ABSTRACT

Climate change, technological innovation, and financialization are three of the most transformative processes shaping spatial planning and policymaking. Yet, each of these macro-structural processes and their consequences are experienced in the short-term and at geographically-specific scales. In the context of planning, financialization needs to be better understood to evaluate its actual processes and consequences through in-depth analyses of specific cases. Since 2007, India’s weather insurance programs have become the largest in the world offering farmers access to new financial instruments and automated technologies to manage the increasing risks of agricultural cultivation. Insurance has come to be seen as a systematic response to the increasing impacts of drought and flooding since the green revolution and an agrarian crisis that has witnessed over 300,000 farmers commit suicide between 1995-2015. In this dissertation, I ask how and why insurance, which never played a significant role several decades ago, has come to be a central planning strategy for agricultural policymakers, outpacing all other government expenditure in the form of premium subsidies.

I study the development of weather insurance programs in India and examine implementation across four major agricultural states—Maharashtra, Andhra Pradesh, West Bengal, and Punjab—to show how risk transfer in the agricultural sector has been increasingly financialized, with a growing dependence on new derivative instruments and the rising penetration of international reinsurance capital. The overarching research questions motivating my dissertation include: how does the introduction of new insurance policies, financial instruments, and weather technologies impact the agrarian landscape? how do these insurance programs define and measure risk? what are the spatial dimensions of insurance, its variation and its coverage? what is the importance of these developments in terms of how agricultural risk gets financialized for long-term planning as well as political contestation? and what it means to plan for weather risk and climate change in a context of the rapid churning of technologies and the financialization of risk? In my research methodology, I employ granular analysis of actors, agents, and actions, while paying attention to structural positions, systemic rationalities, and recurrent patterns. I conducted interviews with over 40 insurance professionals, underwriters and government experts as well as with 60 farmers and local officials in four states – West Bengal, Maharashtra, Punjab and Andhra Pradesh. I used archival and document analyses as well as spatial analysis of insurance business data to understand and explain spatial variation in policy implementation and outcomes.

Amidst the numerous scholarly debates about the role of finance and meaning of financialization, the spatial dimensions of risk and financialization are not well understood. Through my research, I explain financialization of weather risk through an analysis of underwriting methodologies for actuarial models, financial instruments, and automated weather technologies. I show how complexities and shifts in seasonal geographies and temporalities further complicate the extent
to which harm, loss, risk can be correlated with financial precision and pricing. I argue that the speed of convergence towards automated and index-based systems has been followed by the disempowerment of farmers who have trouble disputing the terms and eligibility of coverage especially in the case of index insurance contracts, where disputes related to measurement errors and manipulation have had a significant negative effect on adoption, with many states and insurers reducing their offering of such policies.

I further argue that the rise of the financialization of risk in the agricultural sector in particular is concurrent with the ascent of a global fast policy environment since the 1970s that facilitates iterative and experimental development of actuarial systems along transnational policy circuits. I contribute archival and empirical findings to show that Indian agricultural policy has witnessed a shift in focus away from the distribution of land, infrastructure, and productivity that were important in post-independence India and the Green Revolution, towards new forms of “riskholding” in the post-Green Revolution period, in which the government focuses on the ways in which the financial risks of agricultural producers are managed and transferred. In my comparative examination of the four states, I show that while insurance mitigates some forms of inequality through subsidies, structural inequalities as a function of inherited landholding disparities and landlessness are reinforced. My overall contention is that agricultural planning and policymaking, specifically through insurance, shifts resources away from longer-term considerations of addressing inequalities of assets such as land and capital, towards the problems of “riskholding,” which constitutes a new dimension of differentiation that, in effect, magnifies the salience of short-term financial risk and risk hedging strategies instead of agricultural investment and infrastructure development.

Finally, I find that financial risk in its various forms is becoming politicized in ways that are not accounted for in the current literature. I use my case studies to contribute to the literature on the financialization of agriculture (via an intervention in the ongoing debate on the “agrarian question”) with a focus on the ways in which insurance subsidies, electoral politics and debt-based mobilization are a manifestation of a more broad-based politics of financialization. The politicization of financial risk ultimately upends the actuarial approach through state-specific variations in implementation through insurance subsidies and loan waivers as electoral strategies.

These newly emergent systems are hierarchical and unevenly empower risk capital and new forms of actuarial automation, while risk capital markets and technologies are reshaping the context of planning and the ways weather indicators and indexes are defined and calculated. Furthermore, the uncertainty and severity of climate variability through unseasonal rainfall, drought, flooding, and disease present complex challenges for the very viability of agricultural production that are not adequately addressed through the insurance program, but may in fact, temporarily mask these processes through continued and pervasive ecological extraction and indebtedness. Ultimately, insurance is an incomplete mathematical (actuarial) technology for planning because it assumes fixed aggregate risks and non-correlation of risks. More than the mathematical possibilities and constraints of insurance, new models may show the potential for anti-neoliberal forms of decentralization in insurance and financialization through blockchain and other distributed technology for mutual, peer-to-peer risk management.

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ACKNOWLEDGEMENTS

I want to thank my committee members for their support and guidance throughout the process of writing this dissertation. This dissertation project would not have happened without them. And, it most certainly would not have been written and articulated without the wise and steadfast advice of Janelle, who took me as her student and provided me with the best recommendations I needed at all the right times. From the moment I came to her, she showed amazing grasp of my limitations conceptually and in writing, and how I could push through them. Bish’s voice was one of the first that I had heard upon joining the MIT program. He was generous and friendly and, since then, has continued to create space for ambitious ideas and research to flourish, while offering me incisive questions and counterarguments towards reflective practice and concrete engagement. I have a lot reasons to thank Jim, not least of which is his influence on how I think about disaster risk, agricultural conditions, and the capacity of people to improve those conditions and make themselves more resilient through planning. I have always admired Jim’s attention to detail and the precision of his interventions and I thank him for guiding me while we were both conducting research in India. Neil has been an important intellectual force in my life for over ten years and has always continued to show the same great intensity in his theoretical perspectives as he does in his mentorship and guidance.

My dissertation research took place primarily in India and I was fortunate to meet and learn from the most influential figures in weather insurance that have been working for decades to improve risk governance at all scales in India, including: Dr. P. K. Mishra, Vijay Mahajan, Sonu Agrawal, and Rajeev Chaudhuri. I am grateful for how generous each of them was with their time and without whom I would have not been able to pursue this research fully. I also benefited from the encouragement and advice of Mihir Bhatt, Dr. David Dror, Saurabh Dani, P. C. James, Somil Nagpal. In order to visit and conduct research across the many far-flung farms and areas impacted by weather risk, I relied on a wide range of people and want to thank Anuj Khumbat, Neha Batra, Sandeep Kaushik, Karthik, Kumar, the field-level teams in West Bengal, Andhra Pradesh, Punjab, and Maharashtra teams, and the many farmers and cultivators that took the time to explain what their lives are like and how profoundly reliant we actually are on one another. You each are so dedicated and I thank you for allowing me to enter your worlds and guiding me to understand what is happening more deeply.

My department has been and continues to be a reservoir for heterodox, postdisciplinary thinking and I have been privileged to learn from the DUSP community in ways that I could not have imagined prior to joining them. I want to especially thank Balakrishnan Rajagopal (“Raj”) for advising my first-year paper and general examinations, expanding my intellectual and conceptual perspectives in entirely new ways. And, I thank Phil Thompson, Dayna Cunningham, Xavier Briggs D’Souza, Larry Susskind, Amy Glasmeier, Eran Ben-Joseph, Miho Mazereeuw, Diane Davis, among many other faculty that have been extremely generous with their wisdom over the years. And, in remembrance and celebration of the late, great Alice Amsden, JoAnn Carmin and Judy Layzer. The staff and administration have been incredibly insightful and kind, offering me new domains of knowledge and always there for me when I needed. I want to thank Sandra Wellford, Patti Foley, Karen Yegian, Duncan Kincaid, Harriette Crawford, Charles Leiserson, Jr., Janine Marchese, Phil Sunde, Ezra Glenn and Kirsten Greco in particular.

My inspiration to contribute to academic scholarship comes from my college thesis advisor, Jean Comaroff and my graduate mentor, Louis Herns Marcelin, both of whom in their own ways infuse every act, thought, word, with intellectual brilliance and pedagogical compassion.
My dissertation has also been an outcome of many, many conversations and debates, always enriching, with my esteemed peers and colleagues, both senior and junior to me, including Jason Jackson, Seth Pipkin, Anush Kapadia, Leigh Johnson, Atul Pokharel, Karthik Rao Cavale, Kian Goh, Faizan Siddiqi, Devanne Brookins, Lyndsey Rolheiser, Linda Shi, Ofer Lerner, Zachary Lamb, Chris Smith, Lily Pollans, Babak Manouchehrifar, Anthony Vanky, Mitchell Cook, Nicholas Marantz, Ian Gray, Sanjeev Routray, Anmol Chaddha, Kalin Agrawal, each brilliant in their own right.

I deeply appreciate the generous financial support I received for this dissertation. The research and writing in this dissertation was partly funded by the following MIT institutions: the MIT International Science and Technology Initiatives (MISTI) India Program, Center for International Studies, the Aga Khan Program for Islamic Architecture, the William Emerson Travel Fund, the Harold Horowitz Research Fund, the Lloyd and Nadine Rodwin International Travel Fellowship, and the Program on Environmental Governance and Sustainability. And, I also want to thank the Lincoln Institute for Land Policy for fellowship support during my final year.

I want to thank my entire family, every extension of it—my uncles, aunts, sisters, cousins, and network that knew me before I started this journey—for their positive encouragement and love. I wouldn’t have been able to start out on this without Nayan U, Harsha A, Murthy U, Myetraie A, Shyam U, Lalita A, Kiran A, Gul U, Palak, Purvi, Rahul, Vivek, Rashmi, Aarti, Jigna, Aneesh, Etan, Rohini A, Ravi U, Vidya A, Kanti U, Lesilie and Vicky, Bambi, and Louise. The last years and months were crucial and I especially am grateful the encouragement of several people along the way: Ryan, Michelle, Olivia, Dave, Jeanne, Bunty, Ryo, John, Nancy, Rico, Aram, Aziza, Linda, Sanjay, Feyza, Umang, Jaspal, Hardeep, Balraj, Farhan, Aditya, Anik, Bhavika, Niraj, Smeet, Ajay, Manjari, Bijal, Ajay, Manjari, Indhira K., Haren M, Jyoti M, Nilay, Dhurvi, Miraya, Ila M, Mahendra M. Nilesh, Jessica, Krupal, Keyur, Aparna, Connie, Eduardo, Monique, Sam, Alfonso, Raul, Nancy, Ursula, Sean, Jenny, Andy, Olli, John, Akseli and the ECSA team.

My father-in-law, Ajay Tankha helped me in so many ways during my research and, most importantly, gave me much needed confidence and guidance when I was in the field. I really could not have kept going without the support of the Mimi-s, Philippe, my soundtrack, Hot Java... Sushma, for always inspiring me and making platforms for me to try to fly...PhDs take (too much) time, and I really appreciate my parents’ patience and support in every sense.

I cannot thank my wife, Mrinalini Tankha, enough. And it’s impossible to explain in words anyway. But, she’s my life collaborator and made this dissertation with me, all the while sustaining me and convincing me that I could and should write this.

I want to dedicate this to my grandparents. I wish I knew them more. Their generous conviction and benign purpose was always palpable and their influence immense and far-reaching despite any and all constraints. And, in their name, I’d like to offer this study into the long and vast stream of energy and efforts to denaturalize social inequalities of all kinds, new and old.
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CHAPTER 1. INTRODUCTION

I open this introduction about weather insurance, risk and the financialization\(^1\) of agriculture in India by juxtaposing short excerpts from two parliamentary debates – one in 1897 and the other in 2014 – to show the historical salience and continued relevance of these concerns, albeit in different contexts, for planning and development in India. The first takes place in colonial India in January 1897 and is a statement by Secretary of State Lord Hamilton responding to the Indian National Congress (INC) that had put the blame of famine and subsequent mortality on British rule and alleged that the “Famine Insurance Fund” created through excess taxation on the Indian population, on recommendation by the Famine Commission of 1880, was in fact being diverted for other purposes, such as war and trade, and was not being used for mitigating the effects of famine. Lord Hamilton’s remarks were as follows:

“There are two theories current as to the cause and origin of this distress. There is a small but active body of propagandists who are never tired of complaining that British rule is bleeding India but that it is the result of persistent over taxation and heavy assessment, which has so reduced the condition of the mass of the people, and that they are expiring of inanition. There is another school who maintain a wholly contrary opinion. They assert that from time immemorial famine, due to want of rain, has been a regular and periodical scourge of India, and that under our rule, decade by decade, the effects of famine when it occurs are being narrowed and arrested, not only by the increased resources of the people assailed, but by a systematic and progressive scheme of famine protection, which the British Government has created and is continuously improving” (House of Commons, 8th August 1899: 174-175).

Consistent in its message against British colonial forms of rule, the INC, represented by Dadabhai Naoroji, claimed that “the economic drain by Britain,” was the chief cause of poverty and famines in India, saying:

“How strange it is that the British rulers do not see that after all they themselves are the main cause of the destruction that ensues from droughts; that is the drain of India’s wealth by them that lays at their own door the dreadful results of misery, starvation, and deaths of millions...” (Naoroji 1901: 212)

\(^1\) By financialization, I refer to the expansion of a largely “autonomous,” “accumulation-centered,” vertically integrated financial circuits into new domains (Krippener 2005), which I discuss in greater depth in Chapter 2.
Famine continued to be a contested issue and played an arguably central role in India’s struggles against colonialism and significantly shaped post-Independence government policymaking.

In an early essay entitled *How Moral is South Asia’s Economy?*, anthropologist Arjun Appadurai once wrote, “[f]amine is a powerful but distorting lens through which to look at any society. Both the causes and the consequences of famine...[are] inseparable from the problems of agricultural technology, inequality, and dependence in normal times.” The Famine Commission appointed in 1878 resulted in the first Famine Code, and this was adapted as a national model to different regions of British rule. The Codes provided comprehensive institutionalized guidelines to colonial administrators. They included instructions to anticipate famines, and to save life but explicitly at the lowest possible cost to the exchequer, by providing employment at subsistence wage, and “gratuitous” relief to the “unemployable.” These famine relief codes had deep influences on India’s territorial planning and social protection programs and were the basis of famine prevention until the 1970s, after which there was a shift in the government's strategy post-Green Revolution.

As I will demonstrate in the chapters to come, the political stakes of famine, drought, and poverty have changed in the post-Green Revolution period. The increase of farmer indebtedness and suicides from the 1980s onwards in particular show how the context has shifted and contestations are now over how to govern and control diverse systems of risk and risk transfer.

---

2 See this remark from M. K. Gandhi as early as October 1917: “No well-wisher of India, no patriot dare look upon the impending destruction of the handloom weaver with equanimity... this industry used to supply the peasant with an additional source of livelihood and an insurance against famine” (Gandhi 1917: 6).

through increased foreign investment and financialization as ways of managing and mitigating the effects of disaster. One domain in particular – insurance – has taken center stage in India.

In this next excerpt, from a parliamentary debate in India, I provide a window into the continuity of concerns as they relate to the financialization of risk management and transfer, almost one century later, as observed through the debates over whether to increase foreign direct investment (FDI) limits in the insurance sector. I begin with a statement by Professor M. V. Rajeev Gowda, Member of Parliament in the Rajya Sabha (Higher Assembly) since July 2014 and a national spokesperson for the Indian National Congress (INC) during the parliamentary debates on FDI in India’s Insurance Sector. Rajeev Gowda begins:

Sir, insurance depends on diversification of risks and by making India open to more resources, more companies, by opening our markets to other companies to diversify our risk, their risk here and our companies to play in their markets, we will actually be strengthening the global financial system in the context of insurance. There is much more that we want from these whole moves. If you look at farmer suicides, why do they take place? ... It is extraordinarily important for us to ensure that agricultural insurance markets emerge and are developed, which is possible if this kind of financial infusion comes in, if the expertise that these companies have, in terms of financial insurance markets, for agricultural and rural produce. If those are introduced, then we will be able to make a huge difference to the lives of our rural brethren...[we] are still the most vulnerable among the countries to global climate change and its impacts. It is, therefore, vital for us to have insurance mechanisms that will cover the kinds of potential changes that would occur from global climate change. The NDA Government has talked about setting up of an adaptability fund. This is partly as a result of the unseasonal rainfall and the damaged crops; that we have discussed in this House and even in Lok Sabha. Sir, for this, insurance can play a huge role and that is why it is important to ensure that this Insurance Bill goes through and more funds come in to strengthen the sector.

Following Gowda, another Member of Parliament in the Rajya Sabha, from the ruling Bharatiya Janata Party (BJP), reinforced the earlier argument about India’s need for FDI in insurance:

“... we are all agreed that rural India and the farmers of India need far more protection than farmers in many other countries of the world. Mr. Rajeev Gowda just mentioned the

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4 Statutory Resolution Re.: Disapproving the Insurance Laws (Amendment) Ordinance, 2014 (No. 8 Of 2014) and The Insurance Laws (Amendment) Bill, 2015-- Contd.
point that the vagaries of the climate on which our farmers depend (Time-bell rings) have been all the more reason why they require this cover... Sir, the general insurance sector in India was totally underdeveloped. General insurance means other than life and health. In this area particularly, there is a need to open up the reinsurance sector. Sir, the reinsurance sector in India is almost at its infancy. This Bill actually provides for the opening-up of the reinsurance sector and allows Lloyds, the re-insurance platform of the world, to open its offices in India and to develop the re-insurance market so that bigger companies can share the risk of general insurance. ... (Interruptions)...

One of the notable facets of these discussions is that although many members of the INC challenged features of the Insurance Act amendments, the same INC party that had argued against the British colonial government and held the incumbency position for many decades since Independence, was a major proponent of India’s liberalization especially in the insurance sector. This was despite the many dissenters from other coalition parties, ironically arguing along the same “economic drain” logic the INC used against the British in 1901, that FDI in insurance would allow for foreign reinsurers and hedge funds to derive profit from the risks of small-farmers in India without necessarily contributing to their resilience. Yet, for most of India’s history, the role and significance of such forms of insurance have been negligible at best.

In this dissertation, I ask how and why insurance, which never played a significant role in most people’s lives several decades ago, has come to be a central planning strategy for agricultural policymakers, outpacing all other government expenditure in the form of premium subsidies. And more specifically in India, how and why have highly financialized forms of risk transfer dependent on reinsurance, financial markets, and new derivative instruments been implemented? As referred to in the excerpt above, one reason is that insurance has come to be seen as a systematic response to the increasing impacts of drought and flooding since the green revolution and an agrarian crisis that has witnessed over 300,000 farmers commit suicide between 1995-2015. A Report on Accidental Deaths and Suicides in India (2016) by the National Crime
Records Bureau (NCRB) shows that between 2014 and 2015, increases in bankruptcy, indebtedness and crop failure drove farmer suicides up 42%, “signaling severe distress in the agriculture sector,” especially as one-third of India’s farms are in drought-prone regions.

1.1 Cultivating Insurance

In my research on the insurance industry more broadly, I encountered the following commonly-held perception expressed in texts and interviews: "Far beyond anything else, insurance is the DNA of capitalism. Without insurance, nothing is built, nobody works, nothing floats, nothing runs on tracks, and nothing ships. And nothing is rebuilt." Or at least this is what the insurance industry would like to think and certainly aspires towards. As social policy, insurance systems form an important basis for what constitutes social welfare programs across Euro-America. More recently, government leaders and non-governmental organizations proposed financing new international insurance funds as an ideal mechanism for managing global climate change risk, according to parties and signatories at COP21, especially as the World Bank has piloted such programs for over 20 years across the world. It makes sense within the dominant market-economic paradigm, more “innovative, scientific finance and insurance,” both private and public, are actually the most effective means of reducing inequality, by “quantitatively managing all of

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6 Several similar agreements have been negotiated amongst policymakers from the G7 and other wealthy nation networks. For instance, the G7 Initiative on Climate Risk Insurance aims to increase access to direct or indirect insurance coverage against the impacts of climate change for up to 400 million of the most vulnerable people in developing countries by 2020. See: http://www.swissre.com/climate_action/Insurers_join_forces_to_advance_climate_resilience_through_new_initiatives.html
the risks that contribute to it” (Shiller 2013).

It is clear that insurance in general, and emergent forms of climate and weather insurance that I address in the forthcoming chapters, are important policy mechanisms that pose critical planning questions that deserve further investigation and debate. Yet, the precise meanings and relevance of the financialization of risk are actually contested in the current literature, with significant implications for understanding what it is, how it works, and what consequences it may have. Empirically, we know that the financialization of risk characteristic of contemporary agricultural insurance programs introduces the logic of risk capital and financing into the dynamics of everyday life of farmers (Johnson 2013, Isakson 2015, Hamilton 2016), which has been accomplished by removing the upper bound for insurance and risk financialization to new circuits of capital into processes for governing the measurement, ownership, distribution of agricultural risk. In the context of planning and long-term policymaking, financialization needs to be better understood to evaluate its actual processes and consequences through in-depth analyses of specific cases.

This dissertation aims to provide a better understanding of the precise nature of risk financialization and how it operates in the Indian context as an iterative and emergent process. There are three core reasons that motivate why I use the case of weather insurance and its impact on India’s agrarian sector to study the phenomenon of the financialization of risk and its impact on planning. First, the agrarian sector supports the largest segment of the country’s population,

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making India the largest group of small-farmers in the world at present. As I will show in the background (below) and through my empirical chapters, the Indian agrarian context is highly unstable ecologically, climatologically, politically, and financially, and insurance provides an important intervention into risks and challenges that crosscut these problems. Though the Indian government began local crop insurance pilots in the 1970s, more recent policies have expanded territorial coverage of several insurance systems across the country through automated weather stations, government subsidies, and foreign investment of risk capital. In this study, I examine the emergence of such programs and the ways in which this approach changes how risk is perceived and managed in the agricultural sector.

Second, in the context of the debate on the nature and consequences of financialization more broadly, and its effects on agriculture more specifically, agricultural insurance is sold in spatial quantities of land (e.g. hectares) producing specific forms of spatialized financialization. The spatial dimension of risk and financialization are not well understood in the literature but have significant consequences for reshaping agriculture and its many interrelated economic geographies. I additionally examine the expansion of insurance coverage in the context of the increasing role of financialization as constituting a new form of planning in post-liberalization India.

I highlight the crises of farmer suicides, indebtedness, and rural inequality to shed new light on the debates around financialization, financial inclusion and exclusion in the context of weather

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8 According to the Food and Agriculture Organization (FAO): “India has the largest body of surviving small farmers in the world, on average holding less than 0.56 acres. They collectively hold one-quarter of the world’s 570 million farm lands” (FAO 2014). See also Shiva and Jalees (2005)
and climate risk. In this empirical context, my research aims to explain whether this particular form of financialization succeeds in alleviating the problems they are designed to address or perhaps leads to their accentuation. Planning requires an understanding of whether insurance mechanisms are used merely for mitigating short term (seasonal) financial loss that do not in fact translate into any long-range improvements promoting agrarian development and whether this might naturalize the lack of any sustained investment in large-scale agricultural infrastructure in the post-Green revolution period.

1.2 Chapter Summary

In Chapter 2, I review the relevant debates in the literature that inform my main theoretical framework and research questions (chapter 3). First, I review the literature on financialization in more detail to both establish the relevance of this analytical approach for contemporary India and explain why and how I situate my analysis of insurance in these debates. I begin by explaining the definition of financialization as well as the ongoing debates about the scope and limits of its relevance to agricultural development. I focus on a review of contributions particularly from the field of geography on what kinds of methodological approaches are needed to adequately study financialization.

Next, I explain my decision to use the framework of “fast policy” (Peck and Theodore 2015) to better explain how diverse, but globally integrated policies and paradigms emerge, and employ "granular and specific forms of analysis—close to actors, agents, and actions, but at the same time attentive to structural positions, systemic rationalities, and recurrent patterns" (Peck 2016)—and examine concrete actuarial models that are otherwise often treated as "black boxes"
of financialization (Christophers 2014, Poovey 2015). I review several perspectives on insurance and risk that are important to situate my own focus on *actuarial financialization*. I begin with the theory of risk as it is explained in agricultural economics that forms the basis of crop insurance policies and programs across the world. I show how several core assumptions of this theory have been undercut in practice as is documented in the agricultural insurance literature; as articulated by Peck and Theodore (2015), such “failure” and “contradiction” are constitutive of fast policy. I juxtapose the economics approach to the literature on insurance that is rooted in Michel Foucault’s theory of governmentality that questions who decides what is a risk, how it is measured, and what kinds of power/knowledge result. I review how this approach has come to dominate critical research on insurance and risk for over 20 years, and although it poses important questions and contributes rich empirical findings about the actual working of insurance, it has philosophical limits for explaining the convergence and structural alignments with more general processes of financialization.

Last, I engage with debates in the existing literature that help to explain the structural forces I contend have shaped the terms of policy making for the agrarian sector. My focus is an ongoing, productive debate on the "agrarian question" between Phillip McMichael and Henry Bernstein about the place of agriculture in capitalism and the direction that it is moving towards. Both of them observe the cumulative role of financialization as a structuring logic leading to new forms of agrarian crises. Yet, in distinction with Bernstein’s view of agriculture, which he says is thoroughly integrated in capitalist relations, McMichael argues agriculture unlike other sectors is the central limit for capitalist development because food and its ecological dynamics are the basis of human survival. These views have theoretical implications for the categories I use to
analyze peasants/farmers, financial instruments, and risk. In particular, I follow McMichael’s thesis that transitions of different “food regimes” from place-based (small-scale/peasant farming) to the larger nation-scale projects of green revolution to “de-contextualized” or “de-localized” agriculture via climate variability and financialization are uneven and face structural limits and contradictions (McMichael 2009a). I review the critical geographical literature on rural development and agrarian studies that show how rigid spatial categories and theories, including the "ruralization of agriculture" are counterproductive to understanding the transformed, transnational context of contemporary agriculture. In this context, I incorporate key insights from the literature on debt's uneven geographies and spatial dependencies especially as they relate to agriculture.

In Chapter 3, I explain my theoretical framework as an outcome of my analysis of the gaps in the existing literature, and then present my research questions and methodology. My theoretical framework consists of a scaffolding of the three main theories discussed above: risk financialization as a process, fast policy as a policy paradigm, and new agrarian questions related to financial risk and debt as the basis for political contestation. I rely on specific definitions of each of these concepts in order to ask specific research questions about the emergence of insurance and risk financialization in India’s contemporary post-Independence and post-Green Revolution development. Through my theoretical framework and empirical research, I aim to situate the insights of financialization research and principles of the “fast policy” paradigm of policy analysis to better explain the particularly uneven, but rapid expansion of agricultural insurance and hopefully, other emergent policies, which follow certain pattern similarities.
The overarching research questions motivating my dissertation include:

(i) what is the importance of the current historical moment in terms of how agricultural risk gets financialized for long-term planning as well as political contestation?

(ii) how does the introduction of new insurance policies, financial instruments, and weather technologies impact the agrarian landscape and how do they define and measure risk?

(iii) what are the spatial dimensions of insurance, its variation and its coverage?

In this chapter I also elaborate the methods of data collection and analysis in more depth and provide a map of the different states included in the study. To address the research questions, I used three methods of data collection and analysis and triangulated the different results, as follows:

1. I conducted interviews with industry professionals, underwriters and government experts in New Delhi, Mumbai and Pune and with farmers and local officials in four states – West Bengal, Maharashtra, Punjab and Andhra Pradesh. I transcribed interviews with my observational notes and made conceptual linkages using principles of “theoretical sampling” and “constant comparison” derived from grounded theory methodology (Strauss and Corbin 1994), described in more detail in Chapter 3.

2. I also examined government documents of parliamentary debates, insurance acts, regulations and insurance schemes; reports by the Ministry of Agriculture, Planning Commission, World Bank, National Disaster Management Authority etc.; and also analyzed actual insurance contracts and documents of legal proceedings. I followed a similar method for analyzing documents linking texts that correspond to the themes of each research question, such as organization motives for the emergence of insurance-based policy in the context of historical policies, and reference these conceptual linkages through excerpts from the actual texts.

3. I conducted spatial analysis of insurance business data, which was provided to me by several insurance companies. The data provides partial coverage for the districts because of limits in access to such proprietary data; however, I was able to verify aggregate amounts of total insured amounts and actuarial rates using government documents from relevant states that show comparative bids as required by the regulation. I used descriptive statistics to create tables, charts, and graphs to visualize my findings. I also used ArcGIS software to create maps that provide representations of the spatial distribution of insurance contracts, insurance actuarial rates, premium collection, and the ratio of government subsidies by company, crop, and district in the key states I used for comparative sub-national perspective.

In Chapter 4, I consider what it means to plan for weather risk and climate change in the
agrarian sector in a context of rapid churning of technologies and financialization of risk? I show how complexities and shifts in seasonal geographies and temporality further complicate the extent to which harm, loss, risk can be correlated with financial precision and pricing. And, I argue that there is evidence of mutual reinforcement of financialization and the development of new indices needed to measure agro-economic risk because 1) the expansion of contemporary financialization processes depend on algorithmic models and metrics and 2) there is a need for real-time measurement and assessment of weather parameters with the rapid structural destabilization of the climatic “context” through climatic variability for agricultural production and unregulated exploitation of other factors of production (e.g. groundwater). New technologies such as high-precision satellite imagery, drones, and automatic weather stations, among other technologies play a pivotal role in such measurement, indexing, and financialization, though their actual implementation is highly uneven, experimental and inconsistent for the purposes of underwriting. The rapid innovation both in new types of data and new algorithms for indexing them contribute to a highly dynamic data environment and high variability in the spreads of actuarial rates, which the government and reinsurance firms cannot directly disassociate from “ambiguous loading” by various underwriters. Lastly, the speed of convergence towards index-based systems has been followed by the disempowerment of farmers who have trouble disputing the terms and eligibility of coverage especially in the case of index insurance contracts, where disputes related to measurement errors and manipulation have had a significant negative effect on adoption, with many states and insurers reducing their offering of such policies.

In Chapter 5, I review in some detail the evolution of agricultural insurance in India in order to explain what I mean by a shift toward financialized “riskholding”—or the government’s concern
with the ways in which the financial risks of agricultural producers is managed and transferred. I compare that with earlier spatial planning imperatives focusing on landholding (land reform) in the 1940s and 1950s and on expanding material infrastructure for yield and productivity growth in the 1960s and 1970s (Green Revolution), following severe food shortages (which I narrate in the background section below). I then trace the evolution of the agricultural insurance programs explaining the influences that have brought about the current actuarial regime. I show evidence of these new patterns by highlighting the significant rise in insurance contracts, cumulative sum insured, and area under insurance that is based on access to formal credit, which reinforces highly uneven landholding and cultivation conditions both within and across states. I argue that policymaking focused on territorial coverage of landed farmers rather than farmers more generally, constitutes a highly uneven geography of “riskholding” that excludes the expanding contingent of landless laborers and tenants that are on the rise with increased absentee landlords and informal tenancy in India.

My overall contention is that agricultural planning and policymaking, specifically through insurance, shifts resources away from longer-term considerations of addressing inequalities of assets such as land and capital, towards the problems of “riskholding,” which I describe as a new dimension of differentiation within the agricultural sector that, in effect, magnifies the salience of short-term financial risk relative to landholding, and more generally towards risk hedging strategies instead of agricultural investment and infrastructure development. I show that new structures and patterns of riskholding are dependent on reinsurance firms and other forms of risk capital seeking float profits that have emerged in the increasing financialization of insurance and the restructuring of the reinsurance industry. The motivations and tendencies toward actuarial
financialization are, at least in part, related to narrow constraints on fiscal spending as articulated by the World Trade Organization (WTO), the World Bank and reinforced by the financial markets. Actuarial financialization creates assurance for establishing a pool of risk capital from the insured and government funds, but does not guarantee that the insured will necessarily receive a payout even if s/he experiences losses. Once such insurance systems are instated, regulatory efforts tend to emphasize concerns of adverse selection, moral hazard and sustainability of the actuarial regime rather than moral economy, the effective reduction of risk (mitigation) and its social distribution away from the most vulnerable.

In Chapter 6, I contribute to the literature on the financialization of agriculture (via an intervention in the debate between Bernstein and McMichael) with a focus on the ways in which electoral politics and debt-based mobilization are a manifestation of a more broad-based politics of financialization. This finding is an outcome of my research objective to understand and explain spatial variation in policy implementation and outcomes using an analysis of four major agricultural states in India—Maharashtra, Andhra Pradesh, West Bengal, and Punjab. I draw on the different ways in which insurance has been operationalized in political discourse by the central and state governments as a response to the geographically diverse, agrarian environments in each of the respective states. I highlight the crises of farmer suicides to bring into a different light the political debates surrounding agrarian distress and the ways in which crop insurance figures into the broader context of indebtedness, financialization, and ecological degradation, which I explore and compare for each state. I show that crop insurance can only be understood in conversation with other forms of risks and contingencies.
However, financial risk in its various forms is becoming politicized in ways that are not accounted for in the current literature. The politicization of risk ultimately upends the actuarial approach through state-specific variations in implementation through insurance subsidies and loan waivers as electoral strategies. Simultaneously, farmer groups and movements have politicized their own response to increased financialization of the agricultural sector through massive mobilizations to disrupt production and distribution of agricultural products in exchange for debt relief, higher subsidies, and other demands to lower their financial risks. These political factors contribute to other recent findings indicating relatively low voluntary participation in weather insurance in which farmers instead choose self-insurance and informal insurance by other means.

In Chapter 7, I summarize my findings and address the contributions of my research to the literature and its limits. I find that the agro-economic risk around which the policies are designed narrow the scope of risk management away from the ecological dysfunction of post-green revolution Indian agriculture, with the high quantity of polluting inputs, destabilization of the monsoon weather pattern, and limited, concentrated irrigation infrastructure. The uncertainty and severity of climate variability through unseasonal rainfall, drought, flooding, and disease present complex challenges for the very viability of agricultural production that are not adequately addressed through the insurance program, but may in fact, temporarily mask these processes through continued, pervasive ecological extraction and indebtedness. In the comparative examination of the four states, while insurance mitigates some forms of inequality through subsidies, structural inequalities as a function of inherited landholding disparities and landlessness are in fact reinforced. More broadly, the government introduced new forms and
scales of risk and inequality by restructuring the insurance sector to accommodate new reinsurance firms and risk capital to increase territorial “coverage,” effectively empowering such firms to set the pricing structure of risks facing farmers as well as the fiscal expenditure for governments.

The dissertation focuses primarily on the emergence of insurance and risk financialization in historical and geographical perspective at the scale of policymaking. Further future research explaining more concrete cases of actual farmer-level experimentation and interaction with diverse insurance systems would also be invaluable in the context of the intensification of climate variability, ecological degradation, and the simultaneous disruptions from new technologies for understanding and potentially responding to these issues.

I show that the rules, expectations and thresholds of ambiguity for measuring risk have changed historically, and actuarial automation has the capacity to dramatically redesign the way risk is measured, differentiated, and distributed. But, the core problems of inadequate correlation with actual damage, unequal access to such instruments as well as gaps in trust and governance of such techno-financial systems remain problems for the efficacy of such innovations in a longer-term planning perspective. In that spirit, I point to potential directions for future research such as the use of blockchain and other distributed technologies for peer-to-peer risk management purposes.
1.3 Background

In order to examine the role of agricultural insurance in India, I build on a very particular reading of contemporary agricultural development since independence. This section provides a summary of my interpretation of that history with particular focus on the ways in which government policy and planning priorities were constituted. The first phase in the narrative cover roughly the 1940s-1950s and shows that while planners had initially prioritized agricultural policies to address rural inequalities and employment, those priorities diminished in the context of the food crises and instead the government channeled substantial investments towards better-off farmers that already had more access to land and secure irrigation. The second phase in my argument takes place from 1960s-1970s and explains the decline of, and shift away from, earlier modes of longer-term planning (relating to landholding inequality, expansion of secure irrigation, and overall increases in food production) to instead focusing on the provision of subsidies and the management of financial risks post-Green Revolution. In Chapters 4 and 5, I continue the narrative from the 1970s—the present, describing the new emergent, “fast policy” (Peck and Theodore 2015) conditions for more substantial investment in national insurance mechanisms, new financial instruments, and deeper financialization.

1.3.1 Rural Inequality and the Green Revolution

At the outset, India’s “Five-year” plans established explicit planning priorities and policy targets since its independence. The initial three “Five Year Plans” in particular emphasized capital-goods based import-substituting industrialization (ISI) that were a significant break from earlier policies under British rule and set a new agenda for Indian planning, which was largely based on Lewisian thinking (Lewis 1955). Importantly, though, the Third “Five-year” plan (1961-1966) in
particular opened with an acknowledgement by Prime Minister Jawaharlal Nehru of substantial rural inequality and need for agricultural land reform (Frankel 1978). Legislative interventions such as the Zamindari (landlord) Abolition Act of 1951 began to address at least a few of the many inequities of the inherited system.

But, following the Sino-Indian War and two-consecutive droughts that destabilized an already faltering economy, the government made more calculated trade-offs. A highly cited example of the scale of trade-offs include the agreement India made with the World Bank and the U.S. government through the Food-for-Peace program (PL-480)\(^9\), which promised enhanced aid flow to India during the food crisis in the spring of 1966, under the condition that India carry out trade and industrial liberalization with devaluation, although the promised enhanced flow withered after the first year. This period of the mid-1960s is described by historians as the “crisis in Indian planning,” and in his analysis of this period, Sugata Bose explains why he thinks India moved away from earlier priorities and its significance:

> “while quirks in the weather patterns may well have compounded India’s food situation and the unwarranted export pessimism of the early 1960s may well have been something of a missed opportunity in India’s development trajectory, the real problem was the planners had forgotten the idioms of national development” (Bose 1997: 54).

Immediately, the government’s agenda had narrowed to focus on rapid, increased production (“output”) rather than inequality and rural poverty, which were the defining “development idioms” for the post-independence government.

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\(^9\) The program was an important U.S. policy tool for securing allies from non-aligned countries against the Soviet Union during the cold war.
Following the death of Nehru in 1964, Chidambaram Subramaniam, Minister of Food and Agriculture under the new Prime Minister Lal Bahadur Shastri, committed even more to focus on "overall agricultural productivity" and this eventually translated directly into preferential support towards better-off farmers with more land and secure irrigation, for instance in the Punjab, which emerged as the leading edge of the Green Revolution success. Minister Subramaniam worked closely with the Bell Mission arranged for by the World Bank in 1964. Bell's report recommended many policy changes, including the introduction of intensified agricultural production, and the devaluation of the Indian currency. In return, the mission report supported India's request for additional assistance, as a condition for quicker project disbursements. Subramaniam implemented many of the recommendations to, for instance, import the new high-yielding varieties of wheat and rice and to build the indigenous research capacity needed to sustain innovation in producing new varieties (Kapur 1997: 389). Further, he pressed ahead with price reforms, rapid expansion of efficient indigenous fertilizer production and was prepared to

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10 The Bell Mission was an unprecedented transnational collaboration for policy assessment constituted by a large group of individuals from various sectors and universities as well as USAID, Ford and Rockefeller Foundations. As early as 1963, a World Bank team following events in India convinced President George D. Woods that various lags in the country's development performance warranted a more searching review. They determined that the mission would be large, its members would spend several months within the country, and unlike routine Bank missions, it would be led and in part staffed by people from outside the institution. The American economist, Bernard Bell, was recruited to head the mission. In August 1964, President Woods persuaded an old acquaintance, India's finance minister, T. T. Krishnamachari, to agree to the exercise, and the first members of the Bell Mission arrived in October of that year. The Bell Mission is memorable particularly for its part in the attempt by the Bank, along with the United States as a bilateral donor, to encourage the government of India to consider certain reforms of trade and industrial policy. Even more significant, this episode from 1964 through 1968 was also a precursor to the Bank's "policy-based lending" era that began more explicitly in 1980 and later formed the rationale for the highly controversial "structural adjustment policies". Devesh Kapur (1997) argues strongly about the importance of the agricultural part of the Bell Mission's work, "not so much because of its impact on India but because of its effect on the Bank." The Bell Mission reached outside the Bank for its whole agricultural contingent—in part, at least, because the Agricultural Projects Division was so heavily engaged in trying to implement the program expansion on which the president was insisting. At the suggestion of people in the Food and Agriculture Organization, Bell recruited Sir John Crawford, a distinguished Australian civil servant, as the head of his agricultural group, and Crawford gathered an interesting and able set of colleagues, including the same village-studying Canadian who had contributed to the Schultz thesis, W. David Hopper. Hopper at this time was with the Ford Foundation in New Delhi and moved to the Rockefeller Foundation offices there (he would later become a senior vice president of the World Bank). Others on the team included the University of Chicago-trained French economist Louis Goreux (who would later work at the IMF), and Wolf Ladejinsky, a Soviet émigré.
attract foreign private investors to the industry. Most of all, the government’s approach depended heavily on subsidizing credit to create effective market demand for the new, expensive inputs, and the heavy consumption of water from irrigation as a result, for which the government at the time had committed resources towards. Subramaniam detailed all of this in the “New Agricultural Strategy” document. In the context of severe droughts and an impending food crisis, this new strategy was quickly approved and adopted, despite heavy opposition in the cabinet and Parliament.

Figure 1.1 Chidambaram Subramanian, Minister of Agriculture of India, and George D. Woods, President at the World Bank. 1965. Source: World Bank Archive.

Although the World Bank certainly did not have a determinate role in India’s agricultural development, the government of India relied on the Bank for lending support and managing its debt since the 1960s. In the context of agriculture, the Bank’s technical assistance and advice continues to be instrumental to the mainstreaming of growth-focused policies over objectives that prioritize distribution. As an example, from the 1960s, reviewing “India’s problems” in a report, Irving Friedman, Economic Advisor to the World Bank President George D. Woods, complained about the “excess of national government objectives in India” that included not only
growth of exports and other production but also improving the distribution of income and
promoting full employment. "My personal view," he said, "is that they will not be on a firm
foundation for growth until they have clearly decided that increased growth and improved
efficiency is the number one priority" (Kapur 1997: 199). By the end of the 1960s, early
consideration of land reform, which would affect the majority of India’s population was seen as:

"pointless ... if production expansion is a serious public objective...policy should be
reoriented to the needs of medium and large sized farmers" (ibid). “Furthermore, Irving
recognized that "the low-income farm problem is real and must be treated, the only
ultimate solution lay in the growth of nonfarm employment...[w]hatever is done [within
agriculture] it cannot be with the intent of more than a holding action" (Kapur1997: 206).

The reference to “holding action” is based on the dominant industrial development theory at the
time (as discussed above in Lewis) in which small-scale agriculture had no place and would
eventually cease to exist as was the case in industrialized countries like the United States. This
also paralleled debates about the agrarian question on the role of peasants in capitalist transition.
Although this view was dominant, economists were beginning to show positive efficiency and
productivity of smallholder agriculture than was previously acknowledged. Nevertheless,
subsequent World Bank reports in agriculture made no reference to the land reform and the plight
of the landless.

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'Redistribution with Growth,' the treatise reconciling growth and equity efforts on which, at McNamara's behest,
Hollis Chenery and colleagues collaborated with a group from the Institute for Development Studies, Sussex, in
1974. The premise was that small holdings, especially in the densely populated country side, was not - certainly did
not need to be - inefficient.” See also Saith, A and A. Tankha (1972) “Economic decision-making of the poor
peasant household”, Economic and Political Weekly, 7(5/7), pp. 351 –353, 355 –360. And Gaurav, Sarthak, and
Srijit Mishra. "Farm size and returns to cultivation in India: revisiting an old debate." Oxford Development Studies

Asia by Bank economist Inderjit Singh, The Great Ascent: The Rural Poor in South Asia (John Hopkins University
More specifically in the field of agricultural development and economics, Theodore Schultz, who wrote the influential study, *Transforming Traditional Agriculture*, and who later went on to win the Nobel Prize alongside Arthur Lewis in 1979, began to argue against what had emerged as the growing backlash against the “productivist” rural development programs and the legacy of the Green Revolution. In 1975, Theodore Schultz speaking at a conference sponsored by the Agriculture Development Council, made a cynical synthesis of the arguments against the Green Revolution and agricultural science:

“...If agriculture is the mother of science, motherhood is being treated rather shabbily these days...be it by the current food deficit in India or the approaching doomsday, there is a lot of rhetoric proclaiming that agricultural scientists are to blame. The effects of science on agriculture are deemed to be bad; it follows, of course, that agricultural scientists are responsible for the inordinate appetite of modern agriculture for energy and for chemicals that pollute our soil and that contaminate our food supply. It is also being said that they are making agricultural production more vulnerable to changes in the weather and that they cause much unemployment...some critics proclaim that the Green Revolutions compounds the excess population growth, and worst of all it is popular to say that it is unjust to poor people.”

He went on to argue that what was missing from the critiques were systematic analyses of the examples in which advances in biotechnology and productivity growth were not necessarily generative of inequality and ecological risk.

However, the main critique of the Green Revolution was the government's policy shift away from ameliorating inequality while increasing ecological risk. Michael Lipton extended the critique, arguing that poor “[g]overnment choices on redistribution and land reform also affect the stability and sustainability of farm technology. When market demands for new technology

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http://libcatalog.cimmyt.org/download/cim/25845.pdf  
are very unequal, with big farmers making the running, there is pressure to deliver new farm technology to maximize income, but less so for stability and sustainability” (Lipton 2002: 140). Subsequent studies show how broadly-defined national policies intended to incentivize increased productivity narrowed during the Green Revolution period through the inequitable concentration of inputs to those farmers with existing access to capital and social-caste connections over the less resourced and landless. In this context, privileged farmers emerged as “bullock capitalists,” a demand group that would transform national politics but do little for the aims of equity and rural development (Siegel 2017). The consequent uneven development was leading to increases in “concentrated” rural poverty for the vast majority of the agricultural sector that was still dependent on rainfall for irrigation and had less than two hectares of land.

1.3.2 Post-Green Revolution: From Investment to Subsidies

In this section, I make the second step in my argument explaining the decline of, and shift away from, earlier modes of longer-term planning, for instance, related to landholding inequality, expansion of secure irrigation, and overall increases in food production. At one level, the success of the Green Revolution in massively increasing domestic food production was overshadowed by the uneven implementation, increased inequality and new concerns about ecological risk. However, there was also a broader shift in the macro-political environment towards neoliberal economic restructuring, which reduced the policy space for large-scale government intervention (e.g. the Green Revolution) and the role of the World Bank in such policies moving forward. In 1973, the collapse of the Bretton Woods institutions, Cold War geopolitics, and the rise of the “Washington consensus” altered the ideological context. As Robert Paarlberg stated during a Senate Foreign Relations Committee hearing, “if the Green Revolution in India was proposed to
the World Bank today, it would be turned down. By the 1980s, public investment in roads, research, irrigation, fertilizers, and seeds was politically unacceptable to the Washington consensus on the right—and on the left, among environmentalists opposed to chemical fertilizers, road building, and irrigation projects.”\(^1\) Meanwhile, inside the United States, the World Bank was criticized for operating “a vast welfare program” focusing too heavily on poverty alleviation. This more pronounced neoliberal stance also led to a substantial divestment from rural development on the whole. In India, between 1982 and 1995 the real per capita levels of concessional assistance from the Bank for the agricultural sector decreased by approximately 60 percent. This was especially important for India, because prior to this period, from 1948-1980, India was the largest recipient of World Bank/IDA lending, totaling $11 billion, cumulatively.

In the early 1970s, the Indian government under the leadership of Prime Minister Indira Gandhi at the time, came to power on a markedly populist electoral agenda to “abolish poverty” and increase rural employment. Prime Minister Gandhi began to nationalize all of India’s banking and financial institutions. Though the World Bank termed this policy move “financial repression,”\(^2\) this was actually a major step towards deepening the financialization process. One of the major rationales for the move according to the government was the “inclusion of rural populations in banking,” and this eventually led to the creation of a large network of regional rural banks (RRBs) and the National Bank for Agricultural and Rural Development (NABARD).


\(^2\) Under the “Promulgation of the Banking Companies (Acquisition and Transfer of Undertaking) Ordinance, 1969,” 14 nationalized banks with total deposits of 50 crore were nationalized.
in 1982. Yet, the impact of her political program of “justice for those at the bottom of the agrarian hierarchy was not matched by political or social empowerment at the base and became vulnerable to challenges mounted by middling agrarian groups and rich farmer lobbies in several states.” (Gupta cited in Bose 1997: 55). However, from an investment perspective, the government was not at all focused on longer-term investment in infrastructure for small-farmers and the landless.

Though it was harshly criticized after the fact, government investment throughout the 1970s was primary channeled through subsidized (“cheap”) agricultural credit, in order to expand access to capital to purchase inputs. Eventually, a report from the highly-influential *Spring Review of Agricultural Credit* sponsored by USAID (1974) concluded that subsidized agricultural credit actually undermined agricultural and economic development. At the time, studies by the World Bank itself were showing how cheap agricultural credit led to worsening of land and income disparity and “[r]edistribution in reverse” (Gonzalez-Vega 1981). The empirical evidence of increasing inequality and even lack of aggregate growth and reduction in consumption was cropping up in the literature.

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17 During that nationalization process, the entire general insurance business in India was nationalized by the General Insurance Business (Nationalization) Act, 1972—this included the shares of 52 private insurers, some which had operated since the 19th century. After a process of mergers among Indian insurance companies, four companies were left as fully owned subsidiary companies of the General Insurance Corporation of India (GIC) (National Insurance Company Limited, The New India Assurance Company Limited, The Oriental Insurance Company Limited, United India Insurance Company Limited). The *Insurance Regulatory and Development Authority Act* (IRDA Act) of 1999 ended the monopoly of GIC and its subsidiaries and liberalized the insurance business in India.

Worse yet, by the 1980s, India began drastically cutting its overall spending to manage its fiscal deficits under pressure from lenders. In a report by the World Bank in 1999, the authors criticize the Indian government:

“[they] cut or contained the fiscal deficit by slighting development expenditures that encourage productivity growth in agriculture, and employment in the non-farm economy. For example, public capital formation in agriculture -- almost all of it coming from investments in canal irrigation -- and in rural infrastructure expansion decelerated sharply in the 1990s (World Bank 1999: 10-11)

The report highlights the severe impact on canal irrigation as an example of “Vicious Circle” cause by the divestment. This diagram highlights the Bank’s concerns about the self-reinforcing problems in the poor provision of irrigation to farmers and the negative impacts on poverty (see Figure 1.2). At the time, according to this report, canal irrigation was a key lever of agricultural productivity and growth in production and incomes.

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**Figure 1.2** Canal Irrigation: The Vicious Circle. Source: World Bank Irrigation Sector Report (1998)\(^\text{19}\)

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\(^{19}\) World Bank 1999: 16.
Studies conducted from the 1980s onwards report consistent concerns that the Government of India made a substantial policy shift away from infrastructure and technology—which at the time was understood as instrumental to human development. When examining the new approach, the World Bank report observed steady state expenditures for agriculture and these turned out to manifest in the form of seasonal energy and input subsidies that would remain the target of electoral campaigning strategies and begin a structural shift towards environmental deterioration.

According to the report,

"policy-makers have chosen to sacrifice the productive, high levels of investment in technology, rural infrastructure and human development in order to maintain popular but poorly targeted subsidies...[t]he massive and growing subsidies in rural power, [groundwater] irrigation and fertilizer are not cost-free. The pace of technological change is now too slow to reverse the decline in productivity growth, to raise rural incomes and wages, and to alleviate poverty. Input subsidies that cause increasingly serious production inefficiencies and impose large and often hidden environmental costs on the natural resource base have now grown so large that they severely crowd-out precisely the government outlays that are known to boost the rural economy and reduce poverty. The policy course responsible for these conditions cannot be long sustained."  

Yet, this framework has actually been a policy fixture in Indian states that find it economically and politically too difficult to change course. Over a twenty-year period from 1980-2000, rural development expenditures as a share of GDP declined from 14 percent in the late 1980s to less than 6 percent of total GDP in 2000.  


1.3.3 New Agrarian Questions in India

In this section I provide evidence of recent developments in the agrarian sector in India, which help situate the empirical realities that are the actual stakes of the debates and arguments put forward throughout this thesis. Henry Bernstein offers new perspectives on the “agrarian question” that I find useful in explaining the contemporary role of agriculture in India's capitalist development (Mehrotra 2013).

To begin with, it is important to mention how much developmental theories and templates of scholars such as Arthur Lewis22 (1954), among others, powerfully shaped India’s post-Independence five-year plans. These theories were premised on some version of the capitalist mode of production in which countries made a transition from a predominantly agricultural economy to an industrial economy by using the agrarian surplus to finance industrial development. In contrast, the current structural context is substantively different from that of state-led development where the agrarian question of capital gained precedence. Today, industrial and agricultural development are effectively delinked and industrial development is no longer dependent on an agrarian surplus. Other financial resources are available (e.g. private debt-based capital) and developing states no longer have the power to direct investment and redistribution or command economic growth strategy in the same ways that were possible during the developmentalist stage (Lerche 2008, 2011). Overall high economic growth rates in recent years and a simultaneous decline in agricultural growth rates are related to this general delinking of the agriculture and industrial sectors in comparison with previous decades when a close linkage

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between them was presumed essential for financing industrial development and providing labor for the same (Mehrotra 2013).

Spatially, it is important to note that India is divided into 27 states and 5 union territories, in which agricultural growth and employment vary significantly and state governments retain constitutional control over agriculture. By state, in 2014, India’s most prosperous states by state — Kerala, Tamil Nadu, Punjab and Himachal Pradesh — had the highest proportions of rural households engaged in wage employment, while in poorer states like Rajasthan, Chhattisgarh, Madhya Pradesh and Uttar Pradesh, at least 60 per cent of rural households were dependent on cultivation. The majority of high caste rural households identify themselves as primarily self-employed in cultivation, the largest chunk of Scheduled Caste households in rural areas are engaged in wage labor or salaried employment, while tribal people are over-represented among the landless.

For a general understanding of aggregate distributions of the three factors in contemporary India, I refer to the 70th round of the National Sample Survey Office (NSSO) report released in December 2014 that includes a section on “Key Indicators of Situation of Agricultural Households in India.” From the report, the following (Figure 1.3) is the distribution of landholding (in hectares) for agricultural households. Between 1993 and 2014, the average landholding of small landowners has halved from over 1 hectare to less than 0.59 hectares, with over 70% owning less than 1 hectare. By comparison, in the United States, the average landholding is 175.63 hectares. The disparities in landholding and increasing fragmentation taking place over time constitute a key dimension of inequality that have structured the historical
context of agricultural policy and its distribution (including the primacy of land reform in the post-Independence period in India in concert with many other countries). In particular, such inequalities contribute to what Bernstein calls "reproduction squeeze" and expresses in several ways in addition to the fragmentation of land, including the structures of indebtedness, and the precarity of work, which I will discuss in order.

**Figure 1.3** Landholding of Agricultural Households (hectares). Source: NSSO (2014)

**Figure 1.4** Agricultural Households as a Percentage of Rural Households (%). Source: NSSO (2014)
1.3.4 Lending and indebtedness

Indebtedness is a key dimension of the agrarian sector and in many ways it is the premise of the precise form and function of India’s current crop insurance programs. Typically, most public policy concerns with indebtedness are from informal, unregulated moneylenders charging high interest rates to distressed farmers and this has been a focus driving the massive expansion of commercial bank expansion in to the agricultural and rural sector. More specifically, there has been a large increase in the amount of liquidity flowing to the agricultural sector, both from land sales, as well as from a rise in agricultural credit (see Figure 1.5). More loans to agriculture have fostered substantial private investment in agriculture and every year, the government increases public subsidies and the lending limit for farmers through budgetary allocations to borrow more.

In the union budget for 2015, the finance minister increased the farm credit target for banks to Rs 8.5 lakh crore ($130 billion), thus making total farm loans contribute about 14 percent of total bank loans23. However, based on a study titled Bank Credit to Agriculture in India in the 2000s: Dissecting the Revival, the survey makes it clear that the higher targets for farm credit is helping neither the needy farmers nor the banks: "The implication of this evidence is that lending to agriculture may be excessive and going predominantly to large farmers. It is not being used for agricultural capital formation. Perhaps most significantly a large share of it may not be going to core agricultural activities at all." This is evidenced by the fact that growth of credit to agricultural (16 percent) is well above the growth of the agricultural GDP (3.78 percent), and on aggregate the share of the agriculture sector in the overall GDP has declined from 16.80 percent in 2007-08 to 13.94 percent in 2013-14.

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23 Rajesh Pandithal, Farm lending in India is a puzzle; FM must solve it before giving targets for banks, Firstpost, Updated: Mar 10, 2015. http://www.firstpost.com/business/farm-lending-in-india-is-a-puzzle-fm-must-solve-it-before-giving-targets-for-banks-2143177.html
Yet, the continued expansion of credit has had substantial effects on persistent, substantial household indebtedness across the country. The National Sample Survey (NSS) of 2014 provides estimates across states of indebtedness among agricultural households. The proportion of households with outstanding loans vary across states, with Andhra Pradesh, Telangana, Tamil Nadu, Kerala, and Karnataka reporting more than 70% of the households (see Figure 1.6). Further, another statistic that provides an alternative perspective on agricultural indebtedness shows that the amount of debt outstanding per household is highest in Kerala, and then Andhra Pradesh, Punjab, and Tamil Nadu. For reference, according to the survey statistics nation-wide, the average farm household makes less than Rs. 6,500 a month (approximately 100USD at 2016 September conversion rates) from all sources of income, which relative to their debts, makes it unlikely that they can manage or emerge out of debt relationships. As I will discuss in more detail in the literature review, chronic and widespread indebtedness has far reaching negative
effects including being a core driver of farmer suicides, structuring highly unequal and semi-feudal socio-economic relationships, driven further by higher and higher input costs for groundwater irrigation and fluctuations in global agricultural commodities prices.

**Figure 1.6** Proportion of Agricultural households with outstanding loan, Source: NSSO (2014)

**Figure 1.7** Total Amount of Outstanding Loan per Agricultural Household. Source: NSSO (2014)
1.3.5 Fragmentation of Work

Bernstein’s makes a distinction in articulating the specificity of the agrarian question of labor that provides a relevant framework for understanding and addressing the decentering of agriculture in the rural economy and the critical contribution of overlapping socio-economic relations in reproduction (Mehrotra 2014: 54). There is substantial evidence showing the divergence of “rural” labor with agricultural labor as agriculture no longer constitutes the main component in the wage labor and income structure of farming households. Thus, categories such as, the “peasantry,” which refers to subsistence oriented family farmers is no longer an empirically defensible category. In view of widespread labor mobility and displacement, it would be wrong to even call it “rural” labor (Mehrotra 2013). Simultaneously, putative “rural” areas

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24 Migration is relatively rare among agricultural households, but is highest among households with marginal landholdings unable to provide the family much income; over 75 per cent of all migrants come from marginal landowning households.
are witnessing the recent intensification of land speculation on the “urban-rural periphery” further amplifying class and caste inequalities in ways that are non-labor absorbing and primarily driven by highly leveraged, real-estate development (Levien 2012; Vijayabaskar and Menon 2017). Lastly, based on each successive budget, national efforts continue to echo India’s post-independence public investment imperatives toward maintaining “the best standards of fiscal prudence … [and] promote higher investments and accelerate growth,” while continuing to expand agricultural credit, which now accounts for Rs10 lakh crore (est. $153.8 bn) or almost half of the entire budget in the 2016-2017 financial year, further expanding debt-based investments in the sector. In the next chapter I focus more specifically on the financial and ecological relationships that constitute the agro-economy and the role of financial institutions such as insurance in mediating those relationships.

Lastly, the agrarian question of labor in India can be further explained with reference to the participation rate in one of the national government’s rural employment programs. Launched in 2005, the development and expansion of the controversial and politically-sensitive Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)—the world’s largest public works program, grants workers an assured 100 days of employment in the countryside. As late as February 2017, the Finance Minister announced a 25% increase in funds allocated to the MGNREGA program to Rs 48,000 crore ($7.16 bn). These factors as well as others like resource position, agricultural production processes and livelihood diversification shape the processes of

class differentiation. In this context, petty producers (small and marginal farmers) combine subsistence with commercial agriculture and simultaneously pursue other types of labor commodification. In this framework, even “peasants” are no less subject to the logic and imperatives of the market as McMichael would argue.\textsuperscript{28}

For empirical context, in 2014, the governor of the Reserve Bank of India (RBI) gave a speech (2014) on the Indian economy and monetary policy, with key statements on the noticeable shifts in employment in agriculture with an important reference to the impact of weather, discussed in the next section. One dominant trend is that the labor force has been moving from agriculture to non-agriculture sectors, particularly construction. He explains that this has had the effect of pulling up rural laborers’ wages, especially in the labor supplying states and total agricultural labor declined from 259 million in 2004-05 to 231 million in 2012-12. Agriculture, which accounted for 60 percent of total employment in 1999-2000, accounts for less than 50 percent by 2014. The same process has also had effect on food inflation. In the same speech, the RBI governor asks: "Has the risk of food prices rising at a much faster rate gone away? Not really. Unseasonal rains and hailstorms in parts of the country have damaged crops, and this is likely to push up prices again. The central bank also feels that there are risks...stemming from a less-than-normal monsoon due to possible el Niño effects."\textsuperscript{29}

\subsection*{1.3.6 The Destabilization of the Monsoon}

The main, disruptive climatic trend in India is the destabilization of the monsoon weather patterns and the increasing unpredictability of the seasons that are the spatio-temporal structures

\textsuperscript{28} I elaborate on this issue and the debate between Henry Bernstein and Phil McMichael in Chapter 2
\textsuperscript{29} http://profit.ndtv.com/news/economy/article-rbi-kecpcs-repo-rate-unchanged-at-6-25-1678075

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of Indian agriculture. Because Indian agrarian production is highly sensitive to the weather, it is important to explain the conventional temporalities of monsoon patterns. There are two annual monsoon systems that pass over the Indian subcontinent: the summer or southwest (SW) monsoon, and the winter or northeast (NE) monsoon (retreating southwest monsoon) and India gets rains in all the seasons due to both tropical and extra-tropical weather systems, such as: monsoon low pressure areas, depressions, thunderstorms, tropical cyclones, and western disturbances. However, the summer or the southwest monsoon season (June-September), the main rainy season, which is often called “Kharif” contributes to about 75-80 per cent of the total annual rainfall, with high average rainfall in the east in states such as West Bengal. Additional agricultural production also takes place for certain crops during the winter (January-February), pre-monsoon (March-May) and the post or north-east monsoon (October-December), which is regionally called, “Rabi” important to particular regions. Any major structural shift in the pattern impacts the country’s economy because it relies so heavily on the agriculture output.\textsuperscript{30} According to popular accounts, “a rainfall deficit by a few inches leads the central bank of the country to change reserve ratios.” As an example, in 2009, the widespread drought led to spiraling prices and historic increases in inflation.\textsuperscript{31}

The lack of or a deficit in overall rainfall should be distinguished from the occurrence and impacts of uneven rainfall intensity across the country. For instance, the temporal disparity of intense rainfall events has decreased the precision of estimations for drought vulnerability as total rainfall volumes are reported as normal or above normal. The localized impacts of

\textsuperscript{30} http://www.dnaindia.com/india/report-india-s-monsoon-is-getting-more-erratic-by-the-year-1443394
changing, uneven rainfall intensity can be manageably offset through a variety of mechanism; however, widespread uncertainty and variation of these patterns present more complex challenges. In particular, climate variability is a considerable planning concern because “a structural shift in the pattern of the annual rainfall would force a change in cropping patterns in the country.” Lobell and Schlenker view these not as predictions of actual impacts, but rather as a useful measure of the pace of climate change in the context of agriculture: “the greater the estimated impacts, the faster any adaptation or action to raise yields would have to occur to offset potential losses.” In light of this, fluctuations of rainfall during India’s monsoons and its impact on agricultural production has been at the core of insurance policy design, particularly the weather-based crop insurance scheme’s rainfall index contracts. The implication of climate variability in the context of insurance, technological innovation and the dynamics of financialization are the focus of Chapter 4.

In the next chapter (2), I review the relevant debates in the literature that inform my main theoretical framework and research questions (chapter 3) building on the insights gained from the historical context explained above. I begin with a review of the literature on financialization in more detail to both establish the relevance of this analytical approach for contemporary India and explain why and how I situate my analysis of insurance in these debates. I begin by explaining my interpretations of the debates around the definition of financialization as well as the ongoing debates about the scope and limits of its relevance to agricultural development.


Next, I review several perspectives on insurance and risk, and explaining my use of the “fast policy” framework in an attempt to better explain the shifts in policymaking. Last, I engage with debates in the literature that help to explain the structural forces that have shaped the terms of policymaking and politics for the agrarian sector. I focus on a debate between two scholars, with several decades of agrarian research each, Phillip McMichael and Henry Bernstein, who differ on the “new agrarian questions” that frame the widespread fragmentation of land and labor, financialization and the place of agriculture in planning theory and the international development of capitalism.
CHAPTER 2. LITERATURE REVIEW

I draw distinct aspects from several literatures in this dissertation. I begin with the literature on financialization to establish the relevance of my analytical approach and show how I locate my analysis of insurance in these debates. Next, I review several perspectives on insurance and risk that are important to situate my own focus on actuarial financialization, with an emphasis on the “fast policy” framework in an attempt to better explain the shifts in policymaking. Last, I engage with debates in the literature that help to explain the structural forces that have shaped the terms of policymaking and politics for the agrarian sector. My focus is on an ongoing, productive debate on the "agrarian question" between Phillip McMichael and Henry Bernstein about the place of agriculture in capitalism and the direction that it is moving toward.

2.1 Financialization, Debt, and its Limits

In the case of India, it is important to historicize contemporary financialization processes in relation to earlier rounds of financialization and ecological crises. Alongside the development of 19th century commodity futures markets, like the Chicago Mercantile Exchange (CME) in the American Midwest (Cronon 1992), Bear et al (2015) show how financial speculation has a deep history in colonial India, which established the first global joint-stock corporation (the British East India Company) and contract law as a mode for projecting possible futures, engaging uncertainty, and fortifying powers of administration and security. One example, the Famine Relief and Insurance Fund (described in Chapter 1) was established in 1878 “to ensure that Calcutta (the capital of British India) could finance relief in response to potential droughts and floods without fiscal risk to its other priorities” (Davis 2002: 141). Bear et al (2015) claim that

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34 In 1878, the conservative Viceroy Lord Lytton had set up the Indian famine insurance fund on the premise that those who benefited from charity should pay for it. Compulsory contributions were called for from poor peasants. By 1885, the proimperial/conservative Indian Secretary of State Randolph Churchill applied those peasant funds to
India continues to be a site for the reemergence of a governmental project primarily focused on
the generation of speculation—distinct from social welfare or developmental or socialist
economies—that has intensified since the liberalization of the financial sector, among others, in
1991. I distinguish the focus on speculation from the growing literature on financialization,
which is the basis of my theoretical framework, as I will discuss below.

2.1.1 Financialization and its Limits

I begin with what I consider the main working definition of financialization for this dissertation.
Greta Krippner defined it as “a pattern of accumulation in which profits accrue primarily through
financial channels rather than through trade and commodity production (see Arrighi, 1994)…
‘[f]inancial’ here refers to activities relating to the provision (or transfer) of liquid capital in
expectation of future interest, dividends or capital gains.” (2005: 174).35 Building on her
definition, Lapavitsas and Powell (2013) describe financialization as a process in which the
financial system becomes an “autonomous sphere” for capital accumulation, with its own
independent logic. For both, the seemingly periodic excesses driven by financial institutions do
not represent a temporary transfer of capital to the profits available from financial services but a
long-term restructuring of the global economy to advantage those engaged in financial
transactions and markets.

Both accounts also refer back to an earlier paradigm developed by Giovanni Arrighi (1994)

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35 Krippner hones the two approaches to financialization research as ‘activity-centered’ versus ‘accumulation-
centered’ view. “While the activity-centered view highlights the rise of the service sector and is, therefore,
associated with post-industrialism, a focus on changing patterns of profitability suggests that financialization is
the key development in the US economy in recent decades (2005).
aiming to explain the new role of finance in late capitalism. For him, the structural need to accommodate "financialization" began with the shift to floating exchange rates in the early 1970s, offering an outlet for financial speculation (and hedging) as a form of crisis management. Further, following the end of the gold standard, citizens and governments no longer have effective control of national currencies (McMichael 2000: 470), which forces states to adopt competitive market policies in order to defend their national currency (Lee and LiPuma 2004). McMichael (2000) highlights how after the floating of exchange rates, the International Monetary Fund (IMF) and the World Bank began shaping policies of debt management originating in the 1980s in the interests of the solvency and profitability of global banks, and encouraging a turn towards the accumulation of financial, rather than productive, capital. In India, this meant that the management of the debt crisis included financial liberalization with currency devaluation and export intensification and played an important role in the financial basis of agriculture.

However, scholars in geographical and agrarian studies argue against the “indiscriminate importation” of the financialization concept from other domains (Christophers 2015). More specifically, there is a need to understand the distinctive nature of farmland as a weather-dependent, geographically variegated, socioecologically embedded, and potentially political resource, which makes it a very peculiar case of economization—“there are biogeophysical limits to its financialization” (Ouma 2014, see also French and Leyshon 2011), among others. One way in which the process of financialization affects the structure and concrete practices of agriculture is through new financial instruments. Hamilton (2015) shows that in the United States, agricultural policy has witnessed a significant shift from the exchange of agricultural
products towards the exchange of financial instruments. The introduction and rapid expansion of many government programs and donor-funded initiatives for index-insurance effectively facilitate and intensify such processes of financialization (Johnson 2013; Taylor 2016). Importantly, the sale of financial instruments does not happen in isolated local transactions, but rather through vertically integrated financial institutions, government programs and global reinsurance markets, which are themselves subject to processes of restructuring as catastrophe risk is securitized and commoditized through alternative reinsurance capital, insurance-linked securities (ILS), and catastrophe bonds (Cummins and Weiss 2009) particularly in the context of climate change (Johnson 2013, 2014, 2015; Jarzabkowski 2015). In the next section I examine the literatures related to governance and policy as the means for channeling as well as influencing financialization institutions and processes.

2.1.2 Debt

Gerber argues broadly that debt has not received enough attention as a central relation in capitalism and that usury capital represents the strategic form of circulating capital in many rural areas because peasants are increasingly dependent on credit to reproduce their households. As he states, “the interest rate becomes the primary mechanism for the extraction of surplus value and, accordingly, credit/debt relations can be regarded as ‘concealed wage labor’ (Banaji 1977) or as a distinctive form of ‘production relation’ (Roseberry 1978). Extremely vulnerable to external demands and ecological conditions, poor peasants become ever more dependent on credit, frequently mortgaging their land. As Bernstein notes, they may eventually become full proletarians if they fail to generate sufficient income by supplying (cheap) labor and/or commodities. Bhaduri (1983) showed that peasant indebtedness gives rise to an exploitative
system of “forced commerce” and “contractual interlocking”. The role of debt in the structure of agriculture and agricultural insurance cannot be overstated as a significant body of work on the political economy of agrarian transformation in India.

Indebtedness also creates adverse pressures on the environment as a result of the accumulation and cost cutting it requires. Ecologically damaging growth may represent a response to prior levels of indebtedness (Gerber 2014: 740). Many farmers from developing countries get into debt in order to buy ‘green revolution’ technologies that drastically accelerate pressures on the environment. From the 1980s onwards, for instance, Paraguayan Mennonite farmers experienced a ‘growth miracle’ much celebrated by the political class. But the other side of the coin was a high level of indebtedness resulting from the agro-industrialization process (Gerber 2014: 741). The need for smallholders to repeatedly borrow money to purchase agricultural inputs at the beginning of the season often locks them into lopsided debt relations with landed and merchant capital, in which the power of credit is used to bind producers into relationships that manifestly favor the latter (Shah and Shankar 2007). Access to credit appears as a pivotal means for farmers to overcome barriers to production and profitability. It can facilitate the expansion of cropped area or increase the capital intensity of production. As I show in Chapter 4, state programs have often sought to expand formal credit into rural areas as a lever of agrarian modernization (see also Taylor 2013).

Concurrent to its productive role, credit from either formal or informal sources is also central to the livelihood strategies of rural households. As such, while credit appears as a necessary tool for household livelihoods that enables households to push back against the social and ecological
constraints to social reproduction, it simultaneously amplifies the scale of risks faced by borrowers and can entrench localized hierarchies predicated upon exploitation and dependency. “Damaging fluctuation” (Sinha and Lipton 2001) from illness to crop failure, exacerbate such tensions and credit may appear the only means to avoid distress sales of key assets in such circumstances. To address these risks, households commonly invest considerable material and cultural resources into maintaining multiple sources of credit from family, friends and community members, despite this often requiring the reaffirmation of existing social hierarchies. (Taylor 2013). Guerin et al (2011) have noted that the social meaning of “over-indebtedness and creditworthiness,” in terms of the hierarchically ordered sets of rights and obligations that link debtors and creditors, frames issues of social belonging, status and dignity across the agrarian environment.

To explain the spatiality of these processes, Taylor describes the ongoing production of “debtscapes” of Andhra Pradesh, which I examine in Chapter 6 as it relates to agricultural planning and the political ecology/economy of crop production. Harker (2017) suggests “debt topologies” and “ecologies” in Palestine that extend beyond banking and that are uncovered through ethnographic research, and impacted by formal measures of creditworthiness and scoring (cf. Kear, 2014 on credit scoring and measuring creditworthiness) as well as informal, familial entanglements that can extend across generations and political geographies. And, lastly, Peck and Whiteside (2016) integrate debt into the financialization literature more directly and describe what they see as a shift in policy emphasis in United State’s cities (e.g. Detroit) from the “growth machine” to the “debt machine” that has significant implications because “debt-machine strategies have been normalized” in planning. Drawing on the context of cities, Peck and
Whiteside (2016) analyze the geographies of uneven financialization that shape household and government indebtedness and creditworthiness. They highlight how spatially differentiated patterns of exposure to fiscal crises result in highly uneven—if quite systematically structured—processes of restructuring and downsizing. Meanwhile, more favored cities—with stronger local economies, relatively healthy property markets, and as a result more robust revenue streams—enjoy preferential access to the municipal bond market, and to circuits of public and private investment more generally. This logic parallels the highly unevenly financialized “debtscapes” discussed by (Taylor 2013) across households and district.

2.2 Theorizing Risk, Insurance Markets, Governmentality and Fast Policy

I review a wide gamut of literatures related to insurance and risk to better situate how I approach this field in my dissertation. I begin with the ways the hazards geography literature views risk and vulnerability and how it gets contextualized and then move to the traditional actuarial insurance theories that are based on economic approaches to market and market behavior and proceed to discuss the relevance of Foucaultian theories (inspired by Michel Foucault) and ultimately, to an emergent framework (“fast policy”) that explains the rapid movements of iterative, experimental market-oriented policies.

2.2.1 Hazards Geography and Political Ecology

For over three decades, the hazards geography literature has provided an empirical foundation for an integrated framework specifically attuned to examination of risk and vulnerability within a large spatial framework within which to analyze complex interactions of political, economic, and ecological processes (Wescoat 2015). The literature has also extended into human ecology and
political ecology to present a dynamic and complex understanding of hazards research based on a synthesis of many disciplinary approaches and ideas, providing a convincing survey of the varying range, scales, and histories of human-hazard relationships.

Ultimately, in these perspectives, hazards are not static. A variant of hazards research has also contributed to the reconceptualization of disaster and risk, which include social constructivist interpretations of hazards and vulnerability (Spector and Kitsuse 1987; Quantrelli 1988; Kreps and Drabek 1996). The literature offers several, broadly accepted, claims: the development process itself generates vulnerabilities (Burton et al 1993; Quarantelli 1994); vulnerability is influenced by values and attitudes (Mileti 1999); thus, disasters cannot be meaningfully understood outside of their social context (Hewitt 1983). Insights from these studies and many others prove that the contours of vulnerability are highly contingent and context-specific (McEntire 2001; Ben Wisner et al 2003) and often require the merging of complex system-analysis using sociological, geological, and psychological data.

Another contribution of hazards research manifests through the political ecology literature that examines how risk is constitutive of unequal regional resource allocation patterns (Oliver-Smith 1999) and uneven exposure (Blaikie 1994). In particular, Wisner et al (2014) define vulnerability as the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (an extreme natural event or process). I draw on one particular study heavily in this study by Talyor (2013). In The Political Ecology of Climate Adaptation, Taylor adds an important dimension to the political ecology framework by integrating the political economy of debt and. Through his research from
Andhra Pradesh, India, he shows how differential control over four key productive assets including land, water, labor and credit are key to the hierarchical distribution of survival and security/insecurity across the agrarian population. Importantly, for my proposed research, he articulates how relations of debt and credit have become intertwined with the social and ecological foundations of smallholder production in which groundwater overexploitation is a central outcome of debt-driven livelihoods within a neoliberal agrarian environment. I draw on his work, especially to better articulate why “riskholding” through debt-based agricultural planning, and now insurance, have become a core feature territorial planning in India. The socio-material understanding of risk in the hazards and political ecology literature is the backbone for both the financialization of risk through insurance as well as new interpretations of risk and hazard in the literature on governmentality discussed below.

2.2.2 Insurance and Actuarial Economics

In sharp contrast to the contextual and complex conceptual development of risk described above, the economic market approach to risk defines the dominant analytical model for policymakers and insurance underwriters for how to define risk in order to design insurance markets. In early neoclassical economic theories, insurance is defined most simply as an efficient “mechanism for managing risk” whose value is uncertain (Arrow-Debreau 1954; Marshall 1890). Insurance constitutes a market response to the existence of a "risk averse" population: “Insurance premiums,” argued Alfred Marshall (1890) in his Principles of Economics, are the price the insured have to pay in order to rid themselves of the "evil of risk" and insurance therefore is "a

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36 Taylor’s work stresses the “relationality of vulnerability” as a function of how marginalized peoples are adversely incorporated—what he calls “adverse inclusion”—into political, social and economic relationships that produce their vulnerability while simultaneously creating relative security for others. There are long historical lineages to debt-driven agrarian capitalism across the Deccan region. See, for example, J Banaji, 1997.
risk transfer of a special kind. It is a transfer to one with a lower degree of aversion to the particular hazard sought to be insured against” (Pfeffer 1956: 73). Agricultural economists, in particular, have developed a large literature on the technical feasibility of crop insurance mechanisms and the contextual requirements for their operation with the parameters of neoclassical assumptions. The literature illustrates that insurance can be understood in more or less narrow terms to mean a contractual relationship for transferring idiosyncratic and covariate risk onto larger and more diversified balance sheets (Schiller 1999; Linnerooth-Bayer and Mechler 2006; Collier, Skees and Barnett 2009). Yet, early economic analyses of crop insurance programs in the United States were found to be severely problematic (Goodwin 2013) and the eventual shift to reinsurance markets and financial markets have radically undercut the traditional actuarial model, as I explain in-depth in Chapter 5.

At the same time, as demonstrated in other fledgling markets, the development of new markets for risk takes place within geographically and institutionally specific host markets (Knox-Hayes 2009). In the process, the achievement of market efficiencies if defined narrowly often conflicts with “social efficiencies” and objectives as some have argued in the case of microfinance institutions (Annim 2012) and lead to possible market failure. In the case of index insurance, Miranda and Farrin (2012) show how insurance substantially narrows the definitions of risk and

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undermines the informal communal risk-sharing mechanisms that have been built up by the poor to cope with income fluctuation they cannot address through financial markets. The examination of the spillover effects of individual insurance participation have led to more research on the social dimensions of risk sharing (Fuchs and Wolff 2011). For instance, Mobarak and Rosenzweig (2013) show that individuals do not make decisions independently, as assumed by economic market models, but rather through their group affiliations, for instance, their caste, or more generally through “redistribution norms” within a social network (Monro 2015) that are not captured by individual insurance contracts that, for instance, cover the risk of drought (which in the case of index insurance is measured by insufficient rainfall as measured by a rain gauge). Meanwhile, other studies (Dror et al 2016) testing alternative governance mechanisms have shown that mutual cooperatives and multi-peril programs provide more sustainable coverage over longer time periods in the context of villages in India.

2.2.3 Risk Governmentality

Though I have my own concerns about the governmentality approach below, such approaches establish an important set of critiques of economic accounts, particularly in the domain of insurance and actuarial science. The first critique of the economic account is that it tends to reify or hypostatize risk; thus, insurance appears as simply a pragmatic response to the objective risks residing in an external world.38 As Ian Hacking says, “statistical facts were elaborated into social laws” and in the process the literature describes insurance as a “dispositive” (apparatus) for governing social problems, which is made up of an “assemblage” of institutions, bodies of

38 Interestingly, on the other hand, despite acknowledging the adaptive capacity of the of the insurance industry and other “risk industries,” Ulrich Beck (1992) famously pointed to the overwhelming lack of ability to adequately define and estimate, much less control and mitigate (economically, politically, and practically), emergent risks that have now come to define “world risk society.”
scientific knowledge, calculatory practices, and underlying rationalities that render uncertain futures amenable to intervention, manipulation, and management (Aradau and Van Munster 2007). For instance, Collier (2014) argues that the creation of a governmental flood insurance program in the United States “reshape[d] our political and moral landscape” by introducing probability-based decision-making and changing what individuals are and are not responsible for in relation to the state. The governmentality approach is premised on the ways in which power creates and shapes new epistemologies, technologies and categories of risk as well as its political consequences.

Furthermore, the governmentality approach argues that even private insurance firms “govern” people by producing new ways of categorizing risk, regulating behavior, and mediating risk distribution (Ericson et al 2003). Ericson et al show that insurance and its auxiliary mechanisms, in fact, share many common goals with the state and has now come to replace part of the state’s essential functions through the control over “moral risk” by articulating how people should act, deciding who is eligible for protection, allocating blame and responsibility, and mobilizing forms of surveillance and policing. As quasi-independent spheres of governance within which resources, liabilities, and contracts are distributed, insurance expands governance into new realms and domains and methods, what they call “insurance as governance,” and the rise of

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39 Collier’s work distinguishes the Foucaultian approach through his analysis of NFIP. As he states: “On the one hand, insurance provided a technical solution to problems that had long confronted US policy-makers: How to reduce losses from floods? How to fully compensate individuals who suffered losses? On the other hand, insurance was a device for reshaping the aims and objects of government, and for reframing questions that are more frequently situated at the level of political philosophy: What are the respective responsibilities of individual citizens and government in providing security? What tradeoffs must be made between the provision of security and economic rationality? What values are relevant in orienting public policy?” The NFIP program is also an example of how the state mediates market relations and extreme ecological risk by developing new programs: since 2006, the program replaces properties that are repeated damaged (“severe repetitive loss properties). http://www.nfipiservice.com/watermark/trackinglosses.html
“liberal risk regimes” (Ericson et al 2004). This approach emphasizes how the practices of insurance and its epistemologies of risk shape subjectivity, behavior and political power rather than merely neutral market actors that are less risk averse, and it builds on the work of Jonathan Simon (1998). He provides another important interpretation of the transformation that follows from actuarial systems in society:

“...individuals, once understood as moral or rational actors, are increasingly understood as locations in actuarial tables of variations—a shift from moral agent to actuarial subject marks a change in the way power is exercised on individuals by the state and other large organizations that seek to predict behavior and situate subjects according to the risk they pose. The effects can be discerned on the way we understand ourselves, our communities, and our capacity for moral judgment and political action” (1988: 772).

Such governmentality-based analyses focus on the political and normative (moral) dimensions of market structures and the behaviors they incentivize.

Lastly, the governmentality approach is tied to another notion, “biopolitics,” that I do not employ in the dissertation and which I should explain further. As Collier and Lakoff (2015) describe it, Michel Foucault famously defined “biopolitics” by contrasting it with the juridico-legal power of classical sovereignty. Whereas classical sovereignty sought to ensure the security of the state itself in the face of foreign and domestic threats, modern biopolitics aims to ensure the health and wellbeing of populations—an approach that has been used to describe the colonial and postcolonial ecology, health, and governance in India (Arnold 1993; Gupta 1998). Lobo-Guerrero (2007) argues that insurance derives power through its “biopolitics,” which are “forms of knowledge/power which change according to their own dynamics and changing
understandings of the nature of their referent objects.” Further, Francis Ewald argues commercial insurance “is not just a [means] of passively registering the existence of risks, and then offering guarantees against them...[insurance] ‘produces risks’...by objectivizing certain events as risks, insurance can invert their meaning: it can make what was previously an obstacle into a possibility...[i]nsurance assigns a new mode of existence to previously dreaded events; it creates value” (1991: 200). It is in this regard that the governmentality approach stands in contrast with the financialization literature (described in the previous section), which views mathematical models and financial risk as mechanisms for capitalist accumulation and not just the production of value more generally.

2.2.4 Fast Policy

The governmentality approaches fall short of attributing a coherent financial logic preferring to interpret the use of techniques such as calculation and actuarial statistical data in more indefinite, “open-ended” terms as mobile practices and strategies (Brenner et al 2010), important in their own right as new ways for converting uncertain futures in terms of more or less probable and manageable events that may also generate new value. I would argue that the “fast policy” literature is a critical, but highly appropriate response to ethnographic explanations of “mobile” governmentality (Jessop and Peck 2000; Peck 2011; Peck and Theodore 2015) to analyze the rapid expansion of policy experiments across many different spatial contexts across scales in a short period of time. Peck and Theodore (2015) focus on “silver-bullet” policies in fields like microcredit programming and urban “creativity” strategies as expressions and outcomes of “fast

40 Lobo-Guerrero (2007) develops his argument based on an examination of how insurance contracts facilitate global commerce flowing in the face of a range of potential risks to accumulation and aqua-territorial control from criminal activities that individual states have difficulty controlling. His later work (2010) addresses the role of insurance discourse with regard to climate change more directly.
policy worlds” and acknowledge that though the “various traces of [such policies] are not entirely ubiquitous, of course…they are undeniably far flung.” Further, Peck and Theodore refer to best practices as forms of “mobile” policy frames and the “various forms of ‘speed-up’ they imply” as increasingly normalized in policy and planning. In doing so, they build on existing policy transfer debates, and, in their own words, “are interested, above all, in the social and political practices that enable fast-policy mobilities, in the ideological and institutional alignments that facilitate (or otherwise) their diverse travels and interconnections, and in their frailties and limits” (2015: xvii). As I show in chapter 5, the fast policy framework is an excellent foundation to theorize the mobility and “mutation” of agricultural insurance policies in India, albeit with some modifications.

I relate and contrast the fast policy with governmentality approaches, because often the governmentality (or “Foucauldian”) account of neoliberalism is defined by its “flexibility” and not necessarily beholden to fixed models and schemas. This empirical fact is integrated, as Peck argues, in the ways in which fast policies tend to fail initially but continue to operate “in the shadow of global models…generating second and third generations of reform, as the models themselves mutate ‘in the wild’.” (Peck 2011: 166). However, there is an overarching paradigm for fast policy. Peck (2011) defines it as “a global policy fix [that] has certainly intensified, connecting policymakers (and their experiments) around the world as never before…within narrow ideological parameters.” The primary dimensions of fast policy are the velocity and scalar integration of new policies experimentation in order to incentivize risk-taking. According to Peck, a “defining character of states in late neoliberal times apparently, is to facilitate and enable, not to intervene or interfere; they must establish an environment in which the poor
(conceived here as the self-managing subjects of a market economy) are provided with the necessary incentives to invest in their own human capital, to bear increased risk.” The focus on the role of the poor in planning and policy experimentation in a neoliberal or “austerity” context is a telescoped and inverted version of Scott’s critique (1998) of state efforts in the liberal, modernist era of planning.41 In Chapter 4, I focus on the role of rapidly changing technological development, financialization and uncertainty from climate change as constitutive to the experimental and "fast" nature of policy solutions, especially as they relate to ecologies, food systems, and energy networks, among others.

2.3 New Agrarian Transformations and Questions

2.3.1 Agrarian Transformation and the Rural Context

In researching agricultural crop insurance, I follow historical shifts in the geographical extent and context of agrarian processes to better explain insurance and risk in the context of shifting processes of financialization, ecological transformation, and territorial state planning. According to Agrawal and Sivaramakrishnan (2000), despite the imposition of disciplinary distinctions, agrarian, environmental, and urban processes have been intrinsically co-constitutive as much of the history of “agrarian change” in India has been dominated by the debates about transitions to capitalism, the role of commodity and credit markets, the building of agrarian empires on the revenue derived from agricultural surplus, the impact of technological innovation, urbanization, and the social consequences of privatization.42 In the face of this, as David Ludden (2002)

41 James Scott (1998) shows that in the liberal era, the working poor were often the first subjects of scientific social planning...schemes for improving their daily lives were promulgated by progressive urban and public-health policies and instituted in model factory towns and newly founded welfare agencies.
42 Yet, crude classification of urban and rural areas based on employment distorts the ways in which smallholders and landless laborers migrate, move, and work across agricultural, forestry, small industry and construction environments throughout one year. Over the past three decades, sociologists and demographers have documented an
explains, the forced “ruralization of agrarian space” laid the intellectual basis for India's national agrarian history by establishing the “comprehensive dominion of village tradition everywhere and for all time” (2002: 242). Ludden argues against such distinctions in order to focus on how and why massive ecological disruption and the most severe of the ‘gross inequalities’ of power bear down on the countryside.

More generally, many scholars have decried the persistence of an unsophisticated division of “rural” studies in relation to other fields of research for many decades. British geographer, Keith Hoggart argued: “the broad category ‘rural’ is obfuscatory… since intra-rural differences can be enormous and rural-urban similarities can be sharp” (1990: 245). This argument is implicit in Brenner and Schmid’s theory of “extended urbanization,” in which one of their principal assertions against conventional spatial planning is that it “divides the indivisible in so far as it treats urban and rural zones as fundamentally distinct, thereby ignoring the pervasive imprint of urbanization processes on settlement spaces that, whether based on criteria of population size, administrative classification or otherwise, are officially categorized as rural” (Brenner and Schmid 2014: 17). The broader interlinkages of processes of industrialization, technological intensification, and ecological transformation can help to methodologically reframe what are variously described as “transformations” and “disruptions” of the erstwhile hinterland and rural areas (Needham and Dieterich-Ward 2009). This expands the scale of research through the

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intensification of rural-urban and rural-rural linkages in South Asia, which has enormously expanded labor circulation and caused the catchment area of workers to become regional in scale, rather than locally rural or urban (McDowell and de Haan 1997; Gidwani and SivaramanKrishman 2003). Empirical investigations using official census data and National Sample Survey (NSS) data were found to "underestimate population mobility and labor migration to a significant extent" because they rely on survey instruments that primarily cover permanent and semi-permanent migration and handle short-duration circular or seasonal migration far less effectively. In fact, a one preliminary estimate suggests that one-sixth of India's population moves each year, many to work in agriculture, forestry, small industry, and construction (Rogaly 1998). In fact, water scarcity and lack of income are key drivers of migration (Foster and Rosenzweig 2007; Colmer 2016).
spatial extension of large-scale agriculture, the extension of global agribusiness networks, property and land-use systems devoted to large-scale resource extraction, the production and circulation of food, fuel, energy, water and waste management, which are relevant to shaping the context of the questions in this proposal.

2.3.2. Agrarian Questions

The “agrarian question” is a broad but crucial set of issues that ask what is the role of agriculture and agrarian production in wider historical-economic conditions of production and society. For over a century of debates, the scope was shaped by capitalist development and the transition from a pre-capitalist agricultural production to a more capitalist industrial economy under capitalism and eventually socialism (in the Marxist account). Yet, the diversity of geographical conditions over time made such a linear teleology too narrow to explain spatially uneven change across time and space (Reddy 2016). Her view seems to echo postcolonial skepticism towards the inevitable replication of historical templates of earlier rounds of modernization and industrialization. In comparing the countries with the largest body of agricultural producers, India and China, several scholars acknowledge the possible preservation of “peasant production and peasant cultures, and even the commons” (Chatterjee 2008; Li 2009). I posit that the launch of food regime analysis by the pioneering article of Friedmann and McMichael (1989) greatly enriched the means available for a theoretical and historical framing of capitalist world economy with reference to agriculture.

Here, I begin with what I consider a highly relevant debate between Philip McMichael and Henry Bernstein, scholars who over several decades have shown how capitalist development
continues to transform, or at least impact, the livelihoods and the existence of agricultural sectors and the wider ecologies and economies dependent on them. McMichael and Bernstein differ in terms of how they each situate capital in analyzing agriculture, finance, and production. McMichael (2016) posits that the deepest contradictions of capitalism stem from agriculture itself, and situates current transformation of agriculture, including its financialization, within a series of global "food regimes" that began in the 19th century. He especially asserts the importance of smallholder producers as the “front line” of the limits of capitalist development and its related environmental degradation. Bernstein (2014) differs entirely on the former point and argues that capitalism has fully absorbed agriculture (including farmers not expelled from the land) into circuits of capital, turning agriculture into simply one of many sectors of accumulation and a major front of surplus labor (Jansen 2014: 214). In the dissertation, I argue that it is possible to combine insights from both McMichael and Bernstein and I specify which elements starting with an overview of their arguments below.

2.3.3 Food Regimes

Philip McMichael has worked for over three decades to bridge the understanding of financialization, again as developed by Arrighi (1994), towards an analysis of a global “food regime,” in collaboration with Harriet Friedmann who first developed the notion. A major contribution of McMichael’s “food regime” is a periodization for understanding agriculture’s role in capital accumulation and financialization across time and space. It provides a context for explaining the macro-spatial historical shifts beginning from the colonial trade regime (1870-

43 For more see: Friedmann and McMichael. 1989; McMichael 2009a, 2009b.
1930) through the contemporary period and I will summarize it here because it provides a
ccontext for how I seek to explain the financialization of risk in agriculture.

The following are the three parts to the food regime periodization as articulated by McMichael
(2009). The first food regime (1870–1930s) combined colonial tropical imports to Europe with
basic grains and livestock imports from settler colonies, provisioning emerging European
industrial classes, and underwriting the British ‘workshop of the world.’ Importantly, this regime
generated territorial transformations as a result of monoculture agricultural production. In the
second food regime (1950s–70s), “food aid subsidized wages, encouraging selective Third
World industrialization, and securing loyalty against communism and to imperial markets”
(2009: 141). Indeed, the geopolitical dimensions of the Food-for-Peace program (PL-480) were
critical to the development of agricultural reforms in India in the 1960s. The program re-routed
flows of (surplus) food from the United States to postcolonial states on strategic perimeters of
the Cold War. Effectively, governments like India internalized the model of national agro-
industrialization, adopting Green Revolution technologies, expanding agrarian reforms to
dampen peasant unrest and deepen market relations into the countryside. The appearance of a
“third food regime,” also described as a “financialized food regime” focuses on the role played
by financial institutions and financial instruments that have the capacity to reorganize various
stages of the supply chain, and to alter the terms and conditions under which other actors in the
chain can operate (Burch and Lawrence 2009). Lastly, the framework also addresses power

44 See archival reports from the Office of the Historian, U.S. Department of State,
45 See also Michael (2010) for an explanation of McMichael’s view of the so-called “biofuels rush” that renders
agriculture indistinguishable from energy production, pushing food prices within integrating fuel-food complex, as
alternative energy sources displace food, with fuel, crops has led to a fungibility of investment choices, in plant-
based food or fuel, and this emphasizes the extent to which value relations govern current food relations.
relations through the regulation of the food regime that both underpins and reflects the changing balance of power among states, organized national lobbies, and classes of farmers, workers, peasants, and capital. As I argue in Chapter 6, these political dimensions are an important factor in shaping spatial unevenness of financialization and the increasingly political dimensions of risk and insurance in India.

2.3.4 New Agrarian Questions

Bernstein has moved to pose “new agrarian questions” that are highly relevant to contemporary agrarian policy (Harris-White 2008). First, he differentiates between agrarian questions for labor and those for capital. Bernstein’s analysis of the agrarian question for labor provides a particularly suitable lens for understanding the limits of land reform and the complex spatiality and fragmentation of work in places such as India. According to Bernstein (2002, 2010), the possibility of land reforms of the scale and type seen in early post-independence decades occurring is very unlikely. Other Asian countries including Japan, the Philippines, China and Vietnam, among others, implemented land reform through state-led development in the 1950s and 1960s. At that time, an important element of their industrial transformation was the destruction of landed gentry through taxation and land reforms. Bernstein has pointed out that forging broad based political alliances in the contemporary context would be difficult and at best temporary and fractious, given the diverse economic trajectories of rural classes who are no longer subsistent on agriculture only and their competing class interests in an environment of social fragmentation along lines of caste and gender. Further, “new wave” agrarian reform in the age of neoliberalism, centered on property rights would not be able to significantly stimulate

46 Cited in Mehrotra 2013.
agricultural productivity nor reduce rural poverty (Bernstein 2002). In other words, the problem is not only arriving at a common ground for demanding land reforms but that even if land reforms took place, it is unclear to what extent they would benefit laborers.

To reinforce this point, I also refer to Bernstein’s reconceptualization of the agrarian question of labor as one of “reproduction squeeze.” By this, he means the widespread employment scarcity, labor fragmentation and mobility as laborers struggle to secure daily reproduction. In large part, people make a living by combining agriculture with other types of employment activities that are extremely fragmented as they are constantly moving between work sites (Lerche, 2010) often structured along caste, religion and gender lines (Harriss-White and Gooptu, 2009) as they compete for scarce employment opportunities. The resulting trans-local households, which are strained by evolving gender norms and expectations, provide a low cost and flexible labor force that has fueled economic growth (Nguyen and Locke 2014). Less discussed in Bernstein’s articulation, indebtedness is a central means of agricultural production (see discussion above in 2.1.1). The need for smallholders to repeatedly borrow money to purchase agricultural inputs at the beginning of the season often locks them into lopsided debt relations with landed and merchant capital, in which the power of credit is used to bind producers into relationships that manifestly favor the latter (Shah and Shankar 2007). Access to credit appears as a pivotal means for farmers to overcome barriers to production and profitability. It can facilitate the expansion of cropped area or increase the capital intensity of production, and state programs continue to rely subsidized credit in rural areas as a lever of agrarian modernization (see also Taylor 2013).

47 This is an insight from Nguyen and Locke (2014) analysis of Vietnam and China.
Having laid out some of their arguments, I focus on one aspect of the disagreement between McMichael and Bernstein. The first is the scale of analysis. McMichael’s food regimes are world-historical scales of explanation, borrowing in structure from regulation theories. However, as Bernstein (2016) notes, the three kinds of determinations, distinguished by their ‘locus’ – internal to the countryside, internal to ‘national’ economies and ‘external’ emanating from the world economy – are relevant to studying agrarian change today. He argues that although McMichael places analytical weight on the third kind of determination (world economy), it does not, in fact, make the others redundant but rather locates and elaborates them for the fruitful investigation of rural class formation, including ‘peasant’ differentiation, in changing historical conditions. In particular, he refutes McMichael’s assertion that there is a new “peasant turn” stemming from the contradictions of the third food regime (in the form of projects and movements towards “food sovereignty”).accord According to Bernstein, “the investigation of complex and contradictory realities is displaced by verification of the definitive vices of agribusiness and virtues of small-scale farmers. But, the problem here is that there is no adequate theorization and specification of ‘peasants’, and their various synonyms – ‘small farmers,’ ‘small-holders,’ ‘family farmers’ and the like – which makes it difficult to know who is being signified, where and when. Bernstein goes further to ask: “What exactly is the ‘small’ in these ‘smallholders’? Who are they? Are they all farming in the same ways” (Bernstein 2016). Or rather, are rural households, in the words of Susana Hecht, ‘largely semi-proletarianized, semi-globalized and increasingly semi-urban,’ a condition referred to as the ‘new rurality’ (Hecht 2010)? In the theoretical framework, I explain how I attempt a partial reconciliation of the two views as they relate to the political dimensions of agrarian risk.

48 This is important because it reverses the modernist narrative of smallholder obsolescence etched into the development paradigm amidst the current development industry visions of “feeding the world” (McMichael 2009).
In this section I provide an explanation of my theoretical framework, research questions, and methodology. I begin with the three main areas in which I seek to make a contribution, which include: financialization, fast policy, and the agrarian question. I draw on the literature review from the previous chapter to explain the theoretical context for each intervention. I then list the research questions and sub-questions motivating this dissertation. In the methodology section, I explain the types of data collected as well as the forms of data analysis and measures I conduct in order to answer specific parts of my broader research question. Lastly, there are several photographs and a map of research sites provided for context.

3.1 Theoretical Framework

3.1.1 Financialization

This dissertation makes a contribution to the literature on financialization. As stated, in the previous chapter, Giovanni Arrighi (1994) used the term to explain the new role of finance in late capitalism. For him, the structural need to accommodate "financialization" began with the shift to floating exchange rates in the early 1970s, offering an outlet for financial speculation (and hedging) as a form of crisis management. One distinction of post-1970s financialization with other forms is that it is “a pattern of accumulation (not merely a financial activity) in which profits accrue primarily through financial channels rather than through trade and commodity production (see Arrighi 1994)...‘financial’ here refers to activities relating to the provision (or transfer) of liquid capital in expectation of future interest, dividends or capital gains” (Krippner 2005: 174). Importantly, this process has its own independent logic and does not represent a
temporary transfer of capital to the profits available from financial services but a long-term restructuring of the global economy to advantage those engaged in financial transactions and markets (Lapavitsas and Powell 2013). Yet, Krippner notes that: “financialization has not been subject to the kind of close empirical scrutiny that would illuminate the precise timing and magnitude of this widely-perceived, if little-examined phenomenon.” (2005: 175).

Simultaneously, scholars in geographical and agrarian studies argue against the “indiscriminate importation” of the financialization concept (Christophers 2015) in abstraction. In my work, I address both financialization and its limits especially in terms of the distinctive nature of farmland as a weather-dependent, geographically variegated, socioecologically embedded, and political resource (Ouma 2014; French and Leyshon 2011). My work demonstrates how broader abstract processes of financialization get realized in practice through the workings of a concrete case – weather insurance in India.

My study is focused on the financialization of risk and its articulation to broader theories of financialization. By scrutinizing the instruments and agents of weather insurance – insurance derivatives and contracts, underwriters, and new technologies – I reveal the ways in which risk in the agricultural sector in India has become increasingly financialized, particularly with the increased penetration of international reinsurance firms. I further argue that the financialization of risk in the agricultural sector is concurrent with a fast policy environment in which rapidly shifting new technologies and innovations are constantly changing the ways weather indicators and indexes are defined and calculated. At the same time, I contribute to recent research on the restructuring of reinsurance markets and their variegated consequences for particular geographic risks and markets (Johnson 2013, 2014, 2015; Jarzabkowski et al 2015) by showing how
competitive dynamics and churning between reinsurance firms and alternative risk transfer (ART) capital as well as weather technology and data firms results in a cycle where more technology begets more data begets more finance begets more technology. This is further intensified and accelerated by climate change and variability.

3.1.2 Fast Policy

Peck and Theodore’s concept of “fast policy” draws on the circulation of policy paradigms and best practices as forms of “mobile” policy frames and the “various forms of ‘speed-up’ they imply” as increasingly normalized in contemporary policymaking and planning. In doing so, they intervene in existing policy transfer debates, to assert that a global policy fix has certainly intensified, connecting policymakers and their experiments around the world as never before, though within narrow ideological parameters (2015). The primary dimensions of fast policy are the velocity and scalar integration of new policies experimentation in order to incentivize risk-taking. As I show in chapter 5, the fast policy framework is an excellent foundation to theorize the mobility and “mutation” of agricultural insurance policies in India, and the rapid ascendency of what I call new “riskholding” policies centered on the distribution and transfer of agricultural risk and technological change.

I position the financialization of risk in agriculture as part of a larger history of managing drought and flood risk through insurance programs, the most recent manifestation of which is index insurance. I demonstrate how this process has been embedded in iterative and experimental circuits of fast policy mediated by institutions such as the World Bank and US-based agricultural economists. I argue that parameters including the World Bank providing technical assistance and
the Indian government’s concern with reducing fiscal liabilities, has led to a broader shift in the Indian agricultural sector from a longstanding focus on the unequal distribution of land i.e. landholding, to an increased concern with the distribution of risk, what I term ‘riskholding.’ In doing so, I build on arguments that show that there is a blurring boundary between financial and non-financial economic action (Isakson 2014), and, more specifically, that financialization through new risk insurance instruments creates new subjectivities by virtue of their status as financial consumers of risk-transfer products, underwritten by the globalized financial capital of reinsurers and often subsidized by international donor agencies (Johnson 2013: 2665).

3.1.3 Climate Change, Financialization and New Agrarian Politics

India is arguably an important site for debating the agrarian question, which questions the role of agriculture and agricultural producers in capitalist development. First, following insights from the debate in India, Lerche (2010) argues that agrarian capitalism in India may develop not only different meanings of the agrarian questions but also a "plurality of agrarian questions." The relevance of this point is important to note because the nature of the agrarian question shapes the purpose of policy and planning, because it asks how agriculture relates to broader capitalist, social, and ecological relations. In this dissertation, I posit an approach to the agrarian question that is less landholding-centric, with land being only one dimension, alongside others, such as ongoing processes of fragmentation and financialization and indebtedness, through the notion of “riskholding.” In doing so, I am able to better situate the variegation across states in India to argue that crop insurance can only be understood in conversation with other forms of risk and contingencies--ecological, credit/indebtedness, geographical, and political.
However, I seek to provide a middle ground between McMichael and Bernstein’s contrary positions on the agrarian question. As stated in the previous chapter, while McMichael asserts that small-farmers are central to the future of capitalism, I agree with Bernstein’s postulation of the “new agrarian questions” wherein he argues that small-farmers are more powerless due to their declining economic impact in development, land fragmentation and “reproduction squeeze.” However, McMichael’s notion of the “financial food regime” understood as an outcome of political forces, diverse ecologies, and institutionally specific policies, suggests that even with their fragmentation, farmers actually have a role in negotiating the terms of financialization towards more equitable relationships building on an ongoing politicization of debt and finance that I describe in Chapter 6.

3.2 Research Questions

In this dissertation, I use the case of India’s “cultivation” of insurance to ask how and why insurance, which never played a significant role in most people’s lives several decades ago, has come to be a central planning strategy for agricultural policymakers, outpacing all other government expenditure in the form of premium subsidies? And, more specifically, in India, how and why have highly financialized forms of risk transfer dependent on reinsurance, financial markets and new derivative instruments, been implemented. In the context of territorial planning, unlike many other forms of insurance, agricultural insurance business is sold in spatial quantities of land (e.g. hectares). As Christophers (2015) notes, understandings of the socio-spatial configurations of financialization and risk are a gap in the literature that often get “blackboxed” even though they clearly have significant consequences for agricultural geographies. I examine the expansion of insurance coverage in the context of the increasing role of financialization to
ask whether this particular form of financialization succeeds in alleviating the problems it is
designed to address or perhaps leads to their accentuation. For planners, it is important to
understand whether insurance mechanisms are merely about mitigating short term (seasonal)
financial loss that do not in fact translate into any long-range improvements in promoting
agrarian development and whether insurance might naturalize the lack of any sustained
investment in large-scale agricultural infrastructure in the post-Green revolution period. Below, I
outline the overarching research questions motivating this dissertation:

1. What explains the historical emergence of the nationalized crop insurance policy and its
financialization? What is the historical specificity of this moment?
   a. How is the agrarian sector in India affected and, in turn, how is it being affected
      by the new insurance policies? How is the underlying structure (landholding,
cropping pattern, etc) affected?
   b. How have varying organizational intentions and strategies ultimately led to the
      specific type of insurance policies and also specific styles of implementation in
different settings and what are the organizational and political landscapes out of
which these policies emerged?
   c. More specifically, what are some of the ways in which risk is being defined and
      measured and what is the rational underlying the narrowing of such definition?
      Why, why now, why in this way (i.e., the rainfall index that minimizes human
      dimensions of drought risk) and how is risk understood when agriculture gets de-
      placed within a system of advanced financialization that is making place-based
      risk (crops, seasons, etc) management systems irrelevant?

2. What are the key differences in the agricultural sector between pre- and post-
liberalization (and pre- and post-insurance policy)?
   a. What explains the spatial variation in the implementation by different states and at
different scales—i.e. farm type, crop type, block, and district?
   b. What does the “circuit of capital” look like now, after the newly implemented
      insurance scheme?
   c. What can the daily interaction between the poor farmer and the local authorities
      (or whoever is paying the actual cash) tell us about the changing nature of state-
society relationship?
3.3 Methodology

In this dissertation, I adopt a grounded theory approach as developed by Strauss and Corbin (1994), which explicitly internalizes that a theory “evolves during actual research, and it does this through continuous interplay between analysis and data collection...often referred to as the constant comparative method” (Strauss and Corbin 1994: 273). This entails an adaptive approach to carrying out research in so far as it necessitates systematically revising and rebuilding theoretical insight throughout the process as opposed to a priori or ex-post. Such an approach in which the theoretical frame itself is evolving is arguably quite difficult and risky for a researcher. However, the expectation is that such an approach provides the basis for genuine “conceptual density” (instead of merely descriptive density). In this approach, theory-building consists of defining “plausible relationships...among concepts and sets of concepts,” that can be strengthened or weakened through the research process itself. I chose this approach because it is the most appropriate to address my question about the organizational motives and institutional legacies for developing an insurance-based approach to risk management and in this context it gets expressed from several vantages that cannot be entirely known in advance of the research process.

Through my research method, I respond to a critical problem in the extant financialization literature identified by Christophers who argues,

"Finance itself—its institutions, its functions (control, financing, insurance, intermediation, payment, etc.), its revenue-and-profit-generation models (fees, capital gains, interest rate spreads, buy–sell margins, etc.), and its socio-spatial configurations—is all too often black boxed, as if finance’s usurpation of the world thoroughly transforms the latter but does not require us to over-haul our conceptualization of the former... [t]hat such a blackboxing has theoretic and analytic as well as strategic implications should be plain to see” (2014: 191).
Poovey (2015) stresses that understanding the history of the mathematical models and their professional use to make financial decisions must be central to an analysis of financialization. I agree and in my empirical research, I focus on the underwriting process for creating and interpreting weather insurance contracts. Lastly, following Peck and Whiteside (2016), I pay attention to the “unevenness” of financialization as itself an important contribution to the literature. Peck and Whiteside point out that

“even if this [financialization] is a big process, with collateral effects that are both deep seated and far reaching, making sense of its workings on the ground must involve granular and specific forms of analysis—close to actors, agents, and actions, but at the same time attentive to structural positions, systemic rationalities, and recurrent patterns...[more generally] financialized governance” (2016: 236).

In my research of risk and insurance in India, I searched for conceptual meaning through several empirical strategies. In particular, I first focus on what Strauss and Corbin call “patterns of action and interaction between and among various types of actors and institutions,” with the aim of relating specific “conditions” and “consequences.” For instance, I “follow the policy” (Peck and Theodore 2011) in the archives, using my interviews of insurance underwriters and insurance regulators to make allusions to earlier approaches, policies and their limits—leading to the current approach. Relationships between programs, insurers, and paradigms were validated through further interviews and establishing a rapport with the people who were to be interviewed.

Second, in order to understand the ways in which concepts of insurance begin to emerge and spread in the field, I follow several empirical strategies of data collection and observation rather than selecting one. Grounded theory demands commensurate attention to data types and contextual awareness of the subject of research. As explained by Glaser and Strauss (1967),

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grounded theory emphasizes paying close attention to the “everyday realities of a substantive area...carefully induced from diverse data” (quoted in Strauss and Corbin 1994: 276). Building on this insight, applications of grounded theory may incorporate historical data, document analysis, news media, and visual media, among others, when relevant to the field of inquiry. My documentary research sources incorporate newspapers, policy texts, parliamentary records, contracts, and grey literature. I analyze this material in depth in order to explain the shifts in policy discourses that pertain to insurance and risk in agriculture, as well as the scholarly approaches to risk by agricultural economists, which have had an outsized impact on the scope and nature of agricultural policy in India.

In order to understand the organizational motives of actors and the ways in which particular underwriters create financial risk contracts for farmers, I employ “granular and specific forms of analysis—close to actors, agents, and actions, but at the same time attentive to structural positions, systemic rationalities, and recurrent patterns,” as recommended by Peck and Whiteside (2016). Thus, my research also included the participatory study of the emergent practices and engagements of specific actors involved in insurance contract design, implementation, and outcomes. In this process, I follow “patterns of action and interaction between and among various types of actors and institutions” (Strauss and Corbin 1994) through interviews and observations of insurance company underwriters, managers, along with government regulators, officials, and farmers, in that order. Throughout this process, I was able to observe daily experiences and processes of the actual daily work and routines of insurance underwriters for a period of over 20 days in two companies as well as learn about the context of business acquisition, government regulation, and weather events on the underwriting process. By starting
with insurance firms and underwriters and then proceeding to other actors, I used “snowball sampling” as a sampling strategy where initial study subjects (e.g. insurance underwriters) helped in recruiting later subjects among their colleagues. My sampling approach was also the basis for meeting over 50 farmers in 4 different states and over 14 villages. This approach allows for a multi-faceted investigation, in which there are relatively fewer constraints to the techniques of data collection, partially due to the contingent and context-specific nature of scheduling, restrictions, and the availability of people and the availability of documents (Glaser and Strauss 1967: 65).49 Ultimately, theoretical sampling is done in order to discover categories and their properties, and to suggest the interrelationships to a theory.

Lastly, it was important to incorporate quantitative data in this case study as it relates to insurance program finances and territorial coverage. To obtain this, I collected insurance business data from insurance firms, weather data companies, the government, and the news media on the basis of districts and states throughout India. The data was standardized by using common nomenclature and identifiers in order to carry out descriptive statistics. Further, in order to assess the data patterns and distributions spatially, I used ArcGIS software to map the insurance data. The data provides partial coverage for the districts because of limits in access to such proprietary data; however, I was able to verify aggregate amounts of total insured amounts and actuarial rates using government documents. I used descriptive statistics to create tables, charts, and used ArcGIS software to create maps that provide representations of the spatial distribution of insurance contracts, insurance actuarial rates, premium collection, and the ratio of

49 For instance, as Glaser and Strauss emphasize: “there is little, if any, systematic interviewing of a sample of respondents, or interviewing that excludes observation. At the beginning of the research, interviews usually consist of open-ended conversations during which respondents are allowed to talk with no imposed limitations of time” (1967: 75).
government subsidies by company, crop, and district in the key states I used for comparative sub-national perspective.

### 3.3.1 Nature of Data Collected

- Expert interviews (42)
- 50 farmer interviews jointly through 1-on-1 interview and focus groups: (Punjab-2, West Bengal-4, 20 focus group, Andhra Pradesh- 6, 16 focus group, Maharashtra- 4, 12 focus group.
- Field Visits (14 villages/farms): Punjab, Abohar district; West Bengal: Ghatal; Chandrakona II districts; Andhra Pradesh: West Godhavari and Krishna districts; Maharashtra: Palsoshi, Shingur in Pune district (See Field site map below).
- Office Observations (20 days) underwriter interviews (10) at 1 public and 1 private insurance companies; weather data company; GIC Re; Swiss Re India office (telephone interview); Observations of insurance underwriting and actual models and estimates by insurance underwriting based on geographical risk (“sensitivity”).
- District-level insurance business data: Insurance company bidding documents, tender
results, premium/profit comparison by district (380 districts) and insured districts (insurance penetration).

I conducted interviews with the following institutions:

- The Agriculture Insurance Company (AIC), the sole-public insurance company and largest
- ICICI-Lombard General Insurance Co. Ltd, the largest private general insurance company
- Weather Risk Management Services (WRMS), a private weather data aggregator, assessor, insurance service provider, implemented the first weather-based insurance contract
- Swiss Re (Reinsurance-largest private), India office
- General Insurance Company (GIC) Re, India’s sole national reinsurance company
- Indian Meteorological Department – Agro-meteorology (IMD Agro-met) National authority
- National Disaster Management Authority (NDMA)
- National Institute for Disaster Management (NIDM)
- PMO (Prime Minister’s Office)
- Agricultural Department (state-level)
- District level administration (select)
- World Bank (Technical assistance to Indian Ministry of Agriculture for 2 decades)
- UNDP-Disaster Management Unit
3.3.2 Nature of Data Analysis

I use three methods of data collection and analysis and triangulate the different results. Below are describe the three different methods beneath each set of research questions and sub-questions:

1. How have varying organizational intentions and strategies ultimately led to the specific type of insurance policies and also specific styles of implementation in different settings and what are the organizational and political landscapes out of which these policies emerged? More specifically, what are some of the ways in which risk is being defined and measured and what is the rational underlying the narrowing of such definition? Why, why now, why in this way (i.e., the rainfall index that minimizes human dimensions of drought risk) and how is risk understood when agriculture gets de-placed within a system of advanced financialization that is making place-based risk (crops, seasons, etc) management systems irrelevant? What can the daily interaction between the poor farmer and the local authorities (or whoever is paying the actual cash) tell us about the changing nature of state-society relationship?

Interviews: I conducted interviews with industry professionals, underwriters and government experts in New Delhi, Mumbai and Pune and with farmers and local officials in four states – West Bengal, Maharashtra, Punjab and Andhra Pradesh. I transcribed interviews with my observational notes and made conceptual linkages using principles of “theoretical sampling” and “constant comparison” derived from grounded theory methodology. After coding statements, incidents and observations for the same category a number of times, I looked for commonalities and differences to decide whether or not an existing conceptual category was “theoretically saturated” based on whether the next applicable data points to a new aspect or dimension, or only adds to the coded data but not necessarily to the theory.
2. What explains the historical emergence of the nationalized crop insurance policy and its financialization? What is the historical specificity of this moment? What are the key differences in the agricultural sector between pre- and post-liberalization (and pre- and post-insurance policy)? How is the agrarian sector in India affected and, in turn, how is it being affected by the new insurance policies? How is the underlying structure (landholding, cropping pattern, etc) affected?

Archival Research: I examined government documents of parliamentary debates, insurance acts, regulations and insurance schemes; reports by the Ministry of Agriculture, Planning Commission, World Bank, National Disaster Management Authority etc.; and also analyzed actual insurance contracts and documents of legal proceedings. I followed a similar method for analyzing documents linking texts that correspond to the themes of each research question, such as organization motives for the emergence of insurance-based policy in the context of historical policies, and reference these conceptual linkages through excerpts of the actual texts.

3. What explains the spatial variation in the implementation by different states and at different scales—i.e. farm type, crop type, block, and district? What does the “circuit of capital” look like now, after the newly implemented insurance scheme?

Spatial Data and Analysis: I conducted spatial analysis of insurance business data, which was provided to me by several insurance companies. The data provides partial coverage for the districts because of limits in access to such proprietary data; however, I was able to verify aggregate amounts of total insured amounts and actuarial rates using government documents from relevant states that show comparative bids as required by the regulation. I used descriptive
statistics to create tables, charts, and graphs to visualize my findings. I also used ArcGIS software to create maps that provide representations of the spatial distribution of insurance contracts, insurance actuarial rates, premium collection, and the ratio of government subsidies by company, crop, and district in the key states I used for comparative sub-national perspective.

3.3.3 Informed consent and confidentiality for interviews

Prior to each interview, a written or verbal statement was provided of all pertinent information on informed consent and confidentiality protocols, as well as my contact information and that of MIT’s institutional review board. The interviewee could then indicate his/her consent for the interview with a signature or verbal consent. For instance, when the respondent gave permission, the interview was recorded for subsequent transcription and analysis. However, if the respondent was uncomfortable being recorded, extensive notes were taken as an alternative, less intrusive means of recording information. All interviews followed the protocols set by the MIT Committee On the Use of Humans as Experimental Subjects. The types of questions asked and the expected answers should not place any of the participants at risk of criminal or civil liability or be damaging to their financial standing, employability, or reputation. Due to the public nature of the respondents’ positions and their work within the community, the interviews will be attached to respondents’ names and professional positions, and maybe used for direct quotes, subject to each respondent’s explicit consent. As the principal investigator, only I have access to the digital files, notes, and transcripts, which will remain locked with a secured password on my computer.
3.3.4 Map of Study Sites

Figure 3.1 Map of Study Sites
Figure 3.2 Interview with farmers in Pasaladivi village, West Godavari district, Andhra Pradesh

Figure 3.3 Team of flood loss surveyors in Ghatal Block in West Medinipur district, West Bengal.
Figure 3.4 Interview with marginal tenant farmer in Krishna district of Andhra Pradesh.
CHAPTER 4. PLANNING IN A CLIMATE OF FAST POLICY: WEATHER INSURANCE, TECHNOLOGICAL CHANGE AND RISK FINANCIALIZATION

"the weather is like a universal language that connects smallholder farmers to bankers and insurers around the globe."50

"The Indian monsoon is considered a textbook, clearly defined phenomenon, and we think we know a lot about it, but we don’t."51

4.1 Introduction

In this chapter, I argue for the relevance of critically examining the ascendency of what Peck and Theodore’s (2015) call “fast policy” for my research on weather risk, technological change, and financialization in India. The authors focus on “silver-bullet” policies like microcredit programs and urban “creativity” strategies as expressions and outcomes of “fast policy worlds” and acknowledge that though the “various traces of [such policies] are not entirely ubiquitous, of course...they are undeniably far flung.” Further, Peck and Theodore refer to best practices as forms of “mobile” policy frames and the “various forms of ‘speed-up’ they imply” (2015: xvi) as increasingly normalized in policymaking and planning. In doing so, they build on existing policy transfer debates, and, in their own words, “are interested, above all, in the social and political practices that enable fast--policy mobilities, in the ideological and institutional alignments that facilitate (or otherwise) their diverse travels and interconnections, and in their frailties and limits” (2015: xvii). In this chapter, I use the framework of “fast policy” to better explain the

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rapid adoption and scaling of index insurance for weather risks in India with implications for other contexts as well.

By “fast,” Peck and Theodore (2015) clarify that they are less concerned about “velocity,” than the ways in which contemporary “policymaking conditions [are] characterized by the intensified and instantaneous connectivity of sites, channels, arenas, and nodes of policy development, evolution and reproduction” (2015: 223). However, I argue for a more serious engagement with the problematique of rapid planning in the context of weather risk through more attention to the actual (material) speed of climate variability and, consequently, the contemporary relevance of real-time data and automated weather technology on policymaking because the uncertainty and destabilization of seasonal weather patterns such as the monsoon itself are effectively restructuring the context of planning in the agrarian sector. My aim in this chapter is to situate the problem of rapid planning within rapidly changing technological development, competitive financialization and spatio-temporal uncertainty from climate variability, all of which are constitutive of the necessarily experimental and "fast" nature of policy solutions through an examination of emergence and development of weather index insurance in India.

Since 2003, the Government of India has invested in the development of index insurance systems that compensate farmers for losses that result from catastrophic events like flooding, drought, hail, and windstorms among other risks, as measured by changes in measured weather parameters instead of actual losses or damages (also referred to as indemnities). However, it is becoming demonstrably more difficult to predict drought and flooding events with growing climate variability, and its impact on agriculture and food production in India. In this context,
new sources of data, technological innovation and real-time data transmission infrastructure are significantly expanding the scope as well as the granularity of weather information that can be collected and indexed. Simultaneously, insurers are rapidly investing in these new technologies and expanding the scope of insurability (cf. Beck 1992). Ibarra et al boast, “the range of weather phenomena that can potentially be insured against appears to be limited only by imagination and the ability to parameterize the event” (2007: 62). Beginning with precipitation and temperature, to insufficient or damaging wind, tropical weather events such as typhoons, measures of sea surface temperature that are tied to El Niño and La Niña (ENSOs), and even celestial weather events such as disruptive geomagnetic radiation from solar flare activity, the range, scope and types of weather data to measure, collect, and financialize are immense. I explain the ways in which this is taking place in India based on my field research and interviews.

In the latter part of this chapter I build on my findings with the aim of contributing theoretically to debates on “fast policy” as an explanatory framework. I argue that the speed, scale, and instability of financialization is understated both in the literatures about insurance as well as policymaking and needs to be further understood. I describe the normalization of restructuring through the ascent of “alternative risk transfer” (ART) in agricultural reinsurance markets, which further drives the pace of regulatory and firm-level competition towards newer technologies as well as more data and indices that expand the surface of capital accumulation, data collection and analyses. India provides an important case to examine the uneven speed and scales of experimentation that result from competitive financialization—by which I mean the restructuring and churning of financial firms investing in government-run insurance programs. In this context, I examine the position of contemporary economists and planners at the asymptotic limits of
insurability and financialization for new risks, in an effort to bring the two literatures of fast policy and financialization in conversation.

4.2 Derivatives of Weather Risk

I begin with what systems of indexing preceded the new index insurance approach. At least since India’s independence, weather risks to crops were primarily understood in terms of famine risk and food production risk and less so with respect to minor variations in precipitation, temperature, humidity and wind speed. Because of this, the dominant method for assessing crop losses and risks in insurance continues to be the famous Crop Cutting Experiment (CCE). CCEs are more commonly applied as the methodological basis for statistically estimating 95% of all food grain production in India.52 And, everything from commodity prices to the measurement of drought impacts across all of India rely on this unique survey methodology developed in the 1940s by a scholar named Prasanta Chandra Mahalanobis. He developed the CCE during the Bengal famine of 1943, by using a sample survey of rice crops and comparing that with results of plot-to-plot enumeration simultaneously carried out by the Government Department in Bengal. The sample survey bore accurate results at costs less than one-tenth of that of plot-to-plot enumeration.53 The CCE has been the cornerstone of India’s crop insurance programs since India

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began its first program in 1972. Yet transformations in financialization, climate change, and technology have shifted the basis for measurement towards higher-resolution, remote weather measurements that are seen as having a strong correlation with production outcomes.

The first systematic financial instruments based on weather data were weather derivatives. In the section below, I briefly explain how these instruments emerged and what they measure because weather derivatives determined the design of the new weather index insurance parameters and contracts that are currently used in India. I also show how weather derivatives can be interpreted as a particular vector for fast policy transfer that have "mutated" (Peck 2011) across many interconnected policy channels and industry sectors. The World Bank has been an important platform for facilitating key linkages across policy and industry domains, and I summarize how those inter-linkages have evolved in the following section.

4.2.1 Weather derivatives

A weather derivatives market began to emerge in the United States following the deregulation and privatizing of energy markets in which private firms sought to hedge energy supply fluctuation risks (Brockett et al 2005). The weather derivatives market remained largely unregulated and they were sold mostly in the form of over-the-counter (OTC) products. The first contracts in the early years starting in 1997 were written from the Enron weather desk (EnronOnline Unit) whose key members came mostly from Koch Industries (Stoppa and Hess 2001: 3). These markets suffered a significant setback with the major accounting fraud and eventual bankruptcy of Enron in 2001.
While many of the weather desks were shut down, professionals from these trading desks transferred to the insurance and reinsurance sector where they worked on the same types of products offering them as either insurance or derivative products. Meanwhile, the Chicago Mercantile Exchange (CME) initiated futures and options contracts based on temperature indexes and moved the products from OTC to exchange-traded products. At that time, the contracts were only traded for major cities in the United States and Europe with the expectation that if the volume was large enough it would be possible to develop standard derivative contracts that could be traded on large exchanges. The providers could underwrite the risk themselves or transfer it through counter hedges with other clients, but it was an expensive option, as the index and associated pricing model needed to be developed or at least adapted specifically for the particular circumstances. As an example, a “company brings its risk to us and we tailor an index to address their risk,” explains Brian O’Hearne, managing director of Swiss Re’s environment and commodity market unit. “If we agree with the statistics after reviewing them, then we will offer a price for the derivative. If we don’t have an appetite for a particular risk, because we are not comfortable with the index, we will first work with the company to reevaluate the data and ask it to resubmit.” Swiss Re is the largest writer of weather derivatives in the world.

54 Currently, most weather derivatives are privately negotiated over-the-counter (OTC) contracts (see Climetrix at http://www.climetrix.com). OTC weather derivatives are usually structured as call/put options and swaps based on different underlying weather indexes. In addition to a number of electronic weather marketplaces (for example, Intercontinental Exchange and Swiss Re's ELRx), two exchanges—CME (the Chicago Mercantile Exchange) and LIFFE (the London International Financial Futures and Options Exchange)—offer trading of standardized weather contracts. CME offers futures and options on futures based on indexes of HDDs and CDDs for selected population centers and energy hubs with significant weather-related risks throughout the United States as well as for some European cities. LIFFE trades only weather futures and these future contracts are settled against monthly and winter season indexes based on daily average temperatures in a number of European cities.

It is important to understand the difference between standard financial derivative and weather derivatives. This difference has implications for why actuarial models are used instead of the Black-Scholes method for modeling weather derivatives.\textsuperscript{56} Whereas financial derivatives are based on share prices, bonds, exchange rates, or currencies, the underlying index (data) for a weather derivative contract is a measure of weather conditions (such as the amount today’s temperature or rain differs from the expected mean). For instance, the first weather derivatives were based on temperature changes. The underlying temperature indexes are typically heating degree days (HDDs) and cooling degree days (CDDs). A degree-day is the measure of how much a day's average temperature deviates from $65^\circ F$ measured using trusted weather station data. A Heating Degree Day (HDD) measures the coldness of the daily temperature compared to a standard of $65^\circ F$, while a Cooling Degree Day (CDD) measures the warmth of the daily temperature compared to the standard of $65^\circ F$. The most common time periods in the weather derivatives market are November 1 through March 31 for winter season contracts and May 1 through September 30 for summer contracts.

\textsuperscript{56} See Dischel 2002. In summary, he states the following “as to financial valuation principles, the Black–Scholes method is the most successful pricing approach in the area of derivatives. This method is based on a strategy in which one creates a portfolio that accurately replicates the payoff of the derivative. The risk associated with the financial derivative is thereby completely eliminated or hedged. Thus, one can argue that the value of a product must be the cost of setting up the hedging portfolio, based on the no-arbitrage principle. The Black–Scholes method has been a landmark in derivative pricing in the complete market. A financial market is complete if all claims are attainable, i.e., if all claims can be replicated by means of a self-financing strategy. Despite its success, the Black–Scholes approach breaks down in incomplete markets (Young and Zariphopoulou, 2002). If claims exist, which are not attainable, and hence cannot be replicated by means of any self-financing trading strategies, then the market is incomplete. The weather derivatives market is an incomplete market model (Davis, 2001). The most distinctive feature of weather derivatives is that, unlike traditional financial derivatives, their prices are linked to a weather event rather than the price of an underlying security or commodity. The commonly used underlying weather indexes—for example, heating degree day (HDD), cooling degree day (CDD)—are non-tradeable. On the other hand, there is typically little or no liquidity in weather derivatives (Davis, 2001). As such, the traditional no-arbitrage pricing models of financial derivatives, such as the Black–Scholes model, cannot be applied to price weather derivatives” (see, for example, Dischel, 1998).
According to the U.S. Department of Energy, compared with insurance, derivatives provide a hedge against spatially correlated events such as adverse weather patterns. They note that if, for example, a heat wave moving across the western United States halts production at wind farms in several states, project owners are vulnerable because of the geographical concentration of their production—"derivatives afford project owners access to the risk sharing forums of the financial markets, and this kind of diversification can trump that of geographical distribution." It is also important to understand the contract design of weather derivatives. The contracts for weather derivatives differ from conventional derivatives in two ways. First, the derivative is expected to hedge weather risk, which is considered a "volume" or "quantity" risk rather than a "price" risk—volume or quantity risk results from a change in the demand for goods due to a change in weather. And second, in weather contracts, there is no original and negotiable underlying index, which usually forms the basis of a traditional derivative contract as described above (Brockett et al 2005).

4.2.2 World Bank-led Fast Policy Experimentation

One of the elements that make "fast policy" possible are the ways in which vectors of knowledge production and dissemination interoperate. Similar to the seminal "Transforming Traditional Agriculture" research by Schultz (1964) on agricultural policies worldwide during the 1960s, the emergence of rainfall insurance had particular intellectual and institutional genealogies. And, much like in the case of the agricultural research in the 1960s during the Green Revolution, many of the ideas for the first index insurance studies emerged from long-standing collaboration among many professionals, particularly Peter Hazell at the World Bank and later at the

57 https://financere.nrel.gov/finance/content/weather-derivatives-insurance-products-wind-industry#references
International Food Policy Research Institute (IFPRI), Panos Varangis at the World Bank, and Joe Glauber at the United States Department of Agriculture (USDA). The intellectual role of agricultural economists working at universities and consulting for the World Bank in India’s agricultural policy is an important dimension of understanding the intellectual and institutional antecedents of these programs and these are described below.

The World Bank is a particularly influential institution in the emergence of weather-related financialization in the developing world. According to Skees et al (2007), the simultaneous design advancements in the US-based Group Revenue Plan (GRP) and the new markets for weather derivatives motivated Peter Hazell, who had been working on crop insurance for developing countries at the World Bank, to revisit his thinking about the constraints to risk management in developing countries (Hazell, Pomareda, and Valdés 1986). Hazell received his Ph.D. in agricultural economics at Cornell University in 1970 researching some of the adjustment problems facing British agriculture following entry into the European Union. In 1972, Peter joined the World Bank as a Young Professional and led research and advisory work on policy issues related to agricultural development, food security and rural poverty reduction in developing countries. In country after country, economists admitted that farmers had little access to traditional crop insurance, which suffered from high information asymmetry and high transaction costs. It was also true that in these low-income countries, agriculture was mostly rainfed and crop yield depended highly on spatially correlated climatic factors. An economist named Robert Townsend’s (1994) carried out pioneering econometric research claiming fine-

58 Peter Hazell had begun his academic career researching some of the adjustment problems facing British agriculture following entry into the European Union. In 1972, Peter joined the World Bank as a Young Professional and led research and advisory work on policy issues related to agricultural development, food security and rural poverty reduction in developing countries.
grained analyses of statistical causal significance of “average rainfall (mm) on household savings” in several agricultural villages in India providing models to test. The World Bank group overseeing agricultural commodities and rural development began examining the potential of the weather risk markets to absorb weather risk from emerging markets with the first emerging market transactions completed in South Africa and Central America (Stoppa and Hess 2001).

One of the first studies conducted based on this new approach was a World Bank rainfall insurance project in Nicaragua in 1998 (Skees, Hazell, and Miranda 1999). It was based on the premise that weather explains a large amount of crop yield variability, and specific outcomes (such as crop failure) are statistically predictable. The next year, in 1999, a group inside the World Bank was awarded a Development Marketplace Contract to advance these ideas in Nicaragua, Morocco, Tunisia, and Ethiopia (Skees et al., 2001; Skees et al., 2005; Varangis, Skees, and Barnett, 2002, Martin et al 2001). Most of the index insurance programs across the world to date have received at least partial funding from the World Bank, and many of the early contracts were directly designed by World Bank consultants and economists. Regarding the program in India, Paul Varangis lead economist for the World Bank's Agricultural and Rural Development Department at the time, saw that the program could be a model for other developing Asian economies where agriculture is the mainstay of the economy. He said, "This pilot program shows how non-irrigated farmers in developing countries can protect their livelihoods...the program could lead to weather deals in India and other countries."59 Indeed, since that time, there has been a proliferation of interest and involvement in index-based weather insurance products for lower income countries (Barnett, Barrett, and Skees 2006; Hazell and

59 http://www.atimes.com/atimes/South_Africa/El12F01.html
The rainfall insurance program in India in 2003 was the first commercial re-insured contract arranged by the World Bank as an experiment with other institutions to address agrarian fragmentation and high frequency of losses. With smaller and smaller plots (average landholding for agriculture in India have steadily decreased to 0.56 hectares in 2015), weather-based insurance was promoted as a major government initiative in India aimed at being able to “reach remote small-holder farmers” more affordable in order to address their high sensitivity of to weather risk, where over 60 percent of the population depends on seasonal rainfall for their agricultural livelihoods.

From this point, I would like to trace the overlapping trajectories of financialization and fast policy, beginning with the contract structure itself. Importantly, the instrument used in India’s weather insurance program is a mutation from earlier financial instruments for trading weather risks among large corporations discussed above. Through its adoption in India, the index insurance contract is structured like a weather derivative but regulated as if it were insurance by the Insurance Regulatory and Development Authority (IRDA). Yet, in case after case, I find that the actual terminology for describing the policy across contexts does not have a consensus. In the literature, there are several terms used to describe essentially the same contract design, including: weather insurance, weather derivative (Hess and Stoppa 2001, Isakson 2015), Index-based risk transfer products (IBRTPs) (Skees et al 2007), parametric insurance, and microinsurance (Manuamorn 2007, Cole 2012). Often, studies will use terms interchangeably and arbitrarily. In

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an article purporting to differentiate weather derivatives from other kinds of insurance, Turvey (2002) uses two terms, weather-based insurance and weather derivatives, interchangeably.

And, Skces and Barnett (2006) began referring to these contracts as products (IBRTPs) to communicate that structurally they are open-ended, saying that “in the economic literature, they take the form of contingent claims...[h]owever, in the legal and regulatory environment, they can either be structured as insurance or derivatives.” Thus, for lower income countries, where derivative markets are unlikely to be properly regulated, they recommended that these products be structured as insurance products. Based on the existing literature, the terminology and designation of the instrument is a function of regulatory arbitrage, where in policymakers use a pragmatic approach based on which regulatory body and set of regulations is most likely to allow them to commercialize the contracts most effectively. In the Indian case, the IRDA initially developed new legislation to regulate these products as private “micro-insurance initiatives” (Wiedmaier-Pfister and Chatterjee, 2006) until the central government formalized these types of contracts within the national Weather-based Crop Insurance Scheme (WBCIS) in 2007. Such regulatory experimentation and unevenness is common in the development of new forms of financialization more generally (Cummins and Trainar 2009, Fleischer 2010).

4.3 Inside the Black Box of the Weather Contract

In this section, I describe the mechanisms and design that define such contracts to better explain the granular features of financialization in practice, and how such contracts fit within a larger financialized system. I focus specifically on how the first contract was implemented in India and why to help provide the geographically specific context for which the contracts are customized. I
then proceed to explain how such contracts are priced, essentially the elements that comprise the “black box” of the financialization of risk.

The first reinsured rainfall insurance contract took place in Andhra Pradesh in 2003. The contract was designed based on the World Bank-financed pilot in Morocco (Hess et al 2002) using a European put-option contract design (explained in depth below). The contract was underwritten by ICICI Lombard General Insurance Company (an India-domiciled joint-venture between the second largest private Indian bank, ICICI Bank Limited, and a Canadian insurance-oriented financial holding company, Fairfax Financial Holdings Limited) and reinsured by Swiss Re. The contract was designed for groundnut and castor farmers that were members of BASIX’s water user associations in Andhra Pradesh (in a region that is now part of the newly formed state of Telangana). BASIX had been offering “microinsurance” services since 2001 in health, for instance, coinciding with the opening up of the insurance sector, and partnering with multiple insurance companies to design insurance products for rural customers in particular. 61 BASIX collaborated with ICICI-Lombard on the rainfall policy in order to cover three districts in the state that they knew experienced chronic drought conditions and lacked adequate irrigation infrastructure. The project was an effort to hedge against the risk of droughts by KBS Bank, which was one of several local lenders of agricultural credit. According to KBS Bank director, NV Ramana:

“local area banks are limited to operations in three adjacent districts and therefore face limited natural portfolio diversification…this is why KBS Bank is keen to offer rainfall

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61 BASIX began as a “livelihood promotion institution” established in 1996, working primarily in “backward” districts in over 16 states throughout India and pioneered microfinance services in many parts of the country. In February 2001, BASIX also got a license from the Reserve Bank of India to open a Local Area Bank. The Krishna Bhima Samruddhi Local Area Bank promoted by BASIX commenced operations in March 2001 in the districts of Mahaboobnagar in Andhra Pradesh and Raichur and Gulbarga in Karnataka. (BASIX 2003). BASIX was also a financee of the World Bank’s International Finance Corporation (IFC).
insurance to its borrowers as it would mitigate the risk inherent in lending in drought prone areas such as Mahabubnagar, Raichur and Gulbarga” (Reddy 2004: 87)

KBS Bank and ICICI Lombard used a weighted rainfall index, which means that more critical periods for plant growth are weighted more heavily than others. The following figure of the key institutions and direction of payments was used in the original presentation by stakeholders explaining the new policy design to investors. As pointed out by the KBS bank director, the financial risks of drought directly impact the solvency of banking institutions when loan repayment are disrupted, and these can have system-wide impacts on India’s financial and economic system (as discussed in Chapter 6), especially in regions that are “monsoon-fed.” And, as will be discussed in next chapter, this banking concern has reinforced why government expenditure are moving towards financial programs such as the PMFBY, WCBIS, and loan waiver programs which now constitute the largest fiscal expenditures in agriculture.
One of the key mechanisms for financializing risk in India has been through the contract design and automated settlement processes that looks like a cross between a weather derivative and a European put option. This means that unlike conventional insurance contracts, index insurance does not require assessments and claims adjustment, but instead uses designated thresholds to "trigger" policies based on weather data readouts sent automatically by an internet connected device (i.e. an automatic weather station, which I describe in more depth below). One of the rationales for this approach is to reduce "transaction costs" in the transfer of information, that would otherwise increase the cost of the contract making it unaffordable to small farmers. However, this has led to a policy design based on quantitative abstraction and automation that
eliminates forms of data and experiential interpretation that may be necessary to actual assess material losses.

Early on, World Bank advisors suggested that the policy be designed similar to a European put option proposed by Martin et al (2001) to be the most effective (Figure 4.2). In this type of contract, the option price is the cost of the coverage and the strike is the rainfall threshold below which an indemnity is triggered.62 A rainfall index insurance contract closely follow the model of the European put option (See Figure 4.3) adopting a language similar to futures market contracts. For example, rather than referring to the threshold where payments begin as a “trigger,” index contracts refer to the threshold as the “strike.” In an attempt to make things more straightforward, they also pay in increments called “ticks.”63 In this example, the rainfall contract only covers rainfall deficits between 300mm and 100mm, “triggering” payment of $1 once the cumulative rainfall in the specified geographical area goes hits 300mm, and increasing payment at a rate of $1 per 1mm of rainfall until the cumulative rainfall amount reaches 100mm with a total payment of $200. Below that amount the contract does not payout to the insured. This kind of contract threshold is based on probabilistic modeling of possible rainfall patterns and the extent of money that the entity responsible for the payout (i.e. the insurer) is willing to pay. The structure and principles of pricing such contracts are explained more in depth in the next section.

63 http://www.munichre-foundation.org/dms/MRS/Documents/Microinsurance/MIC_Agriculture_Bibliography/ISMEA_Risk_Management_in_Agriculture_for_Natural_Hazards_2006.pdf. As noted by several observers, the government’s area-yield insurance also essentially operates in a similar way because there is the potential for basis risk between the yield amount of the area sample and the actual yield of the insured farmer.
Figure 4.2 Payoff structure for European put option on weather. Source: Martin et al 2001.

Figure 4.3 Payoff structure for rainfall index insurance contract. Source: Martin et al 2001.
4.3.1 Pricing Insurance and Need for Data

By its very premise, actuarial approaches are preemptively priced and modeled. An underwriter cannot know in advance what the extent of risk will actually be. They can only model risk and expect that financial loss that results from an event on average will fall within the expected probable loss estimates. Pricing for all contracts will contain an element of expected loss (referred to as “pure risk”), some catastrophic and ambiguity loading or “risk margin” corresponding to capital reserve charge (which is required to underwrite the risk at a target level for the business), and administrative costs. Index-based insurance product price have all three components: pure risk, catastrophe and ambiguity loading, and administrative costs; which I explain below in order.

“Pure risk” is the likelihood and severity of a weather event and it is estimated from historical weather data that is to design the index-based insurance product. The persistent lack of historical weather data is often one of the constraints of implementing agricultural risk products often designated within the insurance industry under the subcategory of "specialized insurance". As Jarzabkowski et al (2015: 101) note in their interviews with several reinsurance underwriters, non-modeled risks such as agricultural risks in Asia are made "modelable," at times adopting similar, but often arbitrary, methodologies from other products. Based on my fieldwork with underwriters, I found that this problem was particularly pervasive for newly notified districts with no previous record of crop insurance coverage and claims history. In my observations across several weather insurance underwriters, I found that each underwriter had a slightly different method for “data filling,” by which they approximated values where there was a lack of

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data. Some underwriters approximate values for a missing weather data point using data from nearby weather stations, others use statistical smoothing functions based on the existing crop yield data, and sometimes a combination of the two. They use this data to develop a probability distribution of the underlying weather variable (like rainfall), and explain their methodology for accounting for “missing values” to clients, such as insurers and reinsurers that request these details. On the basis of this, reinsurers will factor in “ambiguity loading” in cases where data used for designing the index-based insurance product is not as reliable.

Ambiguity loading is a broad term for risk pricing with regard to how reserve capital will perform in a given portfolio. Dietz and Walker (2016) note how reinsurers increasingly attempt to factor in the effects of climate change such as decreasing rainfall to determine in the ambiguity factored when pricing products. The pricing also includes catastrophic loading by calculating Probable Maximum Loss (PML), based on the probability of an extreme weather event occurring earlier rather than further on in time, and affecting many people in the same region where an insurer may have concentrated risk, which would affect the overall availability risk capital available. In other words, the Probable Maximum Loss (PML) represents the worst-case scenario for an insurer and is the maximum loss that an insurer would be expected to incur on a policy. Lastly, administrative cost loading includes overhead costs. All of these elements are used to estimate the probability of losses to help insurers and reinsurers to price actuarial premia and adjust their models over time (See Figure 4.4). Underwriters often use a probability distribution of the expected payoff using different statistical smoothing functions based on historical data. Using these estimates underwriters help project what the potential

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likelihood of losses will be within a portfolio of liabilities that make it possible for insurers and reinsurers to then model the aggregate risks and then decide on how to price geographically-specific risks for individual contracts.

Max Payoff(million) 18711.49  Average Payoff(million) Normal 7988.15 ROC(%) (%) 5
Freq Payoff(%) 40.00  PML Assessment Best Fit 99 Total(Mill) 8576.16

The distribution fit may not be statistically significant, as the data available is less, but it still captures the maximum payoff well.

Distribution Type = Lognormal, VAR of Loss = 19748.54, ChiTestStatistic = 1.36, ChiTestPValue = 0.51, KolmogorovSmirnovTestStatistic = 0.1, KolmogorovSmirnovTestPValue = 0.89, Standard Deviation = 3585.93

Filling Color Information : Weather Data Filled - Blue, Index Filled - Red, Weather data and Index Filled - Black with Bold

Figure 4.4 Actual screenshot of a probability distribution of the expected payoff using different statistical smoothing functions and based on historical data. Source: Weather Risk Management Solutions Ltd. (WRMS).

4.3.2 Creating New Data for Risk Financialization

Before explaining new data and the ways in which new technologies are being leveraged, I want to explain the complex and intensive process by which more conventional weather data, such as temperature, is generated by the weather data and insurance firms alike. Indian insurance underwriters emphasized that temperature is an extremely important parameter that affects crop
growth and survival, though its relevance varies by season. While rainfall is the key independent weather variable in the Kharif (summer) season, during the Rabi (winter) season, temperature sensitivity for the wheat and chili crops is high and thus, insurers offer temperature-based contracts (see below in 6.4.2). The common measure of temperature can be derived in several ways and often involves sophisticated forms of validation and ongoing verification that plays into challenges of accurately assessing weather patterns and weather risks. In the dominant method used by underwriting experts I interviewed, data is triangulated using ground measurements as well as data from the Global Forecasting System (GFS) distributed by the National Centers for Environmental Prediction (NCEP) and the National Oceanic and Atmospheric Administration (NOAA) in the United States. The temperature data provides ranges that help provide the upper and lower bounds of expected variation. These estimates are collected regularly twice a month and used to adjust the estimates going forward. This level of validation helps firms differentiate the quality and “robustness” of their data relative to other firms in the global market for weather data. For existing clients such as reinsurers, such data verification provides the metadata needed to explain specific collection methodology and, the often qualitative, interpretative decisions taken in the process. In the context of increasing financialization of weather data and reinsurance, firms use the methodology metadata to be able to combine different contracts and instruments that may be based on other weather data for weather insurance contracts internationally. The analysis and tracking of heterogeneous data sources and their amalgamation feeds into the need for more advance artificial intelligence and machine learning algorithms in the context of the broader financialization of (big) weather data.
Another important dataset for insurers is satellite data, which is used to detect the amount of acreage sown and health for a particular crop. More specifically, insurers often use the Normalized Difference Vegetation Index (NDVI) to measure and estimate yield (crop cover) using the spectral signatures (unique data patterns based on spectral reflectance) of specific crops. Remotely sensed imagery and measures such as NDVI based on the Landsat satellite data collection have been used extensively in environmental and agricultural analysis for many decades. NDVI evaluates crop canopy photosynthesis (more precisely, light absorption) calculated from the difference between near infrared and red wavelengths, divided by their sum: $\text{NDVI} = \frac{\text{NIR} - \text{RED}}{\text{NIR} + \text{RED}}$. However, the NDVI can barely discriminate between pastures and cultivated areas and it is calculated with a delay period because of the potential presence of clouds. It is quite well adapted to biomass assessment but not to yield assessment. This technique is thus more frequently used for large-scale food crisis early warning, livestock management, and forecasts of forage production. Yet, as Leblois and Quirion (2013) note, “improvements in this field are very quick so that imagery resolution increases regularly and new technologies could emerge in the near future” (3). I provide an example of such improvements being implemented in India below.

In countries like India with high climate variability, planners are witnessing rapid improvements and availability of analyses and application of data for specific crops (See Figure 4.5). The map shows a high-resolution (1-meter) satellite image of the territory as well as additional point-specific “spectral signatures” depicted in the inset boxes that distinguish between rainfed and irrigated rice crops using the perceived pattern (“signature”) in the reflected image specific to particular crops within the electromagnetic spectrum. The small circles represent sites for
ground-truthing to test the precision of the spectral signatures collected remotely. Expanding on such methodologies amplifies the types of crop-relevant data that can be analyzed. For instance, scientists at the IMD Agromet utilize several indices to measure the intensity, duration and spatial extent of drought, including: the Aridity Anomaly Index; Standardized Precipitation Index; Palmer Drought Severity Index; Crop Moisture Index; Surface Water Supply Index; Normalized Difference Vegetation Index (NDVI); Normalized Difference Wetness Index, Effective Drought Index and Moisture Adequacy Index.

Figure 4.5. Phenology of the rice crop. Typical phenologies of six types of rice crops (e.g., double crop, single crop) of South Asia illustrated using NDVI signatures of MODIS time series. Top image is a false color-composite image of South Asia based on MODIS bands 1, 2, and 4 from October 31, 2000. The figure shows point-specific “spectral signatures” in the inset boxes that distinguish between rainfed and irrigated rice crops using the pattern (“signature”) in the reflected image specific to particular crops within the electromagnetic spectrum. Source: Gumma et al 2011.
These new methods allow insurers and weather data firms to rapidly combine weather data collected from Automatic Weather Stations (AWS) as well as other methods with remotely sensed visualizations from satellites and aerial photography to assess accurate measurement of the spatial distribution of crops ("crop cover") and the effect of inundation and flash-flooding events at the sub-district level to their clients, something that would otherwise be very difficult to estimate. For example, an underwriter at a private insurance office told me that:

“For West Bengal, I use the difference between NDVI measures between 2015 to 2016 by block to create a benchmark for indicating vulnerability. Values of NDVI at or less than 0.04 difference from the benchmark can indicate less crop growth or less sown area...if we look at what happened in problem with assessment in Rajasthan, we saw district-level claims ratio close to 200%. This is because CCE yield data actually takes (through manipulation) a lower estimate and generalizes (extrapolates) it to other districts.”

In this conversation, the underwriter was explaining how his methodology using satellite imagery data is far superior to the traditional CCE, which has, up until this point, been difficult to replicate remotely in order to avoid ground-level data manipulation. Such remotely sensed measures provide corroborative evidence for area-sown estimates of previous years. However, the same data is provided as maps to clients to see where there will get more business and to assess real-time risks mid-season. The following maps (Fig. 5) were shared with me by the firm I accompanied to estimate damages from inundation claims in West Medinipur, West Bengal.

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66 Interview took place with an insurance underwriter in New Delhi India on July 28, 2016.
As mentioned, lack of consistent, historical high-resolution weather data (e.g. rainfall) and crop loss across all villages makes necessitates more assumptions in actuarial models, which negatively impact the precision of premium rates. Though ad-hoc “data-filling” is the predominant approach, an emergent approach by weather data firms is to gather disparate data forms to arrive at a fuller understanding of the weather and agro-ecological conditions. One underwriter that I interviewed at a Hyderabad-based firm said:

“I am trying to develop new index products to offer to our clients. I collect a basket of measures such as temperature, humidity and soil pH, among many other. I use these to measure which index of weather risk has an effect on yield. I started with HDD (recall this was the weather data used for US-based weather derivative contracts), but it was not significant so I kept adding more parameters including irrigation status and storm surge/cyclone effects and flooding, and found a stronger correlation.”
Through the process of creating new contract structures from different insurance and weather data providers, underwriters are increasingly evolving from earlier contract structures and introducing entirely new forms of weather data for potential risk identification in the near-term, and possibly, new kind of insurance contracts in the future.

4.3.3 UAVs, Automation, and Planning

The corollary of increasing investment in insurance is investments in new technologies for gathering data, assessing losses, and even automating payout. For instance, the PMFBY has been touted for budgeting the use of drones and other technologies incentivized to minimize human interference in processing claims to expedite payments, which political officials promise will help align the Indian insurance system with the systems used in more developed countries. The Home Minister of the Indian Government explained “satellites or drones are extensively used to assess crops for insurance policies in developed countries such as the United States, but India still depends on more primitive methods, with personnel from land record offices traveling around villages to inspect damage.” The demands for new technology is reinforced and sped up because of the demands from insurers. For instance, the government’s newly designed national crop insurance program, the PMFBY, which is explained in much more detail in Chapter 5, promises a “paradigm shift in crop insurance...[where] the idea behind the scheme is to cover as many farmers as possible...[and] [w]e have informed states that we are willing to go beyond the budgeted ₹5,500 crore ($846.2 million) for this year if there is a need,” an agriculture ministry

Ultimately, the budget provision of ₹5,500 crore in Budget Estimates for 2016-17 was increased to ₹13,240 crore ($2.04 billion) in the Revised Estimates for 2016-17 to settle the arrear claims (agricultural loan waivers), and for 2017-18, the Finance Minister announced in the new expanded budget to make sure that “farmers...feel secure against natural calamities.”

Integral to the government’s investment in the index-based programs is an increasing reliance on the automation of reliable weather data collection. In the early 1980s and 1990s, the Indian Meteorological Department (IMD) had been establishing a network of weather stations across the country to better assess weather variation and climate variability. They had already begun to install automated weather station (AWS) (see Fig. 6) across the country, though, because of the price, the network was mostly filled with the normal non-automated stations interspersed with the AWS. A major concern with manual weather stations was the potential for human error, deliberate fraud, as well as the cost of sending trained professionals to remote areas of the country on a regular basis. The technological advance of automation in weather data collection that emerged primarily from the World Meteorological Organization (WMO) and U.S. scientists in particular from the 1950s onwards, helped to reduce the cost of acquisition for the both the Indian Meteorological Department as well as state governments. The World Bank among other institutional actors provided technical support in the acquisition of these devices as well.

The AWSs themselves are embedded in a sophisticated network of computers systems with internal memory, cellular networks, and servers, in order for the information to be processed, verified, organized and recorded accurately (See Figure. 7). Based on the process for the particular AWS (by Ingen) that I examined, each device has the capacity to measure wind (0-100 m/s, 0.1 m/sec resolution), temperature (-40°C to 120°C, .001°C resolution), humidity, solar radiation (0-2000 @/m², 2.5 micro volt resolution), and rainfall sensor (-.5 – 900 mm, 450mm per hour, 0.2mm resolution). The data is recorded through a processor and internal memory (with its own weather constraints for temperature and humidity as specified) and the weather station sends the summarized weather data at programmable intervals of 0.1/1/2/5/10/15 minutes automatically via General Packet Radio Service (GPRS)⁶⁹ to the central server. In case of non-availability of GPRS signal, data is sent to the central server through SMS. In the extreme case of no mobile signal, data is stored in the internal memory unit having a capacity of 1GB sufficient to store 12-month weather data. Newer (often private authorized devices) also have secure Over-The-Air (OTA) configuration, firmware and memory updates. Once transmitted, the software also aggregates, manages, analyzes, organizes and distributes weather information into single system tailored to the preferences of the different users groups (farmers, agricultural officers, insurance companies, administrators).

⁶⁹ (GPRS) is a packet oriented mobile data service on the 2G and 3G cellular communication system's global system for mobile communications (GSM).
At this point, it is important to understand that the regulatory environment in which weather insurance and automatic weather stations emerged, was originally set up for establishing the

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infrastructure for weather and commodity derivatives in India. In 2004, the government sought private bids for the installation and management of more weather stations to increase the network density across the country. Based on interviews in 2004, each firm made clear that the weather stations were part of larger strategic interest in the development of agricultural supply chains, commodity exchange, and derivatives markets. For instance, before joining NCMSL as Managing Director & Chief Executive Officer, Mr. Sanjay Kaul was the director and CEO of the National Commodity and Derivatives Exchange Limited (NCDEX) Institute of Commodity Markets and Research. However, the NCDEX has not been allowed to sell weather and commodity derivatives as of yet. Currently, there are three major private firms: Ingen Private Limited (a subsidiary of the Weather Risk Management Services Private Limited), Skymet Weather Services Private Limited, and the National Collateral Management Services Limited (NCMSL).

Yet the status NCDEX and the derivatives market remains under regulatory review and the AWS infrastructure is steadily becoming an important fixture for the legitimacy and transparency of state governments managing weather insurance and weather risks more broadly. As I was shown by government officials in Andhra Pradesh, the administration has invested heavily in such devices with 1,876 AWSs and other weather-related devices (see Figure 9), and displays the data outputs such as temperature readings and rainfall levels in real-time on the government website.

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(See Figure 10). As the insurance scheme has expanded coverage to more districts and crop types, there has been a massive expansion of AWSs especially through the private firms mentioned above. In addition, the capacity to capture higher resolution data has political relevance for minimizing complaints from farmers as well as providing accurate assessments of drought risk, early warnings, and better weather risk modelling for the IMD, private weather data providers, insurers and reinsurers.

Figure 4.9 Location of all AWS in Andhra Pradesh. Source. AP State Disaster Mitigation Society (APSDMS) 2017.
As will be discussed more in depth in the next section, a key variable of the credibility and validity of the system is the actual distance between the location of weather station relative to the...
insured crops and farmers affected. This is especially of concern for the efficacy of the insurance system for small and marginal farmers whose farm plots may be a long distance away from a weather station. The extent to which there is a difference between the reading of the weather station and the actual insured territory (i.e. the farm), generates what insurers call “basis risk”, or the spread between the actual loss and the loss as estimated by the weather-based insurance contract once the key parameters of the contract have been set. According to a World Bank technical assistance report for the Indian government, “the location of weather insurance has the potential of turning weather insurance—basically a loss compensation instrument, into a lottery” (WBCIS Report 2011). This is because the distribution of funds will increasingly have less and less correlation with the farmers’ own crop damage and will function more as a form of speculation or betting. A government survey in 2011 showed that this remains a major concern for many parts of the country where weather stations are actually more than 20-30km from an insured farm, ranking higher than all other concerns (See Figure 4.11). However, I strongly caution against the extrapolation of the results of this survey as a way to rank farmer concerns and assess what issues impact the program the most. This is because during my fieldwork, I actually found that issues and complaints that were less common still had a severe impact on the credibility of the system as a whole.
Why are farmers unsatisfied with WBCIS?

- Reliability of Weather Data: 16.8%
- Protection Tool against Crop Losses and Climate Change: 17.3%
- Effective against Political Risk and Manipulation: 19.1%
- Weather as Basis for Crop Insurance: 20.8%
- Usefulness as Alternative to NAIS: 25%
- Design of WBCIS Policy: 25.3%
- Types of Risks Covered: 26.8%
- Period of Risk Coverage: 29.8%
- Time Delay in Claim Settlement: 33.8%
- Explanation on WBCIS Policy: 37.3%
- Quantum of Sum Assured: 44.3%
- Responsiveness of Intermediary: 45.3%
- Resolution and Queries: 53.3%
- Convenience in Enrollment: 56.5%
- Mechanisms for Grievance Redress: 56.5%
- Location of Weather Stations: 80.8%

Source: [http://agricoop.nic.in/department/credit/WBCIS_FINAL%20REPORT-060211.pdf](http://agricoop.nic.in/department/credit/WBCIS_FINAL%20REPORT-060211.pdf)

Figure 4.11 Survey research results conducted by the Ministry of Agriculture of the WBCIS program in 2011. Source: The Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW)

4.4 Trust, Failure and the Limits of New Weather Technology

4.4.1 Trust Limits to Actuarial Automation

Farmer mistrust in the system as well as fraudulent behavior related to the AWSs is most common concern of insurance companies. Because of the impenetrable relationship between the AWS readouts and the claims for indexed contracts that are automatically triggered once the weather parameter reaches a pre-specified level, trust in the readout is very important. The validity of the policy is based on the transparent, objective, and exogenous nature of the weather index, which is supposed to inspire trust from the farmer and reduce or eliminate adverse selection and moral hazard for the insurer. Yet, in India, there is evidence of wide-spread mistrust...
in the system based on complaints filed against insurers in most of the states where the policy is offered.

The issue of index insurance fraud or possible inconsistencies affecting a large segment of farmers has expressed in several ways. For instance, the problems of inconsistencies have been to topic of several debates in the lower house of the Parliament is response to increasing complaints and the need to stop selling such contracts. In one such complaint from 2012, a politician from Nalanda, Bihar, Shri Kaushalendra Kumar stated:

"There is a lot of mess in the crop insurance scheme in Nalanda district. Thereby causing huge loss to the farmers. There is a claim of profit-loss of crop insurance on the basis of data collected from the rain gauge machine, but crop insurance benefit is being collected by a private company, NCMSL...which is totally fake. This fraud is clearly seen by NCMSL showing rainfall of 5.58 mm on 16.7.2012, while the figure shown by the Department of Statistics of Nalanda District of Bihar Government was 17.02 mm in 16.7.2012...Similarly, the data obtained by NCMSL on date 17.07.2012 is 50.28 mm. While the data provided by the statistics department in Bihar on 17.07.2012 was 64.02 mm. Similarly, there are many variations in many figures. At the same time, the claim of crop insurance from farmers by NCMSL was paid from Rs. 1004 per hectare, whereas according to the statistics department of Bihar Government statistics department should be about Rs. 3000."  

73 The entire quotation is as follows: In one such complaint from 2012, a politician from Nalanda, Bihar, Shri Kaushalendra Kumar stated: There is a lot of mess in the crop insurance scheme in Nalanda district. Thereby causing huge loss to the farmers. There is a claim of profit-loss of crop insurance on the basis of data collected from the rain gauge machine, but crop insurance benefit is being collected by a private company, NCMSL, collected by rainforest which is totally fake. This fraud is clearly seen by NCMSL showing rainfall of 5.58 mm on 16.7.2012, while the figure shown by the Department of Statistics of Nalanda District of Bihar Government was 17.02 mm in 16.7.2012. Similarly, the data obtained by NCMSL on date 17.07.2012 is 50.28 mm. While the data provided by the statistics department in Bihar on 17.07.2012 was 64.02 mm. Similarly, there are many variations in many figures. At the same time, the claim of crop insurance from farmers by NCMSL was paid from Rs. 1004 per hectare, whereas according to the statistics department of Bihar Government statistics department should be about Rs. 3000. Similarly, about 50 thousand farmers are being given the amount in the district. One shocking topic is that 1.5 percent of the premium insured was taken in wheat, which is taking 4.8 percent of the sum insured from 2014. Similarly, the premium of the sum insured before the paddy (kharif) 2014 was 2.5 percent, which was made to 5 percent in 2014, which is not possible by the farmers. Therefore, the Agriculture Minister has urged that this important issue of farmers should be given in the light of crop insurance and to implement the National Agricultural Insurance Scheme, which was earlier implemented by closing the weather based crop insurance scheme. Simultaneously, the Sum Assured of Kharif and Rabi should be increased per hectare. Source. https://indiankanoon.org/doc/124727771/.
The core of the dispute is the different devices for collecting weather data are showing vastly different values impacting the payouts, in this case, in favor of the insurance company. Since 2013, insurers have said that there has been a significant decrease in WBCIS contracts sold. When I ask about why that was, one insurer said to me that they no longer sell WBCIS policies in several states because,

“large number of cases were filed in the consumer forum alleging that the weather stations were not installed properly with the result the weather data was not captured properly and consequently farmers were paid less claims or no claims when they have suffered losses to banana crop during 2012-2013.”

Many such instances of farmer mistrust have been launched through local and state complaint forums, such as the State Consumer Disputes Redressal Commission (SCDRC). Although the review process can take quite a long time, the IRDAI provides the public access to some of the complaints.

Of course, insurers see this is a potential crisis for their credibility as well as a drain on their resources. In the context of SCDRC contestations, insurers commonly take a strong defensive position on the basis of the precision of the AWS technology and the consistency of their infrastructure. This is apparent from a different complaint filed in December 2011 in Sangrur, Punjab, which took place between Iffco Tokio General Insurance vs Jagmeet Singh and the Bhumsi Co-operative Agriculture Service Society following a similar line of accusation.

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74 The IRDAI website has a sample of several complaints and responses from insurance companies which provides details about the core concerns. https://www.irdai.gov.in/admin/cms/cms/whatsNew_layout.aspx?page=PageNo2623&flag=1, http://www.millenniumpost.in/no-insurance-against-weather-fraud-110951

cases available for review on the Internet also provide summaries of the responses of the insurers. In the case above, the insurer noted that:

“[a] large number of claims have been disbursed based on this data and it cannot be questioned if the claims are not payable in certain [areas] as per the weather data. The data provided by NCMSL also corroborates the data of IMD and the claims are also not payable as per the IMD data. The claims have been paid twice the premium received in during 2012-2013 and four times during 2011. As such we have not adopted any deceptive practices.”

The approach of this insurer illustrates how important the veracity of the AWS is to the social credibility of the system. Increasingly, I encountered informants suggest to me that this defense has been undermined by incidents of farmers and villagers actually manipulating the AWS readings using various methods to distort the devices measurements of temperature and rainfall, though I was unable to find corroboration to support this.

Another line of complaints has indicated the lack of due diligence by insurance companies in signing up farmers. In one such case, the complaint bureau found that “the insurer did not scrutinize the proposal forms for completeness and adequacy at the time of acceptance of risk and the omission and commission was not detected at the stage of underwriting itself. The insurer failed to comply with due diligence at this stage.” In some cases, the lack of due diligence is an indicator of attempts to include tenant farmers and “marginal cultivators” that have little to no paperwork. However, it is also apparent that the inadequate underwriting and due diligence for index-based policies are incentivized in order to increase the aggregate amount of premium income is reminiscent of the “no-document” processing and overall lack of supervision in the home mortgage underwriting industry prior to the US housing crisis in 2008 (see FCIC 2011).

76 Ibid.
The third limit to the process of risk financialization through the WBCIS is the role of social and political institutions with the capacity to negate the ultimate outcome of the contract. An underwriter at a private insurance firm shared several cases in which state elected officials and from Madhya Pradesh forced insurers to carry out claims payments in situations where the trigger was not technically reached. He explained that this was an increasingly common: “we don’t offer policies because this behavior by politicians introduced the possibility of moral hazard.” Although, political officials may follow this route in order to maintain political favor from their electorate, this is actually a much more systemic design challenge for underwriters modelling risks. Because risk models are often proprietary (“black-boxed”), it can be impossible to scrutinize the extent of “model risk”—the risk from the modelling errors in the contract design—that may affect the payout structure. In concert with the problem of “basis risk,” the two risks, “model risk” and “basis risk,” present uncertainties that undermine the “assurance” and protective thresholds of insurance, and is represented in the limited and, in some cases, decreasing demand for these types of policies in India and elsewhere. Beyond India, for instance, a notable example of the ambiguity of basis risk and model risk exists in the Caribbean Catastrophe Risk Insurance Facility (CCRIF), where countries that were actually affected by a hurricane storm did not receive payouts because the index was not triggered, while in a country that was not affected by the same disaster, the index was triggered. Once the payouts were announced, residents that were actually affected by the disaster protested their country’s participation in the insurance scheme and the CCRIF promised to review its catastrophic modelling for possible errors (Brooks 2011). Brooks (2011) points out how the perceived
illogical outcomes of index-based policies can undermine the legitimacy of the underlying risk model as well as the program as a whole.

4.4.2 Automation Risks

There are several actual outcomes in the practical application of the newly update, revised WBCIS (or RWBCIS) that run counter to what is expected from the process of automation that I would like to discuss here as it relates to geographical risk. In the existing research, the weather data and its automation are what make the weather index-based approach more “reliable, low-cost, and measurable” than yield; consequently, it can solve the problem of moral hazard. I describe the main elements of index insurance "term sheet" to better understand how these mechanics work in index insurance. For example, Figure. 11 shows a typical WBCIS termsheet for a weather-based contract in 2016 kharif season that has coverage for temperature and rain deviations. The main features of the termsheet include four components. At the top, the document specifies the crop insured (Chilli), district (Tehri Garwal), and state (Uttarakhand), which is in northern India. Below that, are the two weather station locations, the main “reference weather station” (RWS) and the “back-up weather station” (BWS), that will be used in the policy. Third, for each stage of crop production, the term sheet specifies the trigger temperature, and aggregate trigger levels for deficit and excess rainfall. The rate of payout is also given in the termsheet. Fourth, at the bottom, the document states the total sum insured, which is given as a rate of rupees per hectare (Rs. 60,000).

In theory, the triggers and pay-out rates are chosen based on historical weather occurrences and their effects on, for example, crop growth, and actuaries are expected to determine the pure risk of the insurance contract from these estimates (Skees 2004). However, in actual implementation,
each State Level Co-ordination Committee on Crop Insurance (SLCCCI) is actually responsible for the design of the scheme by setting the “strike” value that will trigger payout and the rate of that payout. Because of this, state governments have a significant design role in the trigger and pay-out rates for districts insured in their jurisdiction through the “termsheet,” which they create before insurers bid on coverage.

Although there are estimations for the impact of excess and deficit of rainfall, temperature, humidity, and wind speed for the growth of particular crops, the relationship is much more complex and less understood at present. I wanted to better understand the relationship between

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**Figure 4.12** The Government-authorized termsheet for the Revised Weather-based Crop Insurance Scheme (RWBCIS) for Kharif (“summer”) season 2016 Chili crop in the Tehri Garhwal district of Uttarakhand. Source: Government of Uttarakhand.
weather data and insurability for agriculture and interviewed the director of the Indian Meteorological Department’s Agro-meteorological division (IMD Agro-met). Confirming observations from my interviews with insurance underwriters, the financialization of risk through the RWBCIS has highlighted many limits to the program’s reliance on automatic weather station.

"[An] important thing is that when you are doing weather related insurance, you need precise and accurate data, which can justify the loss, gain, etc. But, due to reasons like climate variability, climate change, there are lots of variation over very small distances. The rainfall amounts are different after 10km but if your premium is based on data 10km away that is a problem. This means you need a huge network of weather stations, which we don't have."

The director’s statement about spatial resolution underscores the dominant view that the credibility of the system necessitates higher spatial proximity of weather data collection to the actual object or area insured. This is largely a function of cost and technological capacities and the difference between the measured value at the data collection point and the actual weather event at the insured area is also known as “basis risk” and is one of the most controversial dimensions of index-insurance in India and as well as other countries. Though the issue of proximity has generally been limited by the concerns and costs of land acquisition for placing AWSs, this is no longer necessarily the case in the context of substantial capital investments into rapidly evolving new technological innovations. For instance, emerging technologies already provide a new basis for higher resolution weather data collection using already established cellular networks.77

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However, there is an even more challenging problem facing the future of actuarial automation and weather forecasting. This concerns the concrete, material relationship between weather and crop loss. The director of Agro-Met summarized the main dimensions in terms of variability (as discussed above), sensitivity, and awareness, which I will quote below. He began with the following statement:

"Weather-based crop insurance is not a successful story here...aggregate rainfall amount cannot explain weather sensitivity at various phenological stages of crop development accurately enough...[a] second thing is understanding how sensitive a crop is. Let’s say you have Mango. You have to know what is the relationship between the flower drop and the temperature. There are perennial and annual crops. Different crops have different phenological phases. Each phenological stage is sensitive to the weather and temperature, and form “derivative” values, which [are] the sensitivity that I mentioned. We have a lack of [that] information in India...In addition, a missing component in the WBCIS is a high-resolution modeling of soil moisture, composition, drainage, and other ground conditions which affect crop growth. These limits remain even with high precision AWS readings."

The quote provides a number of important relationships that are not known between the weather and its effects on crop development. As he points out, the lack of that information makes weather forecasting for crop insurance at the scale of very granular geographies very hard to accomplish remotely.

The core requirement of index insurance is precise sensitivity data and this still requires significantly more research for such programs to become operational. The Agromet director added that:

"You need sensitivity, parameters, [that are] high resolution. Which is not...[the case] in India...and very few countries are doing this. In Europe, the problem is not there. Here, variability is so much because of insolation (radiation). Right now, it is not working very scientifically. You just imagine a farmer has taken a premium, and there is no observatory. But, now, insurance companies and the government are getting more serious."
This statement is important to situate the current, historically-specific alignment in India in which both the insurance companies and the government are investing more heavily into crop-weather sensitivity research, data coverage at higher densities, and better modeling for weather parameters. And although there has been ongoing research for decades, what I am trying to show is that the iterative and experimental process is dramatically intensified as a result of significant investment in the financialization of agro-ecological risk. Returning to an earlier point made by the director, a key constraint that limits adoptions and scaling of weather insurance and even weather-sensitive behavior more generally, is the gap between high-level analytics with meaningful communication because:

“You have an ocean of information. How to synthesize the data as needed [in real-time] … there are complexities there… [and we need to] explain it in such a way that farmers, small and marginal, will understand. Because they have a different kind of domain [they use different approaches].

In this statement, the director synthesized what he sees as the challenge of how to make weather data meaningful and actionable for hundreds of millions of farmers, who are supposed to be the main beneficiaries of these technologies and data. I focused on this series of interviews because it highlights the difference in concerns, perspective and objectives of the government’s meteorological department as it operates within the ambit of the financialization of risk, but at the same time, well outside the processes of financialization in which the main concerns are the viability of agricultural production, public information distribution, and reliability and consistency of data collections and analysis. In the next section, I examine the effects of climate change and speed of variability in more detail as a broader planning challenge that also has implications for technological innovation and financialization as well.
4.6 Monsoon Destabilization

Here, I focus on the relevance of weather risk in how I reinterpret the analytic of “fast policy” in the context of agricultural insurance. My concern with Peck and Theodore’s (2015) social-constructivist approach to the increased “speed” of policymaking is that it may understate the material need for rapid policy formation, reform and experimentation in particular contexts. My observations are based on interviews with climatologists and weather scientists addressing weather risks in the agricultural sector.

I begin with the IMD’s Director of Agricultural Meteorology who stated matter-of-factly that the department makes weekly strategic and tactical decisions about planting advisories to farmers in the country. He said:

“Every week, we are sending 1 million messages to the farmers through mobile phones along with advisories. We intend to bring 5 million farmers in the network by next year. The process of registering their mobile numbers for regular updates with weather forecast is under way. To furnish accurate weather forecast at panchayat levels, a decision has been taken to install 2,059 weather stations at mandal levels from the present 54...[at the same time] We share advisories through different communication modes through sms, radio, tv. via 130 agricultural universities, we make a 5-days forecast at 11am on Tuesdays and Fridays at the district level (30-35km resolution). Done through automation. The university experts know the sensitivity. We are [now] moving towards village level (9km resolution).”

Besides the plan to increase the density of weather stations, what I find important is the frequency of advisories and broad coordination across geographies. He finally explained what he saw as his main challenge:

“The greatest challenge is climatic variability. The variability happens at a very short interval. In agriculture, take wheat: if it starts in Nov, [and] if in Jan [or] Feb the temperature is higher than normal, then the crop cannot grow. that's not climate change. which is slow and steady...this is climate variability.”
The distinction regarding the nature of climate variability I think is important to unpack, as it relates to Indian agriculture in the longer and shorter terms. The main, disruptive climatic trend in India is the destabilization of the monsoon weather patterns and increasing unpredictability of the seasons that effectively structure most of Indian agriculture.

Because Indian agrarian production is highly sensitive to the weather, it is important to explain the conventional temporalities of monsoon patterns. There are two annual monsoon systems that pass over the Indian subcontinent: the summer or southwest (SW) monsoon, and the winter or northeast (NE) monsoon (retreating southwest monsoon) and India gets rains in all the seasons due to both tropical and extra-tropical weather systems, such as: monsoon low pressure areas, depressions, thunderstorms, tropical cyclones, and western disturbances. However, the summer or the southwest monsoon season (June-September), the main rainy season, which is often called “Kharif” contributes to about 75-80 per cent of the total annual rainfall, with high average rainfall in the east in states such as West Bengal. The contribution from the winter (January-February), pre-monsoon (March-May) and the post or north-east monsoon (October-December), which is primarily called, “Rabi” is not very significant, but important to particular regions (e.g. Punjab). Any major structural shift in the pattern impacts the country’s economy because it relies so heavily on the agriculture output.78 According the popular accounts, “a rainfall deficit by a few inches leads the central bank of the country to change reserve ratios.” As an example, in 2009, the widespread drought led to spiraling prices and historic increases in inflation (Ray 2016).

The lack of or a deficit in rainfall overall should be distinguished from the occurrence and impacts of uneven rainfall intensity across the country. For instance, the temporal disparity of intense rainfall events has decreased the precision of estimations for drought vulnerability as total rainfall volumes are reported as normal or above normal. For instance, in one of the regions that I studied, Western Maharashtra, Akola district received only 60 per cent (500mm) of its average annual rainfall (692 mm) in 2015 but 400 mm of that rain took place over two days, on August 4th and 5th. Fields in this district flooded and rainwater could not percolate into the ground. The localized impacts of changing, uneven rainfall intensity can be manageably offset through a variety of mechanisms. One of these is shifts in cultivation patterns which are challenging but often necessary in adapting to new rainfall patterns. For instance, farmers in Odisha reported using early maturing varieties of seeds and diversifying the seed varieties as important adaptation actions to deal with climate risks (Panda 2013: 67-8). Over the years Panda (2013) finds that farmers are shifting to shorter varieties of paddy rice along with diversification of the varieties of seeds, because the varieties of seeds they were using earlier, especially in the case of paddy, are no longer suited to the emergent climate parameters that are shortening the growing seasons. The changes in cropping patterns following widespread uncertainty and variation of weather patterns present more complex challenges for the entire region more broadly.

Researchers at IIT Madras studied the daily rainfall data of 165 stations across the region to ascertain their extreme point rainfall events (EPREs) — highest rainfall in 24 hours — and studied whether there was any change in the number and intensity of such events during the past four decades. They discovered that the frequency of such events had gone up considerably after
1960, with an alarming rise in the intensity of the rains. Across the country, the changing intensity of the monsoon and long gaps between rainy days pose significant risks to India’s agricultural system in which 60-65% of cultivated land is rain-fed and lacks irrigation infrastructure. Such climate variability is a considerable planning concerns because “a structural shift in the pattern of the annual rainfall would force a change in cropping patterns in the country” (Goswami et al 2006). Lobell and Schlenker view these not as predictions of actual impacts, but rather as a useful “measure of the pace of climate change” in the context of agriculture: “the greater the estimated impacts, the faster any adaptation or action to raise yields would have to occur to offset potential losses.”79 Rapid fluctuations of excess and deficit rainfall and other, often uncertain, weather necessitate highly responsive forms of planning and policy, and the relevant support of new, real-time technologies, which may well emerge from transnational policy, scholarly, and commercial industry circuits of knowledge and technical production.

4.7 Fast Policy and Risk Capital

“If we don’t move, it could well be that technology companies will move, and they will start offering insurance... [and] if the growth is going to come from high-growth markets, we start realizing that pushing the old machinery into the new markets may not work. We have to reinvent ourselves, our processes and the customer experience.”
Paul Meeusen, Project lead at B3i, Swiss Re.80

4.7.1 Understanding Float and Underwriting Data

In this last section, I argue that the most understated factor pushing “fast policy” and reinforcing the churning of new technology and weather data in agriculture is the growing intensity of

80 http://www.reuters.com/article/us-insurance-blockchain-swiss-re-idUSKBN15924K
competition over “float” profits from risk capital and the ways in which that, in turn, shapes and creates the market for diverse risks and its expansion into public agriculture insurance programs and state fiscal strategies financing disaster risk. In this section, I will describe the centrality of “float” in the accumulation logic of risk capital based on interview transcripts from several reinsurance and insurance firms involved in India’s agricultural insurance program. Following that, I will explain how reinsurance firms have impacted the development of weather data and technology since the 1970s internationally. I conclude with references to relevant restructuring of reinsurance markets, which are seeing even more intense competition from hedge funds and “alternative risk transfer” techniques, allowing investors in capital markets to take a more direct role in providing insurance and reinsurance protection, bringing about a tighter convergence of insurance and financial markets. Finally, I draw attention to (often deliberate) conflation in the policy literature between form of "risk finance" as opposed to "risk transfer," which disguise the ways in which forms of risk transfer and pooling can been distinguished from the financialization of risk.

Despite how general insurers describe their core business logic, their key mechanism for profit is rarely through the “front-end” premiums they collect. I interviewed several general (property/casualty) insurance underwriters that underscored this fact. One underwriter from a public insurance company said, “most of our insurance lines [such as auto, fire, property] do not have to make any underwriting profit most years. Most insurers regularly operate at an underwriting loss, meaning that they pay out more money in claims than they bring in as premiums.” To understand how weather risk is financialized, Warren Buffet’s 2009 annual letter to Berkshire Hathaway’s shareholders is instructive. In it, Warren Buffet casually explains to his
shareholder how the company has made massive amounts of money collecting sums of money known as “float” in advance for claims to be paid later, and invest this money in the in-between time for their own benefit and that of their shareholders:

“Our float has grown from $16 million in 1967, when we entered the business, to $62 billion at the end of 2009...Insurers receive premiums upfront and pay claims later. ... This collect-now, pay-later model leaves us holding large sums — money we call "float" — that will eventually go to others. Meanwhile, we get to invest this float for Berkshire's benefit...If premiums exceed the total of expenses and eventual losses, we register an underwriting profit that adds to the investment income produced from the float. This combination allows us to enjoy the use of free money — and, better yet, get paid for holding it. Alas, the hope of this happy result attracts intense competition, so vigorous in most years as to cause the P/C industry as a whole to operate at a significant underwriting loss. This loss, in effect, is what the industry pays to hold its float. Usually this cost is fairly low, but in some catastrophe-ridden years the cost from underwriting losses more than eats up the income derived from use of float.”

As an insurer's business grows, so does its float. In fact, Berkshire's insurance float reached $91.6 billion in 2016. Investing the float has been Berkshire's primary mechanism of growth over the years, and is how the company has grown into the massive conglomerate it is today. Buffett refers to the property-casualty insurance business as "the engine that has propelled our expansion since 1967." The impact of accumulated float for the overall profit of a company is a function of where it is invested, which is why insurance float is a major source of capital in financial assets and investments globally.

Following the implementation of the PMFBY, India became the third largest agricultural insurance market after the US and Canada, with gross premium of over $3 billion. As discussed in Chapter 5, the new structure of riskholding is such that the rates and terms for domestic crop insurance are being driven by reinsurance firms as 75 percent of the capital is provided by 25 reinsurance firms (see Figure. 12), now a major driving force in the pricing, structuring, and

sustainability of PMFBY and RWBCIS programs, rather than the insurance companies
themselves. But, both the reinsurance firms and the insurers that they transact with are concerned
with accumulating floats and have achieved dramatic growth though the PMFBY. According to
the G Srinivasan, Managing Director of New India Assurance, annual growth of 27 percent for
2016 came from the traditional lines like fire, marine, motor, health but most significantly from
the PMFBY, “which has really pushed the premium growth of the general insurance sector. This
year we will cross 21000 crores (approximately $3.23 billion) …[and] our premium will reach at
least 21500 crores so it is much more than what we anticipated. Talking about the foreign
business, we are doing very well, we are looking at something around 3500 crores as our global
(non-India) premium. It will be about 18% of our global business.” 82 For perspective, prior to
the PMFBY, on average the firm had assets of over Rs 60,000 crore and premium income of over
Rs 18,000 crore. On average, analysts of the insurance sector estimate that a 10 percent share
float would fetch Rs 5,000 crores ($779 million) through investments. 83 In the excerpt from
Buffet’s letter, he highlights the “intense competition” that results from firms seeking such
“float” income. Currently the reinsurance sector is being restructured—the ultimate goal of
which is the commoditization of insurance-linked securities, and influx of alternative capital

83 New India Assurance explains its current investment strategies in the following way: “We had maintained the
same trend, in the sense we have a huge equity base and also a large debt investments. We clearly see the interest
rates falling, the equity market has also been quite volatile so we have kept a balance in terms of both equity as well
as debt instruments. In case of equity we really have invested in companies, which are fundamentally strong from a
long-term perspective, we are long term players in the equity market. In case of debt, we really need investment debt
instruments for the sake of regular income and also liquidity so we have also reasonably invested. This year
probably around 3000 crores that is the annual accretion we always do. Today our market value of investments is
close to 50000 crores.”
&utm_campaign=cppst
seeking greater and greater exposure to diverse risk, pose potential risk to the system as a whole for the accumulation of “float” profits.

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Figure 4.13 This is a list of the Reinsurers that have signed reinsurance treaties with Indian Agricultural Insurance firms to provide risk capital for the PMFBY for the 2016-2017 period.

An important corollary to intense competition has been dramatic expansion of new insurance markets outside of Europe and North American (described in the industry as the “Southern Surge”),\(^\text{84}\) the need for standardization of models for “risk-trading,” and the demand for better and new types of crop-specific risk data such as drought risk,\(^\text{85}\) which strengthen risk capital hedging strategies especially because it is not correlated with most other types of risk. First, agricultural insurance has tended to be highly specialized and relatively “unmodeled.” One

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\(^{84}\) The Southern Surge: Prospects for insurance and financial services in India and South East Asia. www.cii.co.uk/media/2256091/cii_the_southern_surge_1july2010_0.pdf

reason why insurers have started using new agriculture models\textsuperscript{86} to assess large loss potentials is in large part because of specific solvency requirements for agriculture risks by domestic insurance regulators (like in China). As a result, agriculture risk models are becoming more sophisticated and standardized as markets grow and exposures increase underlined by the demand of key stakeholders to model and report risks in this growing line of business. Second, tracing the riskholding strategies that result from the financialization of reinsurance—increasingly called “risk capital”—are important for understanding the growing relevance of agricultural risk for hedging and "risk diversification" from other lines of insurance business. Because reinsurers operate in competition with other firms seeking the optimal allocation of risks, reinsurers are incentivized to expand their "risk appetites" across different "pots of capital" between risk-types. For instance, several risk-types include: "Gulf of Mexico windstorm, California earthquake, Japanese earthquake, U.S. Casualty, and so forth...agriculture can be an important part of the portfolio because it provides capital efficiency in hedging for more volatile, albeit higher-priced risk types (Jarzabkowski et al 2015: 131-2). The significance of these dynamics for India’s agriculture is important to draw out. As will be discussed in more detail in the next chapter, the massive influx of capital investment into the country’s insurance infrastructure and market puts upward pressure on actuarial pricing because risk capital in the agricultural sector at present is driven by the supply of such capital needed for the entire system to function. Another outcome of increased involvement of reinsurance and risk capital in India’s agriculture through existing market mechanism will negatively affect inequalities between those

\textsuperscript{86} New frontiers in agricultural insurance, The Actuary, 05 MARCH 2015, AUGUSTE BOISSONNADE, http://www.theactuary.com/features/2015/03/new-frontiers-in-agriculture/. Though, in places where there is a lack of "sufficient data" is not a barrier in itself. There are many risks that insurers take on without an adequate model. As Jarzabkoski et al (2015) corroborate with countless reinsurance underwriters in their ethnography of the industry, the Thai floods, which cause over $16 billion of insured damage was not modeled. And increasingly, the uncertainty and lack of adequate models, have been essential as insurers quickly catch up to cover what are called "frontier risks" in rapidly industrializing regions and in rapidly developing markets, such as cyber risk.
that can afford such protection and those than cannot. And lastly, the permutation of finance, weather technology, and data will drive new outcomes that are difficult to predict. This last point is explored more in depth below.

It is important to understand the mutually reinforcing logics of financialization, weather data and the technology development, as seen from the historical development of the reinsurance sector. Although the reinsurance industry and several firms in particular, including Munich Re and Swiss Re, date back to the 1800s, it was only more recently in the 1970s that these firms saw a growing importance of natural disasters data for their business liabilities. This was a consequence of disasters that occurred in less developed regions and had an unexpected impact on the international reinsurance market. Examples include the earthquake in Managua/Nicaragua in 1972 (US$ 80 million insured loss) and the tropical cyclone Tracy in Darwin/Australia in 1974 (US$ 250 million insured loss). Following this in 1974, Munich Re, the world largest reinsurer, formed the Geo Risks Research Group employing over 20 geoscientists from different disciplines and in 1979 developed the World Map of Natural Hazards mapping probabilities for hazard across the world and the world largest global natural disaster database for the purposes of risk identification (Berz et al 2001). The use of computer-based statistical models by reinsurance companies for analyzing the probability of an event originated as late as the 1980s with the growing financial impact of natural disasters (Lengwiler 2016). Reinsurers mark the change in industry that took place after Hurricane Andrew which struck the Southeast of the Unites States in 1992, as “changing the game in reinsurance analysis, shifting evaluation towards more sophisticated analytic techniques seen as appropriate to the finance industry” (Jarzabkowski et al 2015: 68).
Based on my interviews with reinsurers including Swiss Re and GIC Re, these firms are positioned at higher levels of financialization and control over the transfer of risks across local, regional, national, and transnational scales, with a significant effective demand for rapid weather data availability, standardization, and experimentation. This is evidenced by the many recent index-based experimental pilots and partnerships across many countries and scales that these reinsurance firms are engaged in across the world. The increase in foreign direct investment through agricultural reinsurance contracts has led to an increasing demand for more real-time and more reliable data about the exposure at risk, its vulnerability to the different perils, and transparency on understanding the physical nature of these perils (Kunreuther et al 2013, Kunreuther et al 2011).

This approach puts into context how weather and climate risk are manipulated and new risks generated within the dynamic relationship between actuarial financialization, the demand for new forms of data, and technological disruption. In this context, technological disruption in weather technology and the logic of float capital accumulation may unfortunately express what David Harvey more generally describes what happens... “when...two fetish beliefs in technological and spatio-temporal fixes collide, they feed off each other in frenzies of technological innovation designed to circumvent all temporal and spatial limits to the circulation of capital” (2011: 158). Johnson (2013) builds on this insight to describe how the demand for more data and standardized models follows from the rapid financialization of “exposures” to geophysical, biological, and meteorological catastrophic events that are constituted as securitizable and exchangeable financial investments in the insurance-linked securities (ILS)
market. Catastrophic events—“acts of god”—come to be increasingly understood as just another financial risk amenable to financial instrumentations, exchange, and innovations that have become common in the global reinsurance industry (Ghesquiere and Mahul 2007) with the growing possibility that financialization of agro-ecological risk may eventually contribute global systemic risk in much the same way as the real estate mortgage market (Jarzabkowski et al 2015).

In this chapter, my goal has been to explain the mutually reinforcing and constitutive logic of ongoing restructuring across new weather technologies, weather data, financial institutions that play a crucial role in this project of actuarial development. For national government weather insurance programs in India and beyond, the role of and reliance on reinsurance firms (also known as “risk capital”) has amplified substantially. Reinsurance firms have the larger balance sheet relative to the fiscal liquidity of individual governments, which are often pressured by institutions like the World Bank, creditors, credit rating agencies, to decrease contingent liabilities. As a result, government fiscal liabilities such as drought assistance, flood insurance, crop insurance, have increasingly been rescaled, restructured and influenced state-fiscal liability and risk territoriality. I have showed how that dynamic intersects with the competition for new technologies and weather data, all within a context of increasingly volatile climatological conditions, where historical data models either do not exist and have less and less explanatory power. In the next chapter, I explain the longer policy and regulatory history of India’s shift towards more short-term financialized approaches.
CHAPTER 5: AGRICULTURAL “RISKHOLDING” AND FAST POLICY IN THE CONTEXT FINANCIALIZATION

“What is insured is not the injury that is actually lived, suffered and resented by the person it happens to, but a capital against whose loss the insurer offers a guarantee”
(Ewald 1991: 204).87

Early on in my fieldwork, I had a chance to meet with several of the early planners of India’s first national agricultural insurance programs. They observed the industry develop around them and made important policy decisions that continue to shape the structure of the programs and policies in place today. Some of these interventions included policies ranging from the increase in foreign direct investment (FDI) as well as the privatization of insurance implementation to the introduction of automation and derivative-based instruments that began in 2003 (described in the previous chapter). I was struck by the ways in which many of these experts explained risk and its management in highly discrete terms. For instance, I was told:

“There is a fixed quantity of risk—close to 20-22%—that farmers face. Insurance can manage to transfer close to 5-8% of that amount. So, the rest has to be managed through other means.”

This statement was an implied critique of the government’s insurance program for leaving a 12-14% gap in the coverage facing farmers as a real measurable and objective quantity to manage and contain using the techniques of insurance (complemented by other policy measures) and to reduce discrete “amounts of risk.” This conception is based on a stylized representation (see Figure 5.1) of the potential for financial loss that may affect farmers who make up the largest group of borrowers. Factors such as a farmer’s access to irrigation and insurance substantially changes interest rates for borrowers, which negatively affects the majority of India’s farmers that have the least access to such resources. Thus, farmers relying on rainfed agricultural production,

which constitute the majority of all farmers in India and globally as well, cannot afford formal crop finance, because banks perceive their risks as too high. For example, banks calculate interest rates that they will charge borrowers and often screen out potential borrowers based on the risk of non-repayment, also described as “moral (hazard) risk” (Hess 2003: 8). Weather insurance schemes aim to transfer such systemic risk out of the farmer-bank relationship into insurance markets.

Figure 5.1 Bank perception of crop loan risk Source: Ulrich Hess (2003: 7)

This discrete, quantitative definition for ultimately pricing risk by the financial sector begs for more anthropological concerns related to “ownership,” commodification of risk transfer, and the construction of risk price (Guyer 2009). As Guyer puts it, if “risk is ‘transferred’ not eliminated

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… what is ‘risk’ as a transacted ‘thing’? And to whom is it transferred? Since [risk] mitigation can only ever be partial, where is the excess located in relation to a theory of ownership?” (Guyer 2009 cited in Johnson 2013: 2668). I was forced to think about Guyer’s question in response to a statement I had received from a senior global risk transfer expert that has designed national disaster risk financing projects in several countries:

“unless a potential insurance purchaser thinks they own the risk and need to manage it then they are not going to pay premium—or not on a sustained basis—because it seems expensive next to the alternative (which is paying nothing, as they don’t think they own the risk). If we can broker agreement about which actors take responsibility for which part of the risk pie in any particular setting then appropriate tools can be put in place—including index insurance (which should be subsidized if it is the most efficient way to manage risk, and the risk ownership is agreed as split between farmers and the state, for example)”

What we find is that the discourse of weather insurance has much in common with other kinds of developmental financialization that “returns responsibility to subjects at risk … [who] are now perceived as risk frontiers” (Roy 2012: 139). The implications for planning are important to make explicit because, increasingly, such approaches depend on financializing individuals and families and shifting the responsibility of planning and provisioning from socialized institutions to financial markets and individual accounts (Martin 2002; Peck 2011; Roy 2012).

5.1 Introduction

Though policymakers and development practitioners since independence have had a continuous concern with vulnerability to weather, it was never quite as concrete or urgent a concern as the

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89 Email correspondence on February 2017 with a senior disaster risk expert who has designed and overseen several regional, multi-country disaster risk financing programs.
problems of agricultural productivity, landholding, and inequality. Since the Green Revolution period, India’s agricultural policy has shifted from one centered on augmenting agrarian landholding, irrigation structures and high-yielding inputs toward policies expanding subsidized credit circuits and insured territory—what I call “riskholding.” In chapter 4, I described the emergent financialization of risk, new instruments, and technologies that are shaping India’s agricultural landscape. In this chapter, I investigate how such a system emerged and why it has taken the form that it has.

From the 1970s, what I show is that state governments across India, regional banks, and credit cooperatives, in particular, sought ways to manage the financial risks from chronic crop failure and farmer defaults. Importantly, the actual institutional practices and policies were drawn from experiences and dialogues with transnational institutions and policy networks including the World Bank, US-based agricultural economists, and Indian statisticians. I examine this shift in terms of the significant rise in insurance contracts, cumulative sum insured, and area under insurance as it relates to ongoing processes of insurance-sector liberalization, debt-based production of agriculture, and uneven landholding and cultivation conditions across states. My first, overarching argument in this chapter is that agricultural insurance operates as a “policy fix” (Peck and Theodore 2015) for a set of crises that were impacting the most important sector for employment in India. The idea of crop insurance was not necessarily new to Indian planners and scholars that have been thinking and writing about how to systematically hedge losses from chronic droughts for over a century. However, the aggregate financial risks and systematic defaults that resulted from Green Revolution–era cheap credit and new regulatory conditions
prompted the initial pilot insurance programs for B4 cotton that would eventually become a central feature of agricultural policy for virtually all crop cultivation across India.

This background situates the two programs that are the latest incarnation of a longer trajectory of post-liberalization territorial planning, which are the focus of my dissertation research: the Pradhan Mantri Fasal Bima Yojana (PMFBY), an area-yield-based insurance program, and the Revised Weather Based Crop Insurance Scheme (RWBCIS), which is an index-based insurance program that originated as a weather derivative product in the United States. I review the evolution of the agricultural insurance programs that India established and then explain the influences that have brought about the current financialized actuarial regime. The overview follows the successive programs that the government developed and provides more concrete details of the coverage amounts and policy details that define each program. Drawing on the fast policy framework, my aim is to provide an understanding of the iterative, experimental, and failure-laden process that actuarial regimes go through as well as to offer explanations for the continued expansion of weather insurance, much like other “fast policies,” albeit in new, “mutated” forms (Peck 2011). This information will be important to understand the structure of crop insurance and its rapid financialization.

Second, I argue that the state’s focus on riskholding took place in an emergent, transnational neoliberal policy environment that was only just beginning to generate new experimental forms of financialization in response to fiscal crises and foreign exchange instability both in India and

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91 The Prime Minister’s Crop Insurance Scheme
across the globe, as explained earlier (Arrighi 1994). I show how the causes for insurance
financialization follow in line with previous explanations following macro-economic regulatory
restructuring (Krippener 2005), in this case, through new preferential support for insurance,
beginning with the Uruguay Round Trade Agreement and the World Trade Organization (WTO).
However, I point out that the actual financialization of riskholding was not automatic or
predetermined. To explain this process of transformation, I argue that India’s actuarial
financialization follows iterative, failure-prone patterns of “fast policy” (Jessop and Peck 2000;
Peck 2011; Peck and Theodore 2015). As mentioned, these processes developed through and
alongside transnational circuits of finance, knowledge, and policymaking—in particular, with
agricultural economists designing similar crop insurance programs in the United States and
working at the World Bank. Through this argument, I illustrate the ways the two processes of
financialization and fast policy (and their respective literatures) intersect using the crop insurance
programs in the United States and India, which persists despite systematic contradictions and
failures that continue to the present day.

Lastly, I want to highlight the direct planning implications of these arguments. The focus on
financialized riskholding has led to the creation of new regulatory institutions, the embedding of
small farmers into complex risk-transfer and financial markets, and a diminished concern about
addressing longer term inequities and investments. This is because the focus on insurance
magnifies the salience of short-term, seasonal financial risk relative to more entrenched
structures, such as the distribution of land (landholding), and more generally towards risk-
hedging strategies instead of investment and development, which were the basis of policy
concerns about landholding and productivity that dominated the post-independence period
including the Green Revolution. Because insurance-based riskholding is built on existing financial systems that are increasingly uneven and hierarchical, I argue that the current rounds of financialization are characterized by the rescaling of power relations through the asymmetric empowerment of reinsurers and risk capital. As will be further explored in the following chapter, this approach normalizes the unsustainable and destabilizing ontology of crop risks as a discrete, measurable, and objective quantity to be managed separately from broader relations of resource access, ecological systems, and socio-economic inequality.

5.2 Agricultural Insurance as Fast Policy?

For the agrarian sector, the period following the Green Revolution witnessed diminished state investment in longer-term infrastructure and addressing massive inequalities. Meanwhile, the liberalization of the agrarian sector forced small farmers to compete in a global market where commodity prices were far more volatile and the reduction of government subsidies has made farming more expensive, and subsidized credit has increased indebtedness. State governments across India, along with regional banks and credit cooperatives, sought ways to manage the financial risks from increasing costs of chronic crop failure and farmer defaults. My argument is that from this period onwards, insurance begins to operate as a “policy fix” (Peck and Theodore 2015) for a set of crises that were impacting agricultural production—the largest and most important sector for employment in India.

In this section, I review in some detail the evolution of agricultural insurance in India in order to explain what I mean by a shift toward financialized “riskholding,” which expresses the government’s concern about the ways in which the financial risks of agricultural producers are
managed and transferred that is different from earlier spatial planning strategies focusing on landholding (land reform) in the 1940s and 1950s and infrastructure for productivity in the 1960s and 1970s. I follow the evolution of the agricultural insurance programs and explain the influences that have brought about the current actuarial regime. The overview follows the successive programs that the government developed and provides more concrete details of the coverage amounts and policy details as they relate to broader policy imperatives related to liberalization and financialization. The aim is to provide an understanding of the iterative and experimental process that actuarial regimes go through that is important to understand the punctuated intersections between the networks of financialization, crop insurance, and risk management.

Although, weather risks such as drought were a challenge well before this period, by the 1970s, Green Revolution shifts in production led to the planting of similar crop varieties that were found to have heightened sensitivity to weather and dependence on significant chemical inputs and water. The patterns of covariance in yield growth and losses became apparent as new seed varieties together with credit programs were spreading throughout India (Pinstrup and Hazell 1985; Mehra 1981). In his later years, Michael Lipton, famous for his research on “urban bias,” focused on studying how poverty was increasingly concentrated in rural areas with little water control, intensifying rural drought and water shortages. The high-yielding seeds promoted by the Green Revolution were most beneficial to farmers with irrigation facilities or fairly secure rainfall, and eventually, as agricultural research shifted to the private sector, its results became

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less smallholder friendly and less employment intensive. Ultimately, the problem of concentrated poverty and inequality has been pushed to the background, especially in the context of broader growth. Yet, based on over two decades of findings reported in The World Development Report (2000), Lipton et al. show that “[t]he positive connections between agricultural research and human development have sharply weakened” (Lipton et al. 2002: 123)94 because of the rising impact of “damaging fluctuations” such as drought, flooding, and other risks as major drivers of poverty and inequality post-Green Revolution. Further, Sinha and Lipton (2001) point out that up to half of the people below the poverty line at the time of a survey “are not usually poor, but have been pushed into poverty by ‘damaging fluctuations,’ and the proportion of these fluctuations is higher in un-irrigated, semi-arid or arid rural areas than elsewhere.”95

In official policy discourse, though, the argument for insurance and the implementation of “actuarial regimes” is more a function of state strategies of balancing fiscal politics with the weather risk inherent to a society dependent on agriculture. With approximately 53.8 million victims, droughts constitute most of all climatological disaster victims in 2015 and 48.8% of all disaster victims, though they constitute a small percentage of disaster deaths at 3.5 percent of the total (Guha-Sapir et al 2016: 27). Droughts have the most persistent effect on development in terms of food security, livelihoods, water access, and health. To understand the financial scale of droughts, one of the most devastating droughts took place in 2002. That year there was an average annual reduction in food grains of 29 million tons, a decrease in area sown of 18.53

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million ha, and cropped area damaged of 47 million ha, 150 million cattle affected, loss of rural employment by Rs. 1.25 billion ($192mn), decline in the agricultural GDP of 3.1%, and a loss of agricultural income that approximated Rs. 390 billion ($6bn). As I will show, one of the main arguments by the government for investing in actuarial development was to contain the rising and unpredictable costs of weather risks.

5.2.1 Pickup Up Speed: Insurance Policies in the 1970s and 1980s

Beginning in 1972, with the guidance of V. M. Dandekar, a student of P. C. Mahalanobis, the renowned Indian statistician, the General Insurance Department of the Life Insurance Corporation (LIC) of India introduced the Crop Insurance Scheme on H-4 cotton variety in Gujarat. The policy continued up to 1978-79, and midway through the program Dandekar penned an article urging policymakers to make agricultural insurance a government priority. In a uniquely long, textbook-like article in the Economic and Political Weekly, he began:

"the whole question of introducing crop insurance in the country has been given an expert burial. Moreover, this has been so expertly done that no room is left for an introduction of crop insurance in the near future even on a pilot or an experimental basis. A renewed plea

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See also DMC. 2015, Global Estimates 2015: People displaced by disaster. http://www.internal displacement org/assets/library/Media201507-globalEstimates-201520150713-global-estimates-2015-en-v1 pdf. While drought risk is the most widespread in India, flooding causes a range of short and long-term devastating impacts. The Ganges-Brahmaputra and Indus river systems in the North and Eastern states of India are highly prone to flooding, with the magnitude of land affected by floods having more than doubled in the recent decades. Land area affected by floods increased from about 19 million ha in the 1950s to approximately 40 million ha in 2003. This is about 12 percent of India’s geographic area. Between 2008-2013, over 46 million people were displaced by sudden disaster in South Asia, more than half (26 million) in India. This trend has tended to increase inequality, landlessness, and vulnerability to ecological risk.

98 During that same year, the new government administration led by Prime Minister Indira Gandhi (as discussed above), rapidly implemented a financial nationalization process and through an Act of Parliament nationalized the general insurance business.
for its introduction must, therefore, begin at the beginning and argue beginning with the first principles” (Dandekar 1976: A-62)

For over thirty years beginning with the third Five-Year plan, there had been contestation over the relevance and viability of crop insurance “in a country where agriculture is at the mercy of the vagaries of the monsoon and beyond the control of the farmer” (ibid: A-60). Policymakers took the program seriously and, following new financial sector reforms, a new entity, the General Insurance Corporation of India (GIC), was created by the government to manage all of India’s non-life insurance programs and took over the experimental scheme of H-4 cotton in 1973. The scheme was extended to Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu, and West Bengal, and covered more crops including, cotton, wheat, groundnut, and potato. The geography of cultivation varies significantly across states (Figure 5.2), and the program followed an iterative process in its expansion. It deliberately selected 3,110 well-resourced farmers having assured irrigation and an assured supply of crucial agricultural inputs, such as high-yielding variety (HYV) seeds, fertilizers, pesticides, and other inputs. The insurance scheme was financed by the central government and offered to farmers voluntarily.
What became clear after the first pilot project was that there was need for insurance to address the default risk of increasingly indebted farmers post Green Revolution. However, the terms of insurance—its actuarial formulas—and the responsibility of payment and participation were the focus of reforms and debates going forward. The individual state pilot allowed the policy to engage interested policymakers in the actual design and financing strategies of the program. This first pilot was by all accounts an actuarial failure. For instance, in the final year, the program collected a total premium of Rs. 4.54 lakhs (Rs 454,000 = $56,750 in 1978 INR/USD exchange rate) against claims of Rs. 37.88 lakhs (Rs. 3,788,000 = $473,500). There was a loss ratio of 8.34, which meant that the payout on claims were 8.34 times higher than the premiums paid by
the farmers. The relatively high loss ratio of this program led to rethinking of the actuarial basis of the program.

Importantly, the 1972 crop insurance pilot was modeled on the US program, which was first piloted in 1938. This approach was based on an “individual approach,” which is simply the calculation of actuarial rates, assessment, and claims processing on a per-individual basis. Although it was possible to find a smaller subset of eligible farmers, the policymakers realized that individualized insurance could not scale, especially as the cost of such insurance policies would be unaffordable to most of the farmers, who had less than two acres of land and very little financial liquidity. Based on new recommendations from V. M. Dandekar, in 1979, the Government of India financed a new Pilot Crop Insurance Scheme (PCIS), making several significant changes in conditionality focused on tightening the relationship between insurance and institutional credit by making crop insurance mandatory for “loanees” (borrowers of agricultural credit). Because of this, the crop insurance was limited to loanee farmers only. The scheme was implemented first in three States: Gujarat, Tamil Nadu, and West Bengal in the Kharif (summer season) on pilot basis and was later extended to nine more states.

For the new program, policymakers approved a different, less costly method of implementation from the conventional approach (a “mutation,” in the language of Peck and Theodore [2015]), moving from an individual farm-based insurance to an area yield based (“homogenous”) approach. I review the “area-yield approach” and its components here because the method of implementation relates to new forms of riskholding, indexing, and financialization. The exact geographical area used in the “area approach” was specified for each approved crop. In the 1979
program, the tehsil (a fiscal and administrative subdivision below the district level) was considered an Insured Unit (IU) (See Figure 5.3), and the government began calculating average each seasonal area-yield (SAY) estimate based on harvested production measurements by village-level officials taken at a series of randomly chosen Crop Cutting Experiment (CCE) locations using a statistical table. The CCE measurement results are the basis for the SAY and the probable yield (PY), which is based on a 3-year moving average of SAY for rice and wheat crops and a 5-year moving average for all other crops. The way the insurance would work is that if the observed seasonal area-yield (SAY) per hectare of the insured crop for the defined Insured Unit (IU) falls below a specific threshold yield (TY), all insured farmers growing that crop in the defined area will get the same indemnity payment (per unit of sum insured). Lastly, three “coverage levels” were available with the TY set at 60, 80, and 90 percent of the area PY, fixed by crop at the state level.99 What is important to note is that the difference between the TY estimate and the actual CCE measurement for a given year is the basis for the risk transfer through various insurance instruments and policies. The difference in amount corresponds to price loss estimates and this is the “underlying” basis of the area-yield insurance contracts for India’s farmers and their relationship to the broader risk capital networks that back forms of riskholding.

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99 The coverage levels for TY used in an insurance contract at 60, 80, and 90 are based on coefficient of variation (CV), for yields in the ranges of: greater than 30 percent, 16-30 percent, and 15 percent or less, respectively.
The 1979 scheme was particularly significant for establishing a new remote and probabilistic assessment methodology as a way to scale insurance adoption and a new approach to riskholding in the country. And, for the first time, this program formally pegged the amount insured ("sum insured") to the agricultural loan taken out for growing the insured crop. Premium charges payable by small and marginal farmers were subsidized by 50 percent shared equally between the state and central governments. But because the insurance was linked to crop loans, many small and marginal farmers could not participate in the crop insurance scheme because a majority of these farms had poor access to institutional credit, and even those with access often had no way to learn about the program (Raju and Chand 2008).^100^ The entire program was

^100^ Raju S S and Ramesh C (2008) Agriculture Insurance in India: Problems and Prospects, *NCAP Working Paper* No. 8. The 1979 program covered cereals, millets, oilseeds, potato and chickpea. The maximum sum insured was 100 percent of the crop loan, which was later increased to 150 percent and the insurance premium ranged from 5 to 10 percent of the sum insured.
financed through the GIC based on budget allocations from the central government, and with the success of the program, an All-Risk Comprehensive Crop Insurance Scheme (CCIS) for major crops was introduced in April 1985, coinciding with the introduction of the Seventh Five-Year Plan.

By the end of first year of the program, this scheme surpassed all other fiscal expenditures as the main instrument for provision of risk management for farmers. I mark this as a signal moment in the shift towards more intensive risk management for what was arguably the country’s most vulnerable population through new mechanisms like actuarial insurance linked to short-term credit. As the scale of the program increased, so did efforts to manipulate it and there was more systematic scrutiny. In particular, two key problems emerged. First, there was low adoption from the small and marginal farmers. While they accounted for approximately 61 percent of the population, their participation in the CCIS was between 31-41 percent during the 1985-1994 Kharif season. Second, as Mishra (1995) documented, there was significant corruption and fraud by village-level officials in the implementation of the program. He documents widespread reports of how farmers “pressurize village level officials conducting crop cutting experiments (CCEs)” to underestimate the crop yields so that farmers in that area could get guaranteed indemnity payments. The scheme was optional for state governments to adopt and even so, 15 states and 2 union territories implemented the scheme until Kharif 1999, though as will be discussed more in chapter 6, the most agriculturally developed state of Punjab did not participate in the scheme nor in any other future schemes. Overall, the criticisms of low adoption by a majority of farmers and systematic vulnerability to manipulation at the village level ultimately called into question the massive investment in and management of the program.
5.2.2 Index Insurance as Vector of Fast Policy Integration and Financialization

The actual design and structure of the insurance approach adopted in India drew heavily from the US system and US-trained agricultural economists (Wright 2014; Kapur 1997). The US crop insurance system evolved in the 1970s in response to political pressure against other state disaster-relief funding mechanisms, which I show in this section has strong parallels to the development of crop insurance in India in several key ways. According to policy and theoretical expectations, insurance policies in agriculture promised that if properly designed, managed, and actuarially priced, crop insurance is expected to be self-sustaining in the model.

Yet by the late 1980s and early 1990s, there was much debate over how to fix what were perceived as the “failures” of the Federal crop insurance program. The US Crop Insurance Program is also notorious for being actuarially unsound despite spending the most fiscal resources of any country, and provides an important example of the core problems in the actuarial approach and the limits to government reinsurance. Importantly, both approaches reach similar conclusions that indicate that traditional actuarial approaches to crop weather risk are not tenable on their own, and instead require new forms of financialization through new financial instruments and reinsurance agreements.

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101 In a comparative case perspective, crop insurance in the United States evolved as a way to manage the government’s response to variegated drought risk, and was a key reference for the Indian insurance programs designs from the 1970s. The Federal Crop Insurance Improvement Act of 1980 made crop insurance the primary form of disaster protection for agricultural producers, replacing a standing disaster assistance program with subsidized crop insurance. To encourage sales, private companies were enlisted to deliver the product and significantly share in the underwriting risks. Almost overnight, the crop insurance program was converted from a pilot program offering limited coverage to a limited number of crops nationwide, to a nationwide program covering most major field crops in most major growing regions (Glauber 2004: 1179).
In evaluating the prospects of crop insurance in developing countries where a majority of the population was often employed in agriculture, most early studies portrayed an extremely negative outlook (Skees et al. 2007). By the 1970s and 1980s, donors and development practitioners had discounted the possibilities of agricultural insurance contributing to the development process, and attempts to foster such insurance were largely halted (Hazell, Pomareda, and Valdés, 1986). Ultimately, the troubled experiences with agricultural insurance of developed countries led to considerable confusion among donors, policymakers, and practitioners about how to introduce agricultural insurance without significant subsidies in lower-income countries. Early on, World Bank analysts acknowledged that “[i]ndividual crop insurance would have been prohibitively expensive, or even impossible, in a country such as India, with so many small and marginal farmers.” (World Bank 2011: xi). Based on research in the United States and in India from the early 1990s, economists found that “the covariate nature of yield risk makes both crop insurance and financial intermediation less viable in rural areas … [and] the reasons why the usefulness of insurance, especially all-risk crop insurance, has been questioned in the literature” (Mishra 1994: 536).

Because of the overall high costs associated with administering traditional crop insurance, interest has grown in alternative instruments for insuring a portion of farm yield risks. To further investigation of this type of risk-management program, the World Bank, the European Union, the Netherlands, and Switzerland convened an International Task Force on Commodity Risk Management in Developing Countries (1999) to study the benefits of facilitating access by farmers and small businesses in developing economies to price risk-management instruments. The program focused on finding local intermediaries, mostly producer cooperatives, to aggregate
demand, pay option premia, and disseminate payouts.\textsuperscript{102} Experts claim that although the theoretical aspects of contract design have been explored, and climate-related risks are well understood in developing economies, less is known about whether farmers are willing or able to pay for such insurance.\textsuperscript{103} As explained in the previous chapter, this relationship between crop development and climate risks are actually poorly understood. However, the strength of financing behind these ideas and proposals were more important because they would expand the scope of experimentation.

Conversations amongst experts in the Indian government about agricultural risk were evolving to similar ideas. In 2004, the Working Group on Risk Management in Agriculture for the Eleventh Five Year Plan (2007-2012) was tasked with reviewing programs for addressing agricultural risk and proposing new approaches. The Report of the Working Group on Risk Management in Agriculture also arrived at a similar conclusion and expressed it as such: “Good or bad weather may have similar effects on all farmers in adjoining area...\textit{[thus] the law of large numbers, on which premium and indemnity calculations are based, breaks down}” (12). Positive spatial correlation in losses limits the risk reduction that can be obtained by pooling risks from different geographical areas; it increases the variance in the indemnities paid by insurers and, generally speaking, the more the losses are positively correlated, the less efficient traditional insurance is as a risk-transfer mechanism. As a result, the Indian government turned to the financial market and new financial instruments.


\textsuperscript{103} Important theoretical bases for the new contract designs include, Halcrow (1949), Industries Assistance Commission (1978), and Miranda (1991).
The planners adopted a framework that was based on abstracting and separating risks, between production risk and price risk. According to their 2005 report:

“agricultural risk is associated with negative outcomes that stem from imperfectly predictable biological, climate, and price variables” (6) and “insurance is not as efficient in managing production risk as derivative markets are for price risk. Price risk is highly spatially correlated and...futures and options are appropriate instruments to deal with spatially correlated risks.” (12)

The new approach was hence to combine modified insurance and derivative products, while harnessing the potential of new technologies that had begun to emerge at the time. The report proceeded:

“[t]he poor penetration of and development of various risk management tools in the country...represent the huge opportunities for the emerging agricultural insurance and commodity markets to pull the farmer from out of the poverty trap by insulating him from income shocks and by ensuring that a fair share of the price goes to the producer. Making a strong case for moving risk management solutions towards a sustainable sensing, technologies and ICT in developing early warning systems, increasing effectiveness of instruments for pooling, sharing and transfer of risks, enhancing the coping capabilities of the farmers and other mitigation measures has therefore guided the careful formulation of this Report.” (i)

The discussion took place amongst the country’s most ardent supporters and thinkers of risk management and agricultural policy, many of whom were Indian agricultural economists trained in the UK and the US, searching for ways to adopt new approaches to India’s planning. In this regard, it is important to note the that there is a strong imbrication of the Group Revenue Plan (GRP) developed in the US agricultural insurance programs and index insurance in India, especially through the ways those experiences were translated into the World Bank’s technical assistance programs. The implementation of these ideas was the Weather Based Crop Insurance

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Scheme (WBCIS). I described this mechanism and design of the instruments in the previous chapter.

Figure 5.4 Weather Based Crop Insurance Scheme (WBCIS) Timeline.

Here, building on the social-constructivist framework of fast-policy development, I explain the policy environment that made it possible. Recall that ICICI Lombard had successfully financed the world’s first pilot for a fully reinsured rainfall index insurance contract. Following that pilot, the discussions from the Working Group meetings helped to generate support for launching the WBCIS as a new government-backed parallel insurance program. Though the process of its evolution has been iterative and largely contingent on the regulatory approval of private automatic weather stations (AWS) (see Figure 5.4 above), the WBCIS is now a component of the PMFBY, called the Revised Weather–based Crop Insurance Scheme (RWBCIS), and continues to be the world’s largest insurance system relying on financial derivative contracts whose payouts are based on digitized weather indices, such as the marginal difference between expected and actual precipitation. The program relies on globalized insurance capital to cover drought, flood, cyclones, and drought risks for millions of farmers in under-invested and drought-affected areas.
of the country.105 After the program launched in 2003, the government requested bids from private firms to compete for insurance contracts with additional subsidies totaling approximately $15.4 million. The total territorial coverage of weather insurance, which began at 400,000 acres in 2003 increased to 2.5 million acres in 2007-08 after the privatization of provision. In 2009-10, the cumulative weather insurance coverage by the public insurance company (AIC) and the leading private firm (ICICI-Lombard) covered 8.5 million acres. The program was an important milestone in the development of index insurance contracts.

As “fast policy” WBCIS and other index insurance programs have been defined as much by innovation as failure. And even though the relationship between crop development and climate risks is actually poorly understood, the strength of financing behind these ideas and proposals were more important because they would expand the scope of experimentation. In an interview in 2016, two of the earliest economists and planners, Panos Varangis and Daniele Clarke, evaluated systematic failures after almost two decades in experimenting with risk transfer mechanisms amongst small-holder farmers in over 50 countries. Varangis acknowledges how “[i]n many ways index insurance has not lived up to original expectations.”106 In response, Clarke concurs saying, “[a] lot of effort has gone into trying to offer index insurance to farmers. There have been approximately 150 donor-supported weather index insurance pilots alone, spanning perhaps 50 countries. But we haven’t seen many pilots maturing into sustainable, large-scale programs. Whatever the explanation, there seem to be huge challenges with demand, even for products that are fundamentally sound” (ibid). This statement is remarkable given that there

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have been hundreds of studies, evaluations, and an estimated 45 randomized controlled trials (RCTs)\textsuperscript{107} to answer this very question. Lastly, for a more comprehensive assessment, Collier et al. clearly state the following:

“[w]ith some exceptions, the scalability and sustainability of household-level index insurance projects are unclear; many markets will not survive when donor support ends. Moreover, too much emphasis has been placed on index insurance as a developing country proxy for developed country agricultural insurance with insufficient consideration of its best use for contributing to economic development.”\textsuperscript{108}

Though deeply involved in many of the programs and projects that have taken place, the reflection and realism is surprising. However, the failure in large part is a function of flawed assumptions from the underlying models. Many programs focus on protecting insureds from yield risk associated with a single crop in a single season—a framework outmoded but still in widespread use. As Binswanger-Mkhize (2012) concludes, these flaws define the limited relevance of index insurance for managing disaster risks, leading to serious questions regarding its value for development.

It is important to understand how such programs continue to find new potential applications and relevance despite evidence of failure. Upon closer analysis, actual implementation and outcomes “‘on the ground’ remain geographically differentiated, as even the most aggressively promoted ‘silver-bullet’ solutions prove impossible to replicate \textit{in toto}” (Peck 2011). In addition to the strong demand from reinsurance firms for the adoption of index-based insurance, commercial

\textsuperscript{107} For opposing views on the explanatory scope and limits of RCTs and field experiments (FEs), see the following: de Janvry, Alain, Elisabeth Sadoulet, and Tavneet Suri. “Field experiments in developing country agriculture.” \textit{Handbook of Economic Field Experiments} (2016); Barrett, Christopher B., and Michael R. Carter. “The power and pitfalls of experiments in development economics: Some non-random reflections.” \textit{Applied economic perspectives and policy} 32.4 (2010): 515-548.

banks and local financial institutions (FIs) have been important sites for such forms of the financialization of risk. Based on my findings, farmers with agricultural loans are required to purchase insurance and are often unaware of their conscription in these programs because of the tight integration of banking and insurance relationships. Demand from financial institutions to manage and hedge the significant economic sensitivities to weather variability have recently led to studies recommending that index insurance be designed to manage the portfolio risks of FIs, rather than as products for their borrowers. According to Skees et al. (2007), this strategy would be a more effective starting point for the development of disaster-risk markets serving the financial sector. The deeper consequence of the policy design, which is premised on loan amounts is a much greater value given to credit risks rather than drought and flood risk.

More generally, the WBCIS is just one iteration of a broader set of programs experimenting with index insurance across over 30 countries that has received substantial backing from the World Bank’s Global Index Insurance Fund (GIIF). Increasingly, reinsurers such as Munich Re and Swiss Re sponsor pilot programs with philanthropic networks and NGOs. In my conversations with index insurance underwriters in India, I was told that, “reinsurers are pushing for index insurance, but we have a difficult time with this product due to the lawsuits and complaints from farmers … they don’t trust the CCEs and want to see less human interference … that is why we are still offering this policy.” As described in chapter 4, I specify the implementation problems with index insurance in India and elsewhere, which has limited consistent adoptions and renewal

109 For Skees, this has led to an intuition that these instruments are less appropriate for small-holders as first envisioned and more relevant for financial instruments. Instead, the recent literature finds that these financial products are more effective for protecting financial institutions themselves: Index insurance for FIs improves their ability to manage disaster risks and can enhance financial inclusion and lower interest rates (Collier and Skees, forthcoming; Miranda and Gonzalez-Vega, 2011).
of such policies. Nevertheless, much like the rapid ricocheting movement and adoption of conditional cash transfer (CCT) policies, index insurance operating at different scales has spread across the world (see Figure 5.5 and Figure 5.6 comparing the two).

* Active GIIF/IFC Countries (capacity building & premium subsidies)
* Active GIIF Countries (all components)
* Active GIIF/World Bank Countries (regulatory component)
* Pipeline GIIF Countries

**Figure 5.5** Global Index Insurance Fund (GIIF) Map of World Bank financed program countries at 10 years 2003-2013 (2013). Source. GIIF website.


5.3 New Geographies of “Riskholding” in Context: WTO, IRDA, and Reinsurance Markets

In this section I want to better explain the regulatory shifts that created conditions of possibility for the formation of a new agricultural insurance regime. Here, I show the ways in which insurance “fast policy” and discussions were threaded together with new forms of financialization to create neoliberal regimes of knowledge experimentation. In particular, I explain how the Uruguay Rounds that eventually led to the World Trade Organization (WTO), created an international regulatory space for fostering and subsidizing insurance programs that effectively underwrote and subsidized the amplification of the insurance industry and insurance market while restricting many other forms of domestic government support for agriculture. As Hess (2003) notes in an article about the origins of index insurance, the regulatory prospects for index insurance instruments, at that time, seemed promising precisely because they met conditions of the “green box” (allowable subsidies), concerns identified in the Uruguay Rounds. And while the entire premise and content of the new trade rules focused on removing government subsidies and protections from the agriculture sector, the role of insurance and its subsidization by government was actively encouraged.111
Prior to the Uruguay Rounds that took place from the 1986-1994, India like most other countries provided price protections and support policies to their farmers throughout the post-colonial period. Yet, the crisis of the Bretton Woods institutions and subsequent restructuring of the international trade regimes led to India’s currency floating in the foreign exchange market and it caused difficulties in purchasing energy and food from international markets. The collapse of the Soviet Union in 1991 was of great significance as well. The Soviet Union had a significant influence on the design of national planning strategies for many industrializing countries including India (e.g., India’s five-year plans) and the demise marked the end of “old planning paradigm” ushering in a new planning paradigm premised on the tenants of neoliberal restructuring (Sanyal 2005: 10). Eventually, several new global agreements ushered in a restructuring of agricultural commodity markets including the Uruguay Rounds and the World Trade Organization (WTO). Any country engaged in trading agricultural commodities internationally had to agree to dramatically reduce government price protections under the new trade regimes which regarded them as indirect tariffs—effectively forcing agricultural producers globally to individually manage price volatility and production risk.

Although this transformation and the formation of the WTO are integral to Friedmann and McMichael’s (1989) notion of international food regimes, they do not comment on the role of insurance, arguably the most contentious agricultural policy in most industrial countries. For those countries wanting and able to effect transfer payments into their farming sectors, a convenient channel for doing so was through insurance. In the agreement, insurance was “decoupled” from direct payments and “distortionary” price supports, which were banned under World Trade Organization (WTO) rules. In the United State alone, insurance coverage more than
doubled in the decade after that and had positive effects for the development of crop insurance markets more generally across the world.\textsuperscript{112} As noted by the Food and Agriculture Organization (FAO), since 1995, the impact of the new trade regimes on the farming sector, and its environment, is further reflected in the design of entirely new insurance products adopted from the financial sector including Crop Revenue products as well as Index or Derivative products.\textsuperscript{113}

Since 2002, India’s NAIS was the primary risk-management policy available for farmers from the government, even though the government still maintains some forms of direct support through drought management, price supports, or other protections. The new global regulatory environment for agriculture trade caused a reallocation of much of the previous agricultural support to be siphoned into insurance companies to support an actuarial regime that was designed to address problems (or “shocks”) such as the volatility of agricultural prices and impacts from drought. These efforts and those of national governments generated a trend to articulate and formalize risk management in farming in terms of insurance.

The support of insurance development also facilitated the reopening of India’s insurance sector since it was nationalized in 1972. In 1993, the government set up a committee chaired by former Reserve Bank of India governor R. N. Malhotra to propose recommendations for insurance reform complementing those initiated in the financial sector. The committee submitted its report in 1994, recommending that the private sector be permitted to enter the insurance industry, with

\textsuperscript{112} \url{http://agroinsconf.com/?page_id=376}, international agricultural insurance markets
\textsuperscript{113} \url{http://www.fao.org/docrep/008/y5996e/y5996e03.htm}. FAO (2005) Insurance of Crops in Developing Countries. Agricultural services bulletin 159. Pg. 12. Interestingly, in 1992, the United Nations Framework Convention on Climate Change (UNFCC) recommended measures, such as insurance, to meet the specific needs and concerns of developing countries arising from the adverse impacts of climate change (United Nations, 1992) and Article 3.14 of the Kyoto Protocol explicitly calls for consideration of the establishment of insurance (Panda 2013: 57).
foreign companies entering by floating Indian companies, preferably as joint ventures with Indian partners. And, following the recommendations of the Malhotra Committee, in 1999 the Insurance Regulatory and Development Authority (IRDA) was constituted to regulate and develop the insurance industry and was incorporated in April 2000. New joint-venture companies emerged immediately often with Indian banks partnering with foreign insurers (see Figure 5.7), with the logic being that the private banks had geographical distribution through regional branches across India that would be able to channel and leverage foreign capital investment and knowledge related to weather risk management and pricing. Foreign companies included some of the largest financial institutions in the world, including: American International Group (AIG), Allianz SE, Fairfax Financial Holdings Limited, Tokio Marine Holdings Inc., and the Mitsui Sumitomo Insurance Group.
The IRDA opened up the insurance market in August 2000 with an invitation for registration applications; foreign companies were allowed ownership up to 26 percent. The IRDA, with the power to frame regulations under Section 114A of the Insurance Act, 1938, has framed regulations ranging from company registrations to the protection of policyholder interests since 2000. In December 2000, the subsidiaries of the General Insurance Corporation (GIC) of India were restructured as independent companies and the GIC was converted into a national re-insurer. Parliament passed a bill delinking the four subsidiaries from the GIC in July 2002. There are 28 general insurance companies, including the Export Credit Guarantee Corporation of India.
and the Agriculture Insurance Corporation of India (AIC), and 24 life-insurance companies currently operating in the country.

The AIC is the government’s most important institutional innovation for riskholding in the aftermath of liberalization. At a speech announcing the creation of the AIC in 2002, the Finance Minister in his General Budget Speech said that its purpose was, “to subserve the needs of farmers better and to move towards a sustainable actuarial regime.” The company was financed entirely from existing government insurance and financial companies. The actual shareholding (as well as “riskholding”) structure of the AIC is shown in the diagram below (Figure 5.8). The six financial entities are joint holders of all the assets and liabilities of which there are four government-owned general insurance companies, the government-owned reinsurer (GIC) and the government’s agricultural bank (NABARD). Soon after its creation, the AIC became the world’s largest crop insurer, covering over 20 million farmers and the platform for new crop insurance and risk financing pilot programs, including WBCIS.
5.3.1 Financializing Insurance

If ever there was an inside and outside of risk management, it was fundamentally transformed with the liberalization of the insurance sector and the participation of risk capital, which has created a new geography of riskholding. Often framed in terms of fiscal prudence and actuarial sustainability, the financialization and new geography reshapes the putative inside and outside of sovereignty and risk-management authority. In this section, I discuss the ways in which policy decisions to liberalize the insurance sector manifested through new iterations of the national crop insurance program, through specific shifts in the targets of policy to increasing access to new forms of risk capital (e.g., increasing FDI) and focusing on the percentage of spatial coverage rather than number of farmers covered.

In 1999, after the IRDA liberalized the insurance sector to allow private risk capital investment, the Agriculture Insurance Company of India (AIC) implemented a new program, compulsory for
borrowing farmers as well as voluntary for other farmers, called the National Agricultural Insurance Scheme (NAIS), which by 2003-2004, was the “largest program worldwide in terms of number of farmers covered.” With the new infusion of capital, NAIS covered 13 million farmers in the summer Kharif season and 4 million in the winter Rabi season, a total of 17 million, which was an annual crop insurance penetration of 14.5 percent by the 2004-2005 season. Again, with a larger scale of implementation, there was more scrutiny of problems that came to light.

The General Insurance Corporation of India, the government-financed reinsurance company that underwrote all of the claims complained that the system was not actuarially sound and it was losing significant capital as a result. The key actuarial problems identified in the NAIS were actually a function of the spatial ambit of the program. For instance, the insurance product demand was overwhelmingly concentrated in the states where crops grow under rain fed conditions and weather risks are greater, and where claims were high. This is referred to in the insurance industry as “adverse selection” and it can be ameliorated through expanding the pool of participants to represent different risk levels. Secondly, annual loss ratios (indemnity/premium) remained higher than 100 percent. In other words, the total indemnities paid to farmers exceeded the premia received (including premium subsidies). As analyzed in an evaluation of the NAIS program report (2007), over the period 2000-2004, the average loss ratio was higher than 400 percent and this was described as a direct consequence of the “caps impose[d] on the premium rates for oilseeds and food crops.” These issues were important considerations and became key targets of reform in the redesign of the scheme.
By 2006, the central government made campaign promises announcing that crop insurance penetration would increase to 25 percent in 2006-2007 and 50 percent by 2011-2012 of all cropped land. But by 2014, out of the gross cropped area of 195.26 million ha in the country, only 42.82 million ha or 22 percent were covered under crop insurance. While the coverage was higher in some states—especially Rajasthan, Chhattisgarh, Odisha, Bihar and Karnataka—it was less than 10 percent for Gujarat, West Bengal and Uttar Pradesh.114 This disparity was very evident in the total area insured by state for the WBCIS (Figure 5.9). According to a sobering 2014 Government of India report on agricultural insurance, “this targeted increase in coverage/outreach [was not possible without] the move to an actuarial regime; in the absence of such a move, increased numbers of insured farmers would have meant an unsustainable level of fiscal burden without an accurate method to budget for this.” On the basis of articulating such fiscal constraints, the report proceeded to propose several modifications to NAIS including: (1) “Longer moving average time series for the yield estimate”; (2) “Reducing the Insurance Unit (IU) to a village panchayat115 for major crops”; and (3) “Instilling actuarial principles.” These reforms were expected to help scale the entire system geographically. But the proposal that was the most defining for this period was a proposal to uncap the total “sum insured” (the total amount of insured loss) that actually prevented farmers from obtaining the full commercial value in the case of damage. The government had capped the sum insured for previous iterations of the crop insurance program in order to limit the fiscal liability and without access to much more capital, the scope of expansion remained limited. Additionally, for a farmer, to have so much of

115 Village council.
their actual risk not covered, made insurance unaffordable and weakened their motivation to purchase insurance.\textsuperscript{116}

Area Insured (Ha) by State from 2012 - 2014 Kharif Season under WBCIS

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<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>1,507,093</td>
<td>10,239</td>
<td>1,358,323</td>
<td>32,683</td>
<td>167,778</td>
</tr>
<tr>
<td>Assam</td>
<td></td>
<td></td>
<td></td>
<td>296</td>
<td>11,338</td>
</tr>
<tr>
<td>Bihar</td>
<td>1,292,573</td>
<td>1,685,710</td>
<td>1,477,266</td>
<td>2,005,560</td>
<td>1,700,742</td>
</tr>
<tr>
<td>Chhatisgarh</td>
<td></td>
<td>194,179</td>
<td>169,177</td>
<td>1,688,772</td>
<td></td>
</tr>
<tr>
<td>Haryana</td>
<td>75,676</td>
<td>92,273</td>
<td>144,607</td>
<td>178,053</td>
<td></td>
</tr>
<tr>
<td>Himachal Pradesh</td>
<td>242</td>
<td>961,035</td>
<td>111</td>
<td>15,917</td>
<td>95</td>
</tr>
<tr>
<td>Jammu &amp; Kashmir</td>
<td></td>
<td></td>
<td></td>
<td>809</td>
<td></td>
</tr>
<tr>
<td>Jharkhand</td>
<td>79,915</td>
<td>26,777</td>
<td>153,218</td>
<td>63,844</td>
<td>157,980</td>
</tr>
<tr>
<td>Karnataka</td>
<td>265,563</td>
<td>3,699</td>
<td>265,526</td>
<td>8,435</td>
<td>139,171</td>
</tr>
<tr>
<td>Kerala</td>
<td>6,844</td>
<td>13,638</td>
<td>13,626</td>
<td>13,981</td>
<td>11,801</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td></td>
<td>21,477</td>
<td>14,463</td>
<td>32,614</td>
<td></td>
</tr>
<tr>
<td>Maharashtra</td>
<td>4,932</td>
<td>78,622</td>
<td>12,124</td>
<td>55,083</td>
<td>1,148,389</td>
</tr>
<tr>
<td>Orissa</td>
<td>52,590</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rajasthan</td>
<td>7,877,730</td>
<td>3,806,452</td>
<td>7,567,681</td>
<td>2,734,324</td>
<td>4,312,649</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>17,627</td>
<td>11,940</td>
<td>10,810</td>
<td></td>
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</tr>
<tr>
<td>Telangana</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>67,881</td>
</tr>
<tr>
<td>Uttar pradesh</td>
<td>27,114</td>
<td>26,286</td>
<td>164,173</td>
<td>74,420</td>
<td>151,617</td>
</tr>
<tr>
<td>Uttarakhand</td>
<td>6,093</td>
<td>84,831</td>
<td>14,293</td>
<td>1,646</td>
<td>14,150</td>
</tr>
<tr>
<td>West Bengal</td>
<td>742</td>
<td>5,626</td>
<td>1,861</td>
<td>369</td>
<td>351</td>
</tr>
<tr>
<td>Grand Total</td>
<td>11,124,734</td>
<td>7,001,306</td>
<td>11,205,095</td>
<td>5,368,251</td>
<td>9,606,136</td>
</tr>
</tbody>
</table>

Sum of Area Insured (Ha) broken down by Season vs. State. Color shows sum of Area Insured (Ha). The marks are labeled by sum of Area Insured (Ha). The view is filtered on State and Season. The State filter excludes TOTAL. The Season filter excludes Null, State / UT and Weather Based Crop Insurance Scheme (WBCIS), All Companies Combined- Kharif (2012, 2013, 2014) And Rabi (2012-13, 2013-14) (From : Ministry Of Agriculture & Farmers Welfare).

Figure 5.9 Area Insured (ha) by State from 2012-2014 Kharif Season under WBCIS.

\textsuperscript{116} In such insurance schemes, the sum insured coverage was capped in order to minimize premium costs for farmers and minimizing the fiscal budget for paying subsidies and sum insured. However, this meant that the claims amount was often too far below the farmer's actual losses. For example, in 2013-14, while the average per hectare output was worth Rs. 41,442, the sum insured (SI) under various crop insurance schemes was just Rs.18,464 on an annualized average Kharif (fall), according to the Commission for Agricultural Costs and Prices (CACP). This amount, also called, the gross value of output (GVO), was substantially low for most types of crops. As an example, from the most commonly grown crops, paddy (rice) has a GVO on an all-India average yield of 36 quintals and minimum support price (MSP) of Rs. 1,310/quintal (approx. $20/quintal), which in 2013-14 worked out to Rs. 47,160 (approx. $725.54) per hectare. Similarly, tur (pigeon pea), at 8.5 quintals, Rs. 4,300/quintal ($66.15/quintal) comes to Rs. 36,550 ($562.31) per hectare. The lack of sufficient coverage was suggested as a constraint on insurance demands from farmers.
In the first act of legislation proposed by the new government, the parliament passed the Insurance Act of 2015 in which the main objective was to increase foreign direct investment (FDI) in the insurance sector, particularly expected to “strengthen” the sector’s capacity to “protect our farmers,” by further incentivizing private capital, insurers, and reinsurers to invest in India’s risk contracts (discussed in chapter 1). This rationale was based on the premise that what stood in the way of the government’s goals of broader insurance adoption was the program’s financial logic, which made the government the backstop of the program. It has been relatively common until very recently for national governments to reinsure disaster insurance and crop insurance programs, the United States being a prime example. However, as described in the previous chapter, the context for such programs has changed in line with (1) increasingly neoliberal fiscal policy preferences in the realm of the risk management, and (2) the financialization of the insurance and reinsurance industries and the competition from other forms of capital for more diverse, non-correlated risks.

<table>
<thead>
<tr>
<th>Insurance Program</th>
<th>Total Premium USD (2016)</th>
<th>Participation</th>
<th>Main Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Insurance Corporation CIS (1972-1979)</td>
<td>$56,750</td>
<td>Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu and West Bengal Except Punjab</td>
<td>High loss ratio (8.34)</td>
</tr>
<tr>
<td>Government of India PCIS (1979-1985)</td>
<td>$303,000</td>
<td>12 States: Gujarat, Tamil Nadu, and West Bengal Except Punjab</td>
<td>Modeled on U.S. Crop Insurance Program using the “individual approach”</td>
</tr>
<tr>
<td>Government of India CCIS (1985-1999)</td>
<td>$62.09 million</td>
<td>16 States and 2 territories: Andhra Pradesh, Assam, Bihar, Goa, Gujarat, Himachal Pradesh, Karnataka, Kerala,</td>
<td>After its implementation, this scheme became the first program to surpass all other fiscal</td>
</tr>
</tbody>
</table>
Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Tamil Nadu, Tripura, West Bengal, Pondicherry and Andaman and Nicobar Islands. Except Punjab

<table>
<thead>
<tr>
<th>Scheme</th>
<th>States and UTs</th>
<th>Expenditures as the main instrument for provision of risk management to farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIC NAIS + MNAIS + WBCIS (1999-2016)</td>
<td>24 States and UTs (except Punjab, Manipur, Nagaland, Mizoram and Arunachal Pradesh among the States and Chandigarh, Daman &amp; Diu, Delhi, Dadra &amp; Nagar Haveli and Lakshadweep among the UTs).</td>
<td>These schemes provided farmers three new financial risk (&quot;contingent claims&quot;) contracts including the weather-based index insurance and allowed private insurers to participate</td>
</tr>
<tr>
<td>PMFBY (2016-present)</td>
<td>All states except Punjab</td>
<td>Increased FDI for the insurance sector from 26 to 49 percent with no limit on the total amount that could be insured by the new insurance contracts to farmers.</td>
</tr>
</tbody>
</table>

Figure 5.10 Different Crop Insurance Programs since 1972, with maximum annual premium collected, number of farmers participating, states participating, and key features. Source. Ministry of Agriculture and Farmer Welfare, Agricultural Insurance Company of India (AICI), Banerjee and Bhattacharya (2011).117

The Pradhan Mantri Fasal Bima Yojana (PMFBY), introduced in 2016, was designed to correct for several of the problems of these previous crop insurance schemes (see Figure 5.10 above), chief among them, the challenge to expand adoption in terms of “area under insurance.” To achieve this result, the government modified the financing of the entire program. As discussed, the most important feature is the relaxing of FDI rules that allow foreign companies to reinsure policies directly without limiting the total “sum insured” and providing them with a higher equity ratio than was previously possible. This incentivized reinsurers to expand the amount of “risk capital” they would provide to insurers selling crop insurance in India. A corollary of this policy choice is that it reduced the government’s contingent liability from crop insurance to zero, by

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eliminating the government’s role as a reinsurer or “backstop.” This shift from earlier agricultural insurance programs parallels the two previous liberalization efforts, described earlier, that took place in 1991 during more general reforms and then the first increase in FDI to 26 percent in 2000, respectively (see Figure 5.11 below). I argue that this defines the new structure of riskholding from earlier programs in which the government financed the payout of claims.

Figure 5.11 Timeline of insurance sector liberalization

5.3.2 Spatial Dimensions of Risk Financialization and Reinsurance

In 2013, the IRDA attempted to raise the foreign direct investment (FDI) limit in the insurance sector to 49 percent from its then 26 percent, and succeeded in 2016. I discuss the stakes of the decision to increase the FDI limit in the sector to 49 percent in the broader context of Indian agrarian reform. The policy objective of the Indian government, particularly the Ministry of Finance and the Ministry of Agriculture, has been to bring most of the country’s cropped “area under insurance” through various policy mechanisms discussed above. The current outcome of
the PMFBY indicates a substantial increase in the total amount insured and relatively lower increase in the area under insurance. In this section, I return to explaining the spatiality of risk financialization and the territorial growth of weather insurance over the last few years.

It is important to state that agricultural insurance is unique in several ways. Unlike non-agricultural insurance products, agricultural insurance business is sold in quantities of acres. At the same time, the implications of systemic risk from spatial correlation (as described above) are especially important to understand in the case of India. Unlike other financial products, such as credit or life insurance products, in which defaults or losses are theoretically relatively uncorrelated, weather insurance products hold the potential for large and correlated losses due to meteorological events that affect wide geographical areas. As Johnson notes, “while other microfinancial products can be deployed with small capital reserves held at the regional or national scale, index-based instruments require backing by institutions with large capital reserves and spatially diversified loss exposure” (Johnson 2013). In order to better understand the dynamics of the institutions with such “large capital reserves,” I present findings from my interviews and document analysis below related to the effects of the participation of insurers and reinsurers, focusing on the geographically dimensions and implications of the new ways in which risk is financialized.

As discussed, the government’s decision to increase FDI in 2000 incentivized substantial foreign investment in India’s crop insurance program. The investments were channeled through joint ventures between private Indian financial firms and foreign insurance firms seeking to capitalize on India’s massive crop-risk insurance market. The scale of private firm participation in Indian
insurance markets took time to increase as public, government-owned firms had dominated the sector for many decades essentially without market competition. A substantial expansion of private firms first began with the WBCIS, which was designed to support private firm participation and collaboration on the use of new automation technology and new weather data sources (beyond the IMD). However, the passage of the 2015 Insurance Act along with the new design of the PMFBY for the first time removed the upper limit ("cap") on how many and how much value could be insured through the program, removing any limit of the actuarial price, premiums, and the total sum insured.

Importantly, the government underwrote the cost of “true actuarial” premium (i.e., the amount that the insurers decide to charge based on their models), thus, the government plays an active role working within the narrow ideological parameters of insurance and risk-based fast policy as well as WTO-approved fiscal expenditure described above. In order to increase insurance purchase from the demand side, the government expanded its budget for the crop insurance premium subsidy while reducing farmers’ cost of insurance to a maximum of 2 percent of the entire insured amount. Meanwhile, the program allows companies to charge premiums at their own calculated “actuarial rate” without a cap, promising that the central government and state government of each state would subsidize the difference between the full actuarial rate and the portion that the farmer would be paying. This table (Figure 5.12) is based on actual data for the PMFBY for 2016-2017 Kharif season and it shows the differentiation of costs using the Ahmednagar district in Maharashtra for Black Gram (Urad) covered by HDFC ERGO General Insurance Co. Ltd. The Actuarial rate in this case is 32.67 percent, so the farmer is responsible to pay 360 rupees/hectare (2 percent), while the central and state government each are responsible
to pay the insurers the remaining amount (2,760.30/hectare) each. I explain the remaining
features of the new program as it relates to the creation of new risk clusters for the purposes of
bidding, which is shown below (Figure 5.12).

<table>
<thead>
<tr>
<th>State</th>
<th>District Name</th>
<th>Season</th>
<th>Insurance Company</th>
<th>Crop</th>
<th>Actuarial Rate (%)</th>
<th>Farmer Share (%)</th>
<th>State Govt. Share (%)</th>
<th>Central Govt. Share (%)</th>
<th>Sum Insured/ Hectare (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MH</td>
<td>Ahmednagar</td>
<td>Kharif</td>
<td>HDFC ERGO</td>
<td>Black Gram (Urad Bean)</td>
<td>32.67</td>
<td>2</td>
<td>15.335</td>
<td>15.335</td>
<td>18000</td>
</tr>
</tbody>
</table>

Figure 5.12 Differentiation of costs PMFBY 2016-2017 Kharif for Ahmednagar district in Maharashtra.
Figure 5.13 Map of Insured Districts by Company for PMFBY 2016 Kharif Season
The new spatiality of riskholding through insurance can be better understood through the role of India in the global market for crop insurance. With an estimated global insurance premium of $31 billion in 2014 and annual average growth rates of 20 percent, agriculture insurance has grown four-fold since 2005 and is, in many countries, the largest specialty line in terms of premium volume. To date, the main growth has come from North America with the introduction of revenue-based crop insurance. The implementation of the PMFBY scheme in 2016 has made India the third largest agriculture insurance market in the world after the US and China, with approximately $3 billion in premium revenue as a result of rapidly increasing insurance penetration from both the area-yield and weather-based insurance schemes. When India passed the Insurance Act of 2015, the government liberalized capital controls by increasing the limit of Foreign Direct Investment (FDI) to 49 percent and relaxed reinsurance business restrictions. Though the crop insurance market in India has always been difficult to model and manage actuarially, there has been a rapid expansion in the amount of crop risk to be insured. As the
national spokesperson for the Indian National Congress (INC), Rajeev Gowda, stated during the parliamentary debates on Foreign Direct Investment in India’s Insurance Sector:

“Sir, insurance depends on diversification of risks and by making India open to more resources, more companies, by opening our markets to other companies to diversify our risk, their risk here and our companies to play in their markets, we will actually be strengthening the global financial system in the context of insurance.”\(^{118}\)

This argument reinforced my findings based on my interviews with insurers and reinsurers involved in crop insurance, that the dominant incentive of reinsurance to provide capital for India’s crop insurance programs is related to the overall diversification of reinsurance balance sheets.

According to a reinsurer I spoke to about the increase in reinsurance activity in this sector, crop insurance covers the catastrophic risks of a very large value and has become a reinsurance-driven risk. The practice of crop insurance since its inception has operated somewhere between being a fairly modest domestically driven industry and a massively large government-backed agro-risk and relief policy. In the aftermath of the restructuring in 2015 and 2016, it was very clear to the reinsurer that:

“After PMFBY, it is reinsurance driven. I will go based on the needs of reinsurance. If they won’t support, I cannot take. They say what to quote, which is based on their risk appetite...The most striking problem for us now is that once total aggregate premia rose from 5500 crore to 22000 crore, people thought that when the market grows that the actuarial premium rate would come down. But we are facing another principle, which is demand and supply.”

In this interview, the reinsurer explained how the unprecedented scale of reinsurer participation reshaped the market power relations in favor of reinsurers. The reinsurers control the supply of

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capital or “risk capital” (capital operating in reinsurance markets) and in the context of India’s crop insurance they have the power to shape the terms of capital provision. Thus, even if the expectation is that that rate will decrease with a substantial growth in the market, that need not be the case if the reinsurers on the contract think it should be higher.

One of the reasons for the power asymmetry is that Indian insurance companies (including the joint venture companies) have limited net worth and they transfer most of the risks to reinsurers in both national and international markets. In the industry, the amount of risk (or liability for policies contracted) that is actually retained by an insurance company on its own balance sheet is called “net retention” and the remaining balance is transferred to reinsurers through reinsurance contracts. At present, the maximum retention of an Indian insurance company is 25 percent of the total risk. The remaining 75 percent of the risk is reinsured under the PMFBY, expanding the scope of reinsurance power to negotiate rates that may not be as competitive, which took place in 2016. The expert I spoke with played out a scenario using a simple example described below:

“Lets take this example: I want to insure Rs. 100. But I don’t have capacity: only Rs 25—rest of Rs75 has to come from somewhere else...[like the] books of some reinsurer. But, understand that reinsurance is not insurance, it’s only a capital provider. Most insurers hold 15-25% of the risk, AIC has 25% retention...Because one reinsurer may not have that [entire remaining 75%] capacity, I will find some other reinsurer like GIC for 10%—these contracts are called "slips"—from this I will have terms and conditions, like the quality of how the CCE conducted. There are different types. In quota share reinsurance—Rs.50—share (25% = Rs.15). Stop loss reinsurance, if retaining Rs.25 (take all premium) after how much of it that someone has to come to my rescue (e.g. up to 100% of premium) then after 110%—check max risk (e.g. 200%)

Though the new reform of the crop insurance system increased on several metrics, such as territory under insurance and farmers insured, the largest increase was in “sum insured.” The cropped territory under insurance increased from 33.9 million ha in 2015 to 37.5 million ha to 2016, which is approximately 20 percent of the 194.4 million ha of total cropped land in India.
Yet, the significant increase in total “sum insured” (or total amount insured) is perhaps the most widely circulated statistic. Following PMFBY reforms, the government removed the cap on total sum insured, which meant that the total “liability” would be calculated by insurers based on the actual losses incurred as opposed to being capped at a fix amount due to limited funding. Because of this, the country saw a total increase from $10.6 billion USD to $21.2 billion USD, doubling in one year, and increasing 273 percent from $7.6 billion after three years since the 2013 Kharif season as highlighted in this image circulating on Twitter (Figure 5.15), and making India the third largest crop insurance market in the world, after the United States and Canada. Many new reinsurers immediately signed reinsurance contracts for the first time to “hold Indian crop risk,” manifesting the interest from reinsurers (see Figure 5.16). And, after several decades, in 2016, US-based Reinsurance Group of America Incorporated, Germany-based reinsurance companies, Hannover Re and Munich Re, Switzerland-based Swiss Re and French reinsurer SCOR Re also received approval from the Insurance Regulatory and Development Authority (IRDA) to establish their branches in India. The opening up of India’s agricultural insurance market is particularly important because agriculture is seen as a diversifying risk to other insurance lines of business and is attracting more and more reinsurance capacity, collateralized reinsurance and side cars.\footnote{This was explained to me in interviews as the IRDA. For global perspective, see also, “New frontiers in agricultural insurance”, The Actuary, 05 March 2015, Auguste Boissonnade, http://www.theactuary.com/features/2015/03/new-frontiers-in-agriculture/}
Figure 5.15 Government infographic showing the number of farmers covered from the new PMFBY scheme. Source: Twitter.

1) General Insurance Corporation of India (GIC Re)
2) New India
3) National
4) Oriental
5) United
6) Swiss Re
7) ACR
8) Amlin Synd.
9) Arch Re
10) Berkshire Re
11) Liberty Synd.
12) Q Re
13) Scor Re
14) AXA
15) Axis Re
16) Chaucer
17) Emirates Int.
18) IRB Brazil
We can look at the reinsurer profit to measure how the new program’s approach contributes to the financialization of risk in terms of increased premium growth and profit. Half of India’s reinsurance market is led by the public-sector company General Insurance Corporation of India (GIC Re), and the remaining reinsurance is with international reinsurers (see Figure 5.16). The introduction of the PMFBY has led to a substantial increase in growth across the Indian reinsurance market, especially for GIC Re. The program has doubled the growth for GIC Re, which grew 90 percent for the first quarter of 2017 to $5.17 billion with 50 percent due to crop insurance. GIC reported a 10 per cent growth in net profit at $481.08 million for FY17. Alice Vaidyan, chairman and managing director of GIC Re said, "we are now the largest agriculture reinsurer in the world due to the [Pradhan Mantri] Fasal Bima Yojana." Insurers estimate that the government has channeled approximately Rs. 16,000 crore ($2.46 billion) in the form of premium subsidy through the crop insurance scheme, which will increase to Rs. 20,000 crore ($3.08 billion) by the end of the 2017 financial year. In order to expand insurance coverage, the government invested substantial fiscal resources to pay insurers, reinsurers, weather monitoring technology providers, and to expand the use of drones, satellites and weather stations. As

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described in the previous chapter, the access to risk capital is mutually dependent on the adoption of new technologies and data sources.

Another key measure of how I explain the influence of transnational processes of financialization on Indian farmers’ access to risk financing and transfer are based on actuarial rates. In theory, the actuarial rate insurance companies actually charge should decrease as assumed with such a large pool. The initial assessment of the new PMFBY scheme showed that the actuarial premium, instead of coming down with the increasing scale of coverage, has in fact gone up sharply from 9.8 percent in Kharif 2015 to 14.9 percent in Kharif 2016. This indicates that the inclusion of more farmers into the national insurance program rose the risk premia instead of lowering it as was expected my policymakers. As described in chapter 4, substate level actuarial rates are modeled and mediated by a large network of transnational firms balancing weather parameters, historical data validity, and determining “ambiguous” loading factors necessary to balance to risks of particular geographical risks for specific crops. One manifestation of the scope of variation for actuarial rates that are possible is the “spread” or range of actuarial rates that insurers actually charged for each crop depending on a function of different district locations (Figure 5.17 and Figure 5.18). Just within one state (Maharashtra) the figure shows substantial variation, as much as a 37 percent spread for Guava, which is a high value crop cultivated by very few farmers; even for more common food crops such as Urad (lentil), the spread is greater than 29 percent. Below I explain the how these actuarial rates are selected more upstream in the bidding processes that each government manages for every crop insurance product.
Figure 5.17 Average Actuarial Rate vs. Maximum Rates by Districts in Maharashtra for 2016-2017 Kharif Season.
Source: WRMS
Actuarial Rate (%) for each Other Crop Name. Color shows details about District Name. The view is filtered on Other Crop Name, District Name and Actuarial Rate (%). The Other Crop Name filter keeps 27 of 27 members. The District Name filter keeps 29 of 29 members. The Actuarial Rate (%) filter keeps non-Null values only.

Figure 5.18 Actuarial Rate (%) for each crop type by Districts in Maharashtra for 2016-2017 Kharif Season. Source: WRMS.

With the focus on expanding the geographical coverage of India’s agricultural territory and increasing the financial scope of risk capital available to finance rapid expansion, the
consequences for actual number of participating farmers has been less significant. According to AIC, which covered 40 percent of all farmers under the new scheme (46 percent of all districts), the non-loanee (non-loan taking) farmers were significantly less represented in the overall increase in participation. For the 2016 Kharif crop season, loanee farmers covered under crop insurance (PMFBY and Weather-Based Crop Insurance Scheme) stood at 26.9 million (as of January 3, 2017). In the Kharif season of 2015, the total loanee farmers under all crop insurance schemes was 21.0 million. This 28 percent growth in loanee farmers under crop insurance is courtesy the push from banks. On the other hand, the number of non-loanee farmers (those who have not taken a commercial bank or cooperative crop loan) covered by insurance has increased only 3 percent, to 10.1 million, in Kharif 2016 from 9.84 million the previous year. This result is consistent with the formal credit-centric structure of insurance sales, which are based on bancassurance (a bank-insurance model) or a partnership between a bank and an insurance company that sets up the bank as a channel for the sale of insurance products. However, the distributive outcome is net negative for non-loanee farmers for whom the cost of cultivation is relatively higher because they also pay much higher lease rent.121

The cumulative, hierarchical relationships between insurance and reinsurance firms are built on top of landholding, geography, production, and debt structures generating a new model of “riskholding” (Figure 5.19). The visual representation is a rough schematic of the shift in riskholding from the first “stack” (above) that has four layers: Landholding, Location, Crop Type, and Debt, which were the main operative conditions of risk and agricultural production. Below, that the figure shows the financialized riskholding “stack” which restructures the

121 In costal Andhra for instance, a tenant farmer pays ₹30,000 per acre, per year, in Punjab, this goes as high as Rs. 40,000-45,000 per acre
relations of landholding, geography, production, and credit within vertically hierarchical insurance, reinsurance markets that are meditated by contingent claim contracts and the constant pursuit for float profits. Important to note is that the insurance and reinsurance, and the risk capital markets within which they both operate, use the contingent claims contracts (such as weather derivatives, index-insurance and standard actuarial insurance contracts) to financialize fractions of the financial exposure to weather risk in exchange for premia, which in the case of PMFBY, is heavily subsidized by government entities. The purpose of the visualization is to represent the hierarchical organization of institutions and agricultural production that is the basis for risk financing and transfer mechanisms.

Figure 5.19 Visual representation of the shift in riskholding from the first “stack” (above) that has four layers: Landholding, Location, Crop Type, and Debt, towards the financialized riskholding “stack” which restructures the relations of landholding, geography, production, and credit within vertically hierarchical insurance, reinsurance markets that are meditated by contingent claim contracts and the search for float profits.
5.4 Conclusion

In this chapter, I have focused on the relevance of financialization to explain riskholding patterns in the Indian agrarian sector. My observations indicate that although people and production were embedded in financial systems prior to the contemporary period, current rounds of financialization are characterized by the rescaling of power relations through the empowerment of reinsurers and disempowerment of people through narrowly defined risk factors from derivative-derived contract designs. Much of this is a function of the institutional practices and planning of institutions such as the World Bank, agricultural economists, and the Government of India in their implementation of index insurance programs. In my concluding assessment in this chapter, I provide several explanations for the continued expansion of weather insurance, much like other "fast policies," albeit in new, "mutated" forms (Peck 2011). I make the case for this position, based on my findings of the program which suggest a substantial and ongoing shift towards the financialization of risk management by governments, the increasing dependence on reinsurance ("risk") capital, and the growing inequality of farmers in new financial relationships and increasing vulnerability to financial risk as a result of climate uncertainty and agro-ecological degradation. In the next chapter, I focus more specifically on how some of the factors discussed in this chapter affect the spatial variations in the actual implementation of weather insurance schemes, including both the index-based as well as the more prominent area-yield programs.

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Although institutions continue to invest and subsidize index insurance programs, there is an observed lack of adoption and in India, the country with the highest subsidy rate and largest active program in the world, demand in the 2016-2017 period dropped after over 10 years of market growth. As Peck and Theodore (2015)\textsuperscript{123} indicate, similar “fast policies,” travelling transnationally need not fade away despite local implementation failures and challenges. In the next chapter I investigate the geographical differentiation and uneven development of insurance and risk within and across states through its embeddedness in complex political, financial, and ecological relationships.

CHAPTER 6: INDIA’S MORTAL HAZARDS AND THE POLITICAL GEOGRAPHIES OF INSURANCE

“If the effects of a “development” project end up forming any kind of strategically coherent or intelligible whole, it is as a kind of “anti-politics” machine, which on the model of the “anti-gravity” machine of science fiction stories, seems to suspend “politics” from even the most sensitive political operations at the flick of a switch.” (James Ferguson 1994)\(^{124}\)

In this chapter, I draw on the ways in which insurance has been operationalized in political discourse by the central and state governments as a response to crises in the agrarian environment. I highlight the crises of farmer suicides to bring into a different light the political debates surrounding agrarian distress and the ways in which crop insurance figures into this broader context. Incidents of farmer suicide operate both as a critical event (Das 1995) as in the case of the AAP rally (below) as well as an index for the severity of widespread agrarian indebtedness as described in the NCRB report on Accidental Deaths and Suicides (2015).

Importantly, the report shows that contrary to the dominant view, the majority of suicides happened to those farmer that had formal access to bank financing more than farmers dependent on informal moneylenders due to “financial exclusion.” In this chapter, I explore the ways in which insurance and debt relationships structure the “new agrarian question” (Bernstein 2014) and posit that new political movements that are both massive in scale and coordinated across state lines forcing their governments to provide loan waivers and other entitlements constitute a new terrain for agrarian politics based on “riskholding”, not accounted for adequately in McMichael’s account of the “financialized food regime”.

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On April 22, 2015, just before the monsoon season began, several large farmers’ organizations in conjunction with the Aam Admi Party (AAP), a newly created political party, held a rally in the Jantar Mantar grounds of the nation’s capital, New Delhi. The rally expressed anger with the deteriorating conditions in rural parts of the country and was specifically timed in response to the scheduled parliamentary debates over the newly elected Bharatiya Janata Party (BJP) administration's Land Acquisition Bill (2014)—a controversial piece of legislation that reformed the regulations and procedures for land acquisition, particularly in the case of industrial development on agricultural lands. Yogendra Yadav, a former AAP member and current leader of rival political party Swaraj Abhiyan, called it a "land grabbing" bill, pitting corporate industrial development against farmers.¹²⁶

Mid-way during this rally, at around 2pm, Gajendra Singh Kalyanwat, a tall farmer from Rajasthan climbed up one of the banyan trees and hung himself in front of a sea of 20,000 people. Gajendra Singh’s dramatic suicide was one of the first ever to occur in such a public arena. Almost instantly, politicians started responded to the incident. Senior AAP leaders first alleged that it was an attempt to “sabotage” the rally and slammed the police for being “mute spectators.” By late evening, Prime Minister Narendra Modi tweeted “At no point must the hardworking farmer think he is alone. We are all together in creating a better tomorrow for the farmers of India” (see Figure 6.1). Immediately following the public announcement of the Singh’s death, politicians from rival parties began demanding that the BJP government “waive loans of struggling farmers,” essentially subsidizing debt restructuring or waiving them entirely.

This elicited a critical response from Gopal Shetty, the BJP Minister of Parliament for North Mumbai, who said: “Not all farmer suicides happen because of unemployment and starvation. A fashion is going on. A trend is on.”\(^\text{127}\) He later retracted the statement after being criticized, but it true that the problem of farmer suicides has become a chronic one. Between 1995 and 2016, the Government of India notes that at least 315,000 farmers committed suicide across the country. However, the fact that the incident took place in the nation’s capital in front of the media and the immediate and politicization of the event forced the government in power to respond more forcefully, in a way that had not happened earlier.

\textbf{Figure 6.1} Tweet from Prime Minister Narendra Modi responding to Gajendra Singh Kalyanwat’s suicide

Representatives of the Indian National Congress (INC) party, the main opposition party, demanded the registration of a first information report (FIR) by the police against Prime Minister Modi and Delhi Chief Minister Arvind Kejriwal, holding them “most responsible” for the suicide of the farmer.\(^\text{128}\) Gajendra Singh was taken to the hospital and eventually pronounced dead. Outside the hospital, Rahul Gandhi, the Vice President of the INC party and Member of Parliament, representing Amethi, Uttar Pradesh, who lost the election to Narendra Modi in the 2015 election, spoke to reporters outside the hospital stating, “I had earlier said farmers are being

punished by the Modi government. I had said they only help corporates, in Parliament they said suicides are not taking place. We will do whatever we can for farmers. We are going to fight the land ordinance, we will not let the BJP government take away the land of our poor farmers."\(^{129}\) Meanwhile, #GajendraSingh was tagged in social media channels and hundreds of thousands of posts were circulated on the days following the incident (See Figure 6.2 and Figure 6.3).\(^{130}\)

Figure 6.2 Illustrated cartoon of farmer suicide by Manjul posted after Gajendra Singh’s death on Facebook

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\(^{130}\) Such images and memes were powerful vehicles for regional political campaigns and at times public mobilization suggesting that the incipient role of technologies such as Whatsapp, Twitter and Facebook in political awareness across geographies is an important dimension of understanding contemporary agricultural relations of power.
Gajendra Singh’s suicide forced the hand of national politicians and local policy makers. According to press reports, the fact that this suicide took place in a massive public rally at the iconic Jantar Mantar monument in New Delhi entirely derailed the administration’s plan to pass the Land Bill, which had been expected to pass in both houses of Parliament. Just the next day, the Prime Minister addressed the incident drawing attention his new crop insurance scheme, which he said would extend protection to the nation’s millions of farmers from natural disasters. And this ultimately became the backdrop for the ruling BJP party’s official launch of the PMFBY in January 2016. The new policy was built on a long series of previous programs instituted since 1972, which at the time was only affordable to very few farmers, as discussed in the previous

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chapter. “This scheme not just retains the best features of past policies but also rectifies all previous shortcomings... this is a historic day,” Prime Minister Modi said in a tweet.

In line with my argument that state agricultural policy since the Green Revolution has come to overemphasize “riskholding,” the Prime Minister raised the fiscal priority of crop insurance by increasing the national budget allocation in 2016 in order to provide higher subsidies for the insurance scheme, while lowering previously budgeted infrastructure spending that he had prioritized at the outset of his post-election policy agenda. Indian political commentators pointed out how the new subsidies were a only short-term response to “the impact of unseasonal rains and two straight years of drought on agriculture impacting over two-thirds of India's 1.25 billion people [that had] dented Modi's popularity in the countryside.”132 More specifically at the time, it was reported that the program was an effort to “woo the country’s powerful farming community after being beaten in two recent state elections”.133 Meanwhile, several ministers of the central government praised the new insurance program in terms of religious imagery from Hindu beliefs in supernatural powers that would be able to protect people from evil external forces. For instance, Rajnath Singh, the Home Minister for the central government claims that the Prime Minister’s “new crop insurance scheme will not only act as 'Suraksha Kawach' (security shield) against the vagaries of nature but also safeguard farmers' interests," and Union Minister, M. Venkaiah Naidu, stated that the program would be "amrut sanjivani (divine nectar of immortality) for farmers which will help them in distress." However, these allusions to external forces miss the basis of main problem underlying agrarian crises and farmer suicides.

132 Although this policy was not operative, commentators pointed to the ruling party’s significant loss in the largely rural state of Bihar as evidence of the central government lack of adequate investment in rural development. 
133 http://www.huffingtonpost.in/2015/12/17/modi-focus-on-crop-insurance_n_8824526.html
To situate the problem, across India, suicides by farmers rose 42%, between 2014 and 2015 based on data by the National Crime Records Bureau (NCRB). In the NCRB Report on Accidental Deaths & Suicides in India” (2016), they state that “highly erratic and inadequate monsoon (in 2014 and 2015) aggravated the problems for persons engaged in the farming sector...manifestations of these in extreme situations can be seen in the form of farmers’ suicides" (National Crime Records Bureau 2016: 264).\textsuperscript{134} Yet, the report asserts that bankruptcy, indebtedness and crop failure were the leading causes of suicide by farmers, accounting for over 58% (4,659 out of 8,007) deaths\textsuperscript{135}. Analyzing the 42% spike in farmer suicides in just one year, Himanshu, a professor at Jawaharlal Nehru University in New Delhi points out that:

“[N]early 73% of farmers who committed suicide were small and marginal cultivators owning less than 2 hectares...[this] signals the severe distress in the agriculture sector shows that while wage labourers had the choice to move out to non-farm sectors, the farmer is stuck with rising debt and falling incomes. In this context, there has been a strong movement against the policy overemphasis on increasing lending and credit facilities.”\textsuperscript{136}

This quote begins to illustrate how the problem of farmer suicide and its embeddedness in relations of financialization are uneven in ways that are highly relevant to understanding the nature of “riskholding” and of insurance in India. The quote references the impact of class or landholding status in the incident of suicide, showing that landless laborers are less vulnerable because they may have less contractual obligations locking them to agricultural production unlike the small and marginal cultivators (having less than 1 and 2 acres of land, respectively). At the same time, this has not been the case throughout the country. No farmer suicides were

\textsuperscript{136} http://www.livemint.com/Politics/shu2TA8upeTvOTaEVYd1L/Suicide-by-farmers-rose-42-between-2014-and-2015.html
reported in West Bengal, Bihar, Jharkhand, Uttarakhand and Himachal Pradesh, suggesting the potential for tremendous variations for the underlying factors. Importantly, as we showed in the previous chapter, crop failures are not the only fatal concern. Even with normal seasonal monsoon precipitation, overcultivation of particular crops can push prices dramatically down even as farmers are trying to compensate for a previous season’s drought, leaving farmers both indebted to their lender and ineligible for a new loan for the next season.\footnote{Following the reduction of price controls and opening up of crop and commodity to global prices, farmers face severe price risks even when there is a "normal monsoon" and no weather risk events. For instance, following the normal monsoon in 2016, the agriculture ministry projected record foodgrain production and farm incomes have severely decreased due to falling prices of foodgrain like pulses (e.g. tur) and perishable produce (e.g. onions and potatoes) due to overproduction or overcultivation.} Explaining disparate outcomes as well as more generalized patterns in the context of such a massive agrarian system undergoing transformation is the focus of this chapter.

\section*{6.1 Introduction}

In this chapter, I return to the debates on the agrarian question to situate "riskholding" as it relates to indebtedness, financialization, and ecological degradation and I argue that crop insurance can only be understood in relation to other forms of risk and contingencies—ecological, credit/indebtedness, geographical, and political. To make this point, I build on the productive contributions by and debates between Henry Bernstein and Phillip McMichael on the agrarian question and define a middle position to explain the spatiality as well as the politics of insurance in India. On the one hand, I confirm Bernstein's explanation for contemporary agrarian transformations and structural fragmentation within broader processes of capitalist development. However, I disagree with Bernstein's minimization of the political dimensions of the agrarian question. Building on McMichael's work on "food regime" analysis, I explain how the
financialization of agriculture as well as its ecological and economic contradictions has shaped the mobilization of small-holder farmers (which constitutes the vast majority of the agricultural cultivator and laborer population) into a powerful political force in India. Recent electoral strategies that focus on crop insurance, farmer suicides, and loan waiver (i.e. debt relief) programs provide some evidence of this.

Importantly, these dynamics described above, including the implementation of insurance programs and its contexts vary spatially and cannot be understood from only a nation-state spatial scale. This chapter explores sub-national variation as well as consistencies using the case of four states--Maharashtra, West Bengal, Andhra Pradesh, and Punjab. As I will show, these states have a different histories and contexts of production and geographical risk that express a wide variety of outcomes. In this chapter, I focus on seven factors as axes of description and comparison, which include the following:

1. Farmer Suicide
2. Landholding/Tenancy
3. Indebtedness
4. Political context
5. Weather Risk
6. Irrigation
7. Insurance

The methodology of comparison is based on grounded theory of the case studies to focus on what Anselm Strauss and Juliet Corbin (1994) call “patterns of action and interaction between and among various types of actors and institutions”, with the aim of relating specific
“conditions” and “consequences” (273). I express these findings primarily in narrative form for each of the states separately and compare them in the discussion section.

My findings from this chapter show that the dramatic and uneven expansion of indebtedness, political context, groundwater extraction, fragmentation and landlessness shape the ways in which risk is generated and managed. First, I want to insist that planners and stakeholders have to better integrate debates over the design of crop insurance programs with other forms of risk and contingencies. Building on what I’ve show in the previous chapter, state-wise comparison and analysis show that, contra the dominant agricultural economics orthodoxy based on sustained productivity and growth, India’s agricultural production is underwritten by direct and hidden subsidies and forms of economic and ecological rents (Bernstein 2009: 256)\(^\text{138}\) that are exacerbating ecological degradation as well as agricultural indebtedness and suicide. At the same time, while insurance products are a relevant intervention in such a financialized context, the implementation of the existing programs effectively "redline" a large contingent of agricultural workers that are marginal and tenant farmers with little to no formal landholding (which is also reflected in caste and class hierarchies), sometime a majority of a state’s farmers (e.g. Andhra Pradesh)—amplifying the unevenness of riskholding and disparities often between those with larger landholdings and those will less.

Secondly, to date, much of the analysis in insurance design is focused on abstract and apolitical imperatives to minimize moral hazard. However, financial risk in its various forms is becoming politicized in ways that ultimately upend the actuarial approach through politicized variations in

implementation, by way of insurance subsidies and loan waivers as electoral strategies, that are often an outcome of farmer mobilizations to disrupt production and distribution of agricultural commodities. Crucially, I posit that such mobilizations are not necessarily specific to particular classes of farmers (and may even include non-farmer allied groups) because they are a more system-wide response to the asymmetry of insurance ratemaking and financialization patterns more generally, in which decision-making is highly centralized, extremely hierarchical and provides no power for participation and design by farmers. Lastly, the uncertainty and severity of climate variability through unseasonal rainfall, drought, flooding, and disease present complex challenges for the very viability of agricultural production that are not adequately addressed through the insurance program, but may in fact, temporarily mask these processes in the short-term (O’hare et al 2016\textsuperscript{139}), and increase the probability of more severe crises in the medium and longer term. I will provide a case-by-case description in the following sections and compare the findings at the end.

6.2 Maharashtra

The Indian National Congress party had led most state-level elections since 2000. The election of Narendra Modi from the opposition party, the BJP, as the country’s Prime Minister in mid-2014 helped the same party gaining power and support from the electorate in Maharashtra later that year in December of 2014. Chief Minister of Maharashtra, Devendra Fadnavis came into office during what was already a very serious drought and heat wave that persisted through 2015. Maharashtra was hit particularly hard as a vast majority of farmers depend exclusively on rainfall for growing their crops. On top of that, several areas of the state were facing severe drinking

\textsuperscript{139} O’Hare, Paul, Iain White, and Angela Connelly. "Insurance as maladaptation: Resilience and the ‘business as usual’ paradox." Environment and Planning C: Government and Policy 34.6 (2016): 1175-1193.
water shortages. At the pinnacle of this crises, on April 11th, 2015 for the first time in history, the government designated a train to travel over 300 km to transport 50 wagons filled with over 200,000 liters of drinking water every day to Latur which is located in the Marathawad region of eastern-central Maharasthra, ultimately spending over Rs. 20 billion ($300 million). Protests erupted over high amounts of wastage for watering the massive cricket fields in Bombay for a major event and a case was filed in the Bombay High Court, followed by a final decision by India's Supreme Court, forcing the governing authority to relocate the entire event out of the state. The current political stakes of the agrarian sector and the people that live outside of the cities has thus become more central to mainstream political discourse of the state then earlier periods.

At least 26 million people depend on agriculture in the state and government investment in subsidizing the PMFBY program was expected to relieve farmers of weather risks to their livelihoods. However, in mid-2017, the government of Maharashatra was caught by surprise by the largest protest of farmers in several decades. Across the state but particularly in western Maharashtra, enraged farmers emptied milk and vegetables onto the highway, and blocked trucks carrying produce. The strike brought together a diverse group of political parties and farmers’ organizations to press for loan waivers, free electricity for eight hours, pensions for farmers above the age of 60 years, a fixed price of milk and that the minimum support price for crops be fixed at least 50% above the cost of production, among other demands. The likelihood of such a demand increased significantly in early 2017 when the BJP candidate for Chief Minister of the state of Uttar Pradesh promised an $8 bn loan waiver to farmers across his state if he was elected and immediately began implementing the loan waiver right as soon as he won. Within weeks,
farmer in other states including from Maharashtra began demonstrations and strikes demanding similar kinds of commitments from their respective governments.

### 6.2.1. Indebtedness

Agricultural lending over the past ten years has spread unevenly creating a bifurcation between an agricultural lending policy that benefits larger, capitalist farmers and a microfinance policy that injects small infusions of credit at a household level through the medium of rural women. For example, almost half the total ‘agricultural credit’ in the state of Maharashtra in 2008 was disbursed by urban and metro branches, over 42% of it in Mumbai alone which, and as noted journalist P Sainath puts it, “is the stomping ground of large corporations rather than of small farmers”.140 The Chief Minister, Fadnavis himself acknowledged,

> “Earlier, there was a trend of financial institutions setting target of the funds to be disbursed. Often, big farmers would avail major financial loans, which would sum up their target. Now, we are emphasizing on covering maximum number of farmers and not just quantum of funds disbursed.”141

The new political movements demanding loan waivers for commercial and cooperative bank loans raises new questions for agrarian policy because these measures benefit farmers with larger landholdings. The structural consequence of such policies is an expression of Gerber's (2014) argument that "[t]he emergence of agrarian capitalism thus gave rise to two different types of debt: one was a sign of precariousness, the other of increasing consolidation and capitalization" (732).142 In this context, the relatively rich households have access not only to a greater amount

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of credit (both formal and informal) but also to cheaper credit, thereby perpetuating rural inequality because the burden of higher-interest informal debt on poorer households is much higher than on rich households (Figure 6.4).143

![Chart 4](chart4.png)

**Chart 4**

**Moneylenders a big source of loans for small farmers**

<table>
<thead>
<tr>
<th>Size of land holdings (hectares)</th>
<th>Sources of loans (% of total loans)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bank</td>
</tr>
<tr>
<td>Less than 0.01</td>
<td>12.9</td>
</tr>
<tr>
<td>0.01-0.4</td>
<td>31.0</td>
</tr>
<tr>
<td>0.41-1</td>
<td>37.6</td>
</tr>
<tr>
<td>1.01-2</td>
<td>47.5</td>
</tr>
<tr>
<td>2.01-4</td>
<td>50.0</td>
</tr>
<tr>
<td>4.01-10</td>
<td>53.2</td>
</tr>
<tr>
<td>More than 10</td>
<td>63.5</td>
</tr>
</tbody>
</table>

*Figure 6.4 Source of loans by size of landholding Source: Economic Survey (2015)*

Relations of credit and indebtedness at the individual and household level can be more convoluted with money borrowed from many sources, all of which have varying repayment schedules and different enforcement level. In my interview with people living in a small village called Shirur in Western Maharashtra, though they showed little hesitation to discuss their outstanding loans, they spoke with uncertainty. One farmer in a focus group shared with me that he owed Rs.90,000 ($1,384.62) to the cooperative society. He said, “I couldn’t pay the loan this year. I could not repay the previous year also, but this year will be better. The society knows because this is a problem for many of the others.” His situation was not unique and this was something that the two men next to him also confirmed. However, they said that this made it a challenge to obtain new sources of credit, and limiting the possibility of how much they could grow given the increasing cost of inputs including fertilizers, pesticides, and additional water.

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pumping with the uncertainty in the rainfall pattern even if the monsoon was better this year.

These concerns are reflected in broader patterns in the state.

**Figure 6.5** Group interview with farmers in Shirur village in Western Maharashtra, Credit: author.

State agrarian policy has subsidized and expanded private and public credit as a way to undercut usurious, informal money lending, seen as the leading cause of farmer indebtedness and suicides. Yet, the latest data from the National Crime Record Bureau (NCRB) report from 2015 undercuts this premise, particularly in Maharashtra where more "small farmers" (farmers with between 1 and 2 hectares) have committed suicide than "marginal farmers" (with less than 1 hectare) which are more likely to borrow from moneylenders. It shows that a majority (over 80 percent) of the farmers that committed suicide had outstanding formal, institutional credit. A former member of the government's now defunct Planning Commission stated:

"most policymakers thought that moneylenders were the culprits of the piece...[e]ven today, more than half the people take loans from moneylenders...[but] moneylenders were
more flexible compared to banks and microfinance institutions... The organized sector is less flexible because rules don’t permit them flexibility... They put pressure by telling others in self-help groups that their share would be cut if one person does not pay loans in time. This creates social pressure, as well. Many also send goons to the neighborhood to scare borrowers.”

Maharashtra has the highest number of farmer suicides reported of any state, remaining consistent over the past ten-year period (2007-2017). In 2015, 4,291 farmer suicides took place in the state accounting for 34 percent of all such suicides reported in the entire country. One-third of the suicides have taken place in one region of the state called Marathawad, which includes Latur, the district that had faced acute water scarcity and received daily train shipments of drinking water. Meanwhile, the state sent thousands of water tankers to over 5,000 villages throughout the territory over the course of 2015 (see Figure 6.6) and this effort was repeated though at a larger scale to reach more villages in 2016 facing severe drought (Figure 6.6). In one of the hardest hit districts, Beed, approximately 750 tankers carried roughly 24,000 litres of water each to the district’s 2.7 million people, three-fourths of whom live in villages. Though 2016 was more challenging, in the villages I visited, they have depended on tanker-provided water services from the government for at least 9-10 years.

144 http://www.businessinsider.com/hundreds-of-suicides-in-india-linked-to-microfinance-organizations-2012-2 ...
Particular details in this article pertain to SKS Microfinance. A profound shift in values and incentives at SKS began in 2008. In October, Boston-based Sandstone Capital, now SKS’ largest investor, made a major investment. It joined U.S. private equity firm Sequoia Capital, which funded Google and Apple and is SKS’ largest shareholder, on the board of directors.
A unique pattern that differentiates Marathawad and Vidarbha region from the rest of the state is that landholdings tend to be large as agriculture and population density is smaller than in
Western Maharashtra; however, productivity and fertility of the land is much lower and more susceptible to weather risk and its financialization. The overall trend has shown a decrease in landholdings across the state. In 1970-71, the average land holding per farmer was 4.28 acres and is now 1.44 hectares, while the percentage of small farmers (with less than 2.5 hectare) has increased from 70 percent to 79 percent of the active agricultural population (approximately 13.7 million) in the state. One reason is that cash crops have led to the increased legal division of family lands in Western Maharashtra. This is especially common for lucrative crops such as sugarcane (on average Rs. 80,000 seasonal income) that accounts for just 4 per cent of Maharashtra’s farmland, but use 70 per cent of its water because most of the state has semi-arid growing conditions.

Figure 6.7 A chart from a mainstream newspaper showing the trend in farmer suicides in Maharashtra (grey) as related to the Marathawad region (in red) from 2013-2016.
6.2.2. Rainfall Dependence

For majority of farmers that are dependent on rainfall, their risks and income strategies vary significantly. In Bhor district, located in western Maharashtra, I met farmers in several villages that had recently faced severe drought earlier that year. One farmer explained his situation:

"The entire agriculture here is dependent on rain-fed, that is 4 months Kharif, after that there is no alternative for irrigation. If we get some other system of irrigation, nobody from the village will leave the village. But, after sowing, we'll go to the cities--like Mumbai, Pune and work as laborers, security guards for 7-8 remaining months…Of course, if there is water enough for one more season there is no need to leave the village. But we've always lived like this. My father worked on road construction, dam construction, irrigation. They used to get paid in the form of wheat, rice, oil bags. His father worked as a laborer."

The livelihood strategies of the farmers in this village reflect the "fragmentation" patterns of agricultural more generally; however, the expectation of rainfall is an essential factor of production, making their livelihoods a dependent variable of the rain. An engineer that was accompanying us on the field visit explained:

"So, [if] there is no rainfall, [there is] no cropping pattern. Entirely no alternative. They depend on the employment in nearby places (big towns and big cities) and work on projects, like roads. When there is no rainfall, and no cropping or agriculture, the government runs the employment guarantee scheme (i.e. MGNREGA). Under such schemes, the government hired laborers to build roads and (water) tanks. So the people work there. They worked through the government scheme four years ago. Since then, there has been sufficient rainfall."

The people living in these villages modulate their strategy for income generation based on the rainfall patterns, relying on the government employment schemes when there is no rain, yet they spend most of the year working in cities and towns regardless. However, it’s important to note the difference in income generation in the peri-urban context. I met with residents owning agricultural land living nearby Maharashtra Industrial Development Corporation (MIDC) factories. The residents explained that they no longer use most of the land for agricultural but
instead, they have constructed dormitories and they rent out rooms for laborers working at nearby factories making 5-times more income. They explained that the challenges with water scarcity have not affected them as much because of this.

As distinct from the lack of rain discussed above, the variability of rainfall intensity and distribution has led to different impacts on agricultural patterns. According to climatological scientists of the Agricultural section of the Indian Meteorological Department (Agromet-IMD), “unseasonal downpour and extended periods between rainy days is a new and alarming feature of the changing monsoon pattern” (Nandargi and Mulye 2012).¹⁴⁶ These findings are confirmed by Pune’s Indian Institute of Tropical Meteorology and other research institutions studying climatic aberrations. For instance, Akola, a district in central Maharashtra received 80 percent of its total seasonal rainfall amount (400mm) over just two days from August 4-5 2015—the local district collector said: “the fields flooded and rainwater could not percolate into the ground. This was followed by a dry spell which lasted 41 days...[and] every crop failed: soybeans, cotton and tur” and most families were forced to borrow money from moneylenders in order to survive.¹⁴⁷ I interviewed a group of small-farmers in the remote Palshoshi village approximately 200 kilometers away from Pune in Western Maharashtra to ask about the ways in which they have responded to changes in the weather. The most common trend taking place in the villages in this region is a shift in cultivation towards new crops, such as soyabeans, which are not as sensitive to variability in rainfall (e.g. rain delays, heavy rains, etc). The transcript of their answers along with the comments by an engineer present translating and interjecting with more details:

Farmer: Earlier we were planting rajna (red kidney beans), which is very sensitive to variations in rainfall. But nowadays we have shifted to the soyabean

Engineer: The soyabean is a little more resistant to variability in rainfall. It can sustain if there is less or higher rainfall.

Farmer: So now we are taking soyabeans, which is an alternative to beans.

Engineer: That type of change over or shifting is happening. So now they grow paddy and soyabean. Changes in cropping patterns are likely to increase. But it’s important to realize that each plant is different with regard to cost, weather sensitivity, soil needs, and water requirements and these conditions make it a challenge to rapidly change from one cropping pattern to another.

I was curious about the possibilities of irrigation in this village and asked about what would be required. The engineer, who has worked on groundwater and irrigation projects for many years stated:

"Unfortunately, you can’t provide some alternative source of irrigation besides rainfall. The area has rugged topography, undulating, mountainous hillocks. Under such geomorphological conditions, to provide some sort of surface irrigation is highly impossible. And due to the slope, whatever, ground water gets recharge that flows towards the low-lying area because of gravity. If they get above average rains, then they can grow a second crop with the soil moisture and base flow."

Based on such conditions, it seemed that this region would remain rainfall-based, and consequently vulnerable to the uncertainty and variability of rainfall for their livelihoods.

6.2.3. Insurance in context

In this context, it is important to understand the role and perceptions of the crop insurance programs because it is intended to provide risk transfer for situations such as the one described above, where cultivation is rainfall dependent. Since early on in my fieldwork in mid-2015, one of the most common responses I encountered from farmers was a lack of information about such programs and how they would benefit from them. One of the reasons for this was that insurance companies do not visit the villages to sell policies or market the program. The PMFBY is a central government scheme and though it has enlisted state governments to spread information
and awareness, there has been very limited exposure from insurance companies. Because the insurance is actually deducted automatically from agricultural credit accounts in the new season, it is also the case that farmers who had insurance were not even aware that they were covered.\textsuperscript{148}

By mid-2016, better off farmers in the medium to large farm size ranges were much more aware of the new PMFBY program, and many had participated infrequently in previous programs as well. In Shirur, another village approximately 140 km away from Bhor, I met several farmers that explained their experiences with insurance companies, specifically individual contracts at the farm-level. In one of my conversations a farmer provided an account of how he interprets farmer-insurer relationships.

\textit{Farmer:} I am aware of crop insurance and I took insurance for last two years. I took it for two crops: onion and tur dal [lentil]. The problem is the compensation amount. And the time factor (delay). Even when I have losses, there has not been a payout.

\textit{Me:} How much land do you own?

\textit{Farmer:} I own 13 acres of land. But, after one particular incident I have not taken insurance. Last time, the insurance company said if there is crop failure, the insurance contract promised Rs.1.5 lakhs [~$2,300], but when I called them, they said that I didn’t take the appropriate measure for taking care of the crops. And instead they reduced the amount to Rs 52,000 [~$800]. And even for that amount, I had to give Rs 6,000 [~$90] to the revenue officer otherwise I wouldn’t get anything. So, even after I paid for the insurance, no one comes to actually survey the crop. I had to call them and report it and the revenue officer also came. But, why should the revenue officer come in-between. I don’t trust this scheme because, the crop failure took place for 7 other farmers and I was the only one to take crop insurance. Because I took the insurance, I had more of loss than they had because they didn’t pay for crop insurance. I had invested 1.30 lakhs ($2000) for growing the crop.

The account by this medium-holder farmer conveys several relevant data. First, the characterization of insurance companies as extractive and unreliable based on his previous experience is definitive for his expectation about such companies even in the context of a

\footnote{Similar incidents were reported on in Haryana. http://www.downtoearth.org.in/news/farmers-confronting-banks-against-forceful-deduction-of-crop-insurance-premium-for-pmfby-56739}
reformed governmental policy framework. Second, the experience of negotiating for a claim can be disempowering and introduce new risks in the calculation if a farmer thinks that he may not get a payout even when there is a verifiable loss on account of a technicality. Although the new index insurance policy attempts to resolve the second concerns by automating the payment process using automated weather stations, the most widespread program still operates on the basis of assessors that could behave just as poorly.

To be more specific, through the Weather-Based Crop Insurance Scheme (WBCIS), automated weather stations and payment processes provide a way to eliminate uncertainty and create trust. Yet, throughout India in the first year of the PMFBY, the WBCIS was adopted far less and not even offered in many states, and in many places, the premium was more expensive than yield-based. Within Maharashtra, the way the WBCIS for pomegranate was designed explains how political actors have been able to shape insurance terms. I spoke to a senior underwriter at a weather data company who explained that:

"The WBCIS program was started as an investment program—to ensure people got a payout. When you look at the termsheet of the policy, the product was sold with a 55% premium rate. The pomegranate contract was designed in consultation with the pomegranate growers’ association when they approached the Maharashtra state government. The high rate is a function of the wide threshold for triggering the policy which gives it an almost 100% probability of payout. Even the pomegranate product audit is showing this."

The design of contracts and termsheets are an important dimension of how risk is allocated and I believe it is relevant to illustrate how insurance contracts in the current system are shaped by political actors in the context of uneven structures of financialization, ecological degradation, and indebtedness.
Finally, the actual distribution of insurance in each state is a function of cropping patterns as well as insurance rate-bidding practices, which assign a group of districts to particular insurance companies as one cluster. Particularly in larger states, like Maharashtra the PMFBY mandates the state categorize and group districts into clusters (See Fig. 6.8). From an actuarial standpoint, the spatial ordering of the cluster-bidding system is supposed to control for adverse selection in any one single insurers portfolio of insurance contracts and prevent insurers from self-selecting individual districts. The actual methodology for establishing these districts in not uniform across states and is often not made public. The data on the final insured value for each district based on the new policy will not be available for at least another year; however, I collected data from insurance companies about their estimates of the total allocations during the Kharif season for 2016-2017.
Understanding the spatial distribution of insurance is important for several reasons. First, the map (Figure 6.9) shows the expected area of farms that will be insured by hectares in the state by district for the new PMFBY program based on current and historical data. Here we see that the Marathawad region, that recorded the highest incident of farmer suicides is in the center of the state and shows the largest amount of territory (in Hectares) under insurance. One reason for this is that as discussed earlier, the landholdings in Marathawad region are larger and less dense, yet they also grow crops that have lower market value and thus lower insured value. So, when we compare this to the total estimated amount of value insured (measured in dollar value at an
exchange rate of Rs65 per $US1), the districts with the highest amounts of insured crop value are less geographically concentrated to just Bid and Jalna Districts (see Figure. 6.10) and include several surrounding districts as well. In the last map (Fig 6.11), I’ve calculated the ratio of expected sum insured over the expected area insured to show the districts with the highest ratio of insured cropland relative to area under cultivation that is insured. These are located on the western coast and the eastern region also known as Vidarbha, which produces the most cotton (Yavatmal), oranges (Nagpur) and rice (Gondiya) in the entire state. These maps provide spatial perspective on the insurance geography at the sub-state level, to show the patterns of spatial concentration and distribution that shape riskholding.

**Total Estimated Area Insured in Maharashtra by District for PMFBY Kharif Season (In Hectares)**

![Map of Maharashtra showing estimated area insured](Image)

**Legend**

- State Boundaries
- District Boundaries

**Maharashtra**

- Sum of Area (Hectare)
  - 0 - 50,688
  - 50,689 - 151,815
  - 151,816 - 296,615
  - 296,616 - 530,171
  - 530,172 - 804,778

*Source: Government of India, Agriculture Insurance Company*

**Figure 6.9** Expected Area Insured (in hectares) in the PMFBY in Maharashtra for the Kharif Season 2016.
Figure 6.10 Total Expected Sum Insured (US$) by District in PMFBY Scheme in Maharashtra for the Kharif Season 2016
Figure 6.11 Expected Sum Insured (Rs. Lakhs) Over Expected Area Insured (in hectares) in the PMFBY Scheme in Maharashtra for the Kharif Season 2016
6.3 Andhra Pradesh

In Andhra Pradesh, the Telugu Desam Party (TDM) is a regional party that is an ally of the BJP in power in the central government. The Chief Minister N. Chandrababu Naidu, has long been part of the state apparatus and previously held the Chief Minister position from 1995-2004 prior to the political mobilization that forced the creation of the new state of Telangana formed from the northwest part of the state in 2014. He has worked to consolidate his supporters since then and one of my informants on my trip said that when it comes to banking: "if you are a member of the TDP party then you will get a loan, the TDP is in all the village-level governments, and VRO [Village Revenue Office] official and panchayat office has to approve it." The impact of political party affiliation on access to resources and services is an important dimension to understand the political economy of financialized agriculture, especially at the village levels. At the same time, recent experiences from crisis related to microfinance loans have made forms of affiliation and trust-networks more important for hedging asymmetries in the context financial institutions and rural livelihoods. Andhra Pradesh was the site for high levels of recruitment in microfinance (and microinsurance) from the 2000s, and these programs became increasingly politicized following debtors’ repayment strikes and legal restrictions on debt collection in the state, fueled by the explosion of populist anger over coercive loan recovery practices and debtors’ suicides149 (Taylor 2011). These events have deep implications on the popular perceptions of banking and insurance programs and institutions as well as the kind of claims that can be made against such institutions, which are relevant to the deep political angst related to financial risk and insurance despite people’s dependence on such institutions.

6.3.1. Landholding/Tenancy

Of several factors, Andhra Pradesh's landholding structure is key to understanding the political and economic context within which insurance operates. One of the first comments I was told during my trip to Andhra Pradesh by a team of assessors visiting farms after a recent insured event was that informal tenancy shapes the unequal distribution of credit and insurance programs in the state as well as recently formed Telangana because many of the regulatory structures are the same. Several recent studies discuss the extent of the problem in terms of informal leasing which is higher primarily in command area (canal irrigated areas) as well as a recent survey of "tenancy reform" proposal by Niti Ayog (2016). As noted in the widely respected government commissioned M. Swaminathan Report, Andhra Pradesh has higher agriculture growth compared to the national average being, but a significant percentage of small farmers are "lessee-cultivators" (tenant farmers) that have informal arrangements with the actual land owners so are considered illegal (non-legal occupants) and currently ineligible to receive benefits such as institutional loans, crop insurance, disaster relief and remunerative price for their produce. In a report in 2014, written by the Radhakrishna Commission, the authors point out that this problem persists particularly in south coastal Andhra Pradesh, where 50 to 60 percent of the cropped area was under informal tenancy, because the formal owners lease illegally because they fear the resumption of land (expropriation) under existing tenancy law.

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The two districts that I visited, West Godhavari and Krishna, are part of the agricultural coastal belt and face many of the same issues. The crop insurance underwriters and contracted assessors that I traveled with explained the challenges of insurance provision in the state. One of the more senior ones did not beat around the bush:

"Listen, right now I can tell you that 80 percent of land is across this region is being leased for farming in the coastal belt illegally. The majority of the owners live in Hyderabad [the state capital]. And we see that small and marginal farmers rent the land because their plots are too small. The owners don’t give lease agreements to the actual lessee -- they give it to their friend and submit to the DC [District Collector, similar to the mayor]. Then they lease informally. So insurance and credit actually stays with the owner or explicit lessee. This is actually illegal for the bank to do this. But if you ask the bank officer, he says ‘I am giving loan and just want repayment.’ So they prefer giving to land owners only. In the field, when we talk to the tenant farmers, they don’t implement improved “land development” practices that we suggest. They should be plowing, tilling, leveling, and increasing the nutritional content (organic matter). They don’t do this, and that is what increases land erosion, fertility of land is also decreasing...They don’t take any additional measures."

The history of this problem is explained in previous studies (Bardhan 1994) and several studies on informal leasing, tenancy reform and the R. Radhakrishna Commission and have provided specific recommendations with regard to illegal and informal tenancy in their report titled, “Inclusive and Sustainable Agricultural Development of Andhra Pradesh.” One of the consistent recommendations from many studies in the short-term is to create a land bank for agricultural purposes by taking land from those who want to lease out with ownership guarantee. These lands can be provided to tenants on a long-term lease to end the illegal tenancy problem and facilitate tenant farmers’ access to bank credit, subsidies, and other benefits extended to small and marginal farmers. Yet, landowners remain legitimately skeptical that such


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arrangements would be able to prevent political mobilization and pressure to redistribute land, and this contributes to the political stalemate of the regulatory environment that structures the uneven and precarious tenancy arrangements that exist today. Lastly, this short-term stalemate has also forced marginal and tenant farmers to secure their economic position instead through more intensive and extractive forms of production that undermines the longer-term sustainability of agro-ecological conditions, particularly through the crisis of groundwater overexploitation.

6.3.2 Irrigation/Groundwater

Though less visible in economic and agricultural production statistics, the crisis of groundwater overexploitation has not gone unnoticed by either the Andhra Pradesh state government or the World Bank, both of which have heavily promoted extraction as part of agrarian modernization policies. Groundwater was expected to help smallholders increase agricultural productivity and switch to higher-value crops—deemed central to a broader revitalization of the rural economy (Taylor 2013: 695). Marcus Taylor’s (2013, 2015) research on the relationship between groundwater extraction and debt provides evidence for the reinforcing logic between the two processes. For instance, while direct access to groundwater appears to smallholders and the government as an immediate ecological fix for the pressures of competitive agriculture on limited land holdings, it comes at the cost of deepening the structural pressures of debt and the risks of catastrophic failure. Thus, in areas of high groundwater abstraction, competitive drilling and aquifer depletion over the course of a season lower the water level, making earlier wells obsolete and compelling a new round of deeper drilling. Electricity subsidies are the basis for the widespread accessibility of fuel to extract groundwater and this expenditure now accounts for roughly 50 percent of the annual fiscal deficit. Regardless of the budgetary impact, the promise
of free electricity to rural smallholders has become politically sacrosanct. Efforts to partially withdraw subsidies in Andhra Pradesh in 2000 led to violent protests by farmers mindful of their keen dependence on groundwater (Taylor 2013: 697)

Over the past two decades the area of land under tank irrigation has not simply declined in relation to canal and well irrigation, but has undergone an absolute reduction across semi-arid Andhra Pradesh. Notably, because tanks play an important role in recharging groundwater levels, the decline of tank systems creates a negative feedback loop into aquifer depletion that amplifies the speed of depletion over the course of the season. Groundwater depletion is rampant, particularly following years of below-average rainfall. Government estimates for Andhra Pradesh in 2008 suggested that 41% of groundwater blocks were at overexploited, critical or semi-critical levels. Such aggregated state-level totals, however, do not distinguish regional variations: in particular the manifold differences between the conjunctive use of groundwater in areas already served by canals, and that occurring outside of such zones (Taylor 2013).

6.3.3 Indebtedness/Loan Waiver

Although microcredit was aggressively promoted in rural Andhra Pradesh for decades, it was too “micro” to cover the energy costs of well drilling plus the pump and pipe equipment, which range between Rs. 30,000 and 80,000 (roughly $550–1500) depending on the depth of the well. At present, informal loans remain the primary option for many smallholders, even though these lock them into relations of extraction and dependency that are difficult to break, as described to me when I spoke with several tenant farmers in Krishna district (Figure 16.12). Often these sources of credit involve entry into multiple contracts, in which landlords or merchants tie loans
to agreements for the purchase of the producer’s crop at a time and price most advantageous to
them. As Taylor writes, “the potential for debt traps is written into this political ecology of
agricultural production. Indeed, indebtedness is rampant across rural Andhra Pradesh, with 80%
of farmers holding debts, and virtually all small and marginal farmers heavily indebted. The need
to cover forthcoming debt repayments leads farmers to gravitate further towards cash crops such
as chilies, sugarcane and cotton alongside rice, though rice is incentivized through government
procurement policies” (2013: 703). During my fieldwork, I was confronted several times by
engineers and officials who discussed how overwhelming the problem of groundwater scarcity
has become and the way in which it has been financialized. Taylor’s analysis captures the
problem very well when stating that:

“in the context of contemporary semi-arid regions of southern India such ‘waterscapes’
have become increasingly interlocked with what we could correspondingly term
‘debtscapes’…households repeatedly navigate the temporal disjunctures of agrarian life
in which expenses for various productive and consumptive tasks do not necessarily align
with the seasonal flow of incomes derived from harvests, off-farm employment,
remittances from migration and other livelihood strategies” (Taylor 694).

These relationships are increasingly restructuring social and economic relationships that are
centered even more on credit and debt risk than landholdings, often because changes in
landholding are less dynamic and far more similar.
6.3.4 Farmer Suicide

For smallholders and marginal farmers across the semi-arid regions of Andhra Pradesh water appears fickle and scarce, whereas debt appears ubiquitous and enduring. In Andhra Pradesh one of the epicenters of such agrarian distress, there have been 20,610 farmer suicides between 2003 and 2011, at an average of more than six per day. To some degree farmer suicides are related to cycles of drought, where in crop failure resulting from erratic rains creates compounding pressures upon households. Droughts, however, have been a longstanding feature of this agrarian environment whereas mass farmer suicides are a much more recent phenomenon. As such,
farmer suicides do not simply reveal the unarguable stresses posed upon households by drought. Rather, they open a window onto new dynamics of vulnerability that have arisen in the context of severe cost pressures stemming from liberalized agriculture, rising levels of household debt and the changing ways in which farmers seek access to irrigation (Taylor 2013). To address this structural vulnerability, households have increasingly self-exploited by using greater amounts of unpaid household labor within agricultural work alongside increasing risk-taking through debt-leveraged agriculture in order to try and expand incomes.

### 6.3.5 Weather Risk (geographical: drought, flood, coastal, disease)

Since, 2014, most of Andhra Pradesh’s districts are located on the southeastern coast of India, a region that is highly vulnerable to cyclones. I visited villages in two such districts highly vulnerable to cyclones, West Godavari and Krishna. I travelled with local assessment staff for a weather data company that provides estimates and ground reconnaissance of insured events including flooding to insurance and reinsurance companies. Once they reach a village, the assessors, often a team of more local agents use a randomized method for selecting and measuring crop damage adopted from the standardized crop cutting experiment (CCE). On this trip, the work was primarily to visit areas that have reported severe weather events, such as flooding, drought, windstorms, and inspect for losses that pertain to the crop insurance coverage of prevented sowing, inundation, and deficient rain, among others, of which we were able to document inundation from the freshwater river and canals due to lack of canal infrastructure maintenance by the government, which had destroyed crops. However, farmers explained to me that the most devastating risk is cyclone and coast flooding. One of the most pressing impacts of coastal flooding in recent years has been the increase in saltwater intrusion, both as a result of
cyclonic events as well as less severe storms and sea-level rise. The incidence of saltwater intrusion has altered the soil composition making the land unsuitable for agriculture. I documented widespread conversion of farming land into aquaculture (Figure 16.13) as a result of salt-water intrusion and coastal flooding in Pasaladivi village in West Godavari district (Singh et al 2006: 475). The assessors said that the problem had increased since the last year and had spread to 6 villages.

The inland districts of the state are located in the government designated “drought-prone” region and are facing severe scarcity of groundwater for irrigation as well as drinking water. Even though the rains were within a normal range in the districts I visited, there was a severe drought in the inland districts of the state, with the potential to destroy hundreds of thousands of hectares
of crops. In late 2016, when I visited Andhra Pradesh, the state was reeling from extreme drought in many districts. With the likelihood that the drought could destroy many standing crops, the chief minister declared his state’s efforts a “war on drought” for instance, deploying thousands of “rain guns” to wet standing groundnut crops. He said, “our aim is to save every acre of the crop and we are confident that we will succeed to save at least 90%.”\textsuperscript{157} To provide a sense of the deployment, the government spent Rs 1.6 billion on rain guns alone and added them to other measures in the field. As an example, they deployed 6,777 rain guns, 6,434 sprinklers, in Anantpuramu, which was the hardest hit, and then 3,915 rain guns, 3,855 sprinklers in Chittoor and 2,285 rain guns, 2,686 sprinklers in Kurnool. Though, the coastal belt that I visited did not face significant drought risk at the time, the farmers and state officials commented on the efforts by the chief minister in positive terms. His aggressive rhetoric and visible actions were seen as genuine, though, when speaking to the local assessors, they did not see the effort as commensurate with the needs and severity of the problems facing the states particularly with regard to generalized water scarcity.

6.3.6 Insurance

The distribution of insurance clusters as determined by the state government to insurance companies is show below (Fig. 6.14). In this case, there are only two clusters for all 13 districts in Andhra Pradesh and these are divided between AIC and ICICI Lombard companies. Similar to the case of Maharashtra, the data on the final insured value for each district based on the new policy will not be available for at least another year; however, insurance companies have


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estimates of the total allocations during the Kharif season for 2016. The map of the total area of rice sown and area insured in the state by district (Fig. 6.15) shows the largest rice growing districts—West Godhavari, Krishna, and Srikakulam. The next map shows the insured area by district for the unirrigated cotton measured in Hectares (Figure 6.16). These maps show that the lowland area that has irrigation has concentrated cultivation of cotton. Meanwhile the upland area is rainfed and usually only has paddy (rice). Lastly, the next two map are of the total area insured by district for all crops group by quantiles (Figure 6.17) and the aggregate total amount (is $US) insured (Fig. 6.18) grouped by quantiles ranging between approximately $55.6 million to as high as $168 million for East Godhavari, West Godhavari and Srikakulam districts, presenting the total value of insured rice crops in each district for the Kharif 2016 season. These maps provide spatial perspective on the insurance geography at the sub-state level, to show the patterns of spatial concentration and distribution that shape riskholding.
Figure 6.14 Insurance Company Allocation in the PMFBY Scheme in Andhra Pradesh for the Kharif Season 2016.
Area Sown (in Hectares) for Rice Crop in the PMFBY Scheme in Andhra Pradesh for the Kharif Season (2016)

Figure 6.15 Area Sown in hectares for rice crop in the PMFBY Scheme in Andhra Pradesh for the Kharif Season 2016
Total Area of Insured Cotton Unirrigated (UI) in Andhra Pradesh by District for PMFBY 2016 Kharif Season (in Hectares)

Legend
- State Boundaries
- District Boundaries
Andhra Pradesh
Area Cotton (UI)
- 10
- 11 - 185
- 186 - 495
- 496 - 2,381
- 2,382 - 3,041
- 3,042 - 29,915

Source: Government of India, Agriculture Insurance Company

Figure 6.16 Estimated Area Insured (in Hectares) for Unirrigated Cotton Crop in the PMFBY Scheme in Andhra Pradesh for the Kharif Season 2016
Figure 6.17 Total Estimated Area Insured (in Hectares) for all crops in the PMFBY Scheme in Andhra Pradesh for the Kharif Season 2016.
One of the main critiques of the financialization of risk is that the process uses the problem of risk as a platform for generating new profits for capital accumulation. As discussed in the previous chapter, this is concern that is at the heart of the debate over the increase in FDI in the insurance sector. An important derivative discussion is the role of financialization is not only providing a new market and source of capital for the transfer of risks, but for simultaneously mitigating risks as much as possible by creating incentives for risk reduction—this is the purported effect of expansion of property insurance on the increased adoption of better quality building codes. In Andhra Pradesh as in other states, insurance is primarily conducted through bancassurance. In the case I examined, this means that bank staff deduct an insurance premium
from an existing loan amount. However, because of lack of communication, many farmers do not even know that they have insurance and may not know the full range of products. In areas where they participate fully, many farmers seem to have a less positive experience with insurance. I recall raising this at a meeting with an insurance company contracted to cover farmers in West Godavari, and the response was that this was not a priority for them. I explained that I met several farmers who experience flooding preventing them from growing crops, but they did not know about the “prevented sowing” clause in their insurance policy, largely because they did not have an actual insurance policy document or someone to explain the coverage details. Due to this lack of awareness, they consequently contact or notify people too late to submit claims. In observing the current implementation model, insurance companies are not currently incentivized to be proactive about their outreach to farmers, and farmers confirm this.

That being said, working on the ground in the farmlands across both district I was also able to observe several insurance and risk awareness campaigns during my fieldwork carried out in West Godavari and Krishna districts by an insurance company and weather data provider. This process had an engagement rate of over 5000 farmers over July-August (2 months), averaging about 2,500/month and 625/week. These campaigns were being conducted by the weather data company I was studying and I listened to them provide information about disaster risk and feasible measures for farmers to reduce it while explaining the role and purpose of insurance to farmers. In the process, the people managing the campaign worked alongside farmers and local village officials to conduct infrastructural assessments of area-wide risks for potential damage to infrastructure, maintenance, replacement, and measurement for better tracking of existing infrastructure in rural areas.
6.4 West Bengal

The dominant political party in the state of West Bengal is the All India Trinamool Congress (AITC) Party led by Mamata Banerjee. In 2011, Banerjee defeated the 34-year-old Communist Party of India (Marxist) CPIM-led Left Front government, the world’s longest-serving democratically elected communist government. The AITC is a regional party that broke off from the Congress party in 1998 and launched a platform to compete with the CPIM on the "principles of Nationalism, Socialism, Secularism and Democracy," and committing "to eradicate illiteracy, poverty and injustice and cause upliftment of the downtrodden by ensuring social equality, awakening of the masses by peaceful means, movement and participation in the lawful electoral process."¹⁵⁸ The ideological rhetoric of the party has been especially important for how policies are implemented and contested, particularly in the agrarian context and large paintings of the AITC symbol were visible on village buildings during my fieldwork (Figure 6.19).

¹⁵⁸ http://aitcofficial.org/
There are two events that highlight the ways in which the political platform of the AITC inflects national imperatives and regional policies as it relates to agrarian concerns. In early 2007, the AITC led a movement against national and central government-authorized land acquisition (through eminent domain powers provided for Special Economic Zones) by the then ruling CPIM party of agricultural land by the Hadalia Development Authority for a chemical plant that would forcibly displace 70,000 residents from their land in Nandigram, West Bengal. Fourteen protesting residents were killed by security forces and the project was withdrawn. In 2011, the AITC, led by Banerjee, contested and won in a landslide often citing this struggle and others as
evidence of the party's overall mitigation of dispossession and of villagers and the protection of farmland.

The second important example of the ways AITC political rhetoric influences policymaking in West Bengal is with regard to the premium payment requirements for the PMFBY. A key element of the national policy framework for all states is that the farmers are asked to pay up to 2 percent of the entire amount insured in order to receive coverage. Although for some farmers, this can amount to a significant expenditure, the AITC-led West Bengal government is the only state to make free for farmers, essentially making the insurance program as an entirely state-funded relief program. By doing so it pushes back, at least for farmers, on the kind of riskholding that the rest of the country has moved toward. It followed up in early 2017 to be the only government offering support to farmers following the demonetization of high-value currency notes took a toll on crop prices. Importantly, West Bengal is the only large agricultural state to not report any farmer suicides historically, which may be the result of lax credit recovery and loan forgiveness policies, and a lack of reporting the incidents appropriately. However, from a fiscal perspective, West Bengal's expenditures contribute to its status as the most heavily indebted state in the country with the lowest tax revenue-to-Gross State Domestic Product (GSDP) ratio, and many argue that debt service payments increasingly take resources away for longer-term development programs beyond smaller subsidy-based investments.

159 http://www.livemint.com/Politics/vh1EngRXdNXN3djiLF9AFM/West-Bengal-allocates-funds-for-people-affected-by-demonetis.html

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6.4.1. Landholding/Tenancy

The distribution of land and tenancy has been a central political concern in West Bengal. In 1978, the government at the time launched "Operation Barga" a land reform movement throughout rural West Bengal as a way for the newly elected Left-front government to enact some measure of agrarian reform. The outcome of their efforts stands in stark contrast with other states particularly with regard to the actual distribution of land and the number of farmers benefitted (See Figure 6.20). Thus, in the case of land distributed as well as number of people benefitted, the government of West Bengal’s outcomes were much higher in absolute terms than all of the other states in the country. The operation offered new legal protections for bargadars (sharecroppers) from evictions by landlords, permanent inheritable use rights, and a fair share of the crops produced, essentially re-regulating sharecropping relationships throughout the state. Though the effort only reached less than half of the state’s sharecroppers (approximately 1.4 million of 3.5 million), this effort was the most successful in comparison with any other state in India for improving the legal and social status of bargadars and providing them with more security of tenancy.
Traveling through several villages in West Medinipur district, I asked farmers about their landholdings and the prevalence of tenancy. One farmer explained to me that he owns his *mauja* (tract of land) and he also rents other lands to grow more crops, especially during the Rabi (winter) season. In his Gram Panchayat (village council), 80 percent of the farmers are owners of the land; the rest is rented from others who have more land in the primarily in the same Gram Panchayat. What I found predominant in this village were highly fragmented units of land, which are further broken down when the next generation inherits their parent's landholdings. One family I visited admitted that their landholdings are fragmented, but explained that they also coordinate their cultivation across family members' landholdings, both to increase the scale of production resources but especially as a diversification strategy in response to potential weather events that may affect any one of their plots. This strategy is not necessarily new, but it is an...
effective response against the increasing fragmentation of landholding and ecological uncertainty that farmers face.

6.4.2 Weather Risk

Heavy rainfall and inundation are the most common weather risks in West Bengal. Though there is variation between the sub-Himalayan region and the Gangetic basin, districts in West Bengal receive close to double at the lower bound and up to triple the amount of rainfall as central and eastern states such as Maharashtra. The experience of farmers is that of heavy rainfall that causes inundation and destruction of their crops, especially for those living in low-lying regions. When there is an incident of inundation, the agricultural department carries out assessments of the losses. More recently, along with government assessments, private firms also conduct reconnaissance in the fields on behalf of insurers and reinsurers, for the purpose of conducting their own documentation of losses and damages and overseeing the documentation by the local-village level officials.

In the third week of August 2016, I traveled to a district approximately 300 kilometers west of Kolkata in West Midnapore district, close to Chandrakona and Ghatal blocks after I learned about the heavy rains and flooding that had taken place. I accompanied a private assessment team to survey the villages affected. When I arrived, I several local residents told me that this was actually the result of water released from dams flooding thousands of acres on purpose. Initially, I was skeptical of this explanation. However, we immediately saw reports in the news about how the Damodar Valley Corporation (DVC)-owned dams released water from the dam, at times without any coordination or warning to the residents and local authorities flooding massive
As reported, the Damodar Valley Corporation released 46,000 cusec of water from Maithan and Panchet dams and another 52,000 cusec water from Durgapur barrage. This resulted in inundation of hundreds of villages across different districts and rendering thousands homeless.

The team I was with told me that this level of inundation was severe as we stood on a bridge watching people commute by small boats (Fig. 6.21), and unable to even see houses and temples that were covered by the flooding. The team had forms to fill out with the extent and percentage of damage to be submitted in a report to the insurance firms operating that district. In West Midnapore district, around 20 villages in Chandrakona drowned due to an overflowing Shilaboti river and around 200 houses were washed away in Ghatal, where at least 13 wards were submerged. I visited several villages in Chandrakona two days after the flooding and was able to see some of the damage, including complete destruction of crops on at least 250 bighas161 (34 hectares or 84 acres) of land. The assessment team collected information of the amount of area affects in each village and block for the purposes of claims assessment and created this list (Figure 6.22) and attached a map of a satellite image of the inundated area in West Medinipur for their clients (Figure 6.23). Several farmers said to me that they experience similar flooding every year and little to no support from the government. The reconnaissance team checked their reports with local village-level officials and had to have the report signed by the district collector’s office. The timeline for compensation for crop damage from inundation would take several months to be processed with the other Kharif season claims. In the meantime, the widespread

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161 https://sizes.com/units/charts/UTBLIndia_Kolkata_land_area.htm
damage necessitated state government compensation more rapidly and this was promised by officials once their immediate assessment and emergency response process was completed\textsuperscript{162}.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure6.21.png}
\caption{People commuting by small boats in Ghatal village of West Midnapore district in West Bengal on August 25 2016. Credit: Author}
\end{figure}

<table>
<thead>
<tr>
<th>Tehsil</th>
<th>Total Geographic Area (in ha)</th>
<th>Inundated Area (in ha)</th>
<th>Inundated Area (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghatal</td>
<td>24017.30</td>
<td>6319.44</td>
<td>26.31</td>
</tr>
<tr>
<td>Narayangarh</td>
<td>52276.89</td>
<td>1761.84</td>
<td>3.37</td>
</tr>
<tr>
<td>Keshpur</td>
<td>49469.96</td>
<td>1694.43</td>
<td>3.43</td>
</tr>
<tr>
<td>Daspur-I</td>
<td>16714.37</td>
<td>1652.49</td>
<td>9.89</td>
</tr>
<tr>
<td>Kharagpur-II</td>
<td>25556.82</td>
<td>1640.79</td>
<td>6.42</td>
</tr>
<tr>
<td>Pingla</td>
<td>21867.31</td>
<td>1595.25</td>
<td>7.30</td>
</tr>
<tr>
<td>Chandrakona-I</td>
<td>23536.40</td>
<td>1483.20</td>
<td>6.30</td>
</tr>
<tr>
<td>Debra</td>
<td>34868.49</td>
<td>1530.90</td>
<td>4.39</td>
</tr>
<tr>
<td>Saabang</td>
<td>30408.71</td>
<td>868.86</td>
<td>2.86</td>
</tr>
<tr>
<td>Chandrakona-II</td>
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<td>771.12</td>
<td>4.62</td>
</tr>
<tr>
<td>Daspur-II</td>
<td>16307.82</td>
<td>749.52</td>
<td>4.60</td>
</tr>
</tbody>
</table>

**Figure 6.22** “Tehsils facing inundation problem” (L)  
**Figure 6.23** Inundation Map of West Medinipur (R)  
Source: WRMS.

One of the important measures of reconnaissance and damage assessment involves a using the statistical sampling method adopted from crop cutting experiments (CCEs), which were developed in the 1950s in order to measure food production and crop productivity following a horrific famine. The agricultural sector, insurance providers, and farmers use it to measure shortfalls in crop yield as well as overall production and supply use this approach. Yet, there are several challenges facing this method including past instances of systematic corruption and manipulation for the purpose of increasing insurance payouts. Although this has been a major argument in favor of index-based insurance policies, the CCE assessment process has remained the “gold standard” for assessment because of the limits of AWS-based claims processing.

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described in Chapter 4 as well as the fact that farmers and village governments trust such in-person, observable claims procedures. During my fieldwork I observed this process used many times and documented the process (Figure 6.24).

Rice is the most common crop grown in West Bengal. There are three varieties of rice cultivated in West Bengal throughout the year including: Aush, Aman or Boro. The Aman ("broadcast" and "transplanted") variety is generally cultivated in December-January, Boro in March-May, and Aus in the July-August cropping seasons. Among these, "transplanted" Aman is most important and occupied about 72.85% of the rice cultivated land in 2015, 22.75% of the Boro variety, and 4.4% of Aus Paddy. Although rice is the most common crop grown in the state at an average of about 65 percent of the total area sown (Fig 6.25), the figure below of a box table shows that rice makes up 83 percent of the insured crops (Figure 6.26), followed by potato at 7.81 percent. The map (Figure 6.27) provides a geographic perspective of where insured rice crops are being
cultivated in terms of the percentage in each district relative to the state total. The geographical
distribution of insurance contracts in West Bengal is examined here. The map below (Fig. 6.27)
shows the highest percentage of the total amount insured rice in the state is in West Medinipur,
East Medinipur, and Barddhaman districts which each have between 7.6 to 14.7 percent of the
insured territory of the entire state. Based on this data, we can see that most cultivated crops are
also the most insured in a proportionate manner. This consistency could be explained by the fact
that the West Bengal government provides insurance fully subsidized for farmers.

Figure 6.25 Top 10 crops grown by area (hectares) in West Bengal from 1998-2009. Source: WRMS.
Figure 6.26 Percentage of area insured by crop in West Bengal in 2015. Source: AIC.

Figure 6.27 Percentage of Area Insured for Rice Cultivation by District (2015-2016) as a Percentage of the Total Amount Cultivated in the State.
The distribution of insurance clusters and the companies that won the bid to sell policies in each district is shown in (Figure 6.28). The district I visited for fieldwork, West Medinipur, is covered by Chola Insurance, which the company that have insurance coverage for most of the districts in the state. Below I show geographic distribution of the total area insured for all crops by district in the state as measured in Hectares with the highest amount concentrated in four districts (Figure 6.29). The last figure (6.30) shows the distribution of insured value for all crops, with the highest values reach approximately $455.2 million in a single district. The purpose of these measures is to understand the geographical variability of insurance penetration as it relates go the spatial extent of insurance contracts for the most commonly cultivated crops and the ways that the cluster-based implementation distributes such contracts by company.
Insurance Company Allocation of Districts in West Bengal for PMFBY 2016 Kharif Season

Figure 6.28 Company-wise Allocation of Weather Insurance Coverage by District (2015-2016) in West Bengal. Source: WRMS.
Figure 6.29 Total Estimated Area Insured (in Hectares) for all crops in the PMFBY Scheme in West Bengal for the Kharif Season 2016.
Before I visited Punjab for my fieldwork, I had already known that the state was unique in several respects. First, the state has historically had very high soil fertility and access to water through canal and well irrigation throughout the state. The state depends heavily on agricultural production, which covers 83% of the entire territory. Punjab is popularly known as the "bread basket" of India, contributing close to half (43%) of the national pool for wheat. Leveraging Punjab's agricultural output was key to national economic turn-around in the 1960s after a series of wide-spreads droughts and famine risk. The state also grows 75% of India's high-grade commercial cotton, an outcome of the Green Revolution investments in new seeds and...
pesticides, which were concentrated in Punjab from the beginning. Last, it is important to understand that the government has continued to invest in irrigation and electrification infrastructure for several decades and coverage throughout the state is the highest as far as farmer access is concerned. With access to irrigation from canals or increasingly wells, the government of Punjab has never participated in any of the national crop insurance programs since they began in the 1970s. During the campaign for the new PMFBY program, the Minister of Agriculture noted several times that Punjab was in a unique position where it did not need insurance because irrigation was always available and drought was not a major concern for crop production.

6.5.1 Irrigation/Groundwater

Key to the Punjab agrarian system is the provision of free electricity particularly for running high-powered water pumps for groundwater extraction. This policy began in 1999 and continues to be a recognized entitlement amongst the population and a mainstay in electoral agendas. The focus on increasing productivity and aggregate output through intense usage of water and energy for food security initially, but increasingly for commercial exports has created an ecological crisis driven by the receding water table, reportedly decreasing 3 feet every year. According to the Central Ground Water Board, of the 138 administrative blocks in Punjab, 110 blocks are overexploited, four are critical and two are semi-critical. Only 22 blocks are safe, but they have other problems such as arsenic, fluoride and uranium contamination.164 And yet, each government continues to offers expensive diesel and electricity subsidies (free electricity for 6-8

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hours per day) that encourage excessive pumping of the water and increased fiscal debt with higher energy production costs. As of late-2016, the government estimates that there are 140,000 electrical tubewells in the state. The cost of a diesel pump set can be as high as Rs. 100,000 (approximately $1,538.46) usually the price paid by richer farmers. However, most farmers take out more credit in order to acquire better pump technology and additional energy beyond what the government can supply. Recently, farmers groups are acknowledging the extent of the problem. A report by the Punjab State Farmers Commission says that "the state and farmers are now faced with a crisis...Punjab's farmers are committing ecological and economic 'suicide'...India has to launch a brand new Green Revolution. But this one has to be sustainable."\[165\]

6.5.2 Weather Risk (geographical: drought, flood, coastal, disease)

Not unlike other states I visited, one of main troubles facing farmers in Punjab, according to local assessors, has been unseasonal rainfall patterns that disrupt the phases of plant growth. Excess rainfall and consequent water logging, especially between August and September has been a growing concern. In the Kharif season in 2014, a drought followed by heavy rain over a continuous four-day period cause water-logging a lot of damage. Because this change in climatic conditions is a fairly recent development, the government has not identified this as a major risk for farmers. I wanted to observe and interview farmers in Punjab to better understand the reasons why the state did not participate and whether the risks were different from other states.

During my fieldwork, I visited Abohor, a small-town close to the international border with Pakistan in northwestern Punjab, in September towards the end of the 2016 Kharif season. I accompanied an assessment team visiting farms nearby that had purchased private farm-level crop insurance and had reported crop losses from disease caused by whiteflies (see Figure 6.31 and Figure 6.32). The risk from pests and diseases are particularly difficult to control once they are present in one region. Changes in humidity and temperature can rapidly increase the flow and distribution of pests and diseases. In fact, in 2015, one year before I visited Punjab, 40-50 percent of bt cotton crops were destroyed by the same disease, which was reportedly a major factor in the high amount of farmer suicides that year. This was the first major pest infestation since the country adopted genetically modified cotton in 2002, raising concerns over the vulnerability of the lab-grown seeds that, especially amongst groups that have been pushing the government to conduct more tests and limit their usage.\footnote{http://www.reuters.com/article/us-india-cotton-whitefly-idUSKCN0S30QW20151009} The Punjab government promised farmers 6.4 billion rupees (approx. $100 million) to compensate for crop damage but did not attribute the problem to the seed type. Regardless, the usage of expensive inputs (e.g. genetically modified seeds, farming equipment and proprietary pesticides) has substantially increased financial risks in the event of crop failure.
Figure 6.31 Cotton farmers (father and son) and insurance claims representative drinking tea in village in Abohor, Punjab. Credit: Author
6.5.3 Landholding/Tenancy

One of the striking differences that one observes in the state is how much larger and more expansive farmlands are especially in the cotton belt. The average landholding in Punjab is the largest in the country and whereas the size of farms has been decreasing in most every other state, the average size of a farm in Punjab has increased since 2010. Of course, there are also many small and marginal farmers, however the data indicates the number of these larger farmers has decreased dramatically either through land sales or leasing. These farmers usually have less access to institutional credit and the cooperative banks and are labels "non-loanees," even though they are often highly indebted to informal money lenders and they even worse off now relative to
those with access to subsidized bank and cooperative credit, with growing landholdings. One of the local assessors said: "in Punjab, these small farmers usually don't get insurance. When they face crop losses they are the most likely to commit suicide." The other category of farmers are laborers that come to work on the fields during key phases required during sowing, cleaning, and harvesting. The high demand for additional labor on the large farms and relatively higher pay has witnessed increasing migration from the northeastern states where farming is not as remunerative such as Bihar and Orissa. Alternatively, the village has a parallel or at times complementary system for hiring local women (often relatives) that can come to work on particular tasks for several weeks at a time. The farm I visited had employed 9 such women to work on harvesting cotton from the fields. The women generally are paid less than the migrating laborers but because they are often family relations or friends, the farmers usually contact them only occasionally. This flexibility is an important dimension for how farms manage uncertainty of labor availability on large plots during important, labor-intensive periods.

6.5.4 Insurance in Context

When approached with the central government’s new subsidized insurance scheme, the Minister of Agriculture pointed out that the state has nearly full coverage of irrigation and have no need for such crop insurance which is primarily designed for payout when there is rainfall deficit. As discussed above, thought, the problem of pest and disease are of deep concern and an several insurance companies have begun offering customized individual insurance policy to provide coverage for this problem on a per-farm basis without government support or subsidy. The major crops sown in Punjab are covered. These include wheat, rice, fodder, cotton and maize. The highest amount of area cultivated is for wheat (44 percent) followed by rice (35 percent), based
on 2010 numbers (Fig. 6.33). I was observing the assessment of reported damages to cotton plants and because these were individual policies that required individual assessment, I was able to observe the interactions between insurance representatives and the farmers in more detail.

A farmer, in his fifties, explained that his 8 acres were a combination of his father's, his own and his brother's land and he had purchased 4 more that he was now trying to sell off because of the challenges he was facing. His main problem was that some of the areas of his farm had become diseased and the cotton was not forming properly. The team's assessment involved using the CCE sampling method to randomly select an area where to observe the plant and possible damages. We spent a large part of the day in this process because it involved detailed observation.

Figure 6.33 Percentage of Area Sown by Crop each year (1998-2010). Source: AIC

Percentage of Area Sown by Crop each Year 1998-2010
(Punjab)
and documentation of individual leaf damage for the selected plants, and then relying on those numbers of diseased leaves compared to healthy leaves to calculate an indemnity payment based on the insurance agreement.

Figure 6.34 A regional assessor for the insurance claims explains the insurance policy terms to the farmers. Credit: Author.

I observed how many times and different ways the assessors read and explained the assessment methodology to the farmer, often referring to particular lines in the contract that the farmer had signed months ago before the season began (Figure 6.34). Initially, the farmer was very comfortable with the assessors in the field and expected them to see the damage and agree to a payment. Yet, the assessors ultimately had trouble explaining to the farmer why they would not be able to pay the full amount because it involved intricacies of the actual agreement. A different more senior assessor approached the farmer to clarify what was stated in the agreement more definitively and this immediately upset the farmer who perceived this interpretation of the
agreement as unfair and actually different from what explained to him when he signed up. The conversation went as follows:

Farmer: when you asked me to pay for this insurance, you didn't explain all of these things to me.
Assessor: let me show you what it says in the document--
Farmer: I am saying that when we asked question about this during the insurance information meeting, this was not explained. What is this "random table" you are using? Why can't you look where I was showing you the plants that are having the disease?
Assessor: it says it here in the document that we will use the "random table" and we have to do that.
Farmer: Well, I want to be paid more for the damages because this is why I got this insurance.

As he spoke, his father had ordered tea and as we were drinking tea, the farmer agreed to the terms, realizing that he had still obtained over Rs 60,000 ($923.07) out of Rs 90,000 ($1,384.62) for the damaged plants, which was going to be necessary for him. He said “if the disease had spread further, I would have lost a lot more of this crop...” I interrupted to ask about what he knew about the farmers who lost cotton crops last year and the suicides that had happened in Punjab. He admitted that, "it had happened last year to some farmers because of the disease." I was struck by the matter-of-fact way in which he acknowledged my question about farmer suicide knowing that he was growing the exact same crops and encounter the same diseases threatening his own livelihood. He added that in fact since last year’s devastation of over half of all cotton crops from this disease, “the other farmers had mentioned to me that they would be switching to Indian cotton plants to avoid the risk even though they had less yields, and I am still thinking about that.” He mentioned earlier that he wanted to sell some of his family’s land perhaps as a buffer in this context. Though his situation did not appear as dire, he did not sound certain that he was safe from the new uncertainties with the diseases, unseasonal rains and whether the insurance firm would help him as much as might be needed. This interview highlighted several key conditions that shape the particular conditions of “reproduction squeeze”
even in Punjab, amongst the most resourced spaces of agricultural production in the country with relatively greater access to irrigation, land, and energy.

6.6 Discussion

In this chapter, I have presented the spatial variations of crop insurance implementation looking at four states in the context of diverse political, ecological and economic conditions. I shared findings from my interviews with insurers, officials, farmers, and scholars as well as an examination of the insurance contract sales, policy documents and newspaper articles. My argument in this chapter is that there is evidence of significant forms of politicization of risk financialization such as drought relief in Andhra Pradesh, the restructuring of debt in Maharashtra, energy subsidies in Punjab, and insurance subsidies in West Bengal. In particular I wanted to focus on the ways in which indebtedness significantly shape “new agrarian questions” in India. As Taylor points out in his study of the social ecology of agrarian distress in Andhra Pradesh, “relations of credit/debt have become intertwined with the tenuous social and ecological foundations of smallholder production to create a new dynamic of vulnerability across the agrarian environment” (2013:691). Central to this process is the unevenness both of state implementation of financial and insurance politics as well as the unevenness of how states manage processes of austere agrarian liberalization and indebtedness across India since the 1980s and the fact that farmer suicides have reached a rate of several thousand every year, and have ultimately changed the discourse of agricultural policy with over 350,000 lives taken in a twenty-year period (1995-2015).

Each of the four states’ case descriptions is meant to explain differentiation at the sub-national level as it relates to the ways which insurance is structured, sold, and priced. For instance, in
Maharashtra, the party relationship, extensive drought conditions and indebtedness particularly in the Marathawad region show the highest concentration of insured territory, even though that region has lower value per hectare than the western coast and the Vidharba region. In Andhra Pradesh, high informal tenancy has impacted the extent to which farmers are able to access or even hear about crop insurance and on the coast farmers are increasing converting to aquaculture as a risk mitigation strategy against the ongoing effects coastal flood risk and saltwater intrusion. West Bengal’s political history and land reform effort have influenced insurance awareness among especially smaller, tenant cultivators that need flood insurance and access has been expanded significantly particularly because West Bengal is the only government to fully subsidize the entire premium contribution from the farmer. Lastly, Punjab is the historical origin of the Green Revolution reform towards high-yield production and it remains the only major state not to participate in the national, heavily subsidized crop insurance program based on the premise that farmers have reliable irrigation. Yet, indicators of the receding water table and the high levels of fiscal expenditure for energy as well as increased risks of indebtedness and suicide make this model untenable and its participation in the crop insurance program is being debated. A comparison chart with a summary of the key factors is in Figure 6.35 below.
Figure 6.35 Table of comparison across four states summarizing the different axes. Sources: Indian Council for Agricultural Research (ICAR), NCRB.

However, returning to the concept of “riskholding,” I especially seek to understand the political dimensions of the financialization of risk and insurance in the context of broader agricultural processes. Neither McMichael nor Bernstein provide an adequate explanation for the type of politicization taking place in India at present. For McMichael, the small-farmers and landless

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167 The irrigation rate is not provided by the state government. For the last several years, the Economic Survey of Maharashtra 2012-16 has not mentioned the gross irrigated area and its percentage to the gross cropped area. See Kulkarni, Daival, “Maharashtra: Economic Survey stays mum on state’s actual irrigated area,” 18 Mar 2016.  

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constitute peasant (or semi-peasant-like) class that ultimately are interested in “food sovereignty and land rights” (e.g. MST in Brazil). that are antithetical to the current financialized, global market system and “food regime.” While, for Bernstein, fragmentation of labor and land and entirely distinct historical conditions undercut any possibility for broad-based agrarian movements or mobilizations. Yet, what is evident in the aftermath of farm loan indebtedness, farmer suicides, crop insurance subsidies, fiscal-political alliances, and demonetization, is a heightened politicization of financial risk relationships across states.

A concrete manifestation of farmer politicization of these frustrations and their follow-on mobilizations within and across states took place through pressure on elected officials for massive “loan waivers (also called “debt relief”) (see Figure 6.36). In the spring of 2017, elected officials in Maharashtra, Andhra Pradesh, and four other states made public announcements promising agricultural loan waiver after being pressured by farmers groups in their respective states. Early that year, politicians running for election as chief minister in Uttar Pradesh and Punjab actually ran on that platform and then won their respective elections. The cost estimates for the waivers greatly exceed the total expenditures on all other agricultural programs including insurance and irrigation. For instance, in May 2017, the chief minister of Maharashtra agreed to a deal of Rs. 340 billion ($5.23 billion) debt relief for an expected 8.9 million farmers that have debts of up to Rs 150,000 ($2,307) per farmer. Yet, the deal has yet to be accepted and farmers are already pushing for complete forgiveness of all existing debts and for arrears on electricity bills owed to the State-owned power company (which they needed for groundwater irrigation). I would suggest that this speaks to deeper discontent and desperation within the agrarian system that necessitates much more systematic policy analysis and response.
In several additional states across the country, including Karnataka and Telangana, variations on the same demands are being made and often accepted through the issuing of new debt instruments even as the central government and Reserve Bank of India (RBI) try to push back against such promises acknowledging the fiscal consequences will eventually affect the sustainability of state credit ratings and macroprudential conditions.

"the ad hoc nature of various types of loan waivers announced from time to time by state governments... could add to their fiscal burden and affect their finances over the medium term. While these loan waivers could alleviate the immediate debt burden of financially distressed farmers, it is essentially a transfer from tax payers to borrowers with an adverse bearing on the fiscal viability of states. Moreover, it impacts credit discipline, vitiates credit culture and dis-incentivises borrowers from repayment, thus engendering moral hazard with expectations of future bailouts. Furthermore, if overall government borrowings increase, as is likely due to issuance of debt relief bonds by state governments, yields on state development loans (SDL) may firm up posing a higher interest burden in the future...Even as the Central Government makes significant efforts toward fiscal consolidation, the accumulation of liabilities could result in higher debt burden of the states unless immediate steps are taken to contain them. A rising general government debt-GDP..."
One way to understand this outcome is that once financial systems, such as insurance are instated, the rhetoric of policymakers and even politicians tend to emphasize concerns of adverse selection, moral hazard and sustainability of the actuarial regime rather than moral economy, the effective reduction of risk (mitigation) and its socialization of risk away from the most vulnerable. However, these policies paradoxically necessitate ex-post, fiscal expenditures as well as non-financialized contributions (disaster relief) for non-insured (non-modeled) risks creating the political opportunity for state governments to use fiscal resources in order to respond to their respective context and electorate expectations. These include variations in the levels subsidies given by each state government for premiums, loan write-offs (waivers) provided by state governments threatened by political and electoral crises, and continued debate over the disbursal of disaster relief in exceptional cases, all of which express politically within and across states as opportunities to exert power against what has become an increasingly centralized and hierarchical financial bureaucracy comprised of state and private banking and insurance firms.

My findings from this chapter suggest that planners and stakeholders will have to better integrate debates over the design of crop insurance programs with conversations about other forms of risk and contingencies, such as ecological, credit/indebtedness, and geographical among others. The dramatic and uneven expansion of indebtedness, groundwater extraction, and fragmentation and landlessness shape the ways in which risk is created and managed. At the same time, insurance

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programs effectively "redline" (Squires 2003)\textsuperscript{169} a large contingent of the agricultural workers with little to no landholding, which are predominantly those of the lowest caste and class.

Secondly, to date, much of the analysis in insurance design is focused on abstract and apolitical imperatives to minimize moral hazard. However, financial risk in its various forms is becoming politicized in ways that ultimately upend the actuarial approach through state-wise variations in the deployment insurance subsidies, loan-waivers as electoral strategies, and the farmer mobilizations to disrupt production and distribution of agricultural products. These political factors contribute to other recent findings indicating relatively low participation rates for weather insurance in which farmers instead choose self-insurance and informal insurance by other means. Lastly, the uncertainty and severity of climate variability through unseasonal rainfall, drought, flooding, and disease present complex challenges for the very viability of agricultural production and the severe limits to adaptation that are not adequately addressed through the insurance program, but may in fact, temporarily mask these processes (O'Hare et al 2016, Archita Panda 2013: 68).

CHAPTER 7. DISCUSSION AND CONCLUSIONS

I want to return to the quotes I began with from Secretary of State Lord Hamilton and Dadabhai Naoroji at the turn of the 19th century and the 2015 debates, drawing a line between Naoroji’s argument about the economic drain of colonial financialization to the most recent parliamentary debates about FDI’s potential contribution to farmer welfare and India’s development. Both are important arguments on different sides of the high political stakes that define policies such as insurance. However, both arguments treat financialization in monolithic and stable terms, whereas in practice, financialization manifests through highly uneven geographical and historical processes.

7.1 Comparison of Findings Based on Expectations in the Literature

In this dissertation, I present my research on the emergence, implementation, and outcomes of weather insurance. I study the policy to better understand the emergence of broader policy shifts towards the financialization of risk with specific focus on India’s agrarian context, which is highly vulnerable to increasing climate variability. In this study, I examine policy histories through the theoretical framework of “fast policy” (Peck and Theodore 2015) and I use my findings to contribute to theories of financialization as well as to theories about the agrarian question in contemporary neoliberal capitalism. Below, I review and compare my findings based on expectation in the literature as discussed in Chapter 2.

170 Naoroji moved to Britain once again and continued his political involvement. Elected for the Liberal Party in Finsbury Central at the 1892 general election, he was the first British Indian MP. In Parliament, he spoke on Irish Home Rule and the condition of the Indian people. In his political campaign and duties as an MP, he was assisted by Muhammed Ali Jinnah, the future Muslim nationalist and founder of Pakistan. In 1906, Naoroji was again elected president of the Indian National Congress.
7.1.1 Explaining the Emergence of Insurance

There are several theories purporting to explain the emergence of insurance, the most dominant theories involve the economics of risk contracts and the other is the theory of governmentality and biopolitics. Through my examination and interpretation of the critical scholarship after the Green Revolution, I argue that state investment in crop insurance programs was built on a critical shift in agrarian policy that initially centered on landholding and industrialization in the 1940s-1950s and resource-intensive productivity-based reforms during the Green Revolution from the 1960s-1970s. Thereafter, the government refocused investment on managing and transferring risk, while continuing the provision of input subsidies. What I find is that financialization processes emerged at the time that the government needed a way to stabilize the default risk from India’s debt-based agricultural production. Meanwhile, following the demise of the Brettonwood institutions, the WTO established a neoliberal agricultural regime with a specific exception for public investment and management of government insurance programs. I find that contract economics via agricultural economists explain the rationale and iterative design of insurance contracts implemented more specifically, but not why this approach gain significance. Further, I argue that Foucaultian-inspired analyses are a corrective for overly economistic theories and helps provide relevant interpretations of the arbitrariness of how risks are isolated, defined and valued as well as how insurance constitutes qualitatively new form of governance (biopolitics). However, only theories of financialization directly explain the directional logic and outcomes of such policies with evenhanded attention to the contextual and contractual processes that make insurance and risk financialization possible.
In examining the context for new forms of insurance that are the focus on this study, I argue that there is a mutual reinforcement of financialization of risk and the development of new technologies and indices needed to measure agro-economic risk. This assertion is based on showing that 1) the expansion of contemporary financialization processes depend on algorithmic models and metrics and 2) there is a need for real-time measurement and assessment of weather parameters with the rapid structural destabilization of the climatic “context” through climatic variability for agricultural production and unregulated exploitation of other factors of production (e.g. groundwater). For Indian planners, new technologies such as high-precision satellite imagery, drones, and automatic weather stations, among other technologies play a pivotal role in such measurement, indexing, and financialization, though their actual implementation is highly uneven and inconsistent for the purposes of underwriting. The rapid innovation both in new types of data and new algorithms for indexing them contribute to a highly dynamic data environment and high variability in the spreads of actuarial rates, that the government and reinsurance firms cannot directly disassociate from “ambiguous loading” by various underwriters.

Furthermore, although evident within the actual industry, the mainstream literature on insurance underplays the emergent restructuring effects of risk capital and technology on reinsurance and the competitive dynamics on the expansion of insurance. In the context of heightened financialization, new markets for risk-trading and hedging instruments have opened up and expanded the terrain for new forms of risk capital ((Jarzabkowski et al 2015, Johnson 2013). Building on the previous point, technological disruption in weather technology and the logic of float capital accumulation expresses what David Harvey (2011) more generally describes:
“when…two fetish beliefs in technological and spatio-temporal fixes collide, they feed off each other in frenzies of technological innovation designed to circumvent all temporal and spatial limits to the circulation of capital” (2011: 158), referring to historical antecedents such as canals, railroads, highways, computerized trading.

Finally, through my research, I was able to better understand in what ways financialization and technological innovation are constrained. First, insurance does not embrace risk (2003) in a fluid or abstract sense. It creates contractual mechanisms for purchase in which potential financial loss up to a certain threshold can be financed after assessment and verification well after the actual event. In this sense the notion of “risk transfer” is not as accurate as it conflates and implies shifts in ownership of risk, rather than its underwriting and financing of potential losses.

A second constraint, at present involves the limits to the determining the basis of weather-index insurance. Rainfall-yield correlation create the possibility for financializing weather index-insurance contracts using weather data. Yet, in practice, due to the complexity of the relation between yields and water availability, in most cases, “the indemnity schedule and the parameters are set without a formal mathematical optimization process…[t]hey are based on expert knowledge, simulations and sensibility analysis” (Leblois and Quirion 2013: 4). There is very little acknowledgement of the deficiencies of that ability to precisely enough correlate weather data with agricultural production risks and price risks in actuarial models, at scale, although the literature on index insurance addresses the challenges of basis risk that have plagued adoption, based on the differential between the results from the insured object and the location of actual parameter that triggers the policy. My interviews with underwriters explain several more
constraints to viability of the index-insurance model that are not discussed in detail in the literature.

### 7.1.2 Fast Policy Implementation

Several scholars (Jessop and Peck 2000, Peck 2011, Peck and Theodore 2015) use the concept of “fast policy” to analyze the rapid expansion of policy experiments across many different spatial contexts across scales in a short period of time. I see similar patterns through the recent institutional history of agricultural economic theories, crop insurance policies, and financialized instruments and institutions. I see direct relevance of fast policy in experimentation related to weather insurance primarily as a shorthand for “a global policy fix [that] has certainly intensified, connecting policymakers (and their experiments) around the world as never before…within narrow ideological parameters.” Below, I show further parallels between weather insurance and the financialization of risk as they relate to fast policy and some areas of difference.

My findings indicate a growing reliance of the state on capital markets and reinsurance capital to limit their fiscal liability to manage ad-hoc disaster compensation. According to Peck, a defining character of states in late neoliberal times “apparently, is to facilitate and enable, not to intervene or interfere; they must establish an environment in which the poor (conceived here as the self-managing subjects of a market economy) are provided with the necessary incentives to invest in their own human capital, to bear increased risk.” This role of the state is particularly relevant to India’s often large-scale interventions in the agricultural sector that ultimately facilitate further risk-taking and the accumulation of financial instruments.
The second feature of fast policy is policy failure. It is important to note that the normative advocacy of an actuarially sound insurance system driven by effective demand is misleading in the context of India, when it has historically been proven to have been elusive. As Peck argues, fast policies tend to operate in the shadow of global models...generating second and third generations of reform, as the models themselves mutate ‘in the wild’.” (Peck 2011: 166). In the context of crop insurance, Brian Wright has notably pointed to the “role of agricultural economists in sustaining bad programs” (2014) showing the progression of mistaken assumptions in the American experience with crop insurance. For instance, in most cases, he notes “they over-estimated the value of multiple peril crop insurance (Langemeier and Patrick)\textsuperscript{171} used artificially high estimates of farmers' risk aversion (Rabin and Thaler, 2001), and neglected to consider alternate means of risk protection or risk mitigation as well as the true costs of operating an insurance program”. Many of these flaws have persisted in the implementation of programs in India as well (Biswanger 2012).

The third dimension of relevance of the fast policy framework has to do with the pace of experimentation and the unevenness of implementation and impacts assessment. I argue that in the case of India’s crop insurance programs, the uneven implementation of the policy is shaped by how insurance is primarily conducted through bancasurance. In the cases I examined, this means that bank staff deduct an insurance premium from an existing loan amount. However, because of lack of communication, many farmers do not even know that they have insurance and may not know the full range of products and would not have even seen the actual contract.

\textsuperscript{171} Early economists focused on annual income from one crop, rather than on farmers' annual consumption, which is much less variable, or on total wealth.
Further disparities are due to the fact that at least one-third if not more farmers work informally or are without land and cannot access formal insurance services. At lastly, at the state level, the fiscal health and the political economy of electoral structures and campaigning strategies have strong influences on the how aggressive state governments are in providing insurance more broadly that is currently prescribed in the policy.

7.1.3 Outcomes and Politics

With my findings about crop insurance and the financialization of risk in agriculture, I wanted to contribute to what I saw as a central debate about the place of agriculture in planning theory and the international development of capitalism. Based on several decades of agrarian research each, McMichael and Bernstein differ in important ways, one of which is the on the status of small farmers in relation to capitalist development and the based on this, the place of agrarian crises in relation capitalism and its crises. McMichael's framing of agro-ecological and climatological crises inside of his and Friedmann’s “international food regime” helps explain the transition to insurance in India and increased fiscal expenditures on subsidies and loan waivers, particularly at the state level. But, as Bernstein notes, much of McMichael’s analytic for explaining financialization is based a stylized binary between corporate firms and peasants, which misses the more encompassing and interdependent relationship new “riskholding” patterns rely on.

Bernstein’s analysis of “new agrarian question” are far more relevant to describing the widespread fragmentation of land and labor, the limits to capital formation in the agrarian sector, and the futility of land reform as a sustainable, distributive policy in current market conditions. However, both of them demonstrably underestimate the significant politics of debt and financialization.
In fact, I found that the politics dimensions of debt and financialization is not accounted for adequately in the literature on financialization in the agrarian sector. Based on my research comparing the four states—Maharashtra, Andhra Pradesh, West Bengal and Punjab, I describe as several axes of agrarian politics that draw directly from the deepening of financialization processes in agriculture at multiple scales. I begin Chapter 6 focusing on the persistence of farmer suicides taking place in many states in the country and the ways in which a uniquely public suicide by a farmer from Rajasthan generated significant political meaning for representing the marginalization of farmers in India’s development. The suicide reframed two major pieces of legislation, leading the government to withdraw the land acquisition bill and reprioritizing the expansion of crop insurance over longer-term infrastructure investments. In response to forced participation in the crop insurance program and demonetization (removing certain denomination bills from circulation to regulate the cash economy that most farmers rely on), there have been farmer mobilizations with and across states making fresh demands and then quickly receiving “loan waivers” (debt relief) for this group which constitutes the main electorate in most large states. Notably, the debt relief packages for each state are several times larger than all other agricultural expenditures, raising concerns about the impact on the credit ratings of state government.

The second political dimension which emerges directly from the financialization of risk through PMFBY is new forms of disempowerment: At the level of individual policies, one expression of this is the disempowerment of farmers who have trouble disputing the terms and eligibility of coverage especially in the case of automation in index insurance contracts, where disputes
related to measurement errors and manipulation that have had a significant negative effect on adoption. At a more aggregate scale, however, the agro-economic risk around which insurance policies are designed substantially narrow the scope of risk management and the scope of risk. The definition of risk are primarily related to those that can be contractually transferred through financial circuits.

7.2 Limitations and Next Steps

In Chapter 7, I summarize my findings and address the contributions of my research to the literature and its limits. I find that the agro-economic risk around which the policies are designed narrow the scope of risk management away from the ecological dysfunction of post-green revolution Indian agriculture, with the high quantity of polluting inputs, destabilization of the monsoon weather pattern, and limited, concentrated irrigation infrastructure. The uncertainty and severity of climate variability through unseasonal rainfall, drought, flooding, and disease present complex challenges for the very viability of agricultural production that are not adequately addressed through the insurance program, but may in fact, temporarily mask these processes through the continued, pervasive ecological extraction and indebtedness. In the comparative examination of the four states, while insurance mitigates some forms of inequality through subsidies, structural inequalities as a function of inherited landholding disparities and landlessness are reinforced. More broadly, the government introduced new forms and scales of risk and inequality by restructuring the insurance sector to accommodate new reinsurance firms and risk capital to increase territorial “coverage,” effectively empowering the such firms to determine the pricing structure of risks facing farmers.
The dissertation focuses more on the emergence of insurance and risk financialization in historical and geographical perspective at the scale of policymaking. But, it raises more question about where is the evidence for explaining more concrete cases of actual farmer-level experimentation and interaction with diverse insurance systems. Such research would seem invaluable in the context of the intensification of climate variability, ecological degradation, and the simultaneous creative destruction of new technologies for understanding and potentially responding to these issues. Also, given that much of this research involved office-based observations and interview, the understanding of the geographical variation across states and the relationship with insurers in policy formulation would be an important next step for further research.

Insurance operates as system for probabilistic redistribution of risks in time and space. However, as I show in Chapter 5, insurance is an incomplete mathematical (actuarial) technology for planning because it assumed fixed aggregate risks and non-correlation of risks. More than the mathematical possibilities and constraints of insurance, more complex models of mutual risk management (Dror et al) persuasively show the scope for anti-neoliberal forms of decentralization in insurance and even financialization. Though, in discussing anti-neoliberal experiments, Peck and Theodore caution “If there is a lesson to be borrowed from the World Bank’s adopted role as model peddler it is surely that effective strategies for extralocal distribution and dissemination are at least as important as innovations in design…happenstance mutations and little victories will, on their own, never be enough to disrupt the hegemonic pattern itself, or to challenge the authority of the most fortified power centers (Peck and Theodore 2015: 237).
Based on my evaluation of index insurance, I show that the rules, expectations and thresholds of ambiguity for measuring risk have changed historically, and actuarial automation has the capacity to dramatically redesign the way risk is measured, differentiated, and distributed. But, the core problems of inadequate correlation with actual damage, unequal access to such instruments as well as gaps in trust and governance of such techno-financial systems remain problems for the efficacy of such innovations in a longer-term planning perspective. In that spirit, I would like to explore future research such as the use of blockchain and other distributed technology for peer-to-peer risk management purposes.

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**TOTAL** 260798389 379535679 43861875 1338131 3858553
Appendix 2. Summary Statistics of the Modified National Agricultural Insurance Scheme (MNAIS) 2010-2016 and the Weather Based Crop Insurance Scheme (WBCIS) All Companies Combined 2007-2016. Source: AIC and IRDA.

### MODIFIED NATIONAL AGRICULTURAL INSURANCE SCHEME (MNAIS)

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