overall GDP, and ninety per cent of its rural GDP is estimated to be produced within the informal economy (Harriss-White, 2003:5,246). Ninety per cent of India's workforce is involved in low-income informal economic activity (Drèze and Sen, 2013:31-32).

The understanding from economic and development theory is that market liberalisation and globalisation leads to a transition to regularised capitalist markets (Bardhan, 2009, Coe et al., 2007, Yeboah, 1998). In India, as liberalisation of the economy has progressed, the formal economy and formal business have grown rapidly (Chandrasekhar and Ghosh, 2002, Jenkins, 1999). The theory of formalisation through time informs much of the current literature on BoP capitalism. Studies theorising BoP capitalism have focused on formal businesses entering and developing BoP markets, or on the potential for this. Informal businesses and the informal economy have been theorised as inefficient, corrupt, and pre-capitalist (for example see Hammond et al.,

2007, Hart, 2005, London, 2008, Prahalad, 2005, Prahalad, 2012). There has been some work on how the informal economy is the site of innovation and entrepreneurship, but the development of formal business is framed as the best way to fully realise economic potential (De Soto, 2000). There is little attention to the likelihood of BoP capitalism in the Global South involving the proliferation of both formal and informal business, side by side. In the existing literature, it is the formal sector that is said to be able to profitably deliver good quality and value-conscious products and services to BoP consumers, and in doing so deliver developmental benefits (Roy, 2012a). The off-grid solar market in Uttar Pradesh does confirm this theoretical view to the extent that formal solar businesses are growing in a liberalised BoP market context.

Numerous studies show, however, that informal labour, enterprise, and living are not being reduced within India as neoliberal capitalism takes hold. Informal work continues to dominate the economy, with few formal jobs having been created since the 1990s; the IT and professional sectors being important exceptions (Drèze and Sen, 2013, Fuller and Narasimhan, 2007). Manufacturing, garment production, and construction have seen an informalisation of labour (Mezzadri, 2010, Marjit and Kar, 2004, Sanyal and Bhattacharyya, 2009). A Government of India report recently concluded that informal work is unlikely to decline over the coming decade (NCEUS, 2009). India's urban poor predominantly still live within informal settlements, informally accessing goods and services such as water and electricity (McFarlane, 2011, Roy, 2011). Informal small-scale enterprise is not being formalised and is expanding in many parts of the economy (Vaidyanathan, 2014). Formal and informal economic activity has been shown to be often tied and inter-dependent within the political economy of India (Gidwani, 2015, Harriss-White, 2003, Sanyal, 2007).

In the existing literature on BoP capitalism, there is a striking lack of attention to informal businesses within liberalised BoP markets where formal businesses are also working. In this chapter I firstly outline the finding that informal activity can thrive within a liberalised BoP market context, even as formal businesses grow. The case of the off-grid solar market shows how in rural Uttar Pradesh, many people are buying from informal businesses, which were developing the BoP solar market in a distinctive manner, different from formal solar businesses. The goods and services of informal businesses are usually understood as attractive to customers in terms of being low-cost (De Soto, 2000, Prahalad, 2005). Informal solar shops were predominantly stocking cheap and inferior quality goods. However, I outline how the success of informal shops over formal ones, can be understood by looking at the *ad hoc* and often innovative improvisation, assembly, and repair of products, and at the deceptive, extra-legal, and opportunistic business practices seen within them. I argue that conceptualising the goods being sold in informal shops, and certain business practices seen within them in terms of *jugaad* is useful.

In adopting the idea of *jugaad*, I challenge the existing use of the term. In recent years, the idea of *jugaad* has been adopted to speak of ingenious innovation with few resources to hand in BoP markets (most notably, see Radjou et al., 2012). Based upon interview data and local perspectives in shops, I argue that while existing accounts in the literature have limited their discussion of *jugaad* to speaking about product innovation (for example, see Saraf, 2009, Sharma and Iyer, 2012, Talukdar, 2004), *jugaad* can also be theorised in terms of the opportunistic and illegal practices of businesses. Further, I argue that *jugaad* practices are much more likely to be seen in informal rather than formal businesses, which is not noted in the existing literature. In

making this case, I borrow from the work of Jeffrey (2014) and Jauregui (2014) which explores the ways *jugaad* is often associated with corrupt or opportunistic practices.

I start this chapter by introducing how and why a growing number of informal shops have started selling solar power goods and accessories. I talk about how cheap and inferior quality products characterised much of what informal businesses were selling. I then outline the forms of improvisation, opportunistic, and extra-legal business practices that were evident within informal shops, building an argument about why thinking in terms of *jugaad* is useful, while noting the limits of this line of argument. I discuss how a link was often made between *jugaad* and economic precariousness, and I talk about how *jugaad* was as times associated with second-best solutions and bad business.

This chapter is based upon interviews with twenty-five interviewees in twenty-four informal shops. In seven of these shops I spent time hanging-out, and conducted participant observation over an eight-month period. All shops were single shop, family-run businesses; except for two cases where more than one shop was being run. In each shop between one and four people were working. I interviewed the owner or manager in each shop. The chapter additionally draws on information from interviews with businessmen and employees in formal solar shops.

7.2: The Growth of Informal Solar Business

When travelling by road, passing through towns and stopping at crossroad (*cauraha*) markets in many of Uttar Pradesh's districts: shops selling solar modules, lanterns, lights, batteries, and other solar accessories are a frequent sight. While some are formal solar shops and dealerships, selling standardised branded goods, an increasing number

are informal shops selling a cheaper range of products, usually non-branded, and often non-standard and improvised.

This is a situation that is surprising when considered with reference to the existing literature on BoP capitalism. Prahalad (2012), London (2004), Hart (2005), and others writing on BoP capitalism focus on formal businesses expanding within liberalised BoP markets, superseding their informal predecessors. Customers, it is argued, will choose formal businesses over informal ones because of brand, service, lower risk, and value (Prahalad, 2012). The thesis of a win-win between business and development within the literature on BoP capitalism is predicated upon this. Those to speak of enterprise and innovation within informal BoP markets, such as de Soto (2000), have theorised such markets as nevertheless inferior to what formal businesses can offer, reflecting state and market failure. According to this literature, the commercial market for solar power products, which has only grown beyond a low based in recent years, might have been expected to have been developed by formal businesses, offering good quality and value-conscious products, that are serviced.

However, in Uttar Pradesh informal shops are entering the market for solar power, where they are directly competing with, and often outcompeting, alternative formal solar shops. There are no comprehensive statistics on the number of informal solar shops in the state, as they are not tracked by any government agency. Neither is there good data on the number of solar modules that are sold within them, as official government records only count branded solar modules that were sold with a government subsidy in formal shops. Yet within several kilometres of nearly every formal solar business included in this study would be at least one informal solar shop. The twenty-

four informal shops included in this study were all operating close to a formal shop or dealerships included in this study.

For example, five kilometres from the market town of Bangarmau was a TERI solar power shop run by Prem. This formal shop had been open for four years, and within it was sold an assortment of branded solar panels, batteries, lanterns, lights, and other accessories. The shop, like most other formal shops, has been trying to build a business on the basis of selling standardised, good quality, value-conscious solar products to low-income people. It is a formalised business, operating much like the multiple formal businesses described in the existing literature on BoP capitalism in the Global South. But Prem's shop was facing growing competition from informal shops selling solar power products, within and around Bangarmau. Most interviewees in formal shops and dealerships throughout Uttar Pradesh visited for this research talked unprompted about the recent trend of informal shops starting to sell off-grid solar power products. When visiting his TERI shop near Bangarmau, Prem regularly complained to me that when he started selling solar modules three years previously there had been no other solar shops nearby. In nearby Malawan, Tahir told me how 'There are a lot of [solar] shopkeepers near here. Daily shops are opening'. In Safipur, to the south of Bangarmau, Kalam told me how 'As many electrical shops as there are here, all of them are selling solar power'.

During my fieldwork, I distinguished three sub-sets of informal solar shops. The first was electronic and battery shops, where solar products were a complementary addition and there was electronic expertise. Another was new shops solely selling solar power modules and associated products, usually also providing a maintenance and repair service. By associated products, I mean products typically purchased and used together with a solar module. Lights, lanterns, batteries, fans and wiring are the most notable

examples. A final mixed sub-set were general goods shops, where there was little or no electronics expertise but a small numbers of solar modules were sold alongside existing stock, as well as makeshift temporary (*kacca*) shops, where similarly only a few solar modules were on sale. In most places I was told that only during the last three years had such informal shops started selling solar products. This research involved interviews in seven electrical shops, nine stand-alone solar shops, and eight general or makeshift shops.

A lot of deliberation went into thinking about the category 'informal shops'. All of the solar shops termed informal in this thesis were not registered with the MNRE, were non-commercialised and small-scale, and were mostly unregistered for tax purposes. None were tapping into state subsidy schemes, such as the JNNSM (Jawaharlal Nehru National Solar Mission) subsidy, or into other forms of institutional support, which many formal shops were accessing. However, there were important differences between informal shops. Some electronic shops, assembling and selling a range of goods and providing a high level of electronics expertise, ran sophisticated and complex operations, and had electricians (*mistrii*) working within them. In contrast, single entrepreneurs selling a handful of solar modules, earning small margins and living hand-to-mouth, often provided no repair or maintenance services and had no technical knowledge. While some interviewees in informal shops were seeking to develop their solar business for the long-term, others told me that they would only remain in the market while demand remained high. Further, some of the formal shops spoken about in Chapter Four and Chapter Five were similar to informal shops in terms of the quality of some of the products they were selling, or their inability to access the benefits of the JNNSM subsidy for their customers.

Two hours drive westward from Lucknow, on Uttar Pradesh State Highway 40, the town of Bangarmau strikingly highlights the recent proliferation of informal solar businesses. Bangarmau serves a large rural population, with general goods and services available in shops along a wide vehicle choked stretch of road running through the centre of the town. Typically for Uttar Pradesh, the town is surrounded by electrified and non-electrified villages. Where there is electricity, it is unreliable, arriving for twelve to fourteen hours a day and rarely coming at peak evening hours, when villagers are cooking, children are doing their homework, and the evening staple of Hindi soaps arrive on TV screens. There is a clear unmet requirement for electricity. In early 2014 more than ten informal shops were competing to sell solar products along Bangarmau's main market road. Several other shops were selling solar modules from back rooms, not publicly displaying them.

Informal shops from all three sub-sets were present in the town. Hakim ran a long established electronics shop, which had recently started selling solar products. The walls of his shop were lined with shelves holding bulbs, lights, wiring, and other electrical components. Batteries, fans, and mid- and high-quality solar modules were stocked around the shop. Twenty meters down the road was Sunil's makeshift (*kacca*) solar shop, which with three bare concrete walls was open on its street-facing side. A selection of mid- and low-quality solar modules, between 10-Watt to 40-Watt in capacity, were stacked against boxes on the ground outside the shop, or were hung from the corrugated roof that sheltered the entrance. Inside the shop, batteries and wiring were stored. Across the road from Hakim's business was Manish's shop. Here a large range of modules were available, from 3-Watt through to 120-Watt, as well as lights,

lanterns, and batteries. Many of the goods were assembled by Manish. Modules, batteries, and lanterns were branded with the shop's logo.

Bangarmau was unusual for the number of solar shops it had. But in most towns visited for this study, several solar shops were open, most of which were informal. High demand and growing trust in solar power were regularly cited in informal shops as to why they had entered the off-grid solar power market. Jay, who had started selling solar modules in his electrical store in the district of Azamgargh told me he did so because: 'Customers were always inquiring. Do you have solar power here or not? Therefore, I requested some solar modules [from my dealer].' He had five solar modules stacked in one corner of his large shop. In Heidergargh, Pravin told me how 'Demand grew quickly' (*demand tez barh ho gya*), this is why I started selling'. The word '*tez',* meaning 'quickly' or 'hotly' in Hindi was often used to speak of the growth in demand, and number of informal shops entering the market. Businesses had also been able to benefit from the growing awareness and familiarity of consumers with solar power. I was told regularly how people now have trust (*bharosa*) and confidence (*vishvash*) in solar power.

Within Uttar Pradesh, an ecosystem of dealers supplying solar modules, lanterns, lights, and solar accessories such as fans to the informal sector operated from larger cities such as Delhi, Kanpur or Varanasi. The informal shops included in this study all sourced their products in this way. From dealerships it was possible to buy fully manufactured items or the component parts of products. Both made in India and imported from China goods were available. Most solar modules, lights, lanterns, and components were available at a wide range of quality and price levels. It was easy for existing shops to start selling solar goods, and for new shops to open and easily access supplies. A shop's

start-up costs might simply be the ability to pay for, or to access on credit, several solar modules or lanterns. No technical knowledge about solar power was necessary for an entrepreneur to start selling solar modules. The case of Sunil, who ran a makeshift *kacca* solar shop in Bangarmau, typified the ease of access to solar products for informal businesses. Once every few weeks Sunil, or his father, would travel one hour by bus to the nearby city of Kanpur to visit several dealers. They would see what new products were available, and what prices could be found. When I came along on one such trip, in each of the three dealerships we visited there were a wide variety of solar modules, lights, and fans available.

The rapid emergence of informal solar businesses, and the distinctive way in which they were developing the BoP solar market highlights that more empirical and theoretical focus is needed on informal business within BoP markets. It cannot be assumed that informal businesses will not thrive within liberalised BoP markets, or that formal businesses will outcompete them with their offering of good quality, value-conscious goods and services. This research challenges a straightforward story of BoP capitalism being told in the existing literature, and suggests the need to theorise how BoP capitalism is developing in different wasy in different places. The vitality of informal businesses in the case of a liberalised BoP solar market in Uttar Pradesh reflects research findings from other liberalised sectors of the economy in India, where informal and formal businesses are expanding at the same time, often interlinked, such as the waste (Gill, 2010, Gidwani, 2015) or the manufacturing sector (Mezzadri, 2010).

The growth in the number of informal shops selling solar power also highlights the importance of a network of mid-level and higher level dealers and entrepreneurs being

in place. While it is beyond the scope of this research to focus on the role of mid-level dealers, looking at their role in market development should be a research priority.

7.3: Cheap and Inferior Quality Goods

In India, informal businesses have been associated with cheap, low-quality, non-standard and counter-fit goods and services. Their success is linked to the hundreds of millions of Indians who live economically precarious lives who need such markets to access goods and services, as well as to a lack of formal alternatives (Drèze and Sen, 2013, Harriss-White, 2003). In the BoP capitalism literature, informal markets are similarly said to be the home of cheap and poor quality goods, and are seen as pre-capitalist or proto-capitalist (Prahalad, 2005, See Prahalad, 2012). Importantly, such markets are seen to thrive when formal businesses are not present, or when formal businesses are not taking the opportunity to sell appropriate products to low-income people, who are therefore shopping in informal shops.

The informal shops included in this study were all primarily selling cheap solar modules, lanterns, lights, batteries, and other associated goods. Within shops it was characteristic to see an array of differently branded goods stocked side-by-side. Prices were largely consistent between different shops. 3-Watt and 5-Watt solar modules, used to charge small LED lights or mobile phones, sold for as little as 400-500 rupees [£4-5]. Medium sized 40-Watt modules cost in the range of 2-3,000 rupees [£20-30]. Larger 100-Watt modules, used to power batteries for a Solar Home System (SHS) set-up, could be brought for upwards of 4,000 rupees [£40]. Cheap LED lanterns were being sold for 100 rupees [£1], and LED lights with a small battery for 30 rupees [30 pence]. In a small number of shops, in all cases electronics shops, some mid- or high-quality

branded solar modules, batteries, and lights were also being sold; so informal businesses were not always simply selling cheap and inferior quality goods. Most informal shops were selling SHSs, although these were typically not very popular, with customers usually choosing to buy individual products. Medium quality 40-Watt SHS packages were being offered for 9,000 rupees [£90], and lower quality or scaled back SHSs were available for around 5,000-7,500 rupees [£50-75]. SHSs varied from shop to shop and were often customised. Prices of these SHSs reflected the quality of components and materials used in the package.

Products within informal shops were usually low quality, and often substandard. Solar modules, lanterns, and lights were branded with names that changed month to month. Interviewees in formal and informal solar shops spoke of them as 'unbranded' or 'local' goods; this was because the concept of 'brand' was associated with a small number of good quality products being sold by companies such as TATA Solar Power. The technical performance of solar modules often did not match their description, and there was no certainty about what the long-term performance of solar modules would be. Batteries being sold were poor quality or locally assembled, and were not tested or controlled for safety.

The products within informal shops were significantly cheaper, and usually of a lower quality, than those available in formal solar shops and dealerships. Medium- and good quality stand-alone solar modules within formal shops were typically fifty to one hundred per cent more expensive. Good quality, branded lanterns were rarely available for less than 1000 rupees [£10]. Better quality bulbs sold with standardised and branded SHSs cost several hundred rupees [several pounds]. In formal shops, customers usually had to buy a standardised and branded SHS, with a fixed set of components all of a

certain quality level. Pre-subsidy, the standard price for a 40-Watt SHS in Uttar Pradesh from a formal shop was 14,000 rupees [£140]. Post-subsidy, the price fell to 10,000 rupees [£100].

The cost of solar modules, lights, and lanterns has fallen almost year-by-year over the last decade. This has been because of advances in solar technology and the development of LED lights (Keane, 2014). In Uttar Pradesh falling prices were evident. Interviewees regularly spoke about how prices were continually falling. For example, in an Akshay shop in Lucknow which had been open for over five years, I was told how over the last three years in particular *'goods have become cheap' (saman sasta hua)*. Significantly, people told me that goods in informal shops were getting cheaper much faster than in formal solar businesses. Informal shops were accessing the cheapest goods through dealership networks; with the products and components that were available from dealers typically reducing in price month-by-month.

A further important reason why costs were lower in informal shops was because such businesses did not have to meet any regulatory requirements regarding the quality of products being sold. Informal shops were not accessing the central government JNNSM subsidy scheme for SHSs, and so in putting together a SHS, they had no external requirements to meet specified quality levels or comply with rules about what components can be used. Further, unlike in formal solar businesses, the cost of installation and servicing was not being comprehensively priced into SHSs or other products being sold.

The off-grid solar goods and associated products being sold by informal shops were popularly spoken about and imagined as 'local' (*local wala*), 'Chinese' (*china wala*) and 'cheap' (*sasta wala*) products. Interviewees in formal businesses used these terms

to speak negatively about such products, and the informal shops selling them. The topic of 'Chinese' goods in particular was regularly raised during the first interviews I had within such businesses. For example, when I first walked into Prem's shop in Bangarmau, and he invited me to stay for chai, he was quick to start talking about Chinese products. 'In every place Chinese products are now being sold…. The shopkeepers are unregulated. There is a lot of benefit in selling Chines ones. The margins are high'. In formal solar shops and dealerships, on a day-to-day basis businessmen would frequently tell customers how *china wala* solar modules were cheap, bad quality and that they could not be trusted to perform well. While it was most common to hear talk of *china wala* goods (*saman*) that were low quality and cheap, I frequently heard *local wala* and *sasta wala* also being used to speak of such goods. In informal shops too, these terms were common. Shopkeepers would speak of their 'local' (*local wala)* products in contrast to 'branded' (*branded wala*) products. However, in informal shops the term *china wala* was not used, and in only one interview was someone happy to have their goods characterised as *china wala*. The term was nearly always used and understood in a derogatory manner. In both formal and informal businesses, customers coming into shops or dealerships would regularly ask to be shown *sasta wala* or *local wala* solar modules. These terms, and their association with informal shops, had the effect of further distinguishing informal shops from formal businesses.

In interviews with owners in informal shops I was told that being able to offer cheap goods to their customers was crucial to their success. In all solar shops visited for this research, interviewees would speak about how most people living in villages could not afford to pay for solar power goods. Day-to-day in both formal and informal solar shops

and dealerships, cost would usually be the primary concern customers had. The economically precarious position of customers was always very apparent. Informal shops were positioning themselves to provide solar power goods and services to villagers who could not afford to buy more expensive branded solar goods or SHSs. They catered to customers looking for the cheapest lights, and to the typical customer who wanted to buy the biggest and cheapest solar module a set amount of money could buy. With many customers visiting several shops to compare prices, informal shops had to offer the cheapest options they could.

The association of the informal sector with cheap and often substandard goods did hold true in the case of Uttar Pradesh. However, the idea from the literature on BoP capitalism that people only shop in informal businesses because of a lack of formal business alternatives, and that the informal sector is a 'survival' market of inferior goods, reflecting state and market failure (Prahalad, 2012), was not the case.

7.4: Jugaad within Informal shops

Within all informal shops improvisation was evident in various ways. I argue that improvisation helps to explain the success of informal businesses within the BoP solar market, and highlights the distinctive manner in which they are developing the BoP solar market. Improvisation and ingenious innovation was seen in the way that goods and materials were substituted within shops, in the twinning of materials, components and products from different origins, and in the altering of products and their performance. The trend of customers incrementally purchasing solar products and SHSs over time was supported and facilitated by informal shops offering improvised solar lighting solutions to customers that could be added to and altered. Formal solar

businesses were rarely offering this kind of service. While much repair work within informal shops was standard, improvisation was in many instances important in the repair and servicing work done. Further, I argue that extra-legal, deceptive, and opportunistic business practices evident within informal shops, often highlighting improvisation at play, also help to explain their success.

Improvisation is often seen in everyday life, involving at different times social, political and material action (Young & Jeffrey 2012; Jeffrey & Young 2014). Li speaks of how "practical knowledge… is at work everywhere, at all times" (Li, 2005:389). Within the social sciences, a body of work has looked at how improvisation can be crucial for people living informal and precarious lives. McFarlane (2011), Roy (2009) and Vasudevan (2014) have highlighted how people living in precarious economic and legal positions in cities in India and the development world improvise to survive, to find and build homes, and to access essential services. Gill (2010) and Gidwani (2015) have shown how improvisation is regularly necessary for informal workers in India. The examples of improvisation evident within informal solar shops reflected the creative and inventive use of materials spoken about in the literature on improvisation (see McFarlane, 2011, Jencks and Silver, 2013), and also social and political forms of improvisation. Improvisation within informal solar shops also often reflected contexts of material scarcity and of non-regularised and illegal activity. Identifying and theorising on improvisation within informal shops is therefore a useful starting point in thinking about why informal businesses were thriving, beyond simply highlighting their association with cheap goods.

I further argue that it is productive to theorise the forms of improvisation seen within informal shops, as well as extra-legal, deceptive, and opportunistic business practices

with the Indian concept of *jugaad*. Doing so, I contend, allows for more understanding about the success of informal solar shops. The idea of *jugaad* has already been taken up in work thinking about BoP capitalism. Most notably, Radjou et al. (2012) made the case that '*jugaad* innovation' characterises grassroots BoP innovation in India. They define *jugaad* as referring to innovative and improvised fixes and solutions born from ingenuity and cleverness. They speak about a *jugaad* mindset existing within India, where people find opportunity in adverse circumstances, resourcefully improvising to find solutions using simple means and few resources. *Jugaad* is about 'doing more with less' they say (Pp. 4). Radjou et al. characterise *jugaad* as practiced by millions of Indians. But they also see it as a mindset and approach that can be copied by businesses, in order to be successful in BoP markets. Their work fits with the arguments of Prahalad and other BoP market scholars (for example, see Bhatti et al., 2013, Rao, 2013), seeing opportunity for large companies within BoP markets, when market appropriate strategies and technologies are adopted, in this case *jugaad*. This interpretation of *jugaad* as being about ingenious innovation with few resources has been increasingly adopted (see Aiyar, 2010, Saraf, 2009, Sharma and Iyer, 2012), although Birtchnell (2011) has challenged these accounts, arguing instead that *jugaad* simply highlights a lack of resources and systematic risk. While Prahalad and Mashelkar (2010) also spoke about *jugaad* as involving short-cuts and second-best solutions, they instead speak of 'Gandhian innovation' in India, which is conceptualised in much the same way as Radjou et al. (2012) speak about *jugaad*.

In informal solar shops, frugal ingenious innovation, using components and products to hand, was evident. I argue, however, that *jugaad* should be understood not just to be about the improvisation of products and materials, but also about improvisation within

business, about illegal practices, and about opportunistic business. While the existing literature on *jugaad* within BoP markets has not considered such practices to be jugaad, many interviewees spoke about such practices as examples of *jugaad*. I make the case that considering a wider set of practices in terms of *jugaad* is important. Further, I argue that *jugaad* practices can primarily be seen within informal settings, where there is economic precariousness, something not emphasised in the existing literature. In making this argument, my work is drawing on ideas from Jeffrey and Young (2014), who speak of improvisation by young political entrepreneurs and brokers in North India in terms of *jugaad*. I also drawn on Jauregui's (2014) work, which similarly characterises social and political practices and strategies persued within the Uttar Pradesh police force in terms of *jugaad*.

7.5: Substitution, Twinning, and Altering Goods

Within informal solar shops the substitution, twinning and altering of products, materials, and components was evident. Such practices were sometimes mundane and standard, but at other times were innovative and inventive. They were shaped by the products and materials available in a shop, and were seen to varying extents within different shops, often dependent upon the level of technical ability of the people working within a shop. These practices reflected at times both the creative and inventive use of substitute materials and the twinning of unlikely materials discussed in the literature on improvisation; and ingenious invention and innovation to find a solution or develop a product, as discussed in writing on *jugaad*.

Customers in all informal shops were being offered usually low quality and cheap products that were direct substitutes to mid- or high-quality 'branded' products. In some

shops such products would be stacked alongside their branded equivalents, and customers would be offered the choice of either a 'branded' or an 'unbranded' product. Such unbranded products were spoken of as Chinese (*China wala*), cheap (*sasta wala*), or local ones (*local wala*). For nearly every branded good, whether a solar module, a battery, a light, wiring, a fan or a charge controller, informal shops would have at least one substitute cheaper option that they could provide.

Some substitution did not highlight creative improvisation or reflect *jugaad* at play. For example, the solar modules being sold in shops were in most cases ordered from dealers fully assembled and branded, and therefore in most shops, a standard range of substitute modules could be found. In some shops, solar modules would change little month from month, and would be ordered from one dealer, with whom the shop owner had a relationship. This was the same approach as in nearly all formal solar businesses. Most informal shop owners were buying solar modules from a range of dealers, and the modules that they had available would change month from month, depending on the products available from those dealers, trends in demand, and the prices modules were being supplied at.

In a small minority of the informal shops, cheap and low quality solar modules were being assembled and improvised. Solar cells that had been purchased from dealers would be cut within a small factory set-up, and the modules assembled. Such improvised solar modules were significantly cheaper than their branded equivalents, and their assembly within shops did reflect local small-scale improvisation.

Many other substitute products within informal shops highlighted improvisation, and spoke of *jugaad*. In a few informal shops, lanterns and lights would all be sourced from dealers, and no changes would be made to them. But in most, while a range of pre-

assembled lanterns and lights from dealers were stocked, locally assembled and improvised lanterns and lights were also being sold. These lanterns and lights were assembled from casing, motherboards, wiring, and LEDs that could easily be sourced from towns in Uttar Pradesh. The necessary components and materials were available at various quality levels. Complicated systems or components and safety features, that are designed into branded good quality lanterns and lights, were usually absent from locally assembled lanterns and lights. They were easy to fix together and to take apart, change or repair.

In most informal solar shops, this kind of assembly was evident, creating improvised substitute goods. Some light casings were common from shop to shop. But other light or lantern casings would vary in different shops, and the internal parts used in them would also be different. Sunil Soni, who ran a shop in the small town of Mallawan was typical in his approach. He told me how he bought the casing for lanterns and manufactured them for 50 rupees [50 pence] each. These he sells wholesale for 80 rupees [80 pence], and they retail to customers at 100 rupees [100 pence] or more. He told me how they were easy to make. The materials come from Delhi, and he just put them together.

Batteries and wiring, important parts of a SHS set-up, were also substituted and at times locally manufactured. Locally manufactured batteries replaced more expensive, 'branded' equivalents. The components to make a battery, including the plastic casing and acids, were readily available in most towns. These components were often of inferior quality, and there was little consideration of safety in the assembly of these batteries, but they were much cheaper than branded equivalents. For example, near to Bangarmau, Viresh ran a small back-street shop. Inside this shop, on the mud floor, he manufactured batteries. He had also recently started selling solar modules, a small

number of which were hanging from the walls of his shop, or stacked outside it. When I first visited, Viresh was working on a large battery on the floor, carefully pouring fresh liquid into the battery compartments. The shop had the feel, smell, and look of a mechanic workshop. Pictures 17 and 18 show his shop, and the batteries he manufactured. Cheaper wiring substitutes were available in most informal shops, much like with batteries. While often less efficient, or less durable, they were cheaper than wiring that would come with a SHS or solar module in a formal solar shop or dealership.



Picture 17: Informal shop, where batteries are assembled



Picture 18: Battery assembly in an informal shop

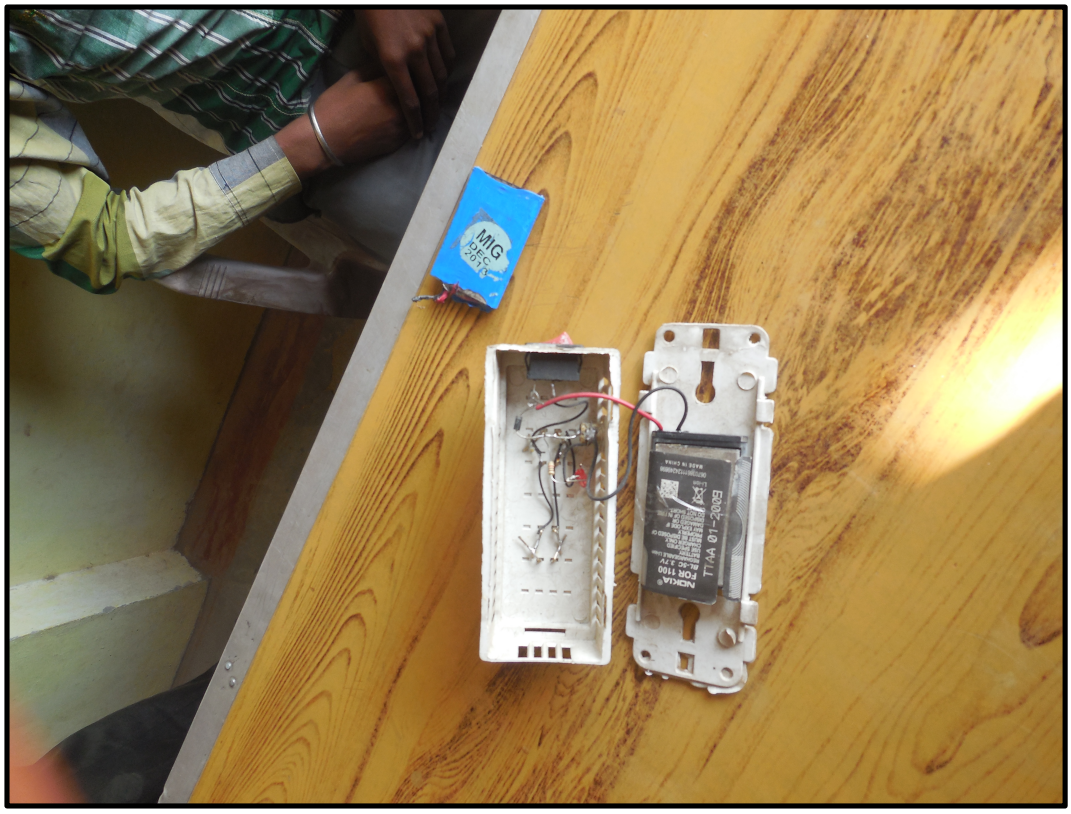
Rustam, the CEO at Boond, spoke of how cheap and improvised products and materials that substitute more expensive products and materials, and cut out any design process, had a big advantage in the market in Uttar Pradesh. He emphasised how with just a little bit of knowledge someone could start a manufacturing unit or a garage, and that supplies were easy to source. Improvised lanterns were a particularly good example of this he said: “Make them from whatever man, make them from whatever casing... Sell them... Don't worry about the heat sink. Don't worry about things that we typically when we are designers we worry about... That is how these products are. The casing is

very simple easy to get in the Old Delhi market. It is like some cents. LEDs you can pick as according to your requirement, a few cents again. All you need is... the good ones who try to sell have a nice casing which is sort of a bigger board which is expensive. But these guys don't care. They will get a tin box. They will put everything together. But to me what it shows is that the people like products which can be fixed, if they are paying in cash. So even if the guy is saying 6 months warranty he is still buying that. Because he knows on the seventh one if he goes back that it is a 20 rupees fix."

Substitution allowed informal shops to customise a SHS packages to meet what customers could afford, what they wanted, and according to what products and components were available at a particular point in time. Typically, cheaper substitute components and parts would replace more expensive ones. For example, replacing a branded battery with a local battery reduced the cost of a SHS by thousands of rupees. Improvised '*china wala*' charge controllers were much cheaper than branded, good quality alternatives. Using cheaper wiring, which might not be as efficient, again made a SHS cheaper.

Further, in putting together a package for a customer, components, and materials from different providences would often be twinned together, in an *ad hoc* manner. Again, this was done according to what was available in the shop, and according to the performance a customer wanted from the different components, or the amount they were willing or able to pay for different components. A customer might, for example, buy a good quality branded solar module, but combine it with a local battery, a 'Chinese' charge controller, along with several improvised LED lights. Often, a good quality, branded solar module would be installed with cheap wiring. Twinning was also common with

the components within products. Shops adding mobile phone batteries into improvised LED lights, thus improvising their performance, was one of the most common examples of this.



Picture 19: New battery being installed in an unbranded light

In the building of a SHS package, or an energy package for a household, improvisation and *jugaad* could often be said to be at play. In a majority of the informal shops there would be electricians (*mistrii*), whose role it was to competently mix and match substitute products and components into a system, often in a creative manner. In some shops substitution and twinning was done in an expert manner, and on a larger scale. For example, at Ankit's Unnao shop, a number of semi-standardised SHSs packages

were being offered, which used a mix of components of different quality levels, the choice of which took advantage of the products available to Ankit at any one time. In other cases, twinning is done in small, single room shops, where a shopkeeper would improvise with products and materials at hand, assembling a cheap combination for a customer. Substitution and twinning was contextual and fluid, but evident within multiple informal solar shops. Usually, the cheapest substitutes available would be combined. While sometimes there was little skill involved in this, often such practices would be innovative and creative.

Adjusting goods was a further way in which improvisation and *jugaad* was evident. Within a majority of informal shops, products were regularly opened up, and their performance altered and added to; again in an ad hoc and contextual manner. A smaller battery might be connected to a larger solar module than the system is designed for. Extra lights were often added to a SHS, above what a manufacturer would add. Solar lanterns were often rigged so that they could also be used to charge mobile phones. Hooking-up a solar module directly to a fan or light, without a battery or controller being used, was also popular with customers. Adding extra cables into the connector point of the solar module allowed a customer to charge a mobile phone and a light at the same time. Removing 'unnecessary' or ‘non-essential’ parts or components, which may be expensive, reduced the prices of a SHS. Altering the functionality could allow customers to do more with a SHS set-up than would otherwise be possible, or might be a way to reduce the price of the system.

In conversations with interviewees and with customers, I learnt that often customers would continue to alter SHSs and solar products once they had purchased them. Solar modules would often be connected-up to existing systems, connected to the electricity

grid in a house, or SHSs might be installed that were then powered by tractor batteries when needed.

This altering of the performance of products, often ingeniously and using resources, materials and components to hand, in a frugal manner, strongly reflected improvised innovation as spoken about by authors including Radjou et al. (2012), Saraf (2009), and Aiyar (2010) in terms of *jugaad*. Indeed, in informal shops, interviewees often spoke about such alterations as 'doing *jugaad'*, or as creating a '*jugaad* solution' or '*jugaad* product'. A number of interviewees spoke of *jugaad* as being about bringing materials together, or mending them, in a creative manner. A number of them also told me that a *jugaad* solution involved creating a SHS for a customer to meet their needs with the money they had, which would usually be not enough money to buy a branded SHS. The electricians working within informal shops were also at times spoken about as '*jugaad* electricians' (*jugaad wala mistrii*). For example, on one occasion, when spending time in a shop in Heidergargh, we had been talking about *jugaad* for a few minutes, when Pravin the shop manager gestured to one of his assistants, telling me how he was a *jugaad* electrician. He told me how the man had no training, but that he was skilled in adjusting, repairing, and creating cheap lights, lanterns, and SHSs for customers.

In explaining the advantage of *jugaad*, Mukesh in Unnao, told me that *jugaad* is about the Indian ingenuity for making things better. If you import a calculator from America, he told me, it will be well designed. To do *jugaad* to it would be to make it better, to add a new function, or to improve its performance. Many interviewees saw *jugaad* as an important practice that allows them to offer better quality goods to their customers, for less money, arguing that people did not want to buy a standardised or fixed product that

they could not adjust or improvise to meet their needs over time, or to fit into an existing set-up.

Not all saw *jugaad* within informal shops positively however; in particular, but not exclusively, interviewees in formal solar businesses viewed *jugaad* negatively. Some interviewees spoke about the second-best nature of many *jugaad* products and solutions. They associated *jugaad* products with poor quality, and said that they typically did not last long. Satyaveer, who ran a TATA Solar Power dealership, told me that people were often connecting the wrong batteries, lights, and solar modules together to change their performance. In such situations they quickly broke, and people needed to then find a *jugaad* repair, or replace components. Often, such *jugaad* involved cutting out components, or altering a product to operate outside of safe operating limits. This reflected Birtchnell's (2011) understanding of *jugaad* reflecting systematic risk. Improvised and *jugaad* products were not, however, always seen in a negative light, and simply rejecting them as second-best solutions would be wrong. Many customers spoke of preferring the customised SHSs that a *jugaad* solution would provide, or were proud of their ability to improve the performance of a product.

Substitute, improvised or *jugaad* products, and improvised or *jugaad* SHSs, were crucial to the success of informal shops, and their ability to offer lower prices to customers. Offering a range of substitute products allowed shops to significantly reduce their prices. The twinning and mixing of products and materials enabled shops to offer flexible and customised options to their customers, who could trade on quality and performance. Finally, altering the performance of SHSs and associated goods allowed shopkeepers to offer better functionality and performance to their customers.

It was striking on a day-to-day basis how most customers in informal shops would not buy a fixed standardised SHS, but would buy either individual products such as a solar module or an LED light, or would buy a customised SHS. This was in contrast to formal solar businesses, where the majority of people were buying fixed SHSs. What customers brought was nearly always closely linked to the amount of money they had when entering the shop. Usually villagers would come into the shop with a fixed amount of money. It was common for someone to ask: 'What can I buy with 1000 rupees?' Such customers would then be juggling the amount of work (*kaam*) that a chosen set of goods could do for them, in terms of power produced versus the quality of the product. Often customers would visit several different solar shops, finding out in which one they could get the best deal. A price difference of as little as 50 rupees [50 pence] would regularly determine whether a customer brought a product, or went elsewhere.

Importantly, such practices were nearly always evident in informal solar shops, and not in formal solar businesses. In formal shops and dealerships, most of the products being sold were branded, good or medium quality, and were standardised. They were manufactured non-locally, and had company warranties. SHSs being sold were also usually standardised, and included branded components, designed to be used within a specific SHS configuration. The idea from Radjou et al.' (2012) and others, that *jugaad* is something that might equally be done by formal businesses, is not borne out in the case of the off-grid solar market in Uttar Pradesh.

Unlike with formal businesses, informal shops were not restricted or incentivised by government subsidy program requirements to sell standardised configurations of SHSs that included a set number of components and were quality approved. For formal shops

and dealerships, carrying out the improvised practices that informal shops were involved in would have prevented them from being able to access government subsidy schemes.

The kind of substitution, twinning and altering of products, components, and materials varied between shops, depending on the skills of the people in that shop, and what materials they had to hand. It was contextual. At times substitution, twinning, and altering were practices that were mundane, and there was not the creativity or improvisation that is generally associated with *jugaad*. Further, in a minority of informal shops such practices were not evident. In some instances, shopkeepers in solar shops knew little about solar power, or the electronics involved, only selling stand-alone products to their customers.

No one believed that the cheap imported products, such as lanterns from China, were *jugaad* products, unless changes had been made to them. It was widely agreed that something was only a *jugaad* product when it had been improvised, a product created or improved in a local context in an *ad hoc* manner. There were therefore relatively complex cultural ideas bound up in what was considered *jugaad*, as has been outlined by Jauregui (Jauregui, 2014).

The same view was held by informal shopkeepers as with formal solar business shopkeepers, that if you sell poor quality products to customers, then you will quickly receive complaints. In Mallawan Arju Singh told me how they are careful what products they sell because he did not want people to come back complaining about a poor quality solar module, if it broke. He told me how his reputation would be damaged by selling bad products, and how people would not come back for a second time. ‘We don’t sell cheap ones. After two days it will go bad. [The customer] will not come again. *(Sasta*

wala ham nahi karege. Do din bad kharab hogo, dobara mere pas aega)'. The importance of building the trust (*barosa)* and confidence *(vishvash)* of customers in informal shops, challenges the idea in some of the existing literature on BoP capitalism that informal businesses are not focusing on providing a good service.

7.6: Incremental Purchasing

Over several months of interviewing in informal shops, I was learning that many customers were buying solar modules and associated goods incrementally over time, or intended to do so. Informal shops were facilitating this trend. They were able to do so, because they were offering improvised and *jugaad* solutions to their customers.

The significance of incrementalism has been theorised in research on informal urban contexts. Writing on Accra, Ghana, Silver (2014) argued that within the post-colonial context, informal urban infrastructure development at the margins of formal development is not only improvised, but is crucially incrementally built and always in flux. McFarlane (2011) speaks of how shack construction in Mumbai is incremental, produced through the labour of assembly over time. Improvised informal settlements are not simply *ad hoc*, he says, but the product of tinkering and tweaking over time. Similarly, Simone (2008) discusses how houses, small businesses, and infrastructure in informal settlements are added to bit by bit, over time.

This research highlights how incrementalism was in the same way a strategy being adopted by people in BoP market contexts, often where they did not have the money to buy a comprehensive solar lighting set-up in one go. Further, improvised and *jugaad* solutions from informal shops were well suited to people buying incrementally. Many

customers, who were buying a solar product for the first time, would come into informal solar shops and only buy a small solar module, and maybe an LED light or a lantern, because that would be all that they could afford. For the smallest 3-Watt modules, and one light, this would cost as little as 500 rupees [£5]. Their solar module would then be typically wired with a small transformer box that had a selection of chargers for mobile phones and light charging. These were usually cheap substitute, so-called Chinese (*china wala*) units. From such a connected solar module, it would then be possible to directly charge a mobile phone, a small LED light, or a fan. This is the bare minimum needed for a customer to benefit from a solar module, and the sale of such a solution was typical in informal shops. In formal solar businesses, selling this kind of basic solution, without a battery and a charge controller was unusual. The majority of customers buying these, when asked, said that they wanted to add to this basic set-up over time.

Other customers to informal shops would already have a basic solar module at home, or some form of a SHS already in place. These customers would be coming to the solar shop to buy additional products or components, such as batteries, lights, new wiring, or other accessories such as fans. Some would be upgrading to a bigger solar module, or to a bigger battery. Some customer would bring their lanterns into shops, in order for them to be fitted with bigger batteries to improve their performance. Such customers would be incrementally adding to their systems.

When spending time in solar shops, it was striking to see how many customers had a good level of knowledge about solar modules, batteries, lights, and other components that formed part of a typical SHS, and of the electronics that connected these different parts together. For example, this was highlighted in typical fashion one day at Pravin's

shop in Heidergargh. Mid-way through the morning a couple of farmers had come in looking to buy a battery. The negotiations took around thirty minutes, and involved detailed discussions about how well different batteries would charge from the 40-Watt solar module they already had, and what kind of wire to use to connect the two. Once they had paid for their battery, they told me how they had a few years previously brought a branded TATA module through a bank, but that it did not have sufficient back-up for what they needed, and that now they were looking around to buy a battery to add to their existing set-up. They were confident about the technical details of batteries and solar modules, and had visited several other solar shops before coming to this one.

Informal shops improvised to meet customer requirements for incremental buying, often creating *jugaad* solutions. In making a basic system work for a customer, which might be missing standard components usually included, or in adding to an existing system, there was the need to improvise in terms of substitution, twinning, and altering. Connecting a solar module directly to a fan, or adding extra wires directly into a solar module so that it charged two things at once, for example, were spoken of as *jugaad* solutions in many shops. These common practices within informal shops contrasted sharply with formal solar shops and dealerships, where shopkeepers were focused on selling standardised, packaged SHSs to their customers.

Importantly, these practices were often tied to economic precariousness. In interviews, I was told that most customers coming into informal shops had limited money available to buy solar products, and that they usually only had access to money at certain times of the year. In many of Uttar Pradesh's districts, migrant labourers in brick kilns would come to buy solar products when they had been paid. Farmers would buy solar products

when they had received income from a crop. The months from May to June were busiest in shops, when the weather was at its hottest, and people wanted to buy a solar module and a fan with the money that they could spare.

Interviewees regularly spoke of improvised or *jugaad* solutions as being something that is done when there is a lack of money. Pravin, a middle aged shopkeeper in the town of Heidergargh told me how 'If people have money, then they don't need to do *jugaad'* (*agar log ke pas paise hai to jugaad zaruri nahi hogi*). When talking with Raj, who worked in a Boond shop, he told me how: 'Those people who are financially poor, they do *jugaad (voh log jugaad juta hai).* They buy cheap ones'. As an explanation to why *jugaad* is done, Manish, put it like this: 'Necessity is the mother of all invention (*aavshyaktaa hii aavishkaar ki jannii hai*). When the facilities are not there, then *jugaad* is about finding things, to do work. *Jugaad* is also about innovation by the the common man (*aam admi*). Where there is necessity, *jugaad* is happening.'

Customers were often buying an improvised solution in the context of not being able to afford a branded and good quality option. Improvised options were very often second-best solutions. This confirms the concerns that Birtchnell (2011) has about romanticising *jugaad*, which is often linked to systematic risks and a lack of resources in the economy.

7.7: Repair Work

Within most informal shops, solar power products and accessories were being repaired and serviced. Repair work in shops was often standard and mundane, such as replacing bulbs in lights, or repairing wiring or connections in lanterns. But improvisation was

often evident, with much repair in informal shops contextual, *ad hoc*, using few resources to hand, at times in ingenious ways. Often products were being repaired ignoring the official servicing protocols of manufacturers.

Repair is a strong theme in the literature on improvisation (Jencks and Silver, 2013). Looking at informal urban development, McFarlane (2011) speaks of how improvised slum houses in urban India in the process of being dwelt within are repaired over time in an improvised and fluid manner. Repair work and finding solutions when things break is also a focus of the literature on *jugaad*. Radjou et al. (2012) and others speak about ingenious and innovative repair solutions, using few resources or materials readily available, as reflecting *jugaad*. In the existing literature on BoP capitalism, there is little talk about local repair within informal shops. Further, when talking with policy makers and solar company managers, I was commonly told that cheap (*sasta wala),* local *(local wala)* and Chinese (*china wala)* products were 'use and throw'; that they were products that could not be repaired. Within the literature on solar power BoP markets, there is a strong narrative that formal companies starting up need to provide good servicing, and that doing so will win them customers and distinguish them from informal businesses (for example see Miller, 2009).

In the informal shops that I visited, to the contrary, repair and servicing was commonly offered. If repair work was not being done in a shop, there would always be a nearby electronic shop or electrician (*mistrii*) providing repair work. The most common repair work being done was for products and components peripheral to solar modules, such as for lights and charge controllers. On a day-to-day basis customers came into shops with broken LED lights and lanterns, which had problems with wiring, batteries, connections, switches or bulbs. Similarly, charge controllers that no longer worked were

brought into shops, requiring fresh soldering or wiring. Often customers would have problems with batteries not charging correctly, or would come with complaints about their SHS set-up not working, and would seek advice and repair within shops.

Sometimes repair work was straightforward, mundane and did not highlight improvisation. For example, reconnecting wires, replacing a broken battery or a dead bulb were jobs done regularly, costing a customer between 10 to 100 rupees [10 to 100 pence]. Locally assembled LED lights were poor quality, and often needed to be repaired. Usually they needed wires to be newly soldered, a small but time-consuming job. In nearly all informal shops a *misterii* (electrician) would be working, usually a teenager, who would do these small jobs. Standard components, although with different quality options, were available for everyday repair work. Sometimes a product would be sent away for repair, if it had a warranty, and the customer did not want to have an improvised local repair job done. While regular company warranties were not usually offered in informal shops for many of their products, shopkeepers would in many instances do repair work for free or for a nominal rate, only charging for components. Even when products had been purchased from other shops or were out of warranty, this would be the case.

Much other repair work did demonstrate improvisation being practiced, and often involved a *jugaad* solution for the customer. For example, in Manish's shop, during a typical day several people would arrive with faulty goods. Manish would spend long periods of time repairing various goods and components. For example, one morning, at around half past ten, Sunil and his friend, two local farmers, came in with a typical problem: a charge controller that was not working. It had been brought new from a different shop a few months previously. Manish opened it up, showing them that the

fuse had blown and the plastic casing to the fuse had melted. Over the next hour, he then dismantled the charge controller, soldering it in several places, before re-assembling it. His assistant then took it outside into the sun, connecting it to a SHS set-up outside the shop, to show that it worked. I was surprised by how complicated the circuit board was in the charge controller in terms of the components and material. The repair work was not straightforward. Manish did not replace the fuse, and when I asked him about it later he described this as a *jugaad* solution to the problem. He said that it could not be properly repaired, but it could be altered so that it would work for some more time. Sunil paid ten rupees [10 pence] for the work, leaving the shop and jumping onto the straw-strewn trailer of a tractor that his friend was coaxing into life.

Locally assembled products, put together using an assortment of components, were usually easy to open, to repair, to adjust, and to add to in an incremental and ad hoc manner when problems arose or people wanted to have them improved. Such goods did not have formal warranties or servicing requirements attached to them. Again, in such repair work, improvisation was often evident, and *jugaad* solutions were often given. Shopkeeper would be doing work with the components and materials they had available, depending on what the customer could afford.

Branded good quality lanterns, lights, and SHSs were also being repaired within informal shops. I commonly encountered villagers bringing branded lanterns and lights, such as D.Light or SunKing lanterns to informal shops to be repaired. These products were sold with warranties, and servicing was supposed to be done in approved repair centres. Further, these products were sealed and had complicated internal parts and irregular components, and could not easily be opened or changed. Doing local repair

work in an informal shop would invalidate any warranty. But many people were still going to local shops to get these products repaired.

In interviews, repair was often spoken about in terms of *jugaad*. In the town of Heidergargh, when I was asking Tahir about the repair work he did in his shop, he told me that *jugaad* repair work was about finding solutions to a problem within the shop, with the resources to hand. He told me how if you have a 'company' product like a SunKing lantern, if there was a problem, then getting the company involved took a lot of time, and so doing a *jugaad* repair was to quickly deal with the problem in the shop. In several instances, shopkeepers spoke of customers being able to choose between a 'company' or a '*jugaad'* repair. In Malawan, Sandeep told me how in his view a *jugaad* solution was about doing things locally, not taking things from Delhi, or taking things back to Delhi to be repaired. In Bangarmau, Manish told me that customers who bought a branded SHS from a formal company found that getting repair and servicing is difficult, as the company will take a lot of time to do the work. Instead, when a product is bought from a local informal shop, it is made by hand (*khud ke hath banaya hai*), and is therefore locally repairable, quickly and easily.

Rustam, the CEO of Boond, also recognised the advantage that informal shops had in repair. He told me how customers were often choosing informal shops because they knew that while they might not have a warranty, they would be able to get products fixed locally. Rustam argued that: "The cash market is not for the Greenlight Planets to be honest or for DLights [formal businesses selling solar lanterns]. Because if they take it apart, it is very difficult to fix it, because they are all stuck together and all that. The cash market is for these guys... And that is the beauty". In stark contrast, in formal solar shops repair work was done according to manufacturing requirements or warranties, and

improvised repair was much less evident. Products were often sent to the manufacturers to be repaired. Branded lanterns and lights that were sealed so as to make them durable would only be opened and repaired using official components, which were often extremely expensive. Warranties were usually being redeemed, and significant paperwork was involved in the repair process.

Four informal solar shops included in this study were not doing repair work. These were shops where only a few solar modules were being sold, and the shopkeepers did not have any technical expertise. For example, in Sunil's shop in Bangarmau, servicing was not being provided. However, people coming to all of these four shops could get products repaired nearby. Next to Sunil's shop were several informal repair shops, and there was one electrician working from a table outside the shop next door. When I visited Sunil's shop, on his desk there would typically be multiple so called 'use and throw' Chinese and local lights, that were in fact being repaired. See picture 20.

Repair work and fixing was an important service provided by informal shops. Where improvisation was evident, it was contextual and *ad hoc*, and highlighted repair skills and knowledge that reflected the improvisation often characteristic of informal urban settlements (McFarlane, 2011). Innovative and ingenious repair work also reflected talk of the ingenious innovation of products using resources and materials to hand spoken about in the celebratory literature on *jugaad*, from authors such as Radjou et al. (2012). However, while such authors have seen *jugaad* as a practice that can be adopted by companies to succeed in BoP markets, this research showed that *jugaad* solutions were strongly linked to informal shops. An improvised or *jugaad* solution involved improving a product in a contextual way, within the constraints of resource scarcity and the lack of money available to the customer. While authors such as Radjou et al. are

celebratory about *jugaad*, often *jugaad* solutions were about second-best solutions, and about finding a way to make a product last for several more months. Improvised repair work was also clearly necessary in a market full of cheap and substandard goods which regularly broke.



Picture 20: Informal electrical repair business

7.8: Extra-Legal, Deceptive, and Opportunistic Business

Extra-legal, deceptive, and opportunistic business practices were evident in all informal solar shops in a number of ways and to varying extents, and help to explain why informal shops were thriving, alongside signalling the distinctive way in which informal businesses have been developing the BoP solar market. In the literature on BoP capitalism, corruption, extra-legal business practices, and deception are practices that are seen as common place within the informal sector (see for example De Soto, 2000, Prahalad and Hart, 2002). Such practices are viewed negatively, as leading to customers getting poor quality goods and service. Formal businesses entering BoP markets are seen as having an advantage over any existing informal businesses because they are understood to not engage in such practices when working properly.

The extra-legal, deceptive, and opportunistic practices that were widely evident within informal shops, however, were often essential for informal shops to succeed. Such practices in many instances could be understood and theorised alongside other forms of improvisation seen within informal shops or can be seen as further instances of *jugaad* at play. Deceptive, illegal, and corrupt practice have been spoken about as examples understood in terms of *jugaad* in the work of Jeffrey and Young (2014) on educational entrepreneurs and brokers, and Jauregui (2014) on the police force in Lucknow, Uttar Pradesh. Jeffrey and Young (2014) look at how student brokers within colleges in Northern Uttar Pradesh, involved in rent-seeking and extortion, speak of much of their work as *jugaad*. Jauregui (2014) looks at the way extortion, bribes, and payments made for promotion evident within the police force in Lucknow, were practices that could be usefully understood in terms of doing *jugaad*, rather than as highlighting corruption.

Birtchnell (2011) is unusual in having spoken negatively about *jugaad* in market contexts, as involving corruption or deception at time.

Within informal solar shops, the origin and quality of solar products and accessories was often unclear, and at times hidden from customers. In many instances, owners in solar businesses stocked products that they had little knowledge of the quality of. It was questionable how durable many solar modules actually were, and whether they would produce the output that was labelled on them. Incorrect or misleading information was attached to products in many cases. When connected to a meter, many of the cheap solar modules stocking the shelves of informal solar shops did not generate the level of electricity that they were labelled as generating. Shops were often buying a batch of products from a dealer, with a particular brand, and the next month buying a different batch with a different brand.

The legitimacy and reliability of warranties and servicing was also often unclear. Cheap low- and mid-level quality solar modules did come with warranties, which would be filled out and given to customers when they purchased an item. However, it was unclear whether such warranties could ever be redeemed. Most warranties were branded with the same logo as was on the product being sold, but month-to-month the logos on products changed. When spending a day with Salim in his shop one day, while he was filling out a warranty card which came with a cheap solar module he was selling, he waved the card at me, joking how this was a '*jugaad*' warranty that was probably not worth anything.



Picture 21: Example warranty card in informal shop

Within local markets there was a strong consumer preference for the biggest and the cheapest modules. As a result, many informal shops had a strong incentive to stock large and cheap solar modules, many of which were cheap because they were poor quality, and did not actually produce the output they were labelled as producing. Interviewees told me that after several years the performance levels of such solar modules would likely decline. Yet, customers rarely were told or understood this.

Within the market there was a strong preference amongst consumers for 'India made' goods, which were considered to be better quality than 'Chinese' products. One day, when sitting with Mukesh in his Unnao shop, I learnt about a number of the ways in which deceptive business practices have become important for shopkeepers as a result.

Mukesh is in his early twenties, and runs two shops in Unnao, as well as supplying solar modules and goods to smaller shops in the district. He was telling me how many local dealers will buy cheap components from China, which are assembled and then labelled as Indian products. As the products have been assembled in India, the dealers have a level of legitimacy in saying the products are 'Indian'. One moment in this discussion was particularly revealing: "Actually I should not be saying this, but this panel is imported from China", he told me, asking his assistant to fetch a 5-Watt panel from a shelf. "There is a dealer in Kanpur, he has put this sticker on under the glass. He is saying that it is made in India, and he is registered here [in India]. It is actually a Chinese one, but it is being sold as an Indian one." This was a common issue with a lot of the cheaper panels, Mukesh said. Chinese modules are much cheaper, and have a higher profit margin for shopkeepers. But shopkeepers are reluctant to be associated with selling *china wala* products to their customers.

Mukesh also talked about manufacturers exaggerating the output of their solar modules. He told me how they used cheaper solar cells to make large solar modules. They then labelled these as producing a higher level of output than they actually produced if you tested them. He cited the recently popular Surana solar modules, seen in many informal shops, saying how they sold 75-Watt panels that only produced around 60-Watt output. "It is on the MNRE blacklist. This is a black money of 15-Watts. But lots of people are going to them and saying give me a panel of this number of Watts, and they will make it for you, and then you will say write this number of Watts on the panel and they will do this for you."

Informal shops were falsely labelling products in some instances. In these shops, cheap solar modules had been labelled as TATA Solar Power modules. This was the case in

Ashish's Bangarmau shop, which I visited on two occasions. Alongside a range of mid-quality modules I noticed that several modules were labelled as 'TATA BP', the old logo of TATA Solar Power from when they were in partnership with BP. When I asked how much he was selling these for he quoted a price that was about 40 per cent cheaper than TATA Solar Power modules actually cost. When I asked Ashish about this, he told me that he had got these modules from Kanpur, and it was easy to find modules with false labelling attached to them. In several shops, such modules were being sold for as little as 50 per cent of the price of genuine TATA Solar Power modules.

Customers were often aware that there was a danger of being cheated, or that the information on products might not be correct. In sales pitches, it was common for customers to ask multiple questions, probing the specifications of a product they were looking at, trying to ascertain the weaknesses or problems that might arise, or why that product was being sold cheaply. Often, customers would ask the shopkeepers to connect up a solar module, a light, or a battery and to show that various functions were working as described. Warranties would be closely guarded. And assurances that if there were problems, customers could come back, would be given. The ability of a shopkeeper to convince customers of the quality and performance of their products, for the price being charged, was important.

Omkar, a manager working for TERI, described how the solar lamps many informal shops sold were often the rejects from branded companies. They are imported from China for about 80 rupees [80 pence] a piece, he told me. The wholesaler then sells them on for 200 or 250 rupees [£2, 2.50], and the shopkeeper then sells them for about 400 rupees [£4]. And they are still then cheaper than their good quality equivalents sell for. This is a profitable line of business for a small informal shop.

A number of informal shops were involved in government work, winning tenders to install solar modules on government buildings or to install solar street lights in villages. To get such work it was necessary to pay bribes. I witnessed this first hand on one occasion, when spending a day with Prem. He had recently won a contract to install a set of solar modules for a government office in his local town, and I accompanied him to sign the deal with a local government officer. He told me how the competition for such work was now high, and that he had needed to pay a cash bribe. When talking with interviewees about the need to pay bribes in order to win tenders, speaking of the need to do '*jugaad*' was common, which mirrors Jeffrey and Young's (2014) and Jauregui's (2014) findings on how extra-legal activities are often understood in terms of *jugaad* in India, and how such activities cannot be simply theorised in terms of corruption.

Extra-legal business practices and deceptive business were essential to the way in which most informal shops had to operate, in various ways, at various times. Being able to source very cheap solar goods, which were poorly labelled or which had unclear quality levels allowed cheap products to be offered. Improvising from month to month with the products being stocked, and being deceptive about how they would perform, kept prices low. Offering a bribe to a local official in order to win a streetlight contract could be very lucrative for a shop, and the only way they could win that contract. Importantly, some interviewees in informal shops did not want to be seen as providing *jugaad* solutions and did not consider themselves to be involved in a *jugaad* business. They spoke of *jugaad* solutions and work often being deceptive, and two interviewees said that *jugaad* was damaging to the trust that customers now had in solar power.

Many businessmen had entered, and operated within, the BoP solar power market in an opportunistic manner, and at times on a short-term basis. Demand for solar power

products was high, and it was easy for someone to go to a dealer and buy a number of solar modules. Within the literature on BoP capitalism, there is a focus on businesses developing BoP markets by building long-term oriented businesses, which have strong connections to the communities where they are operating. Building trust is a big theme in the literature (see Prahalad, 2005). But the opportunistic and short-term business often evident with informal shops was a further way in which informal shops differed, and again could be distinguished in terms of improvisation and *jugaad* in business.

Informal solar businesses were easily able to move into and out of selling solar power, depending on demand and the products available month to month. A sub-set of informal shops were short-term, with interviewees in these shops saying that they had entered the market in response to a high level of demand, coupled with it being easy to source solar modules and accessories. I was told that as long as demand was good, and margins remained good, that it was a good business to be in. For these shops, entering the market was a short-term opportunity, and interviewees had little intention of staying in the business in the long-term, if demand fell. Indeed, in some towns, by early 2014 there was strong competition, margins and sales were falling in shops, and in several shops I was told by interviewees that they were already thinking of moving on to a different business. I found that the people running informal shops were in nearly every instance from trading families, and had been involved in various other businesses in recent years, generally selling goods and services.

Sunil's shop in Bangarmau reflected this model of business. Previously his father had sold locally manufactured batteries, which they had also been manufacturing. More recently they had decided to start selling solar power modules, because demand was high. However, in early 2014, when I met with Sunil after not having visited for several

months, he told me how competition was now too high, and that he was in the process of trying to secure a visa to travel to Saudi Arabia for work. He told me that he had little long-term interest in solar power. Sunil was not the only entrepreneur in Bangarmau thinking of leaving the market, Ashish, who ran a dedicated solar power shop in the town told me that he too was thinking of changing his business, and had heard that the market for medical devices offered good opportunities. Both were at the time still only talking about leaving the solar sector.

Often informal shops had stock that was opportunistically sourced and showed improvisation at play. For example, the stock of solar modules and accessories in informal shops would regularly be changed from month to month, as new goods became available, or particular deals were reached for new stock from dealers. The example of Anil, the CEO of a micro-grid company, characterised this opportunistic business activity. On one occasion I was accompanying him on a visit to a solar micro-gird set-up in a village. On the way back we stopped at several shops. Each time, Anil would open the boot of our car, bringing out a package of torches and a package of LED lights, both from China and obtained cheaply, as he later told me. He was hawking these goods in these different shops, providing him with quick and opportunistic business.

For most informal solar shops, moving into the off-grid solar power market was opportunistic in terms of solar power being a complementary market to enter. Often such shops had been operating for many years, and had experience of selling white goods, and providing an electrical service to customers. In such shops there was a lot of existing knowledge and skills in terms of the material manufacturing and improvisation of goods, which made them well-placed to take advantage of the range of products and components entering the market through dealers. Again, interviewees in these shops

told me that they entered the market for off-grid solar power because of demand, and that if margins reduced or demand reduced, then they would leave it again.

It is useful to think of opportunistic work in terms of improvisation or *jugaad*, fitting with other forms of improvisation and *jugaad* seen within such shops. Informal shops were flexible and fast moving on the products that they were offering, responding to local availability and demand in a rapid manner. This is a key part of *jugaad* practices, and distinguished them clearly from formal solar businesses where standardised and fixed SHSs were preferentially stocked, which were often using out-of-date or more expensive components because of their need to fit regulatory specifications for access to subsidies. In informal shops, businessmen were able to offer a wide and regularly changing selection of brands and quality, at a range of prices, meeting what customer needed, wanted, and could afford.

7.9: Conclusion

Informal businesses have been largely ignored within the recent literature theorising BoP capitalism in liberalised markets in the Global South. They have been framed as providing cheap and inferior quality goods and services, as often corrupt and high-risk, existing because of a lack of market development and formal business alternatives (Prahalad, 2012). The argument from business, economic, and development scholars theorising BoP capitalism has been that low-income people will buy good quality, standardised, and branded products and services from formal businesses, when they are appropriately designed and sold at low prices. Notable proponents of this argument have included Prahalad (2005, 2012), London (2008), and Hammond et al. (2007). This argument more broadly adopts the theoretical perspective that liberalisation and

economic development around the world is laying the grounds for the advancement of pure neoliberal capitalism.

This research has found that informal businesses cannot be side-lined when theorising BoP capitalism. In the case of the BoP solar market in Uttar Pradesh, people were buying solar power products and associated goods from informal shops, despite good quality and value-conscious equivalent products being available from formal solar businesses. While researching, it quickly became clear that the story of the developing BoP solar power market was not only one of formal businesses selling products expertly designed for a BoP market. While formal solar businesses have been developing the BoP solar market in Uttar Pradesh in a distinctive manner, as outlined in Chapter Four, informal shops have at the same time been operating within the market, without any subsidy support, developing the market in a distinctly different manner from formal solar businesses.

Informal shops were primarily selling cheap and inferior quality products, popularly referred to as Chinese '*china wala*', local '*local wala*' and cheap '*sasta wala*' goods. At the BoP, where people are living in economically precarious situations, selling cheaper goods and services was a crucial advantage of informal shops. But this chapter also found that what could be characterised as *jugaad* goods and businesss practices helped to explain the success of informal business. The substitution, twinning, and altering of products, components and materials evident within informal solar shops often demonstrated improvisation at play, or could be understood in terms of a *jugaad* approach to sourcing and making goods. Such products and practices in informal solar shops were crucial to the incremental way that customers often purchased their goods. While repair was often mundane and standard, much repair work again demonstrated

improvisation at play, or spoke of a *jugaad* solution to fix a problem. Beyond the products being sold in informal shops, extra-legal, deceptive, and opportunistic business practices again could often be understood in terms of improvisation and a *jugaad* approach to business.

The improvisation of products and the repair work seen in informal shops spoke of *jugaad* much in the way that Radjou et al. (2012) talk of *jugaad* in BoP market contexts. However, this research found that *jugaad* was associated with informal shops to a much greater extent than with formal solar businesses. This thesis calls into question the idea that formal businesses are able to do *jugaad* to the extent that informal shops are. Indeed, *jugaad* solutions are arguably incompatible with the approach that formal solar businesses have of selling good quality, branded, and standardised SHSs. Further, while Radjou et al. and others have limited their discussion of *jugaad* to speaking about product or material innovation, in informal shops, illegal, deceptive, and opportunistic business practices often spoke of *jugaad*. This understanding of *jugaad*, also being about para-legal and extra-legal activities, mirrors how *jugaad* has been interpreted by Jeffrey and Young (2014) and by Jauregui (2014). Improvisation and *jugaad* within informal shops could often be associated with second-best solutions, with short cuts, and with deceiving customers. Like Birtchnell (2011) has argued, such practices were at times a sign of resources being stretched too thinly. Often it reflected economic precariousness, and people not being able to choose a better option, as has been argued when looking at such practices within urban contexts (McFarlane, 2011, Roy, 2009). But importantly, *jugaad* is a practice that people were often proud of, and did showcase the forms of ingenious innovation that Radjou et al. (2012) talk about.

The improvisation evident within informal shops often mirrored the creative improvising and *ad hoc* use of materials, often in a frugal manner, spoken about in the wider literature on improvisation (Jencks and Silver, 2013). Further, much like as improvisation within urban development contexts was in the context of economic precariousness and material poverty (McFarlane, 2011, Roy, 2011), within informal shops, improvisation was happening in the context of the economic precariousness of customers, and according to products and materials most easily available.

This chapter shows that within liberalised BoP markets in India, both formal and informal businesses can thrive. This shows that the near total focus of the existing literature on BoP capitalism on formal businesses is misguided, and it also shows that the focus of the literature, governments, and international organisations on formal solar businesses, in the case of off-grid solar power markets, is also problematic. The dominant narrative that the BoP solar power market will be solely developed by formal businesses is clearly not in line with what is seen in Uttar Pradesh. The work of Peck and Tickell (2002), and other economic geographers, draws attention to how neoliberal capitalism varies around the world. The case of the off-grid solar power market, where formal and informal businesses are developing and thriving, as a result of very different business practices, and where state and non-state actors are intervening in shaping what businesses do, shows a situation of fluid capitalism, and highlights a need to theorise how BoP capitalism varies through the Global South, rather than to expect pure neoliberal BoP capitalism to develop.

In highlighting improvisation and *jugaad* within the informal sector, I seek to move the literature on from simply seeing informal businesses as the site of cheap and inferior quality products, persisting because of market failure. I have sought to highlight how

looking at improvisation and *jugaad* provides an inroad into seeing practices within informal businesses that gives them an advantage over formal businesses, and allow them to thrive within a liberalised market context. While the success of informal businesses was tightly tied to economic precariousness, such practices were also popular with customers. Further research is clearly required into how consumption preferences in BoP markets in India might not be for standardised SHSs.

Chapter 8: Conclusion

8.1: Introduction

This thesis, through an empirical comparative study of formal and informal solar businesses in the north Indian state of Uttar Pradesh, provides an account of the development of 'Bottom of the Pyramid' (BoP) capitalism within a liberalised market context in India. Working with literature and theory from geography and the social sciences, this thesis challenges and contributes to the existing body of work on BoP capitalism in the Global South. I outline how a new group of formal solar businesses have been selling good quality, value-conscious solar home systems (SHSs), developing the BoP solar market in a manner familiar to the existing literature on BoP capitalism. I show, however, how the success of these businesses was often tied to accessing state and non-state resources and to informal relationships with banks. Furthermore, I expand on how informal solar businesses were regularly outcompeting formal solar business. I argue that this thesis highlights a story of fluid capitalism at the BoP in India.

In focusing on BoP capitalism, the aim of this thesis, set out in the Introduction, has been to empirically interrogate the dominant narrative of the development of BoP capitalism in the Global South that has emerged over the last two decades, primarily from business, economic, and development scholars. In the growing body of literature on BoP capitalism, there has been a focus on formal businesses and multi-national corporations (MNCs) entering newly liberalised markets throughout the Global South. Their success has been associated with innovative business models that allow them to sell good quality, branded, value-conscious, and frugal goods and services (Hammond et al., 2007, Hart, 2005, Prahalad, 2005). Formal businesses developing BoP capitalism has been written about as a free market story, of businesses operating according to

market rationalities. Capitalism at the bottom of the pyramid has been framed as developing in the manner of capitalism elsewhere on the notional global pyramid of capitalism, except that firms must innovate to provide value-conscious and frugal products. Increasingly, economists and development scholars are arguing that supporting BoP capitalism is the best way to fight poverty, and to bring developmental and environmental benefits to low-income populations in the Global South (Moyo, 2009, Prahalad, 2005, Roy, 2012a). BoP capitalism has been framed as 'pro-poor capitalism' (Roy, 2012a) or 'social capitalism' (Cross and Street, 2009). This is theoretically and politically significant, when applied to countries such as India.

Following economic liberalisation in India, there has been a proliferation of private companies selling goods and services to low-income people, leading to the rapid growth of BoP markets (Chandrasekhar and Ghosh, 2002, Jenkins, 1999, Harriss-White, 2003). At the same time, there has been a neoliberalisation of state governance, and a shift towards greater private sector involvement in delivering and running state welfare programs (Corbridge et al., 2012, Fuller and Benei, 2009, Gupta, 1995). There has been a shift in discourse in India to seeing the market as a driver of development and of economic growth, and as a partner in delivering goods and services (Corbridge et al., 2012, Varman et al., 2012). In this context, researching and theorising new BoP markets in India is critical.

At the start of this thesis, I outlined how, within the existing literature on BoP capitalism, there has been little attention afforded to exploring how BoP markets in different countries in the Global South might be developing differently, and not simply according to pure neoliberal economics theory. Geographical and social sciences literature tells us that this is problematic (Harvey, 2005, Peck and Tickell, 2002, Peck

and Theodore, 2007). I looked at how there has also been little focus on the role of the state, and on informal practices such as brokerage and corruption in supporting and shaping new formal businesses operating in BoP markets, again despite social sciences research showing that these should be important areas of inquiry (Harriss-White, 2003, Jeffrey, 2002, Simon, 2009). Finally, I outlined how it has been theorised that low-income customers will choose good quality, but value-conscious products from formal businesses over what is available from informal businesses, then they have that choice (Prahalad, 2012). I questioned the lack of attention to the role that informal businesses might play in liberalised BoP markets, based on the fact that much research shows how informal business continues within liberalised capitalist contexts in the Global South (Gidwani, 2015, Gill, 2010, Sanyal, 2007).

A geographical approach is distinctive for looking at the social, political, economic, and geographical dynamics that shape and structure capitalism and markets in different spaces and places (Berndt and Boeckler, 2012, Coe et al., 2007, Harvey, 2005). Work from the social sciences and geography has challenged the developmental claims regularly made about BoP capitalism (for example, see Kuriyan and Ray, 2009, Roy, 2010, Varman et al., 2012, Weber, 2001), and there is a lot of work on informal business in low-income contexts in the Global South (see Gidwani, 2015, Gill, 2010). However, for the most part, geographers have not engaged directly in the theory on how BoP capitalism is developing, primarily coming from economics, business, and development scholars; this thesis, with a focus on how BoP markets might be taking shape differently in different places, provides a timely contribution.

Addressing the findings and broader relevance of this thesis, this concluding chapter is structured as follows. I start by examining the findings of this research in respect of the

original research questions of this thesis, outlining the contribution of this thesis. I then discuss more broadly how the findings of this research contribute to understanding on BoP capitalism and neoliberal capitalism in India, and to thinking about the role of the state in delivering infrastructure and essential services in India. I end by discussing the limitations of this thesis, and by outlining several areas of further study.

8.2: Growing BoP Capitalism by Selling Good Quality, Value-Conscious Goods

I set out to explore whether formal solar businesses were driving the development of BoP capitalism in the case of the off-grid solar power market in Uttar Pradesh, and to look at whether they were developing the market by selling good quality, value-conscious products to consumers. This thesis shows that formal solar businesses were collectively developing the BoP solar market in Uttar Pradesh in a distinctive manner through their practices and claims in regards to expertly selling good quality, standardised, authentic, Indian, and branded SHSs and goods. The approach that formal shops and dealerships took, of providing warranties and guarantees, of installing SHSs, of giving after-sales servicing, and in often being able to offer bank consumer financing to their customers, was further important to the distinctive manner in which they were developing the BoP solar market. Significantly, what formal solar businesses were doing was defined against what informal solar shops were doing. Informal solar businesses were said to be the site of poor quality, non-branded so-called 'local', 'cheap' (*sasta wala*), and 'Chinese' (*china wala*) goods.

The way formal solar shops and dealerships were growing the BoP solar market reflected BoP capitalism as written about in the influential body of literature on BoP capitalism. While the focus of Prahalad (2005) and others (for example, see Hammond

et al., 2007, London and Hart, 2004) has primarily been on MNCs and larger companies, this thesis provides a case study of smaller formal businesses. In formal solar shops and dealerships, there was a strong belief that a successful market for off-grid solar goods could only be developed by businesses operating as they were. There was a view of business that mirrored the social vision of capitalism that, as Cross and Street (2009) show, is held by MNCs and big companies entering BoP markets. It is revealing that a wider set of neoliberal business ideas, circulating around the world about how best to do business at the bottom of the pyramid, were so strong at a grassroots level in solar shops and dealerships. This research identifies top-down training being given to the owners and managers of formal shops and dealerships as an important way in which these ideas were fostered. The importance of quality, value, authenticity, brand, the SHSs, service, warranties, and finance for formal solar shops and dealerships, from the perspective of the sociological literature on market making (Berndt and Boeckler, 2012, Callon, 1998a), suggests an active process of distinctive market making is taking place at the bottom of the pyramid. Seemingly mundane practices, such as providing formal warranties, a standardised SHS, or claims around the authenticity of products, were crucial for formal solar businesses.

Formal solar businesses are succeeding in providing lighting to people in areas where grid electricity does not arrive, or is unreliable. This shows, in instances, the realisation of the promise made in the wider literature on BoP capitalism, that profitable private businesses can deliver good quality products to low-income populations (Elyachar, 2012, Roy, 2012a).

8.3: The State, State Patronage, Brokerage, and Corruption

In this thesis, I questioned how the state has been involved in shaping the developing BoP solar market in Uttar Pradesh beyond regulating it, and whether state patronage, brokerage, and corruption were practices important to formal solar businesses. I found that, to grow beyond a base level, formal solar shops and dealerships were tapping into state and non-state resources and patronage. In particular, it was crucial for many formal solar businesses to access the JNNSM subsidy for the SHSs that they were selling. Only some, however, with a 'feel for the game' (Jeffrey and Young, 2014), were able to access the benefits of the JNNSM, which was itself uncertain. The JNNSM subsidy was shaping the kinds of products that formal businesses were selling, making certain approved products cheaper for customers, and the service that they were providing. This was in practice creating a dependency between solar businesses and the state, as formal solar businesses struggled to maintain their sales when state support was not available. Through the JNNSM, the state was effectively acting as a patron to formal businesses. Other state and non-state programs and resources, at the central and state level, were also important for many formal solar businesses, or had been in recent years. This research traced how, to grow beyond a base level, formal shops and dealerships also needed to broker informal agreements with rural development banks; and that many had to be willing to make extra-legal commission payments to bankers. Brokerage and corruption were also important in winning government tenders to supply solar power goods, which were lucrative for many businesses.

These findings challenge the lack of focus on the role of the state in supporting the large numbers of new formal businesses entering BoP markets in the Global South, and on the importance of informal practices to the success of formal business in existing

literature on BoP capitalism. These findings from Uttar Pradesh suggest that theorising on BoP capitalism (for example, see Hammond et al., 2007, Hart, 2005, London, 2008, Prahalad, 2005) cannot see the state as a regulator and enforcer of BoP markets at a distance, or as the supplier of subsidies from a neutral standpoint.

The findings of this thesis fit with work from the social sciences showing state institutions and actors remaining involved in markets in the Global South following economic liberalisation (Fuller and Benei, 2009, Gupta and Sivaramakrishnan, 2011, Harriss-White, 2003, Sud, 2014b). Several studies in India, looking at various BoP markets have already shown the state supporting or shaping businesses (for example, see Kuriyan et al., 2008, Kuriyan and Ray, 2009, Simon, 2009, Young, 2010a, Young, 2010b). In work on the nascent liberalised market for cookstoves in Maharashtra, India, Simon (2009) described how cookstove artisans and businesses were tapping into new streams of latent and limited state support within a liberalised market. He argued that this shows a new context of state governance in India. The findings of this research reflect this too.

The case of the BoP solar market in Uttar Pradesh further highlights how state support was targeted and partial, with only some formal businesses able to benefit, the ones which had the knowledge and the know-how, or organisational capacity, to access state resources. The state was effectively a patron of certain businesses and the sale of a select range of products and services. Furthermore, state resources were uncertain, with subsidies and programs coming, going, and changing, over relatively short periods of time. This finding suggests a new context of state engagement in India, as the economy is liberalised, where the state shapes and supports market development in an uneven manner, through regularly changing programs. It suggests a context where formal

businesses have to tap into these uncertain, latent state resources in order to profitably serve the BoP. Indeed, the argument might be advanced that instead of there being a fortune to be made at the BoP from consumers, as Prahalad argued (Prahalad, 2005), in the case of India, there is a fortune to be made for formal businesses within BoP markets by reaching up to latent state resources. The situation found in this research reflects a wider context of uneven, partial, and changing state engagement with, and involvement in, the delivery of essential services and infrastructure in India, which is seen with higher education (Jeffrey, 2010), water (O'Reilly and Dhanju, 2014), and sanitation (McFarlane, 2008) for example.

The existing literature on BoP capitalism has predominantly not focused on the importance of brokerage, patronage, and corruption. Indeed, Prahalad (2012) associates such practices with the informal sector, and poorly governed markets. Again, research from the social sciences shows that, within liberalised capitalist markets in the Global South, brokerage, patronage, and corruption often remains important (Simon, 2010, Watanabe, 2006). This thesis shows that theorising on new liberalised BoP markets needs to focus more on the significance of these practices. In the case of the off-grid solar power market, it was notable that, while business people where often involved in brokerage and informal relationships, it was not possible to identify a group of full-time brokers crucial to the workings of the market and the flow of resources. While a group of dedicated brokers could not be identified, formal solar businesses nevertheless needed to be good at brokering agreements with banks and at tapping into state or non-state resources, in order to grow their sales. This mirrored Simon's (2009) findings from the market for cookstoves in Maharashtra. Extra-legal payments were, in practice, also necessary for many formal solar businesses. The off-grid solar power sector shows that

state patronage, brokerage, and corruption cannot be seen as part of pre-capitalist systems, or as practices largely restricted to informal business. The findings of this thesis suggest that further exploration of brokerage in markets, not necessarily carried out by individuals who are acting as full-time brokers, is needed.

8.3: The Informal Sector

I asked in this thesis whether informal businesses were playing an important role within the liberalised market for off-grid solar products in Uttar Pradesh. The findings of this thesis show informal, small-scale, and non-registered businesses successfully operating within the liberalised BoP solar market, even as formal businesses sell good quality, value-conscious, and branded alternatives. Informal businesses were in many instances outcompeting formal ones. All informal businesses were working without the benefit of the main state subsidy, the JNNSM subsidy.

This finding challenges the strand of thinking in the existing literature on BoP capitalism that formal businesses will supersede informal ones, and that consumers will choose to buy from formal businesses when possible (Hammond et al., 2007, Prahalad, 2005, Prahalad, 2012). Informal business has been presented as pre-capitalist, inefficient, and corrupt, existing as a the result of failed government policies and a lack of development (Prahalad, 2012), or as needing to be formalised in order to realise its potential (De Soto, 2000). While informal economic activity and employment have been shown to continue within liberalised markets in multiple studies (Gidwani, 2015, Gill, 2010, Harriss-White, 2003, Sanyal, 2007), the view that formal business will replace informal business as capitalism develops continues to inform much of the literature on BoP capitalism.

As is often associated with the informal sector, the majority of goods that informal solar shops were selling were cheap and substandard. Yet, my research showed that informal shops were also notably characterised by improvised and *jugaad* goods and business practices. In particular, working with the concept of *jugaad* is useful in understanding BoP informal businesses, and the distinctive way in which they were developing the BoP solar market. A body of very recent research has been theorising *jugaad* in BoP market contexts in India (for example, see Radjou et al., 2012). This work has predominantly focused on the idea that, at the BoP in India, it is possible to see Indians being innovative and inventive, working frugally with resources to hand (Aiyar, 2010, Gupta, 1997, Radjou et al., 2012, Saraf, 2009, Sharma and Iyer, 2012, Talukdar, 2004). *Jugaad* is often romanticised in this literature. The work of Jeffrey and Young (2014), and of Jauregui (2014), use *jugaad* to theorise social and political work, where people use connections, relationships, and skills in innovative ways to achieve work.

Building on both bodies of work, and local understandings of *jugaad* from within solar businesses, I use the concept of *jugaad* to theorise the way in which products were innovatively put together and repaired, often using resources to hand, as well as to theorise the opportunistic, innovative, and at times deceptive business practices seen in informal shops. I argue that *jugaad* products and practices help to explain the success of informal solar businesses, and show them developing the BoP solar market in a manner very different than formal solar businesses. *Jugaad* products and practices were primarily associated with informal rather than formal solar businesses. Improvisation and *jugaad* were especially important in situations where customers had very little money, but wanted to access goods and services. This also raises the issue that, at times,

jugaad was symptomatic of second-best options or systematic risk, which speaks to Birtchnell's (2011) work on *jugaad*.

8.4: Theorising BoP Capitalism and Neoliberal Capitalism in India

The findings of this thesis challenge the way the development of BoP capitalism is being theorised. The BoP solar market in Uttar Pradesh, being grown by both formal and informal solar shops and dealerships, developing BoP capitalism in distinctively different ways, highlighted a context of fluid BoP capitalism. While the development of new formalised solar businesses selling good-quality, value-conscious goods and services, highlights a story told regularly in the existing literature in BoP capitalism, this thesis shows that these businesses were succeeding not only according to market dynamics, that their success was often fragile, and that they and were not operating at the expense of informal business. This is a more complicated case study of BoP capitalism than is allowed for in much of the existing literature. The findings of this thesis show that more focus is needed on how the state is central to the success of new formal businesses in BoP markets, on the significance of informal practices, and into whether the parallel growth of formal and informal businesses adopting distinctive business practices is a widespread structural tendency in liberalised BoP markets. It is notable that in the case of the BoP solar market in Uttar Pradesh, informal businesses were growing independently of a subsidy support scheme, while formal solar businesses were prospering with subsidies.

This thesis provides a study of shops and dealerships at the bottom of the pyramid. Focusing on the retail space is important, because in the case of solar power, this is where state and non-state sources of funding and non-financial support are being

directed. However, while selling through retail spaces is common in the case of solar power, many businesses selling at the bottom of the pyramid are not doing so through retail spaces (Cross and Street, 2009, Cross, 2013, Dolan and Scott, 2009, Rangan and Rajan, 2005, Roy, 2010). Further research would productively look at the extent to which the findings of this thesis apply to solar businesses not selling through traditional retail spaces, or to other BoP markets for goods and services.

As well as contributing to theory on BoP capitalism, the findings of this thesis provide some insights into neoliberal capitalism at the BoP in India, as well as into the role that state institutions and actors are playing within a liberalised economic context. Over the last three decades, as globalisation has progressed and there has been a neoliberalisation of capitalist systems around the world, a body of literature from social scientists and geographers has developed, highlighting how while there are common trends to the direction in which capitalism is developing globally, neoliberal capitalism is taking hold in different forms in different spatial and socio-historical contexts (Ferguson, 2009, Harvey, 2005, Peck and Tickell, 2002, Peck and Theodore, 2007, Peck and Theodore, 2015). Research on India has looked at how a distinctively Indian context of neoliberal capitalism is evident, where market liberalisation is coupled with continuing but changed state involvement in much of the economy, and the continuing inter-dependence of the formal and informal economy (Chandrasekhar and Ghosh, 2002, Corbridge et al., 2012, Gidwani, 2015, Gill, 2010, Harriss-White, 2003, Sanyal, 2007).

The thriving of formal and informal solar businesses in Uttar Pradesh, both developing the BoP solar market, but in distinctive different ways, is revealing. It suggests that in a post-liberalisation context, capitalism at the BoP in India is characterised by two-tiers of business operating side-by-side, adopting very different approaches. A new group of

outwardly formal businesses, supported by state and non-state actors and money, are providing a good-quality range of goods and services to customers, regularised warranties and servicing, and formal financing. Informal businesses, at the same time, are selling a range of cheaper, often sub-standard, and improvised goods and services. Crucially, state and non-state actors, in the case of Uttar Pradesh, were shown to be supporting and shaping this context of two-tiers of business. However, the distinctions between formal and informal businesses at times blurred, and the support that formal solar businesses were getting was not reliable. There was no evidence of formal business replacing or outcompeting informal business.

The theorisation of a homogenous BoP population, that is at the bottom of a national global pyramid of capitalism (Prahalad and Hart, 2002), which I outlined at the start of this thesis, and the idea that pure neoliberal capitalism is being extended down this notional pyramid through time, is challenged by my findings. This research did not find a homogenous BoP population that was uniformly choosing goods quality, branded, standardised, value-conscious products from formal businesses. Some people were going to formal solar shops to buy a standardised SHS that would be installed and serviced, that may be financed through a bank, and that often received a government subsidy. The majority of people, however, were going to informal solar shops, where products were not subsidised or offered with bank loans, and where the likelihood was that an improvised and *ad hoc* solar home solution would be purchased. This may often be an inferior quality solution, and customers could be the victims of unfair *jugaad* business practices and deception.

The failure of consumers to choose products and services from formal businesses, when they became available, suggests that more research is now needed into consumption

purchasing decisions and preferences at the bottom of the pyramid. The fact that there two distinctive analytical groups of solar businesses that are developing in the case of the BoP solar market in Uttar Pradesh also raises significant issues in terms of the policy choices that the Government of India has on intervening in the off-grid solar power market. A question also exists on how things will change in the future, and whether informal shops will continue to be able to compete against formal solar businesses as the price of solar power technology falls, and good quality SHSs become more affordable for BoP populations.

The idea that there is a stark binary between the formal and the informal economy has been critiqued in the social sciences (Breman, 2001, Gidwani, 2015, Sanyal, 2007). This thesis is not claiming such a divide. However, I argue that it is productive to analytically compare formal, regularised and commercialised solar businesses with informal solar businesses, and to speak about the way that the two analytical groups of solar businesses are operating very differently within the same BoP market. The differences in business practices between the two was often significant. Nevertheless, there was blurring between some formal and informal businesses at times. Some formal businesses were not entirely successful in distinguishing themselves from informal businesses, or were unsuccessful in accessing state resources or brokering agreements with banks, and therefore from growing beyond a low base. In some formal shops, elements of *jugaad* could be seen. Likewise, in some informal shops, good quality, branded SHSs were being sold.

Following the financial crisis, there has been considerable debate on the direction of capitalism globally, and on whether an end to neoliberal capitalism might be imminent (Comaroff, 2011, Nayyar, 2011, Peck et al., 2010). The development of BoP capitalism,

and of private businesses delivering essential goods and services highlights one areas where free market capitalism has been advancing in recent years. Following the financial crisis, the microfinance sector was impacted negatively (Di Bella, 2011, Wagner and Winkler, 2013). The development of the commercial off-grid solar power market in Uttar Pradesh has largely taken place since the financial crash, and so this research has not been able to look at the effects of the crash. Further, the off-grid solar power market at a local level has not been dependent upon global financial capital. However, it is notable that the developing off-gird solar power market following the crisis highlights that the role of the private sector in the delivery of essential goods and services is growing in India, suggesting no shift away from economic liberalisation and marketization.

8.5: The Future of Energy Provision in India

This thesis shows a need to reassess the dominant narrative of off-grid solar market development in the Global South, raises challenging questions about how off-grid solar power markets are supported and intervened in, and highlights questions about the developmental claims associated with the growth of BoP capitalism.

There is a strong narrative around the win-win potential of BoP solar markets, in terms of environmental and developmental benefits said to be achievable by formal businesses selling solar products (Bairiganjan et al., 2010, Martinot et al., 2002, Miller, 2009). Yet this narrative is based on formal businesses selling good quality, serviced, subsidised, and financed SHS. Similarly, the increasingly regular talk of off-grid solar power markets replacing the need for rural grid-based electrification is again based upon the idea of formal solar businesses providing good quality products and services to BoP

populations. If most people are in fact buying off-grid solar power goods that may be poor quality, substandard, and environmentally damaging, this changes the way off-grid solar power markets, their potential, and their benefits can be understood.

Further, the findings of this research challenges the popular idea in development literature, of formal companies delivering good quality products independently of the state (Easterly, 2006b, Moyo, 2009), an idea which is marshalled for the promotion of off-grid solar markets in the Global South (Bairiganjan et al., 2010, World Bank, 2015a, World Bank, 2015b). Formal solar businesses, which were dependent upon state and non-state resources and subsidies to grow rapidly, were not confirming a story of free market BoP capitalism to be a binary alternative to central state investment, when it comes to providing energy and lighting to low-income populations. Interestingly, the growth and success of informal solar businesses does highlight the potential of free market capitalism to deliver energy to the BoP.

The findings of this thesis highlight the need for more attention to what the Government of India is supporting in terms of market development, and how state institutions and actors are shaping business development. In the case of off-grid solar power, the Government of India appears to deem formal businesses and their activity to represent the kind of capitalism that it is appropriate to support. State support is not channelled to BoP customers through informal shops, despite these shops serving a large number of people. Indeed, the Government of India is talking of clamping down on the sale of poor quality solar power products and services, and formal solar businesses are lobbying for this (Mahapatra, 2015, Times of India, 2016). Yet, it is unclear why informal businesses should be discriminated against when they are providing goods and services that people can afford, and that many people are preferentially choosing to buy. State support and

shaping of certain businesses, and the impacts that this has on access to goods and services is particularly important in light of the way that socio-economic, caste, gender, and religious inequalities within Indian society often lead to very unequal access to goods and services from the private sector (Kuriyan et al., 2008, Varman et al., 2012). The same questions need to be asked about non-state, national, and international organisations also supporting and promoting formal solar businesses.

In policy terms, the argument can be made that the state needs to reconsider the way that it supports off-grid solar diffusion. This research shows that the support of the state for standardised, branded, and good quality SHSs is not straightforwardly correlating to the realities of how the market is developing in Uttar Pradesh. Further, if subsidies are to be channelled through banks, this research suggests that a reassessment is needed of why the subsidy is tied to only particular products, and efforts need to be made to make sure that it is not only a small number of formal businesses that can benefit from subsidies. In his work on the cookstove market in Maharashtra, Simon (2009, 2010) identifies how the top-down management of cookstove programs often disrupts local, indigenous innovation, technology, and markets. A clear question exists around what indirect effects on indigenous innovation, technology, and markets there are from the support of the state in India, and of non-state organisations, for formal businesses.

The findings of this research are also important in thinking more broadly about the shift within India to the provision of essential services by the private sector, away from a past context where the state would deliver goods and services (Banerjee and Somanathan, 2007, Varman et al., 2012, Sangameswaran, 2009). If BoP capitalism is not just formal companies selling good quality products, then this alters how the private sector delivery of goods and services needs to be analysed. Kundu (2001) and O'Reilly and Dhanju

(2014) have spoken about how, in India, there has been a shift to 'pay-as-you-go' access to services, such as water, and to the delivery of infrastructure. If the situation in the case of the BoP solar market, where formal and informal business is growing in parallel, is seen more widely, then access to essential goods and services in India will be in some ways two-tier; very different for different parts of the population, depending on what businesses they are able to access, or choose to access. A question clearly exists in relation to whether it is poorer people who are primarily accessing cheap, inferior quality, *jugaad* goods and services from unsubsidised informal businesses. Further, if is economically wealthier people who are primarily buying good quality, subsidised goods and services from formal businesses, than this raises difficult political and equity questions. More research would be important to address these questions. If a decentralised energy future is in store for India, or the decentralised delivery of other goods and services can be expected, then this research arguably sheds light on what might be anticipated.

A number of authors have been critical of the move to neoliberal models of private sector delivery of goods and services in India (Varman et al., 2012, O'Reilly and Dhanju, 2014), and around the world more broadly (Bakker, 2002, Cupples, 2011). The off-grid solar power market in Uttar Pradesh, however, does highlight a story of rural BoP communities getting access to electricity and lighting, in a context where the state has failed to provide such services in the past, whether from formal or informal solar businesses. Both formal businesses and informal businesses have in many ways been successful in extending energy access to the BoP in Uttar Pradesh. While research would be needed to look in detail at the socio-economics of who is accessing such energy services, a question which was beyond the scope of this study, the results from

this thesis are in many ways positive. The market for off-grid solar power goods and services in India is still small, but what has been achieved so far in terms of rapid market growth is remarkable.

Off-grid solar power is understood within academic literature and within policy and public discourse as a technology that has the potential to deliver an environmentally clean source of energy (Miller, 2009, Wimmer, 2012). I did not focus on the environmental benefits or implications of off-grid solar power businesses in Uttar Pradesh, but the findings of this thesis do highlight the high potential for off-grid solar power products and services to be diffused through markets. But my findings challenge the idea that formal businesses, selling good quality SHSs, will be driving the diffusion of off-grid solar power goods in India in the coming years. The use of substandard materials in solar products, and the use of cheap, locally manufactured, and poor quality batteries in informal shops, and sometimes in formal shops, highlights unresolved issues in regards to electronic waste in rural India. These issues need to be better studied, and challenge the idea that solar power is an environmentally sustainable and clean technology for providing light and energy at the BoP in the Global South.

8.6: Structural Inequalities and the Shop Space

There is a need for research to focus on the importance of structural inequalities, such as caste, in structuring the activity of solar businesses and market activity in the BoP solar market. The findings of this thesis hint at the importance structural inequalities might play, and areas where further questions need to be asked. It was notable that the majority of people working in formal solar businesses were from more middle classes and higher castes. This tallies with the findings of Young (2010a, 2010b), Varman et al.

(2012) and of Kuriyan and Ray (2009), from microfinance and IT BoP markets respectively, that higher caste men were most prominent in businesses. It would be important for future research to look at how caste, class, religious, and gender dynamics shape the interactions that take place within solar shops and dealerships, and allow them to function as profitable spaces of business at the bottom of the pyramid. Young (2010a, 2010b), for example, showed how different roles within the microfinance business he was looking had class and gender expectations, and how structural inequalities shaped how the microfinance sector worked. Other work on business and work places in India has showed how structural inequalities roles and interactions (Cross, 2014, Gill, 2010, Williams, 2015). This study did not identify caste as important in the day to day activity of selling solar power; however, the methodology of this study was not suited and directed to an in-depth focus on this issue.

Given the significance of brokerage for the success of formal shops and dealerships, and the importance of caste in shaping brokerage that has been highlighted in other research in India (Corbridge et al., 2005, Lerche and Jeffrey, 2000, Jeffrey, 2002, Manor, 2000), it would be important to look further at how caste shapes and whether it potentially enables brokerage and informal relationships in the case of off-grid solar businesses. Research might look at how caste facilitated the ability of entrepreneurs within formal solar businesses to set up their businesses and make links to state and non-state actors. Further research might also focus on whether access to loans and government subsidies to buy solar goods and services is structured by caste.

8.7: Limitations

There were a number of limitations to this study, which became apparent through the course of this research project. When planning the methodology for this thesis, a key decision was on how many businesses and individual shops and dealerships to include in the case study. I choose to include a breadth of shops and dealerships from different companies across the state. I wanted to include a comparative element, to have confirmation of results across businesses, and to have a geographical spread. However, I found that this approach in instances did not allow me to get the level of in-depth qualitative data that I would have liked. For example, due to time constraints, I was only able to visit a number of shops and dealerships once. Having done the analysis to my research, I found that the most engaging and fruitful conversations had been those that were conducted after several meetings with an interviewee, or while spending time hanging-out in a shop, not engaged in a formal interview, or when speaking with an interviewee having known them for a number of months.

A possible limitation of this research was that I did not have a geographical spread of shops and dealerships from all districts in Uttar Pradesh, and that it is difficult to say how relevant the findings of this thesis from Uttar Pradesh are more broadly for India. Income levels vary significantly between different districts in Uttar Pradesh, as does ease of business. This study was unable to comprehensively focus on the differences that might exist in the developing BoP solar market through Uttar Pradesh. Beyond Uttar Pradesh, states in India are economically, politically, and socially very different, and so seeing whether the findings of this thesis are reflected beyond Uttar Pradesh would need to be addressed in future research.

The BoP solar market in Uttar Pradesh is only several years old, and was growing rapidly through the course of this research. From month to month it was possible to see new shops opening in the districts where I was interviewing. Conducting a longitudinal study of the market in Uttar Pradesh, to see whether my results are being confirmed, or whether important new developments are taking place would therefore be important. For example, shortly after I returned to the UK, having completed fieldwork, and following the 2014 general election in India, the JNNSM subsidy was cancelled, and is yet to be replaced. This means that formal solar businesses included in this study will have had to adapt their approaches since the research for this thesis was conducted, in order to continue to support their approach of selling good quality, value-conscious and branded products. More research is clearly important in this regard.

8.8: Future Research

Over the last decade, the body of literature from sociologists and economic geographers theorising marketization introduced new ways of theorising market making (see Berndt and Boeckler, 2011, Callon, 1998a, Muniesa et al., 2007, Mitchell, 2005). This work has introduced the idea that markets might be conceived of as socio-technical 'agencements'; arrangements of people, things, and socio-technical devices that format products, prices, competition, places of exchange, and mechanisms of control. This thesis has highlighted a number of practices and claims as important to the approach of formal and informal solar businesses developing the BoP solar market in Uttar Pradesh. A future research project, directly working with this body of theory on market making might productively think about the ways that practices within formal and informal solar shops are involved in distinctive bottom of the pyramid market marking. Furthermore,

research might look at how top-down practices, values, and devices might be influencing, supporting, and having agency in this process of market making.

This research highlights the need to look more at the supply chains for solar power products and associated goods. Within Uttar Pradesh, numerous dealerships were supplying a range of goods of different quality levels, which was allowing informal shops to enter the off-grid solar power market with ease. It would be valuable to focus specifically on the dealers accessing off-grid solar power goods and associated accessories, where they are accessing goods from, and their role in market development. Focusing on following the assembly and manufacturing of solar goods to a greater extent would likewise be revealing. Following these lines of enquiry was beyond the scope of this study.

An important question lies around the extent of the link between the thriving of informal businesses and economic precariousness. The finding of this research, that many people are shopping in informal shops, where they are buying cheap, improvised and *jugaad* solar power solutions, is significant. A more quantitative or customers focused study would be able to shed greater light on the kinds of customers shopping in both formal and informal shops, and on why they are choosing particular shops and goods and services within those shops. Such research would usefully inquire into the extent to which customers in formal shops are richer than those in informal shops, and whether customers between the two groups of shops are distinguishable in terms of structural inequalities, including caste, gender, and religion. Such a study might also be revealing in looking at consumer preferences, and why it is that the standardised SHSs is not very commonly sold, or chosen, in informal shops.

To substantiate the findings of this thesis further, it would be important to look at how BoP solar markets are developing in others states in India. It would further be potentially productive to look at the extent to which formal and informal businesses are together growing BoP markets in distinctly different manners in other markets for goods and services in India, or more broadly in the Global South.

Finally, in this thesis I have made the case that using the concept of *jugaad* to theorise products and practices within informal shops was productive. In doing so, I challenge the depoliticised way that *jugaad* has recently been adopted to think about ingenious innovation at the BoP. Further research could address the extent to which products and practices within informal shops beyond the off-grid solar power market can be characterised in terms of *jugaad*, and in distinguishing further the extent to which thinking in terms of *jugaad* is more broadly useful when looking at the practices of formal and informal businesses operating at the BoP in India.

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Appendix A: Example Participant Consent Form

Jonathan Balls, Oxford University Centre for the Environment, (Dyson Perrins Bldg.) University of Oxford, South Parks Road, Oxford, OX1 3QY. United Kingdom.

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Participant Consent for Research Project

Research Title: 'The potential and challenges for the nascent Indian off-grid solar power sector'.

Jonathan Balls: DPhil Candidate: School of Geography.

The University of Oxford and myself attach high priority to the ethical conduct of research. We therefore ask you to consider the following points before signing this form. Your signature confirms that you are happy to participate in the study.

1. Your contribution to the research will take the form of an interview. This will be tape-recorded or have notes taken on, depending on your request, and transcribed. It will be anonymised unless direct consent is received.
2. The tape-recording/ notes will be kept securely and destroyed in due course.
3. The transcriptions (excluding names and other identifying details) will be retained for this research and analysed as part of the study.
4. I will send your own interview transcript back to you after it has been anonymised. That way, you can keep a copy of our conversation. I will also give you time to check it over. You can make changes if you want, and advise me of anything else I should do to protect your privacy.
5. The findings of the research will be written up in my DPhil submission, and will be used for the purposes of academic work and publication. It will also be given as feedback to you, and may have use for policy makers and for others interested in this work. The written work may include quotations from the interviews, but individuals will never be named.
6. Over 60 people are taking part in this work. Your contribution is immensely valuable. However, if, at any point during the course of the project, you wish to withdraw from the study, we will respect your decision immediately.

Confirmation and consent
I confirm that I have freely agreed to participate in this research project, and understand that I can withdraw my interview transcript from the research by contacting Jonathan Balls. I have been briefed on what this involves and I agree to the use of the findings as described above. I understand that the material is protected by a code of professional ethics. I hereby assign the copyright in my contribution to the University of Oxford.

Participant Signature: _____ Name:_____ Date: _____

I confirm, for the project team, that we agree to keep the undertakings as outlined above.

Researcher Signature: _____ Name:_____ Date: _____

Appendix B: Copy of Interview Questions

General Questions

Q: Can you give me an introduction about the solar industry in this area/ the area where you work? How is it going? How has it evolved?

Q: The price of solar technology has been coming down steadily. And technology has been steadily improving. Many people say that in the next few years (5-10) this industry will grow very fast. Do you agree?

- Why this? What has/ will be most important for growth/ sales?
- What will happen here?

Q: Can anyone sell a solar product here and have long-term success?

Q: Do you think that all solar companies in reality are all following the same approaches and models for their business and operations? Are exactly the same (magic) ingredients to sell needed for everyone?

- Or are their multiple routes to success you see?
- Some people say that no company is yet financially or operationally sustainable in the Indian off-grid sector.

My research is focused around how different solar companies and shops in different places, and selling to different people, are working day-to-day, and what issues affect

how they work. For example: the state and its role, systems of brokerage or middleman and their role, social inequalities and their importance, and environmental and developmental issues.

Q: In order of importance, how would you rank the following for what you face every day/ for sale/ for growth:

price – technology -- distribution -- subsidies -- regulation -- state and government agencies -- local leaders -- social inequalities -- connections and relationships local social/ local political -- environmental talk and money -- community factors -- employees -- place -- income -- politics.

The role of the State

One aspect of my research is looking at the extent to which the state, pervasive in many areas of economic life in India, is also pervasive in the emerging solar sector, and its shaping.

Q: Why do you think that the state supports solar power?

Q: Is the state (government/ agencies/ politicians) an important actor in shaping the off-grid market, influencing how the sector is developing? In what ways?

(For example: state projects, favouring and intervening, supporting, the playing field in which companies operate, the rules)

- In shaping what companies (can) do?

- Have such factors influenced: Where you operate/ How you operate/ Who you sell to/ Products you sell)

- Some say that as well as having a good product, you need to have support and help from the government.

- Same people say that a totally free market is crucial. It has to be micro-enterprise.

Q: Thinking about what you do day-to-day in this branch/ outlet/ company (establishing and running), how is what the state/ government does important?

- Some say the government meddles too much in business? Other people say you need a good relationship.

- How are different levels/ political/ administrative/ procedural important?

Q: Is regulation/ lack of regulation of the market important?

- Some say that no company is able to operate freely of regulatory and subsidy support?

- Some people think that if cheap products are not regulated the market will be ruined?

- Can the state help you in ways it does not now?

- Has it stopped you doing some things, started you doing others?

- What do you think the aim of this regulation is/ should be?

Q: What subsidies and grants do you deal with? (From where)

- I have heard that subsidies mean you can sell some products and not others. What affect does this have? It is good?
- Does this stop you selling cheap products you would otherwise sell?
- Are you not accessing (able/ choosing to) certain subsidies?
- How has this changed through time?

Q: How have subsidies been working? Practical examples.

- Where subsidies are not available/ available elsewhere: impact.
- How someone accesses them/ the company accesses them.
- Where are subsidies/ grants/ subsidised loans coming down to in day-to-day operations? From where.
- In practice, who is accessing products with support, who is not able to?
- Working well? Or problems and complications?
- If subsidies were not there would you sell to different people/ sell different products?

Q: Do customers come have to deal with the state/ regulation/ subsidies?

- How do they do this?
- Do they tend to know about schemes?
- Are schemes targeting particular groups?

Q: Are there conditions attached to subsidies by the government? (Are they attached by banks?)

Q: How would you change the regulatory/ subsidy system? How would this affect your work?

Q: Are people buying some products/ not others or from some/ companies not others because of non-market funds or activity changing the prices of various products/ services?

Q: Do local officials or politicians have any other involvement day-to-day?

Q: Has the way the state involves itself changed in recent years?

- Some saw that the state is no longer importantly involved?

Q: Tell me about when an official has interfered, or when one has helped.

Q: Some people say that this is as big as the solar sector is going to get, that electricity will arrive in a few years and everything will finish.

Q: What about the direct role of the state in setting up stuff? Street lights. Providing information?

Q: Are other subsidies, such as for kerosene or a focus on electricification programs damaging the solar sector?

Q: Is the state an important source of capital for investment?

Q: Thinking about the links between the state – the market – society, in your view what are the proper links and separations?

Q: In this context how do you view the roles and responsibility of your company and the solar sector to society, the market and the state?

Systems of brokerage

A body of literature talks of how in Indian economic and political life, and in relations between and within communities and political and economic parties, there is a crucial role played by what have been called brokers, middlemen, political fixers, bosses, community activist, social reformer and community level intermediaries. I am interested in whether such players are also important in the off-grid solar sector.

Q: When starting operations in a new place, for accessing customers to sell products and services to, and for arranging bank financing do you work with local intermediaries, middlemen, social reformers, community activists, NGOs or organisations?

- Some people say that without having relationships and connections with key local gatekeepers and actors you cannot easily access customers, products, set-up distribution lines and do servicing.
- Dow do you build such relationships and identify such people?
- Are your local employees crucial to building/ gaining access to these relationships?

Q: What do you understand brokerage to be? In other industries around here?

- Who is a broker? Alpha male/ village headman/ entrepreneur/ local women/ gatekeeper/ social activist or reformer/ local businessman/ NGO organisations? Types: Political/ economic/ community based

Q: What process do brokers/ fixers play in the solar sector for day-to-day operations, and setting up new operations?

- What forms of brokerage might apply to thinking about the solar sector?
- Are brokers essential for getting things done? I heard that you have to go through the right channels entering a place to do business.
- Establishing in an area/ sourcing products and setting up distribution lines/ sourcing funding/ financing sales/ accessing customers
- I have heard that financing requires a lot of work in establishing and maintaining relationships?
- Is the lack of brokerage significant? How does solar power fit into the local way of doing things?

Q: Can you talk through the process of starting up a shop or service in a new area/ of accessing customers in a new place/ establish financing options and subsidy access?

- What are the main challenges?

Q: If you wanted to expand tomorrow how would you go about this? (LOCAL)

Q: Are brokerage opportunities are being used by communities and individuals to access solar products and opportunities?

Q: How important are the employees working day-to-day in solar shops and operations to success?

- What role do you play in day-to-day success?
- What makes a good employee?
- Are you an entrepreneur?

Q: Can many shops be said to be doing jugaad?

- Do you do jugaad?

Q: Is corruption or rent seeking ever something you have heard about happening in the sector?

Q: Tell me a story of when someone broke a product/ didn't want to pay for a product?

Structural inequalities

A further strand of my questions is addressing whether different social and economic groups are buying or not buying solar power in different ways.

Q: From your experience to date, in the customers you are selling to, do you notice trends on:

- Village – Town/ Educated – Uneducated/ Young – Old/ Caste/ Religion/ Occupations/ Female – Male.
- For example, do people with land and a stable salary mostly buy solar?
- This same question in terms of people working in solar companies?

Q: What income levels correspond to the purchase of which products?

Q: In the areas that you operate in what is the social/ economic mix?

Q: Are caste, class, gender, age, economic indicators or occupation important issues when you are setting up operations and deciding on your approach?

Q: Do you have to access different groups in different ways?

- Do different social groups have their own brokers? Does your working with particular people within a site exclude or involve particular groups?
- I hear that only through connected through a broker can you access certain communities. And that when you sell within one community/ political group it can then be difficult to sell to others? Is this so?
- I hear that in villages it is often difficult to sell to everyone equally?

Q: In your experience do subsidies reach all people: do they help the poorest people, or just town people?

- Are Chinese/ low quality products (best) for the poorest?
- Do low caste people tend not to afford solar products, or only cheaper ones?

Q: Is state involvement and regulation targeting certain social groups? What is the aim of subsidies and state involvement in off-grid solar? (What should it be?)

- Does the government help rich people and town people more than village people?

Q: I have heard that to be long-term successful you have to mostly sell to richer customers closer to commercial centres/ towns. You can also sell to poorer customers, but this is more for charity.

- I have heard that in reality it is impossible to reach the last mile.

Q: How do you think that the solar sector compares to other services in providing services to people in this community/ to the poorest people?

Q: In seeking investment do you have to change your model and the products that you are selling so that you can say that you are helping people who are the poorest, or are equally benefiting all people.

Q: It is mistaken to expect private companies to provide services to the poorest and all in the community. Does the state have to step-in to provide for some?

Q: Do poor people get free solar products, and rich people pay for them?

- In the past was it just right people buying, but now poor people are too?

Q: Do people come in to replace broken lamps/ products often? Do they replace them with the same quality or trade-up?

- Are people trading up in the products they are buying in general?

Q: Do caste, class and gender play an important role in other industries?

Q: What scale do you need to have a spatial presence and relationships to be successful?

Q: Do banks lend to all equally?

Q: On what basis are villages going into chosen or not chosen? Access?

Endings

Q: Do you think that none of these above questions are important. That it is all just about prices, technology and distribution. What am I forgetting?

Appendix C: Sample of Hindi Interview Questions

Questions

Introduction:

मैं शोध/ रिसर्च विद्यार्थी हूँ | मैं ऑक्सफ़ोर्ड यूनिवर्सिटी इंग्लैंड में आया हूँ | मेरा शोध का विषय सौर ऊर्जा है |

मुझे सौर ऊर्जा की कंपनियों के विकास में दिलचस्पी है |

पिछले दस सालों में कई नई कंपनियों शुरू कर ली गयी है | और वे गांवों में अलग अलग नए उत्पादों/ ऊर्जा उपकरणों को बेच रहे हैं | और नयी सौर ऊर्जा की दुकाने और शाखा शुरू कर रहे |

मेरी दिलचस्पी है कि कंपनियो और दुकाने कैसा काम कर रही हैं ? जब वे नये गांव या ज़िला में जाता है तब क्या होता ? सौर ऊर्जा बेचने कैसे जाते हैं? बिक्री में क्या चीजें ज़रूरी हैं?

मैं यहाँ आया हूँ क्योंकि मैं सौर ऊर्जा के बारे में आप के साथ बात करना चाहता हूँ | आपके सौर ऊर्जा के बारे में क्या विचार है, और आपके क्या अनुभव है, ये जानना |

क्या मैं आपके इस बारे में कुछ सवाल पूछ सकता है |

मैं आपके रोज़मर्रा किये जाने वाले मुख्य कामों के बारे में जानना चाहता है |

आप अपने व्यापार में दैनिक रोज़ क्या क्या करते है ?

आप जो भी जानकारी मुझे दे रहे है वे पूरी तुरह से गोपनीय रहेगी । मैं आपनी शौद में आपका या आपकी दूकान का नाम नहीं लिखूंगा |

Anonymity/ Confidentiality

मैं आपको नुक्सान नहीं पहुचा सकता । आप मुझ पर बरोसा कर सकते है । सही जानकारी मेरी शौद के लिए बहुत ज़रूरी है ।

The role of the State:

Q: Does the state (government/ agencies/ politicians) play an important role in the off-grid sector? In what ways? (Products, how you work, what you do.)

सरकार के नियमों और नीति और सब्सिडी | सरकार सौर ऊर्जा कंपनियों क्या कर रहे हैं पर क्या प्रभाव पड़ता है ?

Q: Some say that as well as having a good product, you need to have the government/ right agencies support?

कुछ लोगों का कहना है कि एक अच्छा उत्पाद जरूरी है लेकिन सरकार की मदद भी जरूरी है | जैसे सब्सिडी और पैसे और अच्छा नियम |

Q: Thinking about what you do day-to-day in this branch/ outlet (establishing and running), how is the state/ government involved or relevant?

जब आप इस दुकान को शुरू कर रहा था तब क्या सर्कार महत्वपूर्ण था?

मैंने सुना है कि कुछ लोग कहते हैं कि सर्कार को व्यापर में हमेशा हस्तक्षेप करते है।

आजकल आपकी व्यापर के लिए क्या सर्कार ज़रूरी है?

Q: How do you have to deal with this? What aspects do you have to deal with?

- Different levels/ agencies. Political/ administrative/ procedural.

आप किसके एजेंसीज और विभागों के साथ काम करते है?

Q: Do customers come have to deal with the state?

ग्राहकों के लिए जो सब्सिडी उपलब्ध हैं ? वे इन सब्सिडी क्या मिलता है?

मैंने सुना है कि सब्सिडी को मिलना मुस्किल है।

Q: Does regulation affect the way that you work in this branch?

क्या नियमों और कानून आपका काम पर असर है ?

क्या वे लागू कर रहे हैं ?

Q: Does regulation and state involvement help you do better?

क्या विनियमन को आप सफल होने में मदद देते है ?

क्या विनियमन बदलना चाहिए है ?

क्या सुब्सिडीएस जो अलग अलग चीज़े अप बेच रहा है पर कोई असर है?

Q: What are the main points of regulation you experience/ think are important?

क्या नियमों महत्वपूर्ण हैं ?

Q: What subsidies and grants do you deal with?

आप क्या सब्सिडी का उपयोग करते हैं ? मैंने सुना है कि कुछ उत्पादों सब्सिडी मिल सकते है, कुछ नहीं।

Q: How have subsidies been working? Practical examples.

सब्सिडी प्राप्त करने की एक उदाहरण के बारे में मुझे बताओ |

यह मुश्किल था

Q: Are there any government goals/ conditions attached to accessing subsidies?

सरकार की स्थिति पड़ता है

Systems of brokerage:

I am interested in is how companies and branches build a market locally and make new customers and get finance. I am interested in whether this means a role for brokers, middlemen, bosses, community activist, social reformer and community level intermediaries.

मेरी दिलचिस्पी है कि आप स्थानीय स्टार पर बाज़ार किसी नये दुकान को कैसे बनाते है । नये ग्राहकों को कैसे अपने साथ जोडते है तथा वित कहा से प्राप्त करते है ? मैं यह भी जानना चाहता हुँ कि किस लोगों से सम्बन्ध बनकर आप नये काम को शुरु करते है, या आपकी कौन लोग सहायता करते है/ कर सकते है ।

Q: Does brokerage (the involvement of middlemen, intermediaries, relationships, connections, social reformers, community activists) play a significant role for sales and operations? In what ways?

मैंने सुना है कि बिना किसी मध्यस्थ , नेता, या सामाजिक कार्यकर्ता और प्रमत्वशाली लोगों कि मदद के बिना आप ये व्यापार नहीं कर सकते है ? इस बात से आप कितने सहमत है ?

अगर आप इस तेरह के लोग से कम करता है तो व्यापार आसान होगा | ग्राहकों और बिक्री करने के लिए यह आवश्यक है |

Q: For working in this area and selling products and services – do you have to work with brokers to access customers/ sales/ sites/ financing/ subsidies?

क्या विक्रय/ वित्त/ सब्सिडी करने के लिए आदमी के बीच के साथ काम करने आवश्यक है |

- Some people say that without having the right connections locally and relationships a company cannot be successful. Other people say you just need a good product and distribution line and servicing.
- I heard that you can never access a customer base unless you first have good relations with the right people in a village.

Q: How does the company start up in a local area? Can you go through an example? What is the process?

- What are the main challenges?

जब आप किसी नया इलाका में काम शुरु करते है तो उसके लिए आप क्या करते है ? और कौन सी चुनौतिया आपके सामने आते है ?

Q: Getting access to local customer bases? How is this managed and achieved? Give examples to this.

Q: Day-to-day how does brokerage work and become important?

- Who is a broker? Alpha Male/ village headman/ entrepreneur/ local women/ gatekeeper/ social activist or reformer/ local businessman?

- What forms of brokerage? (Political/ economic/ community based?)
- Are brokers essential for getting things done?

Q: Is corruption or rent seeking ever something you have heard about happening?

Q: Are brokerage opportunities are being used by communities and individuals to access solar products and opportunities?

Q: What would happen if the broker role was not there? Do you think that the role that they play is fair?

- Who most benefits from their role?

Structural inequalities:

Q: Do social inequalities (caste, religion, gender, age, occupation, class) play a significant role?

मैं भी सामाजिक मामलों में दिलचस्पी | क्या कुछ सामाजिक या राजनीतिक समूहों ज्यादा सौर उत्पादों को खरीदने करो , दूसरे समूहों से ?

क्या जाति, वर्ग (हैसियत), उम्र या स्त्री - पुरुष होना महत्वपूर्ण विषय होते है, जब आप अपने उत्पाद बेचते है या अपनी स्थानीय या शाखा खोलते है?

- Do all social groups equally buy off-grid solar products?

Is this is a difficult issues for operations sometimes?

जब आप अपनी नई स्थानीय शाखा खोलते है या उत्पाद बेचते है तो इसमें जाति, वर्ग (हैसियत), उम्र, पेशा (व्यापार) या स्त्री – पुरुष कौन सबसे ज़यादा प्रभावशाली कारण होता है? सौर ऊर्जा के उत्पादों का मुख्य खरीदार कौन होते है और क्या ये व्यापार पर प्रभावित करती है या नहीं?

Q: Within your experience - who in communities being sold to mostly so far? (Social groups.)

क्या अलग अलग सामाजिक समूहों को उत्पाद बेचने के क्या तरीके है? क्या हर एक समूह कुछ विशेष (ख़ास) उत्पाद ही लेना पसंद करता है?

Appendix D: List of Codes Used in Analaysis

Descriptive	Descriptive/ In Shop	Descriptive Actors/ Sites	Concepts/ Shops
Context	Quality	Person	Starting
Infrastructure	Technology		Entrepreneurialism
Location		Banks	
Distribution	Prices		Advice
Market Character	Cheap	Management	Support
	China wala	Employees	
Local presence	Government	Worker	Marketing
	Panels		Branding
Formal Shops		Agents	
Local Shop		Dealers	Brokerage
Shop requirements	Components over packaged		Corruption and Commissions
	solutions	Charging Stations	Politics and Power
Business size	Small Systems	Branch	
Business model	Quality		
Investment	companies &		Education
	options	Government	Relationships
BOP market	Local Product	MNRE	Marketplace
For-profit		NGOs and Orgs and	relationships
Second-hand		Intern Orgs	Performance
market	Batteries		Trust
	Lanterns	Minda	
	LED	Boond	Selling Examples
Busy shop	Micro-grids	TATA	Sale Patterns
Character of Shop	Streetlights	TERI	
		NatureTech	Preference
	Manufacturing	Mera Gaon Power	Consumption practices
Informal Local		D.light	Customisation
Market	Loans		Customer cruising
			Customer knowledge
Electricity	Subsidy		Customer types
situation			Home Solution
	Warrenty		Trade-up
Precariousness			
and poverty	Cash		Jugaad
Structural			
inequalities			Installation
			Repair
			Servicing
			Long time
			Change
			Time
			Future
			Scale-up
			Demand
			Penetration
			Market Development
			Competition
			Margins
			Control
			Outside practice and ideas
			Partnerships
			Outside support
			Regulation
			State Policy
			Big Project
			Problems