UNIVERSITY OF CALIFORNIA, SAN DIEGO

The Politics of Economic Risk

A dissertation submitted in partial satisfaction of the
requirements for the degree
Doctor of Philosophy

in

Political Science

by

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2016

DEDICATION

This dissertation is dedicated to my sisters, parents, and Omies.

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Chapter 2, in full, is a reprint of the material as it appears in "Too Certain to Invest? The Political Economy of Ethiopian Insurance Markets," *World Development*, 78 (2016): 37-51. Maya Duru is the primary investigator and author of this paper.

Chapter 4 is a co-authored publication with Alejandro de la Fuente and Xavier Gine. Maya Duru is the primary investigator and author of this paper.

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ABSTRACT OF THE DISSERTATION

The Politics of Economic Risk

by

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Professor Stephan Haggard, Co-Chair
Professor Craig Mcintosh, Co-Chair

This dissertation asks how political economy concerns, namely that politicians face strong incentives to provide citizens with disaster relief, affects the uptake of index insurance. It shows that pre-existing government incentives to provide citizens with disaster relief impedes insurance market formation. If citizens know that they get free relief from the government when they experience shocks then they have no incentive to purchase an insurance product. From a social welfare perspective, however, government relief programs are inefficient and expensive compared to insurance products. The political dynamic necessitates a public insurance system, where the government purchases insurance on behalf of farmers. Yet, this dissertation also shows that once put in politicians' hands, politicians

will be apt to allocate index insurance according to their own political objectives. Political economy concerns thus very much need to be at the forefront of any discussion about how to scale up index insurance.

Chapter 1

Introduction

1.1 Research Question

Two-thirds of the worlds' poor depend on agriculture and natural resources for their wellbeing (Burch et al. (2007)), making them vulnerable to climatic shocks. Research shows that exposure to uninsured risks causes low yields, slow economic growth, forced displacement, and civil unrest. Index insurance is a relatively new product with the potential to revolutionize farmers' access to insurance in developing countries. Index insurance payments are triggered by an index, such as rainfall, falling below a threshold. Index insurance thus avoids the need for conducting farm level verification of yields as well as the moral hazard and asymmetric information issues that impede conventional insurance markets from forming. When farmers do take-up index insurance, they invest in higher risk activities with higher expected profits.

Despite the promise of index insurance, farmers' take-up of index insurance has been low across a number of settings. Indeed, the gap between the high promise and low take-up has been called "one of the most fascinating current puzzles in development economics" (Carter et al. (2014)). Many scholars are beginning to converge on the idea that government intervention in index insurance markets may be necessary to improve index insurance coverage and the product's design. Individual subsidies or institutional level insurance, where the government purchases index insurance and distributes payouts to farmers, do increase coverage (Cole et al. (2013); Cai et al. (2009)). Government intervention may also be needed to certify the quality of insurance contracts (Clarke and Wren-Lewis (2013)).

This dissertation asks how political economy concerns, namely that politicians face strong incentives to provide citizens with disaster relief, affects the uptake of crop insurance. It shows that pre-existing government incentives to provide citizens with disaster relief impede index insurance market formation. If citizens know that they get free relief from the government when they experience shocks then they have no incentive to purchase an index insurance product.

From a social welfare perspective, however, government relief programs are inefficient and expensive compared to index insurance products. The political dynamic necessitates a public insurance system, where the government purchases index insurance on behalf of farmers. Yet, this dissertation also shows that once put in politicians' hands, politicians will be apt to allocate index insurance according to their own political objectives. Political economy concerns thus very much need to be at the forefront of any discussion about how to scale up index insurance.

1.2 Case Selection

Agricultural crop insurance is an ideal case to test for evidence of the effects of distributive politics. Agriculture is a very risky activity and many rural residents in developing countries rely on rain-fed agricultural production for income and consumption. Climatic risks in particular are likely to be politically salient so politicians will face strong incentives to provide citizens with relief. Studies find that voters punish incumbents for the negative impact of weather events despite the fact that politicians cannot control the weather (Achen and Bartels (2004)). However, voters can reward or punish incumbents based on their policy responses to the natural event. If politicians provide aid to those effected by disasters, then voters include their perceptions of that response - either as a direct recipient of the help or through information about a government's efforts - as an indicator of government performance (Cole, Healy and Werker (2012); Gasper and Reeves (2011); Besley, Pande and Rao (2005); Healy and Malhotra (2009)). Even outside of democratic contexts, politicians will have incentives to respond to climatic disasters to appease the selectorate, to preempt

civil unrest, or for fear of international scrutiny. Although the salience of disasters, and political rewards from disaster relief, are likely to be constant across contexts, the form that the distribution will take will differ: from clientelistic strategies aiming to reward individual loyalists or punish defectors to electoral strategies aimed at increasing transfers to co-partisan districts.

Another important facet of insurance is that it can reveal information about citizens' beliefs because it is a product that inherently involves decisions based on future expectations. Citizens form expectations for the likelihood of receiving future government benefits in case of disaster based on past experiences being favored by the government. Citizens who are certain of politicians' responsiveness to them in the event of future shocks will purchase less private index insurance today. Those who are recipients of government safety nets can be certain that the government cares for their needs. If, even among current recipients of a government safety net, the politically connected purchase significantly less market insurance today, then this provides further evidence that those particular citizens have learned that the government will compensate them during disasters.

Finally, agricultural insurance is an ideal case to study political economy dynamics because individuals have had to devise numerous different coping mechanisms to deal with agricultural risks. In addition to private markets, informal insurance groups help networks of neighbors, friends, and relatives to borrow from one another after shocks. However, government provision of disaster relief is likely to change the incentives to participate in these other markets, potentially crowding in or crowding out these other markets. Studying the effect of government provision of disaster relief on both market and informal insurance can provide further evidence that government provision does affect insurance uptake, and highlight the nuance of this effect across different contexts.

1.3 Contribution to Literature

This dissertation contributes to the development economics literature on index insurance as well as the political science literature on distributive politics in developing

countries. The findings in this dissertation are applicable to social insurance generally – from health to unemployment insurance. Researchers can draw lessons from this dissertation on the viability of both public and private insurance programs and how to best design insurance programs given political incentives to strategically distribute benefits. Programs for insurance will be pivotal in the development process, as low-income countries start forming public welfare systems and expanding their markets.

Over the past decade, policymakers and researchers have marketed index insurance as an innovation that can potentially revolutionize individuals' access to insurance in rural parts of developing countries. Index insurance can be contracted at the individual, institutional, national, or regional level so that individual farmers can purchase insurance from private markets or governments can purchase insurance and distribute the benefits to farmers.

Index insurance delinks insurance payouts from individual-level losses and links them instead to some index falling below or above a given threshold. The index is typically based on climatic data collected at meteorological stations, such as rainfall, but it can also be based on average outcomes measured over a small area, such as average yield or livestock mortality, through remote sensing techniques (MDVI). Insurance payments are triggered by the index crossing a given threshold signaling disaster. Farm-level verification is not needed. Thus, index insurance overcomes the fundamental supply problems associated with traditional yield-based insurance by basing individuals' payments on an exogenous publically observable index (such as local rainfall) that is easily measured and not able to be manipulated (Barnett, Barrett and Skees (2008)). Only weather stations readings need to be measured, avoiding the high costs and long delays of claims verification of thousands of dispersed small farms. Index insurance is thus a promising innovation that can deliver insurance to millions of small farmers in developing countries, with huge social welfare consequences. Studies show that when farmers are covered by index insurance, they tend to take on riskier, higher-yield production techniques (Mobarak and Rosenzweig (2013); Cai et al. (2009); Karlan et al. (2012); Hill and Viceisza (2012)).

However, most experimental studies offering farmers index insurance through markets reveal that they buy the least amount of coverage possible in the rare instances that they

do purchase insurance (Binswanger-Mkhize (2012); (Cole, Healy and Werker (2012); (Giné and Yang (2009); with the exception of (Norton et al. (2014)). Economists have put forth numerous explanations for lack of index insurance adoption. Basis risk, or the imperfect correlation between measured risks at the meteorological station level and the occurrence of weather shocks at the location of the farm of the insured, is considered to be one of them main determinants of low demand (Skees (2008); Clarke (2011)). High price elasticity, liquidity constraints, and lack of trust in the product also help explain the lack of demand (Cole, Healy and Werker (2012)).

This dissertation offers another explanation for lack of insurance demand: the presence of competing government safety nets. Governments have incentives to provide disaster relief across many different contexts. This dissertation shows that in Ethiopia, as in many other countries, national governments and international agencies are already providing citizens with safety nets to protect them from shocks. Safety nets and other forms of aid have the potential to impede index insurance market formation (Cutler and Gruber (1996*b*); Gruber and Simon (2008); Krueger and Perri (2011)).

Even if politicians wanted to stop providing expensive safety nets, so that private markets for index insurance could take root, they have no way to credibly commit to withholding aid. Citizens have learned over time that the Ethiopian government will care for their needs and threats to withhold aid will be perceived as cheap talk. Ethiopian citizens are too certain that the government will provide them with relief following shocks so they have no incentive to purchase private index insurance. The Ethiopian governments use of clientelistic strategies in distributing safety nets provides further evidence for this effect: politically connected citizens purchase the least market index insurance.

If private markets for index insurance cannot form due to government incentives to provide ex post disaster relief then governments can instead purchase index insurance on behalf of poor farmers. There are currently a few countries using such institutional level schemes and policymakers' interest in this method of provision is growing. Using the case of Mexico, which has the longest running public index insurance program, this dissertation shows that, when put in politicians hands, politicians strategically target index insurance

payments to farmers to maximize their chances of electoral success. Given the large political payoffs to distributing disaster relief, such as insurance payments, and discretion over the allocation of transfers, politicians will be apt to use index insurance payments to maintain their positions.

Thus, while politicians' responsiveness to citizens impedes private market formation and necessitates public index insurance provision, politicians' selective responsiveness to citizens also undermines public index insurance provision. Distributive politics occurs across contexts: from authoritarian settings to advanced democracies. In Mexico, a developing democracy, distribution of index insurance is likely to be driven by electoral concerns. However, as the dissertation shows, in an authoritarian state like Ethiopia, clientelistic practices are likely to govern the distribution of index insurance, as they do the distribution of safety nets. Formal, public rules for distribution can help offset the propensity for politicians to engage in non-programmatic distribution of index insurance.

1.4 Overview of Dissertation Papers

This dissertation consists of three papers. The first paper, "Too Certain to Invest? Public Safety Nets and Insurance Markets in Ethiopia" focuses on barriers to market index insurance adoption in Ethiopia. It shows that recipients of a preexisting effective, large-scale public safety net fail to take-up a new highly subsidized private insurance offer. The paper uses rich new household survey data from Ethiopia to show that government safety net programs decrease demand for private index insurance, forming an additional barrier to index insurance take-up. Moreover, it shows that even among safety net recipients, those who can expect to continue to receive future government benefits – politically connected individuals and residents of villages historically targeted for aid – are the ones who purchase the least market insurance. Citizens with greater ability to access government support are less likely to purchase market index insurance. Results are supported by numerous robustness checks.

A second paper similarly focuses on how citizens respond to the selective targeting of safety net programs in Ethiopia. "Public Safety Nets and the Crowdout of Informal Insurance Arrangements: Evidence from Ethiopia" takes advantage of a change in the distribution of aid in Ethiopia, with the advent of a large safety net program, to assess the effect on membership in iddir, informal insurance groups providing assistance for funeral and other contingencies. Echoing the above results showing that safety net recipients are less likely to adopt market insurance, this paper shows that individuals whom the government targets with safety nets drop out of their informal insurance groups. Although there is evidence of substitution, individuals with a high likelihood of receiving the safety net primarily drive the effect. Overall participation in informal insurance groups actually increases in safety net villages. This effect is consistent with an explanation where the most at-risk individuals are drawn into public programs, making participation in the informal insurance network more attractive to others. Contrary to the paper on private insurance markets, in this case, government safety net provision increased access to risk protection in the population.

The third paper, coauthored with Alejandro de la Fuente and Xavier Giné, entitled "Electoral Targeting of Agricultural Insurance in Mexico," focuses on the strategies that politicians use to target index insurance. Mexico has one of the longest running public crop insurance programs. In Mexico, governors have great discretion in the allocation of insurance funds and electoral payoffs, in terms of increased propensity to vote for the incumbent party, are high (Fuchs and Rodriguez-Chamussy (2014)). Using panel data, we find that governors increase both insurance coverage and transfers to farmers prior to gubernatorial elections. Governors only increase coverage during mayoral elections to municipalities with co-partisan mayors whereas they consistently reward their core support municipalities with increased coverage. When federal and state level actors are involved in the distribution decision we find that both gubernatorial and presidential elections increase the amount of payments to farmers. We support our results with evidence that weather events and elections are unrelated and a number of other robustness checks.

The dissertation concludes with policy recommendations based on the findings from the three papers. It argues for public index insurance provision due to the large coverage

rates it makes possible, even compared to highly subsidized private insurance. Further, public crop insurance programs are likely to be cheaper than the ex-post transfers that many governments are already providing. The conclusion makes a number of recommendations for public provision, including incorporating objective eligibility criteria, public posting of benefits, and institutional safeguards that will decrease the tendency for non-programmatic distribution of index insurance.

Chapter 2

Too Certain to Invest?

2.1 Introduction

Economic risk is critical for the large population living in rural areas of developing countries, where a bad harvest can mean forgoing food consumption or selling productive assets. Household level impacts on health and well-being have aggregate effects on economic growth and broader development objectives. Despite the great potential for insurance to help farmers, numerous recent experimental studies offering index insurance were met with surprisingly low demand. Prior research has thus far overlooked the critical role that the institutional context – including the rule of law, cost of doing business, and pre-existing public options – plays in the successful formation of private markets by forming barriers to take-up. This paper demonstrates that pre-existing public arrangements, such as public safety nets, can substitute for private insurance. This research is important because properly designed contracts, that account for, or even complement, public options, can increase the viability of important new technologies for the poor.

This paper investigates the institutional determinants of private index insurance adoption based on the premise that government programs change the incentives to participate in private arrangements. Policymakers and researchers are attempting to introduce index insurance to farmers, a form of insurance that is indexed to measures of weather, such as rainfall, that are highly correlated with yields. However, private insurance products are rarely dropped onto a clean slate. In numerous instances where private index insurance was piloted, governments or international organizations had a long history of providing products,

such as food aid or cash transfers, with similar benefits. Individuals may thus be wary of switching from a known relief product, from a credible supplier, to a similar new product delivered by a market agent.

This paper uses data from a recent pilot program in the Amhara region of Ethiopia that offered farmers a free insurance product to cover losses in crop inputs caused by insufficient rainfall. The study region partially overlapped with villages receiving the Productive Safety Net Program (PSNP), a large public safety net program intended to increase resiliency to shocks. PSNP is widely considered an effective program, with 37 percent of participants reporting that they can plan ahead on the basis of PSNP transfers in 2013, as compared to 27 percent at baseline in 2008 (World Bank). Although the study farmers did not face any price obstacle in purchasing the private insurance product and reside in an extremely risk-prone region, with very high fertility in good years but a high frequency of severe drought, adoption of private insurance was extremely low. PSNP, a public program which increases resiliency and shields households from transitory crisis, decreased demand by forming a substitute for private insurance.

Beyond the effects on current PSNP recipients, I find that individuals who can be confident that they will receive future government support invest less in private risk management. Individuals who reside in villages that receive aid are less likely to adopt private insurance, irrespective of their own beneficiary status. And, this halo effect compounds the greater the share of villagers receiving government aid. Finally, among individuals who receive the safety net, those with a stated confidence in district government or who have political connections buy less private insurance. The finding that public safety net provision can displace private insurance demand, despite the offer of a free insurance product in an extremely risk-prone environment, calls for greater attention to the role of institutional context in private market formation.

2.2 Institutional Context

2.2.1 Determinants of Insurance Demand

Private insurance markets are missing in many areas of developing countries despite great potential benefits. A large body of evidence exposes the debilitating impacts that vulnerability, risk, and economic shocks have on the livelihoods of the poor in developing countries (Morduch (1995); Dercon and Krishnan (2000); Baulch and Hoddinott (2000); Yamano, Alderman and Christiaensen (2005)). Lack of insurance also has economy-wide consequences as uninsured individuals are deterred from taking on loans and growth-enhancing investments, such as productivity-enhancing technologies. Moral hazard, adverse selection, and lack of contract enforcement are well-established explanations for the lack of private insurance supply in developing countries. However, even when insurance is provided in developing countries adoption is surprisingly low.

Anticipation for the introduction of private insurance markets grew over the past decade with the formation of a new insurance product. The product, index insurance, overcomes the fundamental supply problems that inhibit the formation of insurance markets in developing countries: that insurance providers cannot know the risk level nor monitor the risk-taking behaviors of beneficiaries, and oftentimes, operate in an environment where they cannot enforce their contracts (Rothschild and Stiglitz (1976); Finkelstein and McGarry (2006)). Index insurance overcomes these problems by basing individuals' payments on an exogenous publically observable index (such as local rainfall) that is easily measured and not manipulable (Barnett, Barrett and Skees (2008)).

The introduction of formal, private insurance in developing countries revealed that the missing market for insurance is largely attributable to determinants of demand and not just supply. Demand for insurance products, especially to cover losses related to agriculture, should theoretically be high in developing countries: large swathes of the population are uninsured despite the vast majority of their income fluctuations deriving from frequent, observable variation in rainfall. Yet, numerous recent experimental studies offering farmers insurance reveal that they buy the least amount of coverage possible in the rare instances

that they do purchase insurance (Binswanger-Mkhize (2012); Cole et al. (2012); Giné and Yang (2009) with the exception of Norton et al. (2014)). High price elasticity, liquidity constraints, and lack of trust in the product have been put forth as potential explanations for the lack of demand (Cole et al. (2012)).

The logic for private insurance markets in Ethiopia is particularly compelling. In comparison to many other African countries, Ethiopian state capacity is strong and the economy is growing. Investments in health and education infrastructure and importantly, new roads, resulted in real per capita GDP growth of more than three percent per year between 1994 and 2009 (Dercon, Hoddinott and Woldehanna (2012)). The environment is also extremely risk-prone. Ethiopia remains an agrarian-based economy that suffers from high poverty rates and frequent episodes of drought. Demand within the study region in particular should be high, as the study team selected the region because of its agricultural potential and susceptibility to droughts. Furthermore, the insurance offer in the study was essentially for a free good as farmers were offered vouchers sufficient to cover the entire cost of the premium. Provision of vouchers should assuage any problems with liquidity constraints, which scholars consider to be an important impediment to index insurance demand (Binswanger-Mkhize (2012)).

The logic for private insurance markets in Ethiopia becomes less compelling after one considers the presence of a large, institutional competitor to private insurance and its history of food aid reliance. As yet, the relationship between formal, public insurance programs and private insurance has not been explored in the index insurance demand literature despite the economic literature showing that the provision of public insurance affects participation in the private insurance market (Cutler and Gruber (1996*a*); Kronick and Gilmer (2002)). That government provision of insurance can substitute for private insurance may not seem surprising. However, the relationship between PSNP and private insurance markets is not obvious a priori. If the provision of PSNP is only indicative of need, as PSNP is targeted towards drought-prone regions, then PSNP households should have greater demand for private insurance than non-beneficiaries. Farmers may want the coverage provided by the safety net to help smooth consumption as well as the coverage against the loss of input costs.

However, if PSNP has a treatment effect, providing households with increased resiliency to shocks as well as transfers to deal with transitory need, then the relationship becomes less clear.

PSNP is a program targeted year after year to build up the asset base of chronically food insecure households, irrespective of actualized rainfall. By building up households' productive asset base it intends to make households resilient to income shocks, which may make the project's private insurance offer redundant. Conversely, PSNP may provide individuals with a financial cushion to purchase insurance, which can be seen as a risky investment in its own right due to basis risk. Basis risk is the imperfect correlation between the index and the losses experienced by the policyholder. PSNP may also affect insurance demand through an income effect, as it makes recipient households wealthier, which should increase demand unless insurance is not a normal-good or if the two products provide similar benefits. The two products overlap with respect to their ability to cover variable losses. The amount of benefits provided by PSNP is a small, roughly fixed amount (less than the market rate for five days of work per month), but PSNP also includes extra financing for transitory need, such as that caused by rainfall shocks. The pilot project's payouts vary according to the cost of inputs purchased, which are realized in the event that rainfall falls below a specified threshold. Given the success of the PSNP program in increasing household resiliency and scaling up to deal with transitory need, benefits that are very similar to those offered by the private insurance product, I expect the substitution effect to dominate and individuals who receive PSNP to take-up less insurance.

The targeting of PSNP makes further testing of the above hypothesis possible by showing that individuals who can expect to continue to receive government benefits demand less private insurance. PSNP adopted the targeting structure that determined prior distribution of food aid (explained in the PSNP Operations section below). In examining the distribution of aid prior to the start of PSNP, both Clay et al. (1999) and Jayne et al. (2002) found evidence of geographical inertia in spite of potential differences in the spatial pattern of vulnerability and poverty from one year to the next. Inertia is now PSNP policy: woredas (districts) are selected upon determination of being chronically food insecure and

having been a recipient of food aid for a significant period in the past. This geographical constancy stems from the regions' recurring droughts and decreases the need to conduct continual reassessments.

PSNP's targeting indicates that individuals who live in villages that receive aid can expect to continue to receive government benefits. As described above, PSNP can scale up to accommodate extra need caused by droughts, or other disasters, or due to changes in households' consumption needs. But, extra support is typically provided in villages that historically received PSNP. Thus, individuals in PSNP villages will be likely to expect that they will get support if they experience extra need, even if they do not currently receive PSNP. Furthermore, beyond the direct effect of expectation of becoming a future beneficiary, there may be an indirect effect of residing in a PSNP village. Even if an individual doesn't receive PSNP, he may reap some of the benefits by borrowing from friends and relatives who do receive PSNP. Both the direct and indirect effects should increase the greater the share of the village that receives PSNP. Therefore, we can expect that individuals who live in a village that receives PSNP, but do not themselves receive PSNP, will take-up less insurance than individuals who live in non-PSNP villages. Similarly, individuals who live in areas where a greater share of the village receives PSNP, but do not themselves receive PSNP, will take-up less insurance than individuals who live in areas where a smaller share of the population receives PSNP.

Finally, Caeyers and Dercon (caeyers2012political) found that in the aftermath of the 2002-3 drought, prior to the advent of PSNP, households with close associates in official positions had more than 12 percent higher probability of obtaining free food aid than households that were not well connected. Additionally, they find that households with local political connections not only have a higher probability of receiving free food they also "get significantly better rewarded in terms of cash or food receipts per working day than households without such connections" (Caeyers and Dercon (2012), p.642-3). There is no published evidence on whether or not politically connected individuals remain more likely to obtain government benefits today and, in fact, PSNP has increased targeting oversight and monitoring compared to prior food aid distribution. Nevertheless, a direct implication of

Caeyers and Dercon (caeyers2012political) is that individuals may still hold an expectation of the utility of political connections for receiving benefits, irrespective of whether or not such benefits actually accrue today. Therefore, individuals who get PSNP and are connected to the local political elite will take-up less insurance than individuals who receive PSNP and are not politically connected.

2.2.2 PSNP Operations

Beginning in 2002, the Government of Ethiopia and a consortium of donors formed PSNP as a new form of safety net to curb the massive increases in international food assistance. The objectives of the PSNP are to provide transfers to the food-insecure population to prevent asset depletion at the household level and create assets at the community level (PSNP Program Implementation Manual). The program, originally scheduled to end in 2008, has been extended three times. Ten development partners have committed approximately US$2.3 billion for the third phase of implementation (2011-2015) and the fourth, which is set to extend PSNP until the end of 2020, is projected to cost more than US$2.6 billion. PSNP covers more than 7 million people through direct income support (cash transfer or food), primarily through participation in large-scale public works. Although PSNP is a large program by developing country standards, it only reaches roughly eight percent of the Ethiopian population, leaving many deserving people exposed (Berhane et al. (2011)).

Interviews with government officials at the federal and regional levels as well as with donors revealed that the government holds a perception that individuals are becoming too dependent on PSNP and are not self-reliant. The government has set Food Security Program graduation targets, including graduation from PSNP, with administratively set quotas. The Government's Disaster Risk Management and Food Security scale-down strategy mentions a "re-deployment of resources from social safety nets to productive investments" including the use of innovative risk management tools such as weather index insurance and commodity options trading (Government of Ethiopia, 2010).

PSNP began mainly as a welfare program and later added a social insurance component.[1] In normal (e.g., non-drought) years, PSNP operates as a welfare program by providing transfers to eligible households. The determination of PSNP receipt occurs at both the woreda and the household level. The revised PSNP Program Implementation Manual (PIM, 2006) outlines the targeting criteria to be used by government officials and community members to identify program participants. Participation at both levels is based on a determination of being chronically food insecure. At the woreda level, woredas are included if they are located in one of eight specified regions and if they have been recipients of food aid for a significant period prior to the beginning of PSNP in 2005. Kebeles (villages) located within such woredas are given PSNP.

Woreda officials receive participant numbers from the regional level and must determine how to distribute caseloads

across each kebele. Caseload figures are determined broadly by following the PIM's criteria of: population size, rainfall levels and farming potential, average size of landholdings, levels of malnutrition, and the estimated size of the chronically food-insecure population. Similar to the process at the woreda level, in selecting kebele caseloads woreda officials must consider previous relief caseloads (World Bank, 2010).

Household PSNP targeting is primarily a community determination although government administrators determine the number of beneficiaries. Households are considered chronically food insecure if they received food assistance prior to the formation of PSNP, face continuous food shortages, experience a severe loss of assets, and do not have other means of social protection. In assessing the "food gap," the PIM states that the determination be based on family size and number of dependents and status of expected household food production and other sources of income compared with household monthly consumption requirements. Households graduate from the program by accumulating an asset and income

[1] Social insurance differs from private insurance in that participation in social insurance programs is mandatory or is induced by substantial fiscal subsidies. Social insurance also differs from welfare programs because social insurance only refers to transfers to deal with risk. Welfare benefits are means tested, i.e., they are paid only to those with incomes (and assets) below a specified threshold.

level that enables them to meet 12 months of food needs and to withstand modest shocks.

PSNP recipients either receive direct support, if they are unable to work (e.g., elderly, disabled, post-partum women), or are compensated for their engagement in public works (such as road building, soil and water conservation, etc.). In 2010, the PSNP introduced the principle of Full Family Targeting, which stipulates that every household member in a PSNP household receive a cash or food transfer. Each able adult is required to work for five days per month, six months per year. The choice of food or cash is mainly dependent on grain availability in the market, with cash being the default. Payments are made on a monthly basis with community representatives overseeing the cash payment process. Transfers are set at a level intended to smooth household consumption or fill the food gap over the annual lean period. Wage rates are reviewed annually and adjustments are made based on market food price changes. Benefits can represent the equivalent of approximately 10-40 percent of annual basic food needs as defined by Ethiopia's national poverty line (World Bank, 2010).

PSNP has two public insurance features, the contingency fund and risk financing mechanism (RFM), which allow it to scale up in times of transitory crisis. The mechanisms operate in chronically food-insecure woredas that are already receiving PSNP. Transitory needs that exceed this amount are to be covered through the Emergency Response System. In addition to these two mechanisms, PSNP administrators introduced annual retargeting to correct for inclusion and exclusion errors, thus taking into consideration changes in the relative welfare position of households.

The PSNP includes a 20 percent budget for contingency funds. Contingency funds are used to increase caseloads to new beneficiaries or to "top-up" the amount of assistance for current PSNP beneficiaries by giving beneficiaries extra months of support. Individuals included in the contingency fund get the same amount of support as other PSNP recipients (e.g., each person in a PSNP household receives either (1) the cash equivalent of five hours of work at the local wage rate or (2) a set amount of food per person, meant to fill the food gap). Requests for use of contingency funds are justified according to the Early Warning System. The requests are based on market information on crop and livestock prices collected on a weekly basis. The Woreda Early Warning Committee coordinates pre- and post-harvest

assessments. District and village level officials verify requests in field visits. Some districts also use nutrition surveys to verify need.

In 2009, a separate process in PSNP was started to cover transitory needs that are more acute. Risk financing funds can be drawn on once the contingency budgets have been exhausted. The RFM budget exceeds the contingency fund budget. In 2011, the RFM was triggered to address the transitory food needs for 9.6 million people, 6.5 million of whom were existing clients (who received an additional three months of rations on top of the usual six months of support). The RFM program is also linked to the Early Warning System and focuses predominantly on the distribution of free food, although it also contains elements of health, nutrition, water, and education. Households receive a full ration (2,100 kcal), which is larger than what PSNP clients normally receive.

2.2.3 The Private Insurance Project

Private insurance was recently piloted via a randomized project of over 15,000 farmers in the Amhara region of Ethiopia between 2010 and 2014. The project was designed by a research team from the University of California, the United Nations Food and Agriculture Organization (FAO), the Joint Research Center of the European
Commission, University of Athens, and the Ethiopian Economics Association (EEA), an independent Ethiopian research organization. The largest private insurance company and the largest private bank in Ethiopia, Nyala Insurance Company and Dashen Bank, administered insurance and credit, respectively.

The project offered farmers rainfall index insurance, which, in this case, only insured against inadequate rainfall. Farmers could purchase insurance prior to the planting season for a specified crop and quantity of land and purchase insurance to cover losses up to the total cost of inputs, such as fertilizers and high yield seeds. In the event of a drought, compensation would be determined according to a calculation based on the crop grown, the location, and the amount of rainfall. A typical product offered involved paying roughly 500-1000 birr (approximately $38-75 using the exchange rate in 2010 of 13.3 birr per USD) in premiums to insure 4000 birr (approximately $300) worth of input purchases for one

hectare of land.

The project's original research design randomized the placement of the treatment (insurance or insurance with credit) within study kebeles. Although a separate treatment arm was designed to interlink insurance sales with credit, logistical issues prevented Dashen Bank from supplying credit, so the intervention only consisted of a randomized insurance offer in all 80 treatment villages. Households within selected kebeles were randomly sampled to participate in the study. In each village, 18 cooperative households and two households that are not a member of the primary cooperative were selected. The original sample thus consisted of 2,400 households, across 120 villages (80 treatment and 40 control). The choice of kebeles was nonrandom but instead was designed on the basis of the informed opinion of Nyala Insurance Company as to where in the Amhara region the market for insurance has the best potential. Randomization of treatment assignment was done within the selected high potential kebeles. In addition to the insurance offer, voucher coupons were distributed to study households via a lottery system. Vouchers were distributed before the time of the marketing campaign, and could be subsequently redeemed if farmers bought weather insurance. This was done to increase the variability of prices faced by potential insurance buyers (mcintosh2013productivity).

In 2010, a baseline survey was administered to the 2,400 households in the study. Over the next four years, survey households' insurance purchase, consumption, input use, and other behaviors were tracked over multiple rounds of annual insurance offers. Over the course of the study the sample was restricted, first to limit it to those farmers that face deficit rainfall risk and are located close to rainfall stations. Subsequently, the number of study kebeles had to be further restricted to 49, as the available historical rainfall record for ten of the 17 stations was not complete enough to allow the construction of rainfall indices that would be acceptable by Nyala's partner reinsurance company. Of these, 34 were treatment kebeles and 15 were controls for the pilot, comprising 1,189 households (mcintosh2013productivity). These survey households provide the data for this study.

2.3 Analysis

This paper tests whether individuals who receive PSNP take-up less insurance than individuals who do not have access to PSNP. Substitution is exhibited by relative lack of demand for private insurance among beneficiaries of the government safety net, as compared to demand among non-beneficiaries. The analysis proceeds as follows: first, to analyze whether PSNP acts as a substitute for private insurance, I run a reduced form regression of insurance uptake amount on PSNP, controlling for factors expected to influence both receipt of PSNP and insurance uptake. OLS provides a simple, easily interpretable measure of the effect of PSNP on take-up. Second, as PSNP is not randomly distributed across the population, a propensity score matching technique is used to compare insurance take-up among PSNP beneficiaries and like non-beneficiaries. Finally, I run three tests that corroborate the estimated relationship between PSNP and private insurance, by showing that even among individuals receiving PSNP, those who expect to continue to get government benefits take-up less private insurance.

The analysis, of the effect of PSNP on insurance uptake, is restricted to a sample of 365 households. These are households that received a voucher and reside in kebeles reporting any sales, in the second year in which sales were offered. Additional analyses that use the same restriction rules but apply the rules to data from first year sales, and pooled first and second year sales, are also conducted for robustness. The reason for restricting the sample is threefold: (1) Only individuals in treatment villages could purchase private insurance, making these individuals the relevant group for the analysis of the effect of PSNP on insurance uptake. (2) Sales overwhelmingly took place only among voucher recipients. Restricting the sample to only voucher recipients therefore reduces noise, giving more precise estimates of the effect of PSNP on take-up. (3) Some kebeles had no sales. In the first year, Nyala teams were successful in selling insurance products in only 23 of 34 kebeles. In the second year, 29 kebeles had vouchers distributed, of which 25 had any sales reported. Supply side problems existed stemming from Nyala's implementation of sales to households, particularly in villages originally designated for interlinked sales but where credit ultimately

failed to be delivered. Further, information was not directly communicated to farmers by Nyala but instead was conveyed through Ministry of Agriculture officials, "model farmers," and local extension agents. It is thus not clear whether the information about the nature of the insurance was transmitted clearly to all farmers. Kebeles without any sales are dropped as they could introduce a confound (mcintosh2013productivity). It may be that constraints to adoption were on the supply or the demand side of the market and it is impossible to statistically distinguish between the demand-side correlates of behavior and the supply chain-driven explanations for why contracts could not be offered (mcintosh2013productivity).

Only approximately eleven percent of individuals in the baseline survey purchased insurance and the few that did insured on average 186 birr (equal to $14 at the 2010 exchange rate of 13.3 birr to 1 USD). However, study conditions seem favorable for insurance. Approximately half the population reported experiencing a shock that negatively affected their incomes the previous year and reported that, on average, over two years in the last ten their incomes were reduced by 25% or more. Although Nyala chose the study area for its high agricultural potential and relatively higher income, the population is still quite poor. Approximately ten percent of individuals receive PSNP and average farm income is 4,527 birr ($340). In-kind and food expenditures account for 80% of total expenditures. Most of the population is illiterate and only received one year of formal education. Connection to formal financial institutions is also low. Less than a quarter are members of microfinance institutions and even fewer have a bank account or were able to get credit to fund their purchases of agricultural inputs. The subsample is similar to the full sample of households in the study across a number of dimensions including crop production, income, and demographics. Although farm income is somewhat higher in the subsample (5,186 birr in the subsample compared to 4,527 birr in the full sample), non-farm income is slightly lower in the subsample (679 birr versus 793 birr). The value of crop inputs used is lower in the subsample than the full sample despite their higher farm income (570 birr versus 832 birr). The ratio of PSNP households is also slightly lower in the subsample (eight percent versus nine percent).

Table 2.1: Summary Statistics

	Full Sample		**Subsample**	
	mean	sd	mean	sd
Insurance Purchased	.109	.312	.312	.464
Amount Insured	185.721	682.342	528.910	1070.703
Voucher Amount	68.6009	101.319	178.978	83.943
PSNP	.0948	.293	.076	.265
Officer in Household	.052	.222	.063	.242
Total Farm Income (1,000s)	4.527	9.440	5.186	14.739
Female Headed Household	.115	.319	.087	.282
Negative Shock	.502	.500	.470	.499
Dependency Ratio	.335	.207	.322	.196
Value of Agricultural Capital (1,000s)	.892	3.275	.866	5.245
Value of Crop Inputs Used	832.021	1403.229	570.499	1070.43
Used Improved Seeds	.214	.409	.245	.430
Used Chemical Fertilizers	.515	.499	.401	.490
Hectares	1.286	3.296	1.144	1.301
Years of Education	1.236	2.508	.970	2.304
Literacy	.454	.497	.320	.467
Disabled	.032	.175	.067	.251
Non-Farm Cash Income	793.193	2296.226	678.641	2784.952
Number of Parcels Cultivated	3.648	2.013	3.344	1.778
Microfinance Member	.242	.428	.403	.491
Agricultural Credit	.163	.369	.137	.343
Bank Account	.189	.391	.295	.456
Years (in last 10) Income Reduced by 25%	2.223	2.297	1.566	1.855
Inkind and Food Expenditure Share	.803	.118	.789	.114
N	2114		365	
$Number of villages$	106		25	

Summary statistics shown are for the baseline observations in the private insurance experiment first. The sample size shown is reduced to 2,116 individuals due to missing sample weights for fourteen of 120 kebeles (villages). Summary statistics shown next are for the subsample of the observations used in the private insurance take-up analysis (i.e., individuals that received a voucher and reside in kebeles reporting sales in year 2). Estimates have population adjustments using sample weights equal to the inverse of the probability that the observation is included in the sample

2.3.1 PSNP and Insurance Take-up

Non-PSNP beneficiaries purchase private insurance at higher rates than PSNP beneficiaries (14 percent versus six percent). However, PSNP beneficiaries are also likely to be poorer, reducing their financial ability to purchase insurance. To test for substitution between PSNP and private insurance, I first use ordinary least squares. I run the regression of the amount of insurance taken-up controlling for only "institutional determinants" of PSNP receipt, as outlined in the official PSNP PIM.[2] *PSNP* indicates whether a given household is a PSNP beneficiary. *AgriculturalCapital* measures the value of agricultural capital owned by the household in thousands. *NegativeShock* indicates whether the household reported that a shock very negatively affected its consumption in the prior year (at least a 25 percent reduction in income). *DependencyRatio* measures the share of members aged 0-12 and older than 65 to total number of household members.

I also run a model controlling for potential confounds. I include a number of factors outside the official PSNP targeting criteria such as political capital, demographic, and economic factors. These are factors that are not specified in the PIM but could determine PSNP receipt and are also likely to influence private insurance take-up. I control for whether anyone in the household is a chair of the kebele council or a kebele council member. These are positions that are perceived as being intimately tied to the local political elite. I also controlled for whether the household is female headed, disabled, and their years of formal education. Finally, I control for the number of hectares the household farms.

Table 2.2 shows the OLS models including only voucher amounts (model 1), PSNP receipt (model 2), institutional determinants (model 3), and both institutional and unofficial determinants of PSNP receipt (model 4). The choice of an OLS model allows me to estimate how much insurance individuals who receive PSNP purchase compared to non-beneficiaries. Logit models (available from the author upon request) predicting whether or not a household purchased private insurance reveal that PSNP beneficiaries are 15 percent less likely to purchase insurance, using the institutional determinants model (model 3 below), and are 18

[2] The PIM guidelines specify the official criteria for PSNP targeting, as described in the above PSNP Operations section.

percent less likely to purchase private insurance, using the model with both institutional and unofficial determinants of PSNP receipt (model 4). Results are significant at the 99 percent confidence level.

Table 2.2: OLS Regression of Year 2 Sales and PSNP Recipients

	(1)	(2)	(3)	(4)
	Model 1	Model 2	Model 3	Model 4
DV: Insurance Take-up	b/se	b/se	b/se	b/se
PSNP		-800.961**	-938.841**	-929.852**
		(298.89)	(343.24)	(349.95)
Voucher Amount	4.070**	4.666***	4.477***	4.389***
	(1.59)	(1.65)	(1.48)	(1.56)
Total Farm Income			-9.046**	-9.847**
			(3.77)	(4.13)
Value of Agricultural Capital (1,000s)			-7.245**	-5.758**
			(3.17)	(2.62)
Negative Shock			-19.060	-1.732
			(105.56)	(110.40)
Dependency Ratio			1151.477**	1116.711**
			(431.78)	(412.17)
Officer in Household				415.335*
				(215.93)
Female Headed Household				-99.244
				(208.94)
Hectares				28.878
				(41.77)
Years of Education				17.973
				(36.82)
Disabled				-173.815
				(242.71)
Constant	-199.548	-245.492	-509.392**	-544.606**
	(197.91)	(201.11)	(222.99)	(219.70)
N	349	349	349	349
Numberofvillages	24	24	24	24

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Sample includes individuals that received a voucher and reside in kebeles reporting sales in year 2. Standard errors in parentheses, clustered at the kebele level. All models have population adjustments using sample weights equal to the inverse of the probability that the observation is included in the sample

Results shown are from second year sales, including sample weight adjustments. On average, being a PSNP beneficiary decreases the amount of insurance purchased by approximately 930 birr (in the preferred model), with results significant at the 95 percent confidence level. Results for PSNP receipt are very stable across the different specifications

even after controlling for a number of variables that are anticipated to be correlated with PSNP and insurance demand.

The appendix includes specifications for second year sales without sample weights as well as pooled first and second year sales with and without sample weights. PSNP coefficients are negative and significant without the inclusion of the weights, but the PSNP coefficient is halved without the inclusion of sample weights. These differential marginal effects indicate that the effects of PSNP are larger for individuals residing in larger kebeles and for non-coop members, who were under-sampled in the survey.

2.3.2 Insurance Uptake and Matched PSNP Individuals

The treatment in this study is participation in the government safety net program, however, there are numerous potentially omitted covariates that prevent making causal claims about the relationship between PSNP and private insurance demand. To address these omitted covariates, a propensity score model is estimated to evaluate the amount of insurance that PSNP beneficiaries take up compared to their non-PSNP counterparts. Matching constructs a counterfactual using a single propensity score that selects relevant observations of individuals that receive PSNP (a treatment group) to compare with individuals that do not (a control group), as developed in Rosenbaum and Rubin (1985).

To conduct propensity score matching it is necessary to first estimate a model of assignment to treatment. As described in the above section using OLS, I define the logit model of PSNP households, based on institutional (PIM) guidelines. Table 2.3 below shows the results of a logit model predicting PSNP receipt based on PIM guidelines only (model 1) and the PIM plus non-institutional determinants of PSNP receipt (model 2). Note that all baseline observations are used in this analysis to take advantage of all heterogeneity in available determinants of PSNP. Sample weights adjustments are included, restricting the sample to 2,114 households. Results without the inclusion of sample weights are in the Appendix.

The performance of the institutional determinants of PSNP is mixed in the logit models below. As expected, experiencing a negative consumption shock and having a higher

dependency ratio positively predict receipt of PSNP. Interestingly, farm income has no effect on receipt of PSNP nor does the value of agricultural capital owned by the household. This may be due to the fact that these variables are highly skewed towards zero. Results suggest that some factors outside the PIM do determine receipt of PSNP. The number of hectares the household farms, both an indicator of wealth and a productive asset, decreases the likeliness of PSNP receipt. Upward ties to local political elites positively predict PSNP although the mechanisms through which this effect operates are unknown, and the effect may be driven by other sources of unobserved heterogeneity. Although the pseudo-R squared is low for the models, the models correctly predict over 87 percent of the cases.

As seen in the OLS results in Table 2.2, vouchers strongly predict insurance sales but are not determinants of PSNP receipt. To conduct propensity score matching it is thus necessary to first regress insurance sales on the voucher amounts only, and save those residuals. This saves only the variation in uptake amounts unexplained by the vouchers. Then, matching can be conducted using the residuals as the outcome variable and PSNP as the treatment variable, controlling for all the factors (in the above models) that determine receipt of PSNP. This approach estimates the difference in the sum insured, accounting for voucher amounts, between the PSNP and non-PSNP samples. If matching works, the only factor that differentiates the control from the treatment group is receipt of PSNP, enabling a determination of the causal effect of the impact of receiving PSNP on the amount of index insurance purchased. A key assumption, which must be satisfied to use matching methods, is the conditional independence assumption. This requires that conditional on the vector of observable characteristics, the outcome variable is independent of the choice of treatment, that is, that unobservables do not predict assignment to PSNP as well as the amount of private insurance purchased (Rosenbaum and Rubin (1985)).

Propensity score matching is conducted for PSNP beneficiary households, with one-to-one matching imposing a common support. Imposing a common support drops all observations with a propensity score higher than the maximum or lower than the minimum propensity score of the controls, in order to reduce the effect of any “bad” matches. Matching is conducted controlling for determinants of treatment specified in the PSNP PIM as well

Table 2.3: Logit Model of PSNP Receipt at Household Level

	(1)	(2)
	Model 1	Model 2
DV: PSNP Receipt	b/se	b/se
Value of Agricultural Capital	-0.028	-0.012
	(0.07)	(0.03)
Total Farm Income	-0.067	-0.033
	(0.05)	(0.04)
Negative Shock	0.598**	0.561*
	(0.28)	(0.29)
Dependency Ratio	0.927*	0.855*
	(0.51)	(0.51)
Officer in Household		0.948**
		(0.45)
Female Headed Household		0.069
		(0.30)
Hectares		-0.956***
		(0.31)
Years of Education		-0.040
		(0.05)
Disabled		-0.348
		(0.52)
Constant	-2.675***	-1.787***
	(0.34)	(0.45)
N	2114	2114
$Number of villages$	106	106
Pseudo R^2	0.0309	0.0763

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Summary statistics shown are for the baseline observations in the private insurance experiment. The sample size shown is reduced to 2,114 individuals due to missing sample weights for fourteen of 120 kebeles (villages). Standard errors in parentheses, clustered at the kebele level. All models have population adjustments using sample weights equal to the inverse of the probability that the observation is included in the sample

as with the non-institutional determinants of PSNP: households that have an officer, are female-headed, the number of hectares they farm, their years of education, and whether or not the head is disabled. Fortunately, the logit models used perform well in generating matches that are on-support for all recipients in the first model and all but two of the PSNP recipients in the second model. There is no clear guidance in the econometric literature on how to accommodate sample weights when conducting matching. The current recommended approach is to ignore sampling weights when conducting matching since the outcome of interest is not generalizing the propensity score model to the population (Zanutto (2006)). Thus, sample weights are not included here.

Table 2.4: Propensity Score Regression of Year 2 Sales and PSNP Households

	(1)	(2)
	PS Matching PIM	PS Matching PIM Plus
Outcome: Residuals	b/se	b/se
Treated	-435.252**	-442.77**
	(194.44)	(224.79)
Constant	70.021	94.563
N	365	365
Numberofvillages	25	25

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Standard errors in parentheses. Table shows the treatment on the treated, the effect of the safety net policy on private insurance uptake. Outcome variable is the residual from an OLS regression of the amount insured on voucher amounts only, with kebele level clustering. Both models use one-to-one matching imposing a common support. Sample includes individuals that received a voucher and reside in kebeles reporting sales in year 2. Model 1 calculates propensity score matching, matching on the determinants of PSNP specified in the PSNP PIM. Model 2 calculates propensity score matching, matching on the determinants of PSNP specified in the PSNP PIM plus additional factors expected to determine receipt of PSNP.

Matched results, shown in Table 2.4, are of a similar magnitude to OLS results without sample weights. Matched sample estimates for PSNP recipients are on average

approximately 440 less birr of private insurance purchase than the control group. This is the estimate of the average-treatment-effect-on-the-treated, the statistic that shows the effect of the safety net policy on private insurance uptake while controlling for sample selection bias. While it is highly unlikely that all determinants of PSNP receipt are captured in the matching model, Rosenbaum bound results show that the odds of one person receiving PSNP have to be more than 1.3 times higher (according to the fully saturated model 2 and 1.8 times according to institutional determinants-only model 1) because of different values on an unobserved covariate, despite being identical on the matched covariates, for the inference to change.

Table 2.5 presents a test of balance in the propensity score over the common support. The table reports results of difference in means tests between the treatment and the control groups (PSNP vs. non-PSNP recipients) for each correlate for all 365 observations. The table reports the difference in means and the standard errors. None of the differences is statistically significant at the 99% level.

Table 2.5: Balance Table for Matched Observations

Variable	mean treated	mean control	t-test	p>|t|
Value of Agricultural Capital	.506	.594	-1.00	0.323
Total Farm Income	3.266	3.11	0.16	0.874
Negative Shock	.567	.667	-0.79	0.434
Dependency Ratio	.344	.402	-1.29	0.204
Officer in Household	.067	.133	-0.85	0.398
Female Headed Household	.167	.133	0.36	0.723
Hectares	1.018	1.11	-0.50	0.619
Disabled	.033	0	1.00	0.321
Years of Education	1.133	.933	0.38	0.706

Balance table for matched sample from one-to-one matching imposing a common support. Sample includes individuals that received a voucher and reside in kebeles reporting sales in year 2. Propensity score model calculates propensity score matching, matching on the determinants of PSNP specified in the PSNP PIM plus additional factors expected to determine receipt of PSNP.

2.3.3 Discussion

The working hypothesis states that individuals fail to adopt insurance because they believe they can rely on the government for support following economic shocks. To show this, the first part of the paper illustrates that individuals who receive the government safety net buy less insurance on the private market than individuals who do not get the safety net program. Matching models included a model with determinants of PSNP stipulated in official government documents as well as a model that additionally controls for potential confounds.

But other factors could potentially be influencing adoption of private insurance that could also predict PSNP receipt. Risk aversion, for example, is likely to be correlated with PSNP and with demand for index insurance. PSNP recipients are likely to be among the most poor and to have suffered from economic shocks, making them loath to take on risks. As index insurance still leaves insurers exposed to basis risk, PSNP recipients will be less likely to purchase it. The original survey questionnaire asked respondents "Many farmers consider new agricultural practices that give higher yields but may have unpredictable and unknown consequences. Are you generally a person who is prepared to take such risks or do you try to avoid taking risks?" Respondents who answered that they "never take such risks" are coded as risk averse. Results from both OLS regressions and propensity score matching show that risk aversion does have a negative effect on index insurance purchases, but PSNP estimates remain robust to the inclusion of risk aversion.

An alternative explanation is that individuals who receive PSNP are likely to be less educated and unlikely to understand how insurance operates. Survey questions attempted to illicit respondents' ability to reason and to apply simple numerical concepts. It asked them simple mathematical questions such as filling in the missing number in a numerical sequence or to count backwards (such as "what is 40 minus 10? and that answer minus 10?"). Respondents were given no more than 1.5 minutes to answer each question. Only 22 percent of respondents were able to answer the missing number questions correctly but 77 percent of respondents could answer the subtraction questions correctly. Including a

measure of whether respondents answered both the subtraction and the missing number questions correctly, or including separately a measure of the ability to correctly respond to either type of question, does positively affect insurance take-up but has no effect on the PSNP coefficient.

As the insurance product covered input costs only, and as PSNP recipients use less inputs[3] it may be that non-PSNP beneficiaries had less use for the private insurance product. The PSNP coefficient does decrease with the inclusion of controls for use of improved seeds, chemicals, and organic fertilizers (792 birr) in the OLS model of insurance demand, but remains statistically significant.

Finally, liquidity constraints are known to influence index insurance take-up. In addition to the above tests, I test the effects of liquidity constraints on PSNP recipients by interacting PSNP with the voucher amounts. The coefficient on PSNP is positive and significant, indicating that when voucher amounts are zero PSNP has a positive effect on uptake. To explore this further I plot the interaction effect of PSNP receipt and voucher amounts, both with and without imposing the condition that households receive any voucher (results are consistent). The test reveals that for voucher amounts beyond 100 birr, PSNP beneficiaries take up significantly less insurance. Take-up for PSNP and non-PSNP households that receive no voucher or a 100 birr voucher cannot be statistically distinguished. Figure 2.1 plots the predictive margins for this interaction effect. Moreover, there is a positive sloping demand curve for households that do not receive PSNP.

OLS results for the alternative explanations are presented in Table 2.6 below. Propensity score matching results, including all potential confounds, are included in Table A13 in the Appendix. Treatment on the treated effects of negative 453 birr are remarkably similar to the above estimates, and remain significant at the 95 percent confidence level.

[3] Only seven percent and 24 percent of PSNP beneficiaries used improved seeds and chemical fertilizers as compared to 31 and 65 percent of non-beneficiaries, respectively.

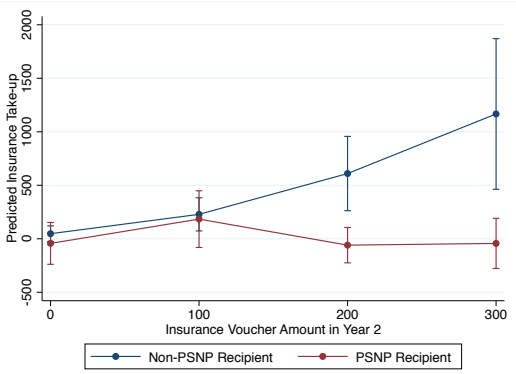

Figure 2.1: Predictive Margin of PSNP and Voucher Amount

Table 2.6: OLS Regression of Year 2 Sales and PSNP Recipients

	(1)	(2)	(3)	(4)
	Model 1	Model 2	Model 3	Model 4
DV: Insurance Take-up	b/se	b/se	b/se	b/se
PSNP	-928.702**	-950.521**	-938.498**	574.848**
	(335.50)	(346.84)	(343.01)	(249.38)
Voucher Amount	4.468***	4.407***	4.476***	4.828***
	(1.50)	(1.48)	(1.48)	(1.55)
Total Farm Income	-9.286**	-9.349**	-9.077**	-9.471**
	(4.03)	(3.87)	(3.87)	(3.95)
Value of Agricultural Capital	-7.406**	-7.272**	-7.230**	-7.440**
	(3.19)	(3.18)	(3.16)	(3.22)
Negative Shock	-29.739	-10.648	-18.446	-8.641
	(103.63)	(111.19)	(106.72)	(105.63)
Dependency Ratio	1137.475**	1190.509**	1151.308**	1198.240**
	(410.69)	(442.58)	(432.56)	(438.91)
Numeracy	247.840			
	(172.20)			
Risk Averse		-364.618*		
		(202.38)		
Value of Crop Inputs Used (1,000s)			0.364	
			(2.65)	
PSNP*Voucher Amount				-6.254***
				(2.08)
Constant	-521.376**	-491.338**	-510.086**	-587.053**
	(221.10)	(221.88)	(223.89)	(227.85)
N	349	349	349	349
Numberofvillages	24	24	24	24

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Standard errors in parentheses, clustered at the kebele level. Sample includes individuals that received a voucher and reside in kebeles reporting sales in year 2. All models have population adjustments using sample weights equal to the inverse of the probability that the observation is included in the sample

2.3.4 Expectation of Future Benefits

To further corroborate the substitution hypothesis, I run three tests to determine whether individuals who can expect to receive government benefits purchase less insurance. First, I estimate the halo effect of living in a village that receives PSNP, controlling for an individual's PSNP beneficiary status.[4] The PSNP village dummy should capture an individual's perception of the likeliness that they could receive aid, even if they are not a recipient currently, due to officials' ability to scale-up aid in PSNP villages in response to crisis. In addition, it could also capture PSNP village residents' ability to borrow from friends or family members who receive aid. Second, I measure the affect of the share of the village that receives PSNP on private insurance take-up. The share measures whether the halo effect is greater when more of the village receives PSNP. Finally, I estimate the effect of heterogeneity in expectation of receiving aid, conditional on receiving the safety net.

Heterogeneity in expectation of receiving aid is measured in two ways. The first measure is a direct measure of connections: whether anyone in the household is a chair of the kebele council or a council member. The dummy for political connections is interacted with a dummy for whether the individual is a PSNP beneficiary. A significant and negative interaction effect would suggest that individuals who receive the government safety net and have ties to local political elites will expect to continue to receive aid and so turn to the private insurance market less than individuals who receive the government safety net but are unconnected. Whether or not the expectation of benefits that derives from political connections is due to political favoritism, increased information flows to those in power, or another mechanism is beyond the scope of this paper. The second measure of heterogeneity in expectation of receiving aid is based on respondents' responses about their confidence in government. The survey instrument asked respondents how much confidence they have in

[4] A halo effect is a psychological term used to explain the bias shown by individuals towards certain products/individuals because of a favorable experience with other products/individuals in another area. In this context, a halo effect refers to a given villagers positive impression of the effectiveness and likeliness of PSNP receipt based upon observation of other villagers positive experience with PSNP.

district government. Given district governments' influence in resource allocation, including aid distribution, individuals who are connected may see the government as more responsive to their needs and hence place greater confidence in them. Respondents were presented with a choice of answering: a great deal of confidence, quite a lot of confidence, not very much confidence, or none at all. These responses are collapsed into a binary indicator for whether respondents answered a great deal or quite a lot versus not very much or none at all.

Table 2.7 shows the results of the inclusion of the targeting variables in OLS regressions of insurance uptake. Model 1 shows the effects of political connections conditional on receiving PSNP. The differential effect of being a recipient of PSNP and having direct ties to the local political elite is a reduction of insurance sales of 627 birr. Similarly, the differential effect of both having confidence in district government and receiving PSNP (model 2) reduces insurance sales by 759 birr. Both sets of interaction effects are significant at the 90 percent confidence level. Undoubtedly, receipt of PSNP is influenced by other factors that are unobserved or difficult to measure, limiting the ability to estimate causal effects of PSNP on private insurance demand. Nevertheless, these interaction effects, which corroborate the explanation that expectation of aid reduces private insurance demand, are difficult to explain through alternative hypotheses. Similarly, living in a village that receives PSNP (model 3), as well as the share of the village that receives PSNP (model 4), negatively predict insurance demand at the 90 percent confidence level. Holding PSNP beneficiary status constant, living in a village that receives PSNP decreases private insurance demand by 452 birr. The effect of the share of the village that receives PSNP on insurance uptake is even more overwhelming (decrease of 1,613 birr).

The figures below illustrate the predicted values of having political connections, conditional on receiving PSNP. Figure 2.2 shows the predicted amount of insurance purchase for households with and without an officer in their households, conditional on the household receiving PSNP, and holding all other values at their means. Results suggest that individuals who get PSNP but lack strong ties to local elites buy more insurance than individuals who get PSNP and have direct political connections. Figure 2.3 shows the results of stated confidence in government, conditional on receipt of PSNP. Results are consistent with the

Table 2.7: OLS Regression of Insurance Uptake Interacting PSNP and Aid Targeting

	(1)	(2)	(3)	(4)
	Model 1	Model 2	Model 3	Model 4
DV: Insurance Take-up	b/se	b/se	b/se	b/se
Officer in Household*PSNP	-627.161*			
	(305.33)			
Confidence in District Govt*PSNP		-758.495*		
		(377.29)		
PSNP Kebele			-452.084*	
			(234.27)	
Share of Kebele Receiving PSNP				-1612.508*
				(879.83)
PSNP	-892.967**	-584.880*	-603.919**	-672.691**
	(333.47)	(285.82)	(216.87)	(268.10)
Voucher Amount	4.256***	5.352***	4.436***	4.354***
	(1.42)	(1.59)	(1.50)	(1.47)
Total Farm Income (1,000s)	-9.203**	-9.071**	-9.508**	-9.347**
	(3.77)	(3.83)	(3.52)	(3.50)
Value of Agricultural Capital (1,000s)	-6.874**	-9.277**	-2.912	-2.174
	(3.13)	(3.46)	(2.60)	(2.86)
Negative Shock	23.618	63.613	112.240	84.040
	(105.50)	(105.09)	(130.82)	(123.89)
Dependency Ratio	1078.289**	1226.532**	968.348**	1017.952**
	(414.77)	(456.71)	(407.88)	(407.55)
Officer in Household	513.267**		518.257**	501.186**
	(206.92)		(184.68)	(190.11)
Confidence in District Govt		234.789		
		(183.87)		
Constant	-499.568**	-840.818**	-438.470*	-450.526**
	(211.31)	(339.54)	(214.22)	(211.73)
N	349	333	349	349
Numberofvillages	24	24	24	24

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Standard errors in parentheses, clustered at the kebele level. Sample includes individuals that received a voucher and reside in kebeles reporting sales in year 2. All models have population adjustments using sample weights equal to the inverse of the probability that the observation is included in the sample

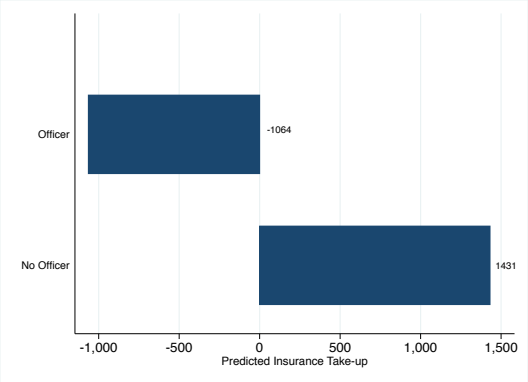

Figure 2.2: Predicted Insurance Take-up and Political Connections

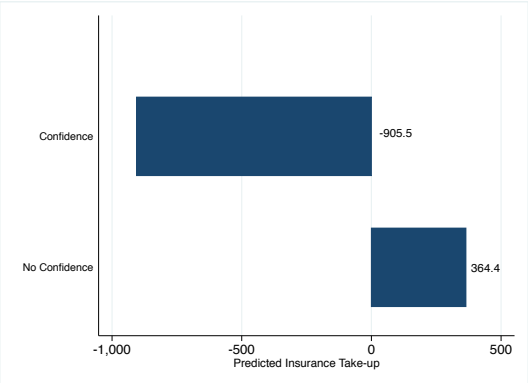

Figure 2.3: Predicted Insurance Take-up and Confidence in Government

results for the measure of political connections.

It may be, however, that individuals' general levels of trust would cause them to be more trusting of a new product. The measure of trust in government would thus incorporate individuals' likeliness to be trusting, in addition to their trust in government. To account for individuals' generalized trust level, a measure of trust is included in the OLS regression of insurance purchase that includes an interaction of PSNP and stated confidence in government. The measure of trust is a dummy equal to one if individuals responded to the question "Generally speaking would you say that most people living in this village can be trusted or that you need to be very careful in dealing with people" by answering that

"most people can be trusted." I conduct two placebo tests showing that interacting PSNP with other measures of trust, that are unrelated to the government – trust in banks and trust in the press – yield an insignificant interaction effect. Results are shown in Table 2.8 below.

2.4 Conclusion

This paper provides evidence that is consistent with the explanation that lack of demand for private insurance is attributable in part to government provision of safety nets. It further presents evidence that individuals, who can expect to continue to receive public benefits, because they live in villages that receive aid or are politically connected, buy less private insurance. A few caveats must be presented along with these findings. First, Ethiopia is only one case, and in many respects, a most likely case to test this hypothesis. Its history of drought, longstanding reliance on aid, and strong state capacity make it an environment where a perception of government responsiveness to economic shocks is highly likely to be found. Second, the power is limited by problems with implementing the randomized control trial. Thus, although the negative effect of receiving PSNP on private insurance take-up is substantial, the size of the confidence intervals means that the effects could be far more moderate. Finally, the identification strategy relies on a matching strategy, which assumes that the model of assignment to PSNP is correctly specified. Given allegations of political targeting of PSNP it may be that the government rewards supporters with PSNP, which may also correlate with private insurance demand. As the insurance pilot survey did not collect data on voting behavior or political preferences it is not possible to rule out this confound, and opposition parties were essentially non-existent during the study period. Nevertheless, as the bounds analysis shows, results for the affect of PSNP on insurance uptake are so large that unobserved variables would have to be very influential to get these effects.

Supplying insurance privately in developing countries is likely to require major expenditure in the form of subsidies. However, even highly subsidized insurance offers have been met with indifference in field experiments in part because many governments have fashioned themselves as being credible sources of aid following disasters. The reliability of

Table 2.8: OLS Regression of Insurance Uptake Interacting PSNP and Trust

	(1)	(2)	(3)
	Model 1	Model 2	Model 3
DV: Insurance Take-up	b/se	b/se	b/se
PSNP	-1105.301**	-627.058**	-575.918*
	(421.01)	(228.09)	(297.12)
Voucher Amount	4.634***	5.177***	5.322***
	(1.52)	(1.62)	(1.56)
Total Farm Income (1,000s)	-9.472**	-8.634**	-10.206**
	(3.93)	(3.67)	(4.30)
Value of Agricultural Capital (1,000s)	-7.808**	-9.482**	-8.859**
	(3.53)	(3.76)	(3.39)
Negative Shock	-42.811	46.487	2.483
	(126.62)	(108.48)	(99.75)
Dependency Ratio	1158.373**	1312.153**	1148.058***
	(438.13)	(507.95)	(404.54)
Confidence in Press	13.527		
	(139.06)		
Confidence in Press*PSNP	384.226		
	(314.33)		
Trust in Banks		336.996	
		(223.41)	
Trust in Banks*PSNP		-575.078	
		(398.42)	
Generalized Trust			236.722
			(236.08)
Confidence in Dist Govt			236.628
			(181.18)
Confidence in Dist Govt*PSNP			-842.968*
			(450.70)
Constant	-516.231**	-923.450**	-852.541**
	(228.63)	(402.97)	(340.73)
N	334	337	332
Numberofvillages	24	24	24

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Standard errors in parentheses, clustered at the kebele level. Sample includes individuals that received a voucher and reside in kebeles reporting sales in year 2. All models have population adjustments using sample weights equal to the inverse of the probability that the observation is included in the sample

government as a source of disaster relief is likely to enter individuals' demand functions when presented with a private insurance offer. Individuals may even be afraid of losing access to government benefits if they take-up the private insurance offer. Given the many challenges that the introduction of insurance in developing countries has met, when policymakers consider the viability of insurance the institutional context should figure at the forefront. They should accordingly strive to incorporate pre-existing public arrangements into insurance contract design.

This chapter is in full, is a reprint of the material as it appears in "Too Certain to Invest?The Political Economy of Ethiopian Insurance Markets," *World Development*, 78 (2016): 37-51. The dissertation/thesis author was the primary investigator and author of this paper.

Chapter 3

Public Safety Nets and Crowd-out of Informal Insurance Arrangements: Evidence from Ethiopia

3.1 Introduction

Informal risk sharing networks are common in many rural areas of developing countries (Rosenzweig and Wolpin (1988); Townsend (1994); Ligon, Thomas and Worrall (2000); Ligon, Thomas and Worrall (2002); and Fafchamps and Gubert (2007)). Informal arrangements allow neighbors, friends, and relatives to borrow from one another following an economic shock but have known shortcomings as such groups can offer only incomplete risk protection. Informal arrangements help rural households cope with shocks because in much of the developing world formal insurance arrangements, both private and public, are missing.

As low income countries start developing formal public welfare systems, scholars have studied whether formal arrangements crowd-out informal arrangements or whether they can complement them (Albarran and Attanasio (2003); Attanasio and Rıos-Rull (2000)). However, there has thus far been little empirical research on the crowding-out effect of government provided assistance on informal insurance arrangements and only a further few demonstrate a causal effect. Additionally, research to date has not examined the implications of government provided assistance on informal insurance groups' composition and functioning. The selection into, or out of, informal insurance groups changes the characteristics of individual who remain in the groups and consequently, both the attractiveness of the group to others and the types of services that the group provides to members. This question has

important policy implications because public safety nets change the incentives to participate in informal insurance groups. Thus, public assistance has the potential to either increase or decrease individuals' ability to shield themselves from risk compared to a world without public expenditures.

Contemporary rural Ethiopia provides an ideal setting to examine the consequences of government transfer programs on informal risk-management networks. Ethiopia has an agrarian based economy subject to frequent intense episodes of drought. Its population has had to devise risk-coping mechanisms to deal with a series of famines. Over the past century, Ethiopians developed a system of traditional risk-management networks called iddirs. Iddirs are funeral associations that ensure a payout in-cash and in-kind at the time of a funeral for a deceased member of the family of a member of the group. However, iddirs serve many functions beyond providing financial support for funerals. A substantial number of iddirs offer other forms of insurance, for example for losses due to fires or destruction of crop or livestock, and many offer loans (Dercon et al. (2006)). People can and usually are members of more than one association for funeral insurance and the number of funeral associations can vary widely across areas (Dercon et al. (2006)). Furthermore, Ethiopia has a long history of food aid reliance and its aid distribution system has undergone a significant transformation over the last decade. Ethiopia is a large beneficiary of the global food aid system. In the 1990s, food aid transfers to Ethiopia were as high as 15 million tons annually (Jayne et al. (2002)).

Using the Ethiopian case, it is possible to analyze whether government aid crowds-out informal insurance arrangements. Since 2005, the Government of Ethiopia and a consortium of donors formed the Productive Safety Net Program (PSNP), a large scale safety net program reaching approximately eight million beneficiaries. The transition to the PSNP provided more reliable assistance, that reached a larger population, than the prior aid distribution system. The advent of PSNP provides a natural experiment to study whether public safety nets crowd-out informal insurance arrangements. To study this problem, I use four rounds of the Ethiopia Rural Household Survey (ERHS), between 1997 and 2009, a unique longitudinal household data set covering households in a number of villages in rural

Ethiopia. The identification strategy takes advantage of the two step targeting procedure for PSNP: first, towards drought-prone regions and second, to food insecure households within these regions. I estimate individuals' propensity to receive PSNP and use this score in a linear probability model to estimate whether, after PSNP is introduced, individuals with a higher propensity to receive PSNP, living in PSNP villages, switch out of iddirs. This method allows me to compare changes in iddir membership among individuals living in a village that does not receive PSNP with individuals of a comparable propensity to receive PSNP, who reside in villages that do receive aid.

Results indicate that with PSNP individuals do select out of iddirs, however, this substitution actually increases overall risk protection in the population. The reason is two-fold. First, individuals with a high likelihood of receiving the safety net switch out of iddirs, however, the general population living in a village that receives PSNP actually increases their iddir participation. This effect is consistent with an explanation where the most at-risk individuals are drawn into public programs, making participation in the informal insurance network more attractive for others with the decrease in adverse selection in the group. Second, remaining iddirs provide services that complement PSNP. Remaining iddir insure against the idiosyncratic shocks that PSNP does not cover and are more likely to provide loans. Iddirs have deep, local knowledge about individuals' characteristics and the losses they experience that give them an advantage in providing insurance for idiosyncratic losses. And, with the selection of low risk types into iddirs and the selection of higher risks types out of iddirs, iddirs are more likely to provide loans that would otherwise be too costly for the group to provide.

3.2 Institutional Context

3.2.1 Government Assistance

Ethiopia has been one of the largest recipients of global food aid for the past several decades. From 1984 to 1998, it received almost 10 million metric tons, an average of almost 10% of national cereal production over this period. In bad production years food aid was as

high as a fifth of domestic production. In the late 1980s, Ethiopia was receiving roughly 25% of all food aid deliveries to Africa, and as late as 1996 was still receiving 20% (Jayne et al. (2002) citing then current WFP website statistics). The amount of people in need of food assistance then rose from approximately 2.1 million in 1996 to 13.2 million in 2003, before falling back to 7.1 million in 2004 (World Bank website). In 2005, Ethiopia rolled out PSNP as a new form of safety net to curb the massive increases in international food assistance. PSNP has since become the largest safety net program in Africa, outside of South Africa. The program, originally scheduled to end in 2008, has been extended three times. Ten development partners committed approximately US$2.3 billion for the third phase of implementation (2010-2014) and a fourth phase is currently underway (2015-2020).

Food aid delivery in Ethiopia has long taken two main forms: food-for-work and free food distribution. The official goal has long been that work-based allocation (as in food-for-work or cash-for-work) programs account for 80% of all distributions (WFP, 1995). Food aid in Ethiopia is delivered using administrative targeting, with extensive decentralization. The amount of food to be allocated to each wereda (district) is determined at the central government level. Weredas are selected due to the regions' recurring droughts. The actual beneficiary households for either free food or food-for-work are designated at the local community level, by the kebele (village) committees. The kebele is a locally elected administrative unit, with close links to local, district and national political processes. This system of targeting was designed to account for the limited information available to central bureaucracies. Decentralized community based systems for transfer delivery may offer a mechanism to ensure service to the poor, as local government officials may have superior access to information about households in their community. Determinations are usually based on some underlying criteria such as land size, work ability and asset ownership.

The Government of Ethiopia and a consortium of donors developed PSNP in an effort to replace a food aid distribution dependent on emergency appeals. Emergency appeals may arrive too late, causing households to draw down their productive assets or resort to other coping strategies. Beyond ensuring reliable, timely support, PSNP aims to increase households' resiliency to shocks by building community and households' productive asset

base. Like prior assistance, PSNP transfers are distributed through food or cash for work and free food or cash programs. Transfers are set at a level intended to smooth household consumption or fill the food gap over the annual lean period. Wage rates are reviewed annually and adjustments are made based on market food price changes. Benefits can represent the equivalent of approximately 10-40% of annual basic food needs as defined by Ethiopia's national poverty line (World Bank, 2010).

PSNP adopted a similar targeting procedure as governed prior aid distribution. Further, the targeting guidelines incorporate prior aid receipt as a determinant of current PSNP receipt. Weredas are selected upon determination of being chronically food insecure and having been a recipient of food aid for a significant period in the past. Households are selected if they received food assistance prior to the formation of PSNP, face continuous food shortages, experience a severe loss of assets, and do not have other means of social protection. There is considerable evidence on possible biases in food transfer delivery against the poor in Ethiopia, in terms of geography, demography, gender or assets (Clay, Molla and Habtewold (1999); Jayne et al. (2002); Coady, Grosh and Hoddinott (2004); Gilligan and Hoddinott (2007)). Both Clay et al. (Clay, Molla and Habtewold (1999)) and Jayne et al. (Jayne et al. (2002)) explain the targeting as the product of inertia. Geographical constancy stems from the regions' recurring droughts and decreases the need to conduct continual reassessments. However, constancy can also cause targeting errors stemming from any pre-existing bias and errors of exclusion and inclusion, due to changes in households' food insecurity status.

3.2.2 Informal Insurance Arrangements

In Ethiopia, iddir are associations that ensure a payout in-cash and in-kind at the time of a funeral for a deceased member of the family of a member of the group. Membership in iddirs provides financial assistance in times of death or illness. The insurance that these groups provide is substantial with payouts of approximately $20 on average per group, which provides important protection for the insured households. Funeral expenses can cover a significant proportion of a month's income. The average cash payout per iddir is about

40% of monthly household consumption, so iddirs are crucial to households in helping cover these expenses (Bold 2007). Member households generally pay a fixed monthly contribution and make a claim make when they incur burial expenses. Some groups require member pay-in only when a funeral occurs whereas others adopt hybrid systems, collecting a small regular up-front payment and a larger pay-in when a funeral occurs.

Many iddir provide services beyond financial support for funerals. Dercon et al. (Dercon et al. (2006)) find that a substantial number of iddirs offer other benefits to their members: 64% of groups offer loans to members and 64% (but not necessarily the same groups as those offering loans) offer other forms of insurance. Some iddirs help unemployed members (Pankhurst and Mariam (2000)). And, beyond financial assistance, iddirs also provide social support from the community in the grievance process. Some iddirs also take on community development activities. Functions of iddirs have at times included establishing and maintaining good relations among members, coordinating members for community sanitation and crime prevention, and organizing and carrying out development projects.

Iddirs are believed to have evolved from migrant support organizations, possibly as late as the beginning of the 20th century, and to have spread rapidly after the Italian occupation (Pankhurst and Mariam (2000)). Unlike other forms of collective associations, such as cooperatives, iddirs are perceived as being separate from the state, although iddirs' relationship with the state is complex and has evolved over time. Departing from the two previous regimes, the current Ethiopian People's Ruling Democratic Front (EPRDF) regime does not interfere with names of iddirs, and their ethnic, regional, and religious composition. The current regime also does not curb the development role of iddirs, diverging from the prior militarist Derg regime. Nevertheless, a World Bank study of iddirs finds that informal institutions, such as iddirs, have a mistrust of outside agency, particularly from government (Butcher (2007)).

Despite being informal institutions, iddirs call regular meetings, keep minutes, and establish bylaws to regulate how funds will be collected and disbursed and how fines will be assessed. Data from the Funeral Insurance Survey reveal that the average group size of

iddirs was about 85 members and all are substantially smaller than the community (Bold 2007). Membership is clearly defined with written lists and does not change rapidly with members coming in and out. This formalization can be seen as a response to enforcement problems. Like other informal insurance arrangements, membership in iddirs must be self enforcing. Members called upon to make a transfer have incentives to defect. In any given period, only a few members will receive support and the others must be willing to remain in the system in case of future hardship. Further, commitment is not perfectly enforceable in these settings (Ligon, Thomas and Worrall 2002). Individuals cannot be forced to participate in the scheme and pay the transfers they are called to make. For the group to persist, at no point must individuals called upon to make a transfer have incentive to deviate and not make the transfer, given that they will be punished by some sort of exclusion from the scheme in the future (and possibly face other penalties). However, government provided social assistance can change members' incentives to remain in the group.

3.2.3 The Relationship between Formal and Informal Insurance

Theoretically, the inflow of additional income changes households' incentives to participate in informal insurance arrangements. Households may treat transfers of food aid or cash transfers as they would an insurance payout. Aid generates a positive income shock for recipient households, which should induce some redistribution among households according to a partial risk-sharing model. But insofar as it reaches those with low current income, aid also serves as a public transfer, thereby decreasing the need for private transfers. That is, aid, both in-cash and in-kind, can be used to pay for funeral and other contingencies previously covered by iddirs. Standard informal insurance models under enforcement constraints predict substitution: government transfers targeted to a particular person will change the outside options available and therefore increase incentives to leave the informal risk sharing groups (Cox and Jimenez (1992); Attanasio and Rıos-Rull (2000); Cox, Hansen and Jimenez (2004)). Attanasio and Rios-Rull (Attanasio and Rıos-Rull (2000)) showed how the informal support system may break down due to the introduction of a formal insurance scheme, even if the formal insurance insures risks that are different from risks insured by

the informal system.

Results from empirical studies are similarly mixed. Cox, Hansen and Jimenez (Cox, Hansen and Jimenez (2004)) find public expenditures crowd out significant portions of private transfers in the Philippines, but Gibson, Le, Olivia and Rozelle (Gibson, Olivia and Rozelle (2006)) find in a preliminary study that no linear nor non-linear relationship exists between private transfers and income in Cambodia, Indonesia, Papua New Guinea and Vietnam, and conclude that expansions in public transfers have not crowded out private transfers in these countries. The evidence from within Ethiopia is also mixed. There is some evidence from Ethiopia using earlier rounds of the ERHS that the presence of food aid in the community crowds out informal insurance (Dercon and Krishnan (2003)). However, the authors' test of the presence of informal risk-sharing arrangements is indirect: they examine the effect of food aid on log real consumption per adult. Changes in consumption caused by a village receiving aid may be due to informal arrangements other than membership in informal insurance networks, such as remittances. Conversely, aid may have other consequences, such as depressing food prices or disincentivizing labor participation, that are unrelated to informal insurance but affect consumption. In contrast to these findings, Lentz and Barrett (Lentz, Barrett and Hoddinott (2005)) do not find any evidence of substitution effects in Ethiopian food aid targeting. They find no significant impact of food aid on the amount of remittances received in southern Ethiopian and northern Kenyan households.

To further complicate an evaluation of the evidence, most of the empirical literature does not attempt to account for the selection of individuals into government programs. Differences among recipients and non-recipients complicate the identification of the effect of the program on informal arrangements. Albarran and Attanasio (Albarran and Attanasio (2003)) use the randomized roll-out of villages into Progresa, a conditional cash transfer scheme in Mexico, to show that public transfers decrease private transfers and do so more in villages where the variance of income is smaller. This paper contributes to the evidence base by revealing a causal effect of government transfers on self-enforcing, informal insurance groups.

3.3 Analysis

3.3.1 ERHS Data

The ERHS is a unique longitudinal household data set covering a number of rural Ethiopian villages. Data collection for the project started in 1989 and the last round of the ERHS was conducted in 2009. The long nature of the panel, unique among African data, allows for more precise estimation procedures by tracking the behavior of the same households, in the same villages, over time.

The ERHS surveys were carried out by Addis Ababa University, University of Oxford, and the International Food Policy Research Institute (IFPRI). ERHS data were collected in order to study the response of households to food crises. The study collected consumption, asset, and income data. The ERHS survey was redesigned in 1994 around core modules covering topics such as demographic characteristics, assets, income and consumption. In subsequent rounds, the modules were retained with little change in format while additional modules on specific topics were added and dropped on an ad hoc basis.

This analysis uses data beginning with the 1997 round of the ERHS, the first year in which questions on iddir membership were included in the survey. The 1997 survey covered 1477 households in 15 villages across the country. The 1999 and 2009 studies included three more villages. Survey rounds were conducted in 1997, 1999, 2004 and 2009. Attrition at the household level is low. Just under eight percent of the sample was lost between 1994 and 1999, and a further 5.2% were lost from 1999 and 2004. The attrition rate between 1994 and 2004 is 13.2% or 1.3% per year.

Despite the relatively large samples within each village, only 15 villages were sampled (18 in two rounds). Although ERHS data are not nationally representative, the data can be considered broadly representative of households in non-pastoralist farming systems as of 1994. Communities were selected to account for the diversity in the farming systems in the country, including the grain-plough areas of the Northern and Central highlands, the enset-growing areas and the sorghum-hoe areas. Within each village, random sampling was used, stratified by female headed and non-female headed households and landless

households. Unfortunately, the information available for ex-ante or ex-post weighing of the sample when pooled is limited. Sampling size in each village was governed by an attempt to obtain a self-weighting sample, when considered in terms of farming system: each person (approximately) represents the same number of persons from the main farming systems. Table 3.1 below shows the summary statistics, by round, for the 1997 to 2009 rounds of the ERHS.

Table 3.1: Summary Statistics by Survey Round

	1997		1999		2004		2009	
	mean	sd	mean	sd	mean	sd	mean	sd
Government Aid	0.17	0.38	0.23	0.42	0.46	0.50	0.39	0.49
Climate Shock Index	1.20	1.19	1.68	1.68	1.70	1.58	2.36	1.53
Iddir Member	0.73	0.44	0.78	0.41	0.81	0.39	0.85	0.35
Below Poverty Line	0.32	0.47	0.22	0.41	0.25	0.43	0.45	0.50
Real Consumption Per Capita	93.19	117.76	96.87	86.54	99.07	98.56	59.72	44.90
Iddir loan amount in 2005 birr	13.31	87.47	11.11	75.01	25.41	166.38	19.74	112.24
Number of Members in Iddir	.	.	.	.	137.31	196.93	154.59	233.11
Iddir gives loans	.	.	.	.	0.41	0.49	0.45	0.50
Father was member of Iddir	.	.	.	.	0.40	0.49	0.40	0.49
Iddir pays for non-funeral events	.	.	.	.	0.41	0.49	0.43	0.50
Dependency Ratio	0.40	0.22	0.32	0.25	0.39	0.23	0.38	0.23
No Education	0.61	0.49	0.45	0.50	0.49	0.50	0.45	0.50
Head is Disabled	0.24	0.43	0.19	0.39	0.20	0.40	0.24	0.43
Plot Size (hectares)	0.37	6.70	0.48	7.57	0.20	1.41	0.87	6.03
Female Headed Household	0.23	0.42	0.25	0.43	0.30	0.46	0.34	0.47
Head is a Political Official	0.17	0.38	0.19	0.39	0.23	0.42	0.20	0.40
Parents are Political Officials	0.11	0.31	0.13	0.34	0.16	0.36	0.13	0.34
Relatives are Political Officials	0.28	0.45	0.32	0.47	0.39	0.49	0.32	0.47
Equb Member	0.16	0.36	0.13	0.34	0.17	0.38	0.14	0.34
Tigray Ethnicity	0.11	0.32	0.15	0.35	0.11	0.32	0.12	0.32
Oromo Ethnicity	0.24	0.43	0.29	0.45	0.24	0.43	0.24	0.43
Amhara Ethnicity	0.30	0.46	0.38	0.49	0.31	0.46	0.31	0.46
Muslim Religion	0.24	0.43	0.23	0.42	0.22	0.42	0.23	0.42
Protestant Religion	0.16	0.36	0.19	0.39	0.19	0.39	0.19	0.39
Orthodox Religion	0.53	0.50	0.53	0.50	0.53	0.50	0.53	0.50
Number of Villages	15		18		15		18	
Observations	1416		1646		1354		1541	
Number of Villages Receiving Aid	11		12		14		16	

Sampled households are very poor: households living below the poverty line vary

across survey rounds from approximately 20% to 40% of sampled households.[1] Real monthly per capita consumption averaged across survey rounds is approximately 90 birr in 1994 birr, but varies from a high of 100 birr in 2004 to a low of less than 60 birr in the last survey round in 2009 (in 1994 prices). Unadjusted consumption per capita in 2009 (i.e., in 2009 prices) was approximately 213 birr, which is equivalent to approximately $24 USD/month (in 2009 dollars) at the average exchange rate in 2009 of approximately nine birr per US dollar. Approximately half the sample has no formal education while almost 20% can be considered to have some form of physical disability. Households experience a fair number of climate shocks, measured as an additive index ranging from zero to five, based on their reports of insufficient rainfall, rains not stopping on time, etc. Political connectivity varies significantly across households. Only approximately 13% of households report that the household head's parents held an official position but more than 30% report that they have relatives who do. On average, 30% of households receive government assistance (financed by a combination of the Ethiopian government and international sources), but there is significant variation in receipt of government aid across survey rounds.

3.3.2 Propensity to Receive Aid

This paper tests whether households who receive PSNP switch out of iddirs, their informal insurance networks. There is an upward trend in the share of iddir members receiving aid before PSNP, but this trend reversed with the advent of PSNP in 2005. In contrast, the share of non-iddir members who receive aid increases over the study period. However, as PSNP receipt is likely to be driven by numerous variables, such as wealth, which could also affect membership in iddirs, it is necessary to estimate a model that isolates the causal effect of PSNP on iddir membership. To do so, I first estimate a propensity to receive PSNP for households who live in a PSNP village in 2009, the last year of the survey. 2009 is the only post-program period available in the survey, as ERHS survey rounds were conducted in 2004 and again in 2009, and PSNP was rolled-out in 2005. Then, I examine

[1] The poverty line used for each period uses the same basket throughout, but valued at the prices for the survey period.

the effect of the interaction of the propensity to receive PSNP, a dummy indicating whether a household resides in a village that receives PSNP, and an indicator for the year 2009, the last survey round, on iddir membership.

The identification strategy captures the treatment effect of receiving PSNP by comparing individuals with similar propensities to receive PSNP who reside in villages that receive PSNP, to their counterparts who do not reside in villages that receive PSNP. This paper diverges from Duru (unpublished, 2015) by taking advantage of the pre-treatment data available in ERHS to compare individuals, in PSNP and non-PSNP villages, pre and post PSNP treatment. In a PSNP village, I expect a large drop off in iddir membership rates when moving from a low likelihood PSNP candidate household, say a husband and wife with no dependents, to a high candidate household, such as a female headed household with many dependents. However, I expect no change in iddir membership rates when conducting a similar comparison, of low and high candidate households, among households who do not live in a PSNP village, since even high need households will not be able to access PSNP in non-PSNP villages.

I model the propensity to receive government assistance based on a large number of demographic, political, and economic factors. Coefficients are included with an eye towards explaining as much of the variation in PSNP receipt as possible. However, I only include "deep" explanatory variables, that are unlikely to vary signficantly over time so as to avoid including variables that could be affected by prior aid receipt, and hence cause simultaneity bias. For example, including variables such as consumption or assets is problematic because prior aid receipt is likely to affect these variables. I include indicators for the major ethnic groups, with "other" being the omitted category, and religious groups, with Orthodox Christian, the dominant religion in Ethiopia, as the omitted category. Other demographic indicators include indicators for being a female-headed household, the household head having no formal education, and the household head being physically disabled. I considered a household head to be physically disabled if they reported they couldn't stand up after sitting, sweep the floor, walk for five kilometers, or hoe a field for a morning. The dependency ratio varies from zero to one, and is measured as the share of household members aged less than

13 or older than 65 to total household members.

Economic variables include a measure of the amount of land the household owns. A dummy is included for equb members, which are informal savings associations. Objective climatic indicators, such as rainfall, are not readily available at the level of resolution used in this study.[2] Therefore, I construct an index of climatic shocks based on subjective measures of experience with climate shocks. The index is the sum of the following five self-reported indicators: the kiremt (main rainy season) rains not coming on time, not enough rain at the beginning of the rainy season, rains not stopping on time, rain during the harvest, and insufficient rain during the growing season. High scores on the climatic index indicate more negative economic shocks. Miguel (Miguel (2005)) finds a high correlation between reports of droughts or floods and actual rainfall in Tanzania, suggesting that subjective climate reports are reliable. Finally I include three political measures based on political connections: whether the household head, parents of the household, of relatives of the household hold official positions with the local political leadership, such as being a member of the village council. Other political measures, such as vote shares, are not available in the survey, but are unlikely to be informative since opposition parties were absent during the majority of the study period.

A probit model was run of PSNP receipt on all explanatory variables, in PSNP villages, in the last survey round only. This model isolates determinants of receiving PSNP to develop a model of an individual's propensity for receiving PSNP, that can then be applied to an unrestricted model, of non-aid villages and in pre-program years. Table 3.2 shows the results of the probit model of PSNP receipt.

[2] The Ethiopian Meteorological Agency collects data on rainfall but does not make these publicly available.

Table 3.2: Probit model of PSNP Receipt, in PSNP Villages in 2009

	PSNP
	b/se
Relatives are Political Officials	0.059
	(0.09)
Head is a Political Official	0.000
	(0.10)
Parents are Political Officials	-0.047
	(0.11)
Climate Shock Index	0.102***
	(0.03)
Dependency Ratio	0.219
	(0.17)
No Education	0.125
	(0.09)
Plot Size (hectares)	-0.231***
	(0.08)
Equb Member	-0.597***
	(0.13)
Female Headed Household	0.140
	(0.09)
Head is Disabled	-0.039
	(0.09)
Orthodox Religion	0.498**
	(0.20)
Tigray Ethnicity	1.033***
	(0.17)
Oromo Ethnicity	-0.239
	(0.15)
Amhara Ethnicity	-0.161
	(0.14)
Muslim Religion	0.788***
	(0.21)
Protestant Religion	0.333*
	(0.20)
Constant	-0.943***
	(0.21)
Observations	1189
Pseudo R^2	0.1587

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Robust standard errors in parentheses.

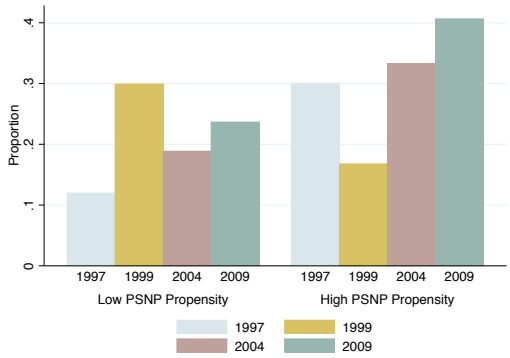

Figure 3.1: Aid Receipt by Receipt Propensity

Ethnicity and religion explain a large component of the variation in receipt of PSNP. This may be due to geographic clustering of individuals of the same ethnicity and religion, which could covary with other pertinent, but uncontrolled for, variables like average rainfall. Of the economic variables, plot size ownership and equb membership negatively predict PSNP receipt whereas the index of self-reported experience with climate shocks positively predicts receipt of PSNP. None of the political connections variables are significant predictors of PSNP receipt. These results are suprising given Caeyers and Dercon (Caeyers and Dercon (2012)) finding of increase in probability of aid receipt (before the advent of PSNP) due to political connections of 12%. Overall, the model explains about 16% of the variance in receipt of PSNP. This is similar to the pseudo R-squared found in other models of aid receipt in Ethiopia. Caeyers and Dercon's (Caeyers and Dercon (2012)) models of free food and food-for-work vary from a low pseudo R-squared of 0.105 to a high of 0.19. The overall rate of correct classifications of the above model is over 65%, with over 75% of the normal weight group correctly classified and 53% of the low weight group correctly classified.

Figure 3.1 below shows the share of households receiving aid according to high or low PSNP propensity scores, across the survey rounds. Low scores are defined as less than a 50% probability of receiving PSNP and high scores as greater than 50%. With the exception of 1999, higher PSNP scores predict receipt of government aid across the survey rounds. Further, aid receipt peaks in 2009.

3.4 Results

3.4.1 Risk Protection Access

The working hypothesis states that households that are targeted for aid will stop investing in their informal insurance arrangements. To measure the impact of government aid on participation in informal insurance networks I interact the propensity score from the above probit regression, the dummy indicating whether a household lives in a village receiving aid, and an indicator for the year 2009, the post PSNP period. This model isolates the treatment effect of receiving PSNP without controlling for actual receipt of PSNP, by capturing those individuals highly likely to be selected for PSNP, and enabling a comparison with their counterparts who do not receive PSNP (e.g., either they are observed before PSNP roll-out or live in villages not receiving PSNP). I also include controls for an index of political connections, economic need, and experience with climatic risks. The political index ranges from zero to three, based on households' official political connections, their parents' connections, and their relatives' connections. The economic need index is the sum of the dependency ratio, having no education, being a smallholder farmer (defined as a household who owns less than 0.25 hectares of land), being female headed, and being disabled, and ranges from zero to five. The climatic shock index ranges from zero to five, as described above. I include village fixed effects to control for unobserved, but constant, variation at the village level over time and survey round fixed effects, to difference out any yearly variation that is likely to affect both PSNP receipt and iddir membership, such as the state of the economy.

Given the small number of villages (15 in two survey rounds and 18 in the other two), I ran one-way analysis-of-variance models on government aid to determine whether to include bootstrapped standard errors, as suggested in Cameron, Gelbach, Miller (CGM) Cameron, Gelbach and Miller (2008) for improved inference with few clusters. The intra-cluster correlation is 0.21 for government aid. As there is a relatively high correlation within villages (and little across villages), I run a wild bootstrap. High intra-cluster correlation combined with a small number of clusters leads to low statistical power. Standard asymptotic

tests can over-reject with few (five to thirty) clusters. CGM's bootstrapping procedure corrects the standard errors by implementing a bootstrapping procedures that leaves the regressors at their sample value, but resamples the response variable based on the residuals values. Table 3.3 shows the results of probit and OLS specifications first, adding in fixed effects to OLS next, and then with bootstrapped standard errors.

Table 3.3: Impact of PSNP on Iddir Membership

	(1) Probit b/se	(2) OLS b/se	(3) OLS b/se	(4) Bootstrap OLS b/se	(5) Bootstrap OLS b/se
Propensity*PSNP Village*2009	-2.674**	-0.478***	-0.370**	-0.360**	-0.370**
	(1.18)	(0.17)	(0.15)	(0.18)	(0.18)
PSNP Village*2009	0.169	-0.015	0.209***	0.211***	0.209***
	(0.48)	(0.06)	(0.06)	(0.00)	(0.00)
Propensity*2009	1.420	0.518***	0.215	0.208**	0.215**
	(1.06)	(0.16)	(0.15)	(0.10)	(0.10)
Propensity*PSNP Village	-2.349	-0.598***	0.116	0.121	0.116
	(1.43)	(0.14)	(0.13)	(0.14)	(0.14)
2009	0.706*	0.027		-0.097*	
	(0.38)	(0.06)		(0.06)	
Propensity	-2.215*	-0.659***	-0.197	-0.219*	-0.197*
	(1.21)	(0.14)	(0.12)	(0.13)	(0.11)
PSNP Village	1.434**	0.338***	-0.016	-0.025	-0.016
	(0.59)	(0.05)	(0.04)	(0.07)	(0.11)
Political Index	0.154**	0.024***	0.021***		0.021***
	(0.06)	(0.01)	(0.00)		(0.00)
Climate Shock Index	0.162**	0.038***	0.010***		0.010**
	(0.07)	(0.00)	(0.00)		(0.00)
Economic Need Index	0.033	0.010*	-0.016***		-0.016
	(0.07)	(0.01)	(0.00)		(0.01)
Constant	1.108***	0.897***	0.592***	0.741***	0.592***
	(0.38)	(0.05)	(0.05)	(0.00)	(0.00)
Observations	4884	4884	4884	4884	4884
Round Fixed Effects	No	No	Yes	Yes	Yes
Village Fixed Effects	No	No	Yes	Yes	Yes

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Propensity is the propensity to receive PSNP in a PSNP village in 2009, estimated in a probit regression including demographic, economic, and political variables.

Results are consistent across all model specifications and show a significant, negative

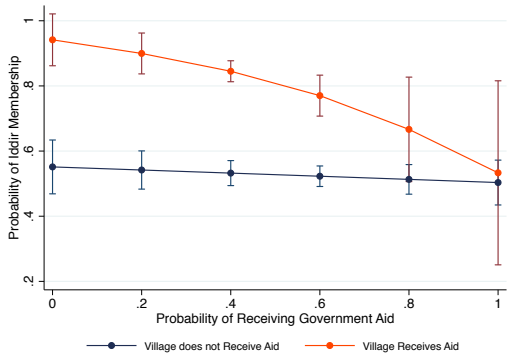

Figure 3.2: Predicted Probability of PSNP Membership in 2009

relationship between PSNP and iddir membership for individuals with a high likelihood of receiving PSNP. According to the OLS specification with fixed effects, in non PSNP villages in 2009, the marginal effect of going from zero to 100% propensity to receive PSNP on iddir membership is an increase in probability of less than two percent, and is not statistically significant. However, in PSNP villages in 2009, the marginal effect of moving from zero to 100% propensity to receive PSNP on iddir membership is a decrease in probability of nearly 24%, and is a statistically significant difference. Figure 3.2 below plots the predicted probability of iddir membership in 2009, as the probability of receiving PSNP changes, for PSNP and non-PSNP villages.

As Table 3.3 and Figure 3.2 reveal, however, the main effect of a village receiving PSNP, in the post-treatment period, is actually an increase in iddir membership. Only individuals with a high propensity of receiving PSNP (approximately 80%) substitute away from iddirs. In 2009, an average individual in a PSNP village is almost 30% more likely to belong to an iddir than an average individual in a non PSNP village. This effect is consistent with an explanation where the most at-risk individuals, who have the highest propensity of receiving PSNP, are drawn into public programs. The selection of high risk types out of iddirs decreases adverse selection in the group and makes participation in the informal insurance network more attractive for others in the village. Government safety net provision

thus increases access to risk protection in the population.

3.4.2 Risk Protection Levels

An additional implication of the change in incentives brought about by PSNP on iddir membership is that iddir may change the types of services that they provide. It is likely that this effect is driven by the selection of high risk types out of iddirs, once these households have a free public insurance option. As the iddirs start to attract less risk-prone members with the decrease in adverse selection in the group, the groups are able to provide services that were previously too risky.

Iddirs have localized knowledge that enable them to ascertain individuals' distinct losses. It is extremely costly for a state government to ascertain and verify every individual loss, and is instead better equiped to insure against losses, such as droughts, that affect entire villages. Indeed, such covariate shocks would overwhelm the insurance capacity of an iddir. From an individual members perspective, they will be more fully protected if they can leverage the insurance provided by PSNP against covariate shocks and the insurance provided by iddirs against idiosyncratic shocks, such as funerals. Further, unlike PSNP, certain iddirs also provide loans. Similar to insurance for idiosyncratic losses, loans are complementary services to PSNP that rely on localized knowledge to ascertain and ensure the likeliness of repayment by a loan recipient. Iddirs' social function in communities not only enables them to know who a good candidate is for receiving a loan, in terms of the likeliness of repayment, it also ensures members' ability to monitor the recipients' behavior and apply social pressure to ensure loan repayment.

It may be the case that individuals choose to remain in iddir that provide complementary services to PSNP (Duru, 2015 unpublished shows that PSNP substitutes for private insurance where both cover covariate climate risks). I am able to separate this alternative mechanism from the change in iddir service provision caused by the reduction in adverse selection, as explained above. The main effect of the interaction of the post program period, 2009, with a PSNP village reflects changes in iddir service provision for an average individual in a PSNP village. This effect should reflect changes caused by general changes in the

types of individuals belonging to iddirs, with PSNP provision. I consider this coefficient to be indicative of effects caused by changes in adverse selection in the informal insurance group. The triple interaction of 2009, PSNP village, and the propensity to receive PSNP isolates the characteristics of the types of iddirs that individuals who are more likely to receive PSNP remain in, and so is indicative of what I will call a selection effect.

I conduct two tests to determine whether with PSNP individuals are more likely to belong to iddir that provide complementary services. Using the above specification, I test whether PSNP households are more likely to belong to iddirs that provide loans. I also test whether households that receive PSNP are more likely to belong to iddir that pay for non-funeral expenses, such as fire or crop insurance. In addition, I test other variables to determine how the composition and functioning of the iddirs compare across individuals who receive PSNP. I analyze whether individuals might not only belong to iddirs that provide a select subset of services, but whether they are also more likely to belong to iddirs that require regular upfront monthly membership fees, as opposed to iddirs that only require fees be paid when a death of a member occurs, or a combination of upfront fees and fees following a death. One way to interpret this coefficient is its effect on whether members can be trusted to provide contributions in the event of a loss of another group member, when they have an incentive to renege on their commitment, or whether they are required to provide upfront fees, because their likeliness of reneging on the group commitment is too great. Finally, I test whether the iddirs they belong to have fewer members. Smaller iddirs are likely to provide less risk protection as they cannot pool risk across a wide number of individuals. In larger iddirs, members are unlikely to experience (idiosyncratic) shocks at the same time and will be more likely to have different risk profiles. However, smaller iddirs may also be composed of individuals who are more closely connected, increasing their informational and sanctioning capacity.

Table 3.4 shows the effect of PSNP receipt on indicators of the types of iddirs that households belong to. All models include the triple interaction of the propensity to receive PSNP with indicators for living in a PSNP village and the year 2009, as well as all subcomponents of the interaction. Controls are included for political connections, economic

need, and climate shocks. All models are run with OLS with wild bootstrap standard errors and village fixed effects. The dummy variable for 2009 serves as a round fixed effect, since only two rounds of data are available on membership in iddir types. The number of observations differs slighty between the specifications due to survey non-response.

The triple interaction results show the effect on the types of services that iddirs provide, after PSNP was introduced, for individuals in a PSNP village, as the likeliness of an individual receiving PSNP increases. The main effect of post program with PSNP village reflects the effect on iddir membership type for the average PSNP villager. The former result can thus be interpreted as the effect on the types of iddir that high versus low propensity individuals choose to remain in, since these are the individuals who were shown in Table 3.3 to switch out of iddirs once given PSNP. This is the "selection effect," revealing the types of iddirs that individuals with differing propensities to receive PSNP remain in, in PSNP villages. The latter result is the "adverse selection effect," which shows changes in the types of iddir services provided deriving from compositional adjustments in iddir membership, with the influx of individuals in PSNP villages to iddirs.

Across all model specifications, results are consistently negative for the triple interaction term, which includes the individual propensity to receive PSNP, and consistently positive for the interaction term of the post treatment period and PSNP village. However, underlying the coefficients are more nuanced effects. Focusing first on the model predicting whether individuals belong to iddirs that provide loans, Figure 3.3 reveals that in the post PSNP period, individuals residing in villages that receive PSNP are more likely to belong to iddirs providing loans than individuals residing in villages that do not receive PSNP. Results are statistically different among PSNP and non PSNP villages for an average propensity of receiving PSNP of approximately 40%. Interestingly, results do not vary within a PSNP village as individuals become more likely to receive PSNP, whereas in non PSNP villages individuals with higher propensity to receive PSNP are significantly less likely to be members of iddirs providing loans. A probable explanation, that is consistent with the adverse selection mechanism, outlined above is that in PSNP villages high risk types select out of iddirs, so iddirs can provide loans to all members. Further, these individuals may have

Table 3.4: Effect of PSNP on Iddir Composition and Service Provision

	(1) Iddir gives loans b/se	(2) Non-Funeral Events b/se	(3) Regular Fees b/se	(4) Membership b/se
Propensity*PSNP Village*2009	-0.844**	-2.227**	-2.004**	-335.084**
	(0.41)	(1.08)	(0.98)	(163.07)
PSNP Village*2009	0.150***	0.597***	0.655***	117.281***
	(0.00)	(0.00)	(0.00)	(0.00)
Propensity*2009	0.820***	2.308***	1.970***	336.631***
	(0.00)	(0.00)	(0.00)	(0.00)
Propensity*PSNP Village	1.041***	1.635***	1.691***	226.764***
	(0.00)	(0.00)	(0.00)	(0.00)
2009	-0.130**	-0.608**	-0.608**	-116.020**
	(0.06)	(0.30)	(0.30)	(56.46)
Propensity	-1.041**	-1.792**	-2.029**	-291.126**
	(0.51)	(0.87)	(0.99)	(141.68)
PSNP Village	-0.214**	-0.399**	-0.502**	-70.003**
	(0.10)	(0.19)	(0.24)	(34.07)
Political Index	0.022***	0.008	0.041***	4.069
	(0.00)	(0.02)	(0.00)	(8.70)
Climate Shock Index	0.005	-0.004	0.027***	1.939
	(0.01)	(0.01)	(0.00)	(3.70)
Economic Need Index	0.005	-0.013	-0.001	3.849
	(0.00)	(0.01)	(0.00)	(4.20)
Constant	0.533***	0.911***	1.396***	167.051***
	(0.00)	(0.00)	(0.00)	(0.00)
Observations	2539	2540	2567	2525
Village Fixed Effects	Yes	Yes	Yes	Yes

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Wild bootstrapped standard errors in parentheses. Propensity is the propensity to receive PSNP in a PSNP village in 2009, estimated in a probit regression including demographic, economic, and political variables. Provides loans indicates whether the iddir provides loans to members. Non-funeral events indicates whether the household belongs to an iddir that makes payments for non-funeral expenses. Regular fees indicates whether the household belongs to an iddir that requries regular monthly fees. Membership indicates the number of members in the largest iddir the household belongs to.

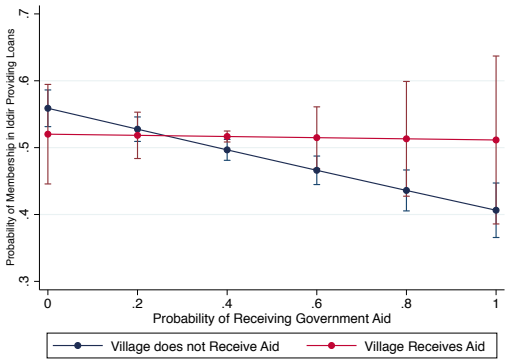

Figure 3.3: Predictive Probability of Iddir Membership Providing Loans in 2009

more access to cash or food from PSNP that they can share with other group members. In non PSNP villages, high risk types, that have a high propensity of receiving aid, are considered too risky to be given loans, although they remain in iddirs as this is the only risk-management mechanism available to them.

Turning next to the model predicting membership in iddir paying for non-funeral events, Figure 3.4 shows a broadly similar trend. In PSNP villages, individuals have a relatively constant probability of belonging to iddirs that provide support for non-funeral expenses. However, in villages that do not receive PSNP, as individual propensity to receive PSNP increases, individuals are increasingly more likely to belong to iddirs that provide non-funeral support. An explanation that is consistent with these results is that in PSNP villages, individuals who remain in iddir have protection against covariate risks through PSNP. Iddirs in PSNP villages can thus focus on providing support for funerals and idiosyncratic shocks that PSNP does not cover. However, in villages not covered by PSNP, individuals that are higher risk types will select iddir that can provide them with non-funeral expenses, for example for crop losses, since they do not have this protection through PSNP. This explanation is again consistent with the adverse selection mechanism since, unlike in non PSNP villages, in PSNP villages there is no difference in iddir membership type among the spectrum of propensities to receive PSNP.

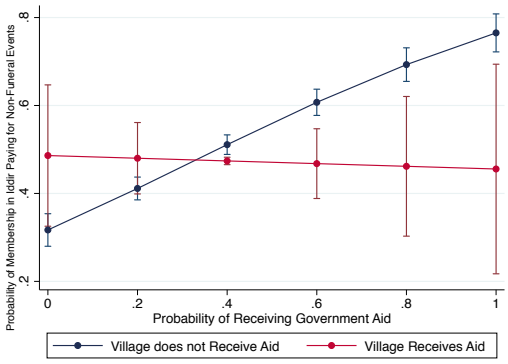

Figure 3.4: Predicted Probability of Membership in Iddir Paying for Non-funeral Events

The latter two models reveal the work of a different mechanism at play. As Figure 3.5 shows for a model predicting membership in iddirs that require regular upfront fees, and not fees be paid in the event of a member's death or other loss, in PSNP villages, as individuals become more likely to receive PSNP they are significantly less likely to belong to iddir that require upfront fees. This pattern is consistent with the selection mechanism whereby individuals within PSNP villages, who are more likely to receive PSNP, choose to remain in certain types of iddirs. These individuals who are likely to receive PSNP may switch out of iddir that are more financially onerous, by requiring that they give regular contributions to the group.

Figure 3.6 shows a similar relationship where individuals in PSNP villages that are more likely to receive PSNP are less likely to belong to large iddir. In contrast, in non PSNP villages, comparing across the spectrum of likeliness of receiving PSNP, there is no difference in the size of iddirs that individuals belong to. However, this relationship may be merely mechanical. As shown in Figure 3.2 above, individuals who get PSNP are likely to switch out of iddir, and other, less risky types may join the iddirs due to the reduction in adverse selection in the groups. Thus, higher risk types who remain in iddirs may belong to smaller groups, whereas less risky types could join iddirs with other similar low risk types.

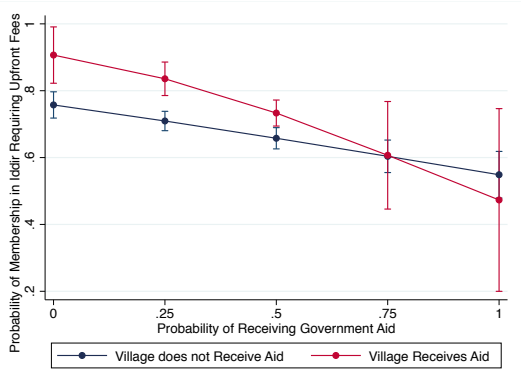

Figure 3.5: Predicted Probability of Membership in Iddir Requiring Upfront Fees

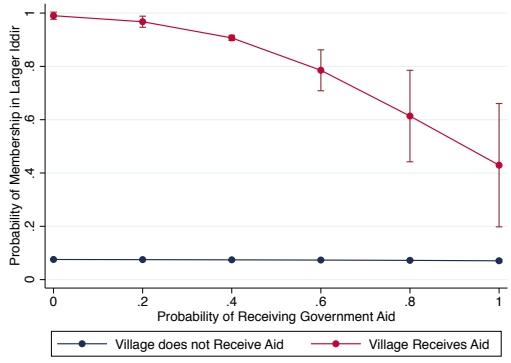

Figure 3.6: Predicted Probability of Membership in Iddir Requiring Upfront Fees

3.5 Conclusion

This paper focuses on the consequences of public safety net programs on membership in informal insurance arrangements. It shows that in Ethiopia, the transition to the PSNP, a large-scale safety net program meant to increase households' resiliency to shocks, formed a substitute to the iddir, informal associations that help households insure against funeral and other contingencies. However, the government program was targeted according to economic need, meaning that higher risk types were more likely to leave iddir. The reduction in adverse selection into informal insurance groups actually made the group more attractive to other individuals in PSNP villages, who were more likely to belong to iddirs in the post program period.

Beyond substitution effects in membership in informal insurance groups, this paper analyzes the effects on the "intensive margin" by examining the effect of PSNP provision on the types of services that informal insurance networks provide. It shows that due to the exit of higher risk types out of iddir, other villagers in PSNP villages are more likely to belong to iddir covering idiosyncratic shocks and providing loans. These services rely on the comparative advantage of iddir in providing knowledge about group members individual specific losses and their likeliness of repayment. Households in PSNP villages thus maximize their risk protection by drawing on both the services provided by PSNP, for protection from large covariate shocks, and those that iddirs can provide, against idiosyncratic losses and for loan provision. Policymakers can learn from PSNP and seek to maximize the gains from safety nets by explicitly designing programs to complement pre-existing informal arrangements.

Chapter 4

Electoral Targeting of Agricultural Insurance in Mexico

4.1 Introduction

Index-based weather insurance is a major innovation with the potential to expand access for millions of smallholder farmers in developing countries to insurance. These farmers have typically lacked access to formal insurance, so their incomes have been subject to frequent and severe fluctuations in rainfall. When making planting decisions, poor farmers choose less risky but lower return production techniques because of the possibility of a weather shock, keeping them trapped in poverty. Policymakers are attempting to introduce index insurance, a relatively new form of insurance that pays out benefits on the basis of a predetermined index (e.g., rainfall level) that is highly correlated with yields. Studies have found that when farmers are covered by index insurance, they tend to take on riskier, higher-yield production techniques (Mobarak and Rosenzweig (2013); Cai, De Janvry and Sadoulet (2012); Karlan et al. (2012); Hill and Viceisza (2012)). Despite these gains, numerous experimental studies show that farmers' index insurance uptake has generally been low and in most cases under conditions that were highly subsidized, and not sustainable (Giné and Yang (2009); Cole et al. (2013)).

Scholars are considering alternatives to market driven index insurance given the current and mounting problem of weather risks. The primary method to increase coverage of index insurance is for the state to provide it and make it free to eligible beneficiaries. However, a heretofore unexplored consequence of government provision is that it is susceptible to politically-motivated targeting, meaning that deserving, yet politically marginal

farmers, may remain uninsured.

The Mexican insurance scheme, Component for the Attention of Natural Disasters (CADENA) comprises both traditional, yield-based insurance where payments from insurance companies to the government depend on yield measurements, and index-based insurance, where payments depend on objective weather station readings. We take advantage of differences in electoral timing, party alignment, and vote shares to test for evidence of electorally motivated targeting. We present evidence that Mexican state and federal level politicians target both insurance coverage purchases and farmer transfers strategically, by timing purchases and providing transfers according to electoral cycles, political party alignment, and electoral support.

We compare insurance coverage in years prior to scheduled elections, to coverage in off-election years. Given that governors have discretion over the allocation of insurance payouts they can increase coverage before elections to maximize payouts, which they can use to disburse to farmers, spend on other programs, or to buy votes before elections. We also test whether governors respond to program rules limiting governors' discretion over transfers if the federal government purchases coverage. We test whether states purchase more coverage in co-partisan and core support municipalities to prevent the federal government from controlling funds in these areas. We estimate whether the insurance transfers to farmers accordingly vary with electoral timing, electoral support, and co-partisanship with the governors' party. We find that governors tend to purchase more insurance coverage and increase farmer transfers before gubernatorial elections. They also decrease coverage and transfers before mayoral elections, except for municipalities with co-partisan mayors, whereas they consistenly reward their core support municipalities with increased coverage. We additionally test for evidence of co-partisanship with the president's party in transfers that depend on federal discretion. When transfers to farmers depend not only on governors, but also require federal approval, we find that distribution of benefits respond to presidential and gubernatorial election cycles in addition to gubernatorial electoral objectives.

Our identification strategy rests on the fact that weather and electoral events are unrelated. We show that weather and the associated payments that insurance companies

should have made, but for electoral manipulation, are uncorrelated with electoral variables. This supports our hypotheses that coverage and distribution decisions are directly politically motivated. Increases in insurance coverage and farmer transfer before elections cannot be due to a higher incidence of weather events before elections.

Our findings contribute to two literatures. The first is a well developed literature on distributive politics in Mexico. We show that politicians increase insurance coverage and discretionary transfers of insurance benefits prior to elections. This is consistent with prior studies on Mexican vote buying before elections (Larreguy, Marshall and Querubın (2014) and Nichter and Palmer-Rubin (N.d.)) and evidence of electoral cycles (Albertus et al. (2016) and Diaz-Cayeros, Estévez and Magaloni (2012)). We also find evidence of distribution according to political alignment. Not only do we find evidence that, during mayoral elections, governors favor co-party municipalities we also show that they punish opposition led municipalities by witholding funds. This shows that governors continue to pursue the party strategy despite the presence of no reelection laws, in the hope of advancing within the party (Weldon (1997) and Weldon (2002)). Finally, we show that governors consistently reward core support municipalities with increased coverage and certain types of transfers. This extends work from prior studies that showed that the Partido Revolucionario Institucional (PRI) party maintained political hegemony for decades in Mexico by rewarding voters with transfers for their political loyalty (Greene (2007);Molinar and Weldon (1994); Magaloni (2006); Diaz-Cayeros, Estévez and Magaloni (2012)).

The second literature we contribute to is a relatively recent literature concerned with how to increase uptake of agricultural index insurance in developing countries. Researchers have thus far focused on determinants of individuals' adoption decision (Clarke (2011); Cole et al. (2013); Cai, De Janvry and Sadoulet (2012); Elabed, Carter et al. (2013)). However, there are several institutional level insurance schemes where governments, and not individual farmers, are the policyholders. We find that government provision of insurance (both yield- and index-based) is susceptible to political capture. When governments have discretion in the allocation of insurance funds they are likely to distribute it to increase their chances of reelection. They increase insurance coverage purchases before elections with some of the

increased funds going to increase farmer transfers in those years.

We do not think that Mexico is unique in its susceptibility to politically-motivated targeting. Many of the countries in which researchers piloted agricutural index insurance, or would be likely candidates for index insurance due to climatic conditions, also have weak systems of politically accountability, meaning that distribution of agricultural index insurance could also be subject to political manipulation. Overall, however, the evidence of a nine percentage point increase in coverage prior to gubernatorial elections is relatively modest compared to the gains in coverage achieved through the CADENA program. CADENA insured more than 2.5 million farmers in 2011 of 4.5 million subsistence smallholders farmers through both traditional and index insurance, which is far beyond the coverage rates achieved under current unsubsidized market index insurance studies. Public provision of index insurance can be a viable and effective means of increasing farmer coverage – if coupled with guidelines regulating purchase and the distribution of payments to farmers.

4.2 CADENA Operations

Mexico is among the first countries in the world to adopt a macro-level catastrophe crop and livestock insurance policy for small subsistence farmers. In 2003, the Mexican Federal Government introduced CADENA to protect farmers from climate shocks.[1] The program's main objective is to assist low-income agricultural producers who suffered from a climatic contingency, like a drought, to smooth their consumption and reincorporate into productive activities. Although employment in agriculture has declined (from 18% in 2000 to 14% in 2012), one-fifth of working men in Mexico are formally employed in agriculture. This population is vulnerable to climatic shocks because they rely on rain-fed agriculture (about 75% of agriculture production is rain-fed) and have limited resources to protect themselves. CADENA supports farmers affected by climatic shocks via two

[1] In 1995 the federal and state governments of Mexico introduced an ex-post national natural disaster scheme. In 2003, the government contracted Agroasemex to substitute the ex post disaster compensation programs with an ex ante macro-level index insurance for catastrophic climatic perils.

main instruments: index-based and traditional crop and livestock insurance as well as direct income transfers. By 2011, the CADENA crop and livestock insurance programs covered 2,362 municipalities in 30 out of Mexico's 32 states with total premium income of more than 1.5 billion Mexican pesos (MXN) and total sum insured of 12 billion MXN (SAGARPA, 2012). Although CADENA was designed as individual producer insurance for small-scale farmers, the program in fact insures federal and state governments' budgets. CADENA allows for annual budget planning to minimize governments' risk of major expenditures due to catastrophic weather events.

There are a number of complex rules governing CADENA's operations that are critical to understanding which farmers will be getting how much in insurance payments, when. There are two main procedures for contracting insurance coverage under the CADENA program. Under the first procedure state governments directly contract insurance cover for a municipality and share the cost of the premiums with the Federal government agency, the Ministry of Agriculture, Livestock, Rural Development, Fishing and Food (SAGARPA). Under the second procedure SAGARPA contracts cover for municipalities in its own name and covers 100% of the premiums. Under both programs, eligible farmers in covered municipalities become automatically insured and do not pay anything. For both procedures, SAGARPA defines the eligibility criteria that farmers must meet to get insurance coverage: farming up to 20 hectares of rain-fed annual crops and up to five hectares of perennial tree crops and for livestock owners up to 30 livestock units.

If the state chooses to purchase coverage, it identifies which municipalities it will cover, how much insurance coverage it will purchase, and then contracts with either Agroasemex, a parastatal specialist agricultural reinsurer operating as a direct insurer, or private commercial insurers under a tender process which SAGARPA defines. The state is responsible for paying its share of the premium, which varied from 10% - 30% prior to 2012, according to the degree of marginalization of the farmers being protected under a particular crop or livestock insurance program. In the event of an adverse weather shock, the state government receives the full insurance payment. The state government has discretion over whether, how much, and when to distribute funds. This discretion is critical because it

means that a state can choose to distribute insurance payments in a municipality other than the one that experienced an adverse weather event, in a year other than the one of the shock, and may retain whatever funds it does not distribute. Under this scenario, states receive insurance payments, only pay 10-30% of premiums, and retain discretion over whether, when, and how much of the insurance payments they will disburse.

When a state government does not request agricultural insurance cover for a municipality, SAGARPA is entitled to purchase cover in its own right and pay 100% of the premium. If the state government has not purchased coverage, and SAGARPA has, and an adverse weather shock occurs, then the state can still benefit from direct payments. States must make emergency appeals for direct payments and if approved, will receive federal funds. Specifically, in order for direct payments to be triggered when SAGARPA has purchased coverage, the state government must make a request for the National Water Commission (CONAGUA) to verify that a catastrophe occurred and another federal agency, the Ministry of Finance, must release funds.[2] An important difference from the case in which the state purchases coverage is that under this scenario, the state must disburse all of the funds in the municipality in which the catastrophe occurred, within the year. SAGARPA will only compensate 50% of the total estimated (assessed) cost of the damages and the state is obliged to fund the other 50% of the direct payments. Thus, under this scenario, states do not receive insurance payments, pay 50% of the damages if they declare a state of emergency (that is approved), and have no discretion over the allocation of direct payments.

There are at least three reasons why a state may not purchase insurance cover for a municipality: (i) the private insurance companies may not provide, or charge high rates for, coverage; (ii) there aren't enough resident farmers that meet the eligibility criteria; or (iii) the state does not have sufficient funds. However, this system incentivizes states to purchase insurance cover because SAGARPA finances between a minimum of 75% and a maximum of 90% of the costs of the premiums, whereas the state would be on the hook for 50% of the

[2]The rules were changed after the time period of our study. In 2013, the procedures were modified to transfer responsibility for the declaration of a catastrophe event triggering direct payments to the state governments in conjunction with the state-level delegation of SAGARPA.

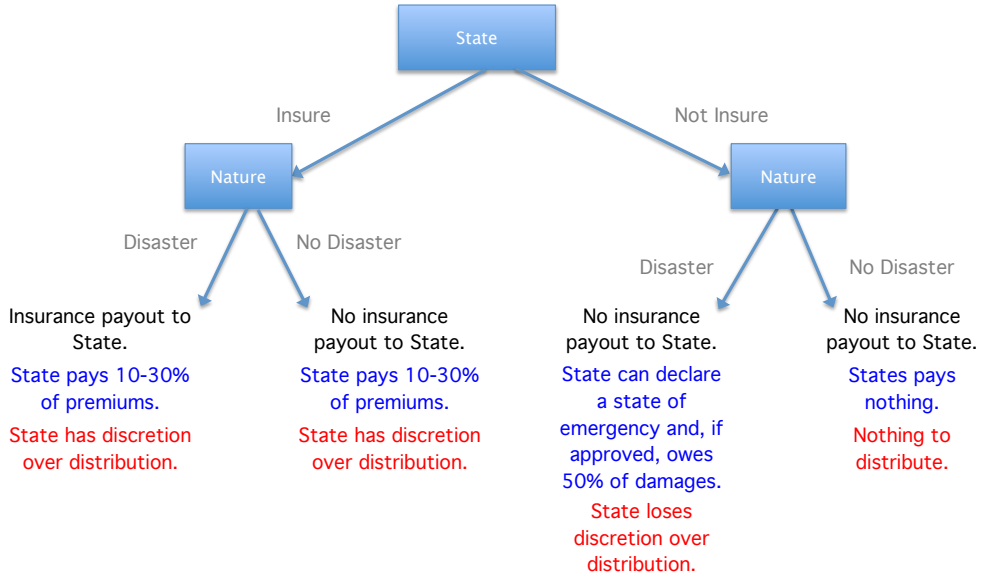

Figure 4.1: CADENA Operations

cost of damages if it did not buy cover and had to make an emergency appeal for funds (e.g., for direct payments).

Moreover, this system incentivizes states to purchase coverage for political reasons. States retain complete discretion over whether, where, and when to spend indemnity payments if they purchase coverage whereas if they have to make an emergency appeal for funds, they have to spend all the funds in the municipality and year in which the disaster took place. The system particularly incentivizes states to purchase coverage if they want to minimize the potential for the federal government to have discretion over the allocation of funds through the direct payments mechanism. States will thus be particularly incentivized to purchase coverage for municipalities that are important for them to win elections so they will not be beholden to SAGARPA to determine the amount of damages that should go to the municipality.

Figure 4.1 below illustrates the sequence of insurance coverage purchase, insurance payouts, and disbursements to farmers when states do and do not purchase coverage.

4.3 Mexican Politics

We focus our analysis on the states' decisions only, in deciding whether to purchase insurance coverage, disburse insurance payments to farmers, and provide direct payments to farmers. All state decisions are made on a municipality and year basis. Governors' payoffs from strategically allocating CADENA funds are likely to be large: both discretion over the allocation of funds and the salience of CADENA transfers for farmers are likely to be high.[3]

CADENA was introduced in Mexico at a time when the hegemonic party, the PRI, was struggling to maintain power. The 2000 election for President in Mexico marked the breaking point of the transition to democracy with the defeat of the PRI by Vicente Fox, the Partido Acción Nacional (PAN) candidate. One of the institutions that remained largely unaffected by the democratic transition was Mexico's system of fiscal federalism. The general procedures and institutions governing the division of resources between layers of government in Mexico have been in place since the 1950s (Ward and Rodríguez (1999)). Under this system, state and municipal governments relinquish almost all powers of taxation to the federal government. Local governments receive fiscal resources through a system of revenue sharing in which the federal government apportions transfers of money to state governments based on various criteria. Studies have found that the combination of fiscal dependence at lower levels of government and discretionary methods of distribution at higher levels makes Mexico's system of fiscal federalism susceptible to political manipulation (Hernandez-Trillo and Jarillo-Rabling (2008)). The rules governing CADENA similarly impose few restrictions: when purchased by state governments, there are few objective criteria governing allocation of insurance cover and payout distribution and, even when purchased by SAGARPA, is subject to the discretion of states' request for emergency relief

[3] Interviews with CADENA officials and analysis of the coverage decisions reveals that SAGARPA acts primarily as a backstop for state governments, filling in insurance coverage when states choose not to purchase. Therefore, states are really the only decisionmakers and hence, are the only actors of interest in this study. States are also the only actors that can disburse funds to farmers. The only way that funds can be released to farmers if SAGARPA gets a payout from insurance companies is for a state to declare a state of emergency.

via direct payments.

With the advent of political turnover, the allocation of public goods to the poor rural sector became a critical component of electoral strategy because the rural sector comprises a large segment of the voting population (Diaz-Cayeros and Magaloni (2003); Domínguez and Shifter (2003); Diaz-Cayeros, Estévez and Magaloni (2012)). The transfer of CADENA funds may similarly appeal to the rural vote since CADENA transfers are likely to be politically salient. Studies find that voters punish incumbents for the negative impact of weather events despite the fact that politicians cannot control the weather (Achen and Bartels (2004)). However, voters can reward or punish incumbents based on their policy responses to the natural event. If politicians provide aid to those effected by disasters, then voters include their perceptions of that response - either as a direct recipient of the help or through information about a government's efforts - as an indicator of government performance (Cole, Healy and Werker (2012); Gasper and Reeves (2011); Besley, Burgess and Prat (2002); Healy and Malhotra (2009)). Moreover, recent work on insurance transfers to Mexican farmers shows that disaster relief spending is a politically salient issue. Fuchs and Chamussy (Fuchs and Rodriguez-Chamussy (2014)) estimate that the presidential incumbent's vote shares increased by 7.6 additional percentage points in those electoral districts that received government agricultural insurance transfers six to nine months before the 2006 election.

Mexico has a presidential, multi-party system with three dominant political parties with set election timing. At the national level, presidents are elected every six years by winning a plurality of the votes. Similarly, at the state level, governors are elected every six years by a plurality, in staggered elections. The basic unit of Mexican government are the municipalities which are headed by municipal presidents (mayors). Mayors are elected every three years, falling at the midterm of, and concurrently with, gubernatorial elections. During the time period of this study, reelection was not allowed at any level of government in Mexico. However, governors have incentives to maximize the chance of their parties' electoral success due to career advancements and other rewards (Weldon (1997); Weldon (2002)). We consider three electoral considerations that governors are likely to account for in determining their insurance purchase and distribution decisions: the timing of elections,

co-partisanship with mayors, and core support municipalities.

4.3.1 Coverage Politics

Studies find that politicians from the national down to the district level respond to electoral cycles in order to improve their chances of reelection (Nordhaus (1975); Tufte (1980); Baleiras and da Silva Costa (2004); Drazen and Eslava (2005); Mouriuen (1989)). In examining Pronasol, a poverty relief program in Mexico, Diaz-Cayeros, Magaloni, and Estevez (Diaz-Cayeros, Estévez and Magaloni (2012)) find evidence that local politicians modified their portfolio of electoral investment, increasing clientelistic practices over public goods provision, prior to municipal elections. As recently as the 2012 presidential elections, Mexican politicians used gifts and other transfers in order to buy votes and turnout prior to elections (Larreguy, Marshall and Querubın (2014); Nichter and Palmer-Rubin (N.d.)). We expect that governors will be more likely to purchase insurance coverage prior to gubernatorial elections. Although governors do not have to distribute insurance payouts in the same year in which a disaster occurred we expect them to increase spending on coverage prior to elections in the hope that they will receive payouts that they can use to disburse to farmers or to buy votes.

H1. Governors will increase coverage before gubernatorial elections.

Governors are not tied to distributing insurance payments in the municipality in which they purchased coverage. However, due to the insurance transfer system, governors will have incentives to purchase coverage in areas that are politically important to them. If governors do not purchase coverage for an area that is important to them, say a co-partisan municipality, and a disaster occurs there then they may be forced to declare a state of emergency if they do not have sufficient funds to distribute. In that case, they may be at the whim of a possibly opposition-led federal government for determining the amount of damages the municipality should receive. We expect that municipalities in which governors and mayors are of the same politically party will be important to governors because of the strength of the party label in Mexico. During mayoral election years governors will want to purchase more coverage for co-party municipalities, because they will want to assist those

mayors.

H2. Governors will increase coverage before mayoral elections when there is governor and mayor co-partisanship.

The literature on Mexican politics emphasized the PRI's use of clientelism and patronage in sustaining its prior dominance using a core voter logic because it could credibly threaten to dramatically reduce funding (i.e., punish) any municipality that elected an opposition party (Diaz-Cayeros and Magaloni (2003); Greene (2007); Magaloni (2006)). Following this literature we expect governors to increase insurance disbursements in core support municipalities, preventing the federal government from having discretion in these areas.

H3. Governors will increase coverage in core municipalities.

4.3.2 Disbursement Politics

If governors purchase coverage, then they are free to distribute the funds as they wish. Similar to the objectives stated above, governors should care about disbursing funds before gubernatorial elections. Governors should also care about disbursing funds during mayoral elections, in municipalities where there is mayor and governor co-partisanship. At all times, governors will want to reward core support districts with disbursements.

We do not expect that disbursements should respond to federal electoral considerations because the federal government has no discretion over all the allocation of disbursements. We also do not consider presidential election year effects in this model because we only observe one presidential election in the period in which we have disbursement data coverage and therefore it would be impossible to discern the effect of an election from other events that happened in that year. We expect that disbursements should not vary with mayor and president co-partisanship during mayoral elections. In fact, governors may wish to withhold funds from municipalities if it is a mayoral election year and the governor and mayor are of different political parties.

H4. Governors will increase disbursements before gubernatorial elections.

H5. Governors will increase disbursements before mayoral elections when there is

governor and mayor co-partisanship.

H6. Governors will not increase disbursements before mayoral elections when there is mayor and president co-partisanship.

H7. Governors will increase disbursements in core municipalities.

4.3.3 Direct Payment Politics

When governors do not purchase coverage but have to declare a state of emergency due to a disaster then they must rely on federal involvement to determine the amount of funds that will be released. Therefore, both state and federal electoral concerns will matter for direct payment decisions. We expect that gubernatorial and presidential electoral cycles will increase direct payments. As with disbursements, mayoral elections should see increased direct payments if the governor and mayor are co-partisans. However, we now expect that mayoral elections should also see increased direct payments if the mayor and president are co-partisan, due to federal discretion over funds. Finally, we expect that governors will wish to reward their core support municipalities with increased direct payments.

H8. Governors will increase direct payments before gubernatorial elections.

H9. Governors will increase direct payments before presidential elections.

H10. Governors will increase direct payments before mayoral elections when there is governor and mayor co-partisanship.

H11. Governors will increase direct payments before mayoral elections when there is president and mayor co-partisanship.

H12. Governors will increase direct payments in core municipalities.

4.4 Data and Measurement

4.4.1 Insurance Data

Our data on CADENA come from SAGARPA and are available for different periods of time between 2003 and 2012, all at the municipality-year level. The data include information on insurance coverage purchases, indemnity payments to states, disbursements

to farmers, and direct payments to farmers. The coverage data run from 2003 to 2012 and include information on: the policy holder (SAGARPA or the state), the amount of land covered, the premium amount (as well as the share subsidized by the federal government versus the state), the premium rate, and the policy type (e.g., traditional yield-based crop insurance or index-based livestock insurance). One limitation is that these data are only the insurance coverage options that were purchased and so are not reflective of the policy choices that were available to governors to select from. In fact, the menu of insurance coverage options available to governors does not exist. When governors want to purchase insurance for a given municipality they call for a tender process and the insurance companies adapt the policy to the municipality (in terms of the triggers, crop covered, insurance type, coverage windows, etc.); each policy is tailor-made for each municipality.

An important component of the insurance data are the indemnity payments, which we refer to as "payouts." These data are available annually between 2004 and 2011. We match states' coverage with their payout data and their transfers to farmers, which we refer to as "disbursements." Disbursements data are available between 2006 and 2011. Payouts, and by extension disbursements, are direct functions of the amount of insurance coverage that states purchase: if states purchase coverage for more municipalities they are more likely to get an insurance payout, that they can choose to disburse. Direct payment amounts, on the other hand, depend only on CONAGUA's damage assessment. Direct payment data are available between 2003 and 2011.

Over time, states have responded to incentives to purchase coverage. Figure 4.2 shows the share of municipalities that the states and federal government covered with insurance between 2003 and 2012. Total coverage of state and federal municipalities may exceed 100% since municipalities may be covered by both federal and state insurance.

States' disbursements are clearly susceptible to political manipulation given the lack of restrictions on how and when they can be used. Figure 4.3 below shows the running total of the amount of payouts states received and the amount they disbursed to farmers. Of

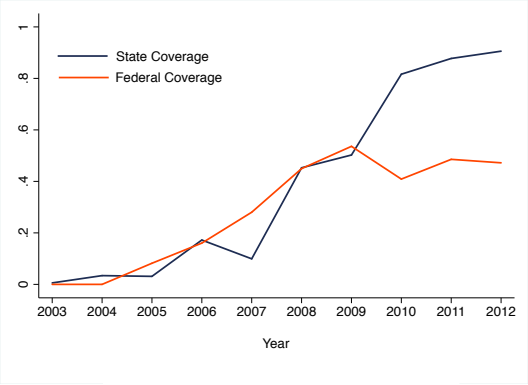

Figure 4.2: Share of Municipalities Covered by State or Federal Insurance

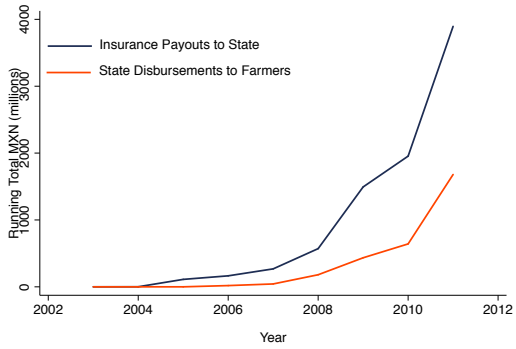

Figure 4.3: Running Total of Insurance Payments Disbursed to Farmers

total insurance payouts between 2004 and 2011, states have disbursed 43% of the funds to farmers through the CADENA insurance program. Some of the funds, however, may be used for disaster related purposes. In fact, states may be using insurance payouts to fund direct payments in areas or years that they did not purchase insurance but experienced shocks.

4.4.2 Political Data

Our political variables come from two sources. We downloaded presidential and gubernatorial vote share data at the municipal level from the Mexican Federal Electoral Institute (IFE) website. IFE also provided us with the list of registered voters for each municipality. Mayoral election data are from the Center for Development Research (CIDAC),

a non-profit independent think tank. From these data we create variables for mayoral, gubernatorial, and presidential election years.

We specify the party affiliation for each mayor and governor as well as the political party alignment between mayors, governors, and presidents. Over 300 municipalities in Mexico are governed by indigenous customary law, the overwhelming majority located in the state of Oaxaca. A legal reform in 1995 gave full legal standing to a form of traditional indigenous governance. Under this system, individuals are elected to leadership positions through customary law in non-partisan elections, make decisions through participatory democracy, and monitor compliance through a parallel (and often informal) system of law enforcement and community justice. We code the co-partisanship variables as missing in these municipalities. Governors will have no incentive to reward or punish such municipalities based on party identification because these municipalities have no party identification and cannot change party identification.

We also construct indicators for whether a municipality is a "core" municipality for the governors' party, which we define conservatively to be winning by a wide margin. We code municipalities as core if the governor won by more than a ten percent margin of victory in the last election.

By law, Mexican politicians are not allowed to disburse funds, including insurance payments, during the veda electoral, which is the three month prohibition period prior to elections. Given these restrictions, that elections in Mexico are generally held in spring or summer, and that the harvest seasons for the major covered crops (maize, barley, beans, and sorghum) are in fall (and a smaller portion in spring/summer), we look for evidence of electoral cycles by focusing on the calendar year prior to the year of the election (for example, if an election is held in June, 2016 we look for evidence of increased spending in 2015).[4]

[4]We label the variable as, for example, "governor election year" in the tables below although the year refers to the calendar year prior to the election.

4.4.3 Other Municipality Characteristics

We include two controls to account for relevant time varying differences in municipalities. The first source of heterogeneity we are concerned about is variation in coverage or farmer transfers due to weather conditions. As numerous rainfall stations are not located within a municipality, but are geographically close (e.g., are located near the border of two or more municipalities), we used GIS methods to construct a buffer of ten miles around municipalities and attribute the data for all rainfall stations located within the buffer to the municipality. We construct the measure of rainfall per municipality by taking the average of all weather station readings within the municipality buffer, and aggregate all rainfall within each year.

We also control for municipal population to account for changes in spending due to population growth. We use yearly population estimates before 2010 from the CONAPO website and after 2010 from the Estimaciones de Población CONAPO-COLMEX SINAIS website.

4.4.4 Descriptive Statistics

Our data cover all municipalities in Mexico over a relatively long time span. The number of observations vary across variables because we have longer coverage for some variables than others (variables related to eligibility, coverage, disbursements, payouts, direct payment) and some variables suffer from missingness (e.g., rainfall and budget). Table 4.1 shows the summary statistics.

Municipalities are fairly small with an average of 55,000 residents although they vary greatly in size. Mean annual rainfall is approximately 1,000 mm although this also varies greatly throughout the large country. On average, half of municipalities had governors and mayors that are of the same political party while only 28% of municipalities had mayor and president party alignment. Approximately 47% of municipalities were also core municipalities for the governors' party. States purchased insurance for approximately 35% of municipalities over the period and recieved insurance company payments for disasters

Table 4.1: Summary Statistics

	count	mean	sd	min	max
Presidential Election Year	13280	.2362952	.4248216	0	1
Gubernatorial Election Year	13280	.1972892	.3979674	0	1
Mayoral Election Year	13280	.3578313	.4793802	0	1
Governor and Mayor Co-Partisanship	13280	.4892319	.4999029	0	1
President and Mayor Co-Partisanship	13280	.2790663	.4485571	0	1
Governor Core	13280	.4705572	.4991512	0	1
President Core	13259	.2163059	.4117408	0	1
Annual Rainfall	13102	1036.104	674.4803	0	5714.5
Idealized Insurance Payment Trigger	13280	.4421687	.496663	0	1
Population	13280	55746.13	148845	407	1842819
Municipal Budget (millions MXN)	11936	136.3975	371.6423	.234531	7761.573
Eligible Agricultural Hectares	8564	4736.074	7295.508	0	109282
Paid Farmers	10289	67.64797	436.3201	0	15911
Insurance Coverage Purchased	13280	.3537651	.4781554	0	1
Insurance Coverage Amount	13280	102560.5	344589	0	6704941
Premium Rate	7808	.1213973	.0675783	.0025	.538322
Payout Occurred	13280	.1898343	.3921847	0	1
Payout Amount (thousands MXN)	13280	254.0958	1286.808	0	31780.67
Disbursement Occurred	13280	.0985693	.2980941	0	1
Disbursement Amount	10289	145.2826	857.5196	0	25455.6
Direct Payment Occurred	13280	.13125	.3376863	0	1
Direct Payment Amount (thousands MXN)	13280	222.904	1244.15	0	40098.92

Data cover 2,438 municipalities. All monetary figures are in Mexican pesos. The exchange rate was approximately 12.43 MXN per US dollar in 2011.

nearly 19% of the time. States disbursed insurance payments to farmers only 10% of the time although they also made direct payments to farmers in approximately 13% of cases. On average, 68 farmers per municipality received approximately 1 million MXN in insurance disbursements from states, or approximately $1,371 USD per farmer (using the 2011 exchange rate of 12.43 MXN per USD).

The estimation models in this paper use municipality and year fixed effects. Due to the municipality fixed effects our identification derives from changes in municipalities over time, conditional on controls. There is significant variation in the main independent variables. On average, there were over two mayoral elections and more than 1.5 gubernatorial elections during the time period of the study. Because we count the year before an election, there were also two presidential election years between 2004 and 2011 (2006 and 2012). Due to staggered elections, some municipalities could have had three mayoral elections (e.g. 2005, 2008, and 2011) and two gubernatorial elections (2005 and 2011) whereas others would have had two mayoral elections and one gubernatorial election. More than half of municipalities (56%) changed whether or not the mayor and governor were aligned. Municipalities change whether or not there was party alignment between mayor and governor in 36% of elections and whether or not they were core supporters of the governors party in 34% of elections.

4.5 Estimation Framework

4.5.1 Coverage Models

We test for evidence of temporal manipulation in the decision to cover a municipality and in the amount of coverage purchased for a municipality. We expect that governors will increase coverage prior to elections to increase the probability of payouts that they can use to disburse and purchase votes. We also expect increased coverage in co-partisan municipalities during mayoral election years because governors will want to ensure that SAGARPA does not have discretion in these areas, if a state of emergency is declared.

We include a number of controls in our model. We control for the prior year's total rainfall ($Rain_{mt-1}$) and population ($Population_{mt-1}$) in the municipality, information

that is available to politicians at the beginning of the year when they are making their coverage decisions. The rainfall variable capture increases in spending due to changes in weather conditions. Governors may also increase spending in areas with larger populations to buy votes. Conversely, they may want to provide individuals with compensation in areas with higher populations. For example, governors may want to increase spending in more populous areas if the population was impacted by the weather events, even if indirectly and even if they are not eligible farmers. Although we have data on the number of registered voters in each municipality we do not include this variable in our models because of the high correlation between the population and number of registered voters (98%). Therefore, we cannot discern which of these two mechanisms is driving governors' decisions. We control for whether the state purchased insurance coverage the prior year because there is persistence in the coverage decision (e.g., if a state starts purchasing insurance coverage for a municipality it continues to cover that municipality). We also control for the insurance payout amount that municipality received in the prior year. We model states coverage purchase decision as follows:

$$y_{mt}=\alpha_m+\gamma_t+\delta\text{GovElection}_{st-1}+\zeta\text{MayorElection}_{mt-1}+\varphi\text{MayorElection}_{mt-1}*\text{CoPartyMayorGov}_{mt}+\Gamma\text{CoPartyMayorGov}_{mt}+\sigma\text{CoreGov}_{mt}+\eta\text{Rain}_{mt-1}+\theta\text{Population}_{mt-1}+\lambda\text{Payout}_{mt-1}+\phi\text{Coverage}_{mt-1}+\varepsilon_{mt}$$

Where y_{mt} refers to the decision by the state to cover a municipality. The subscript m refers to municipality and t to year. The municipality fixed effects (α_m) control for time-invariant characteristics in a district that affect coverage, such as the amount of arable land. Year fixed effects (γ_t) control for macroeconomic fluctuations, such as levels of inflation.

We model the states decision to cover a municipality using a linear probability model with municipality and year fixed effects. We run the same regression and specify the dependent variable to be the amount of coverage a state purchases. We also estimate the decision of the amount of coverage using OLS with year and municipality fixed effects. Standard errors are clustered at the municipality level to account for municipality level autocorrelation.

4.5.2 Transfer Models

In addition to the above tests, we test for evidence of electorally motivated manipulation in the transfers to municipalities of disbursements and direct payments to farmers. States have the sole discretion to transfer payouts they receive to municipalities and may transfer payouts to any municipality, regardless of where the disaster occurred. We thus test for evidence of electoral cycles and distribution to municipalities that are politically important to governors. We also test whether federal electoral considerations are not significant in these models. The rainfall, population, and payout control variables now enter unlagged since by the time that disbursement decisions are made politicians will have witnessed the year's events.

$$w_{mt}=\alpha_m+\gamma_t+\rho\text{Payout}_{mt}+\delta\text{GovElection}_{st-1}+\zeta\text{MayorElection}_{mt-1}+$$
$$\varphi\text{MayorElection}_{mt-1}*\text{CoPartyMayorGov}_{mt}+\Gamma\text{CoPartyMayorGov}_{mt}$$
$$+\vartheta\text{MayorElection}_{mt-1}*\text{CoPartyMayorPres}_{mt}+\psi\text{CoPartyMayorPres}_{mt}+$$
$$\sigma\text{CoreGov}_{mt}+\eta\text{Rain}_{mt}+\theta\text{Population}_{mt}+\zeta\text{Payout}_{mt}+\varepsilon_{mt}$$

Where w_{mt} refers to the decision to disburse to a municipality. We also run the same regression with the dependent variable measured as the disbursement amount. As before, we run a linear probability model for the decision to disburse to farmers and OLS with fixed effects when modeling the decision of the amount to disburse. Standard errors are clustered at the municipality level.

Finally, we run a similar specification for direct payments. We again specify the dependent variable as a dummy, indicating whether or not direct payments were transferred, as well as another model with the dependent variable being the amount of direct payments transferred. In these models we do not include the insurance payout amount because direct payments can only occur when the state did not purchase insurance coverage. We add in a variable indicating whether it is the year before a presidential election because federal agencies (CONAGUA and the Ministry of Finance) have discretion in distributing direct payments to municipalities.

4.6 Results

We begin by focusing on states' coverage decision and test for evidence of electoral cycles and distribution towards core support and in mayoral election years, to co-partisan municipalities. Models 1-3 of Table 4.2 below show the results for states' decision to cover a municipality and models 4-6 the amount of insurance coverage states' purchased.

Table 4.2: State Insurance Coverage Decision 2004-2011

	(1) OLS Coverage Dummy	(2) OLS Coverage Dummy	(3) OLS Coverage Dummy	(4) OLS Coverage Amount	(5) OLS Coverage Amount	(6) OLS Coverage Amount
Governor Election Year	0.086***	0.086***	0.085***	9312.192	10257.236	9452.719
	(0.01)	(0.01)	(0.01)	(7673.78)	(7806.42)	(7834.53)
Mayor Election Year	-0.106***	-0.115***	-0.113***	-4089.406	-16126.773*	-15114.210*
	(0.01)	(0.01)	(0.01)	(5715.35)	(8296.88)	(8392.60)
Mayor Election*Mayor-Gov CoParty		0.018	0.017		23873.019**	23330.999**
		(0.01)	(0.01)		(10623.25)	(10678.46)
Mayor-Governor CoParty		-0.014	-0.015		-8157.751	-9108.730
		(0.01)	(0.01)		(7680.36)	(7661.38)
Governor Core			0.041***			23238.339**
			(0.01)			(10082.27)
Prior Year Population (thousands)	0.002***	0.002***	0.002***	2257.933***	2259.625***	2257.493***
	(0.00)	(0.00)	(0.00)	(657.66)	(657.15)	(659.53)
Prior Year Rainfall (thousands mm)	0.006	0.006	0.007	7661.302	8100.151	9010.797
	(0.01)	(0.01)	(0.01)	(7282.67)	(7310.03)	(7268.48)
Prior Year Payout (thousands MXN)	0.017***	0.017***	0.017***	21853.792**	21747.089**	21725.147**
	(0.00)	(0.00)	(0.00)	(10106.64)	(10108.93)	(10109.93)
Prior Year Coverage Purchased	0.088***	0.088***	0.087***	16376.165**	16577.289**	15949.872**
	(0.01)	(0.01)	(0.01)	(6817.62)	(6787.10)	(6805.43)
Constant	-0.075**	-0.069*	-0.092**	-123468.294***	-120469.673***	-133464.683***
	(0.04)	(0.04)	(0.04)	(36404.00)	(36842.17)	(37719.92)
Municipality Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13280	13280	13280	13280	13280	13280
R Squared	0.2554	0.2556	0.2564	0.0693	0.0697	0.0702

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Model 1-3 show the results for states' decision to cover a municipality and model 4-6 the amount of insurance coverage states' purchased. Standard errors in parentheses clustered at the municipality level. Data cover 2,438 municipalities between 2004 and 2011. All figures are in Mexican pesos. The exchange rate was approximately 12.43 MXN per US dollar in 2011.

Focusing first on models 1-3 of the decision to cover a municipality, we see that governors tend to purchase more coverage where they had larger insurance payouts, gambling that another climatic disaster will occur again in the same location. For every thousand MXN increase in insurance payouts, governors are 1.7 percentage points more likely to purchase insurance coverage. We do see persistence in coverage. When governors purchased coverage in the prior year they are nearly nine percentage points more likely to purchase again in the current year. They also purchase more coverage where populations are larger.

As expected, we see a significant and positive increase in the probability that governors purchase coverage before gubernatorial elections, confirming hypothesis 1. In model 2 and 3, we also see that governors purchase more insurance during mayoral elections in co-party municipalities as predicted by hypothesis 2, however this result is not significant in this model. Note that the coefficient on mayoral elections indicates effects for mayoral / midterm elections only because the gubernatorial election dummy also captures mayoral elections that coincide with gubernatorial elections. The coefficient on gubernatorial elections indicates that governors are nine percentage points more likely to purchase coverage before gubernatorial elections. They are eleven percentage points less likely to purchase coverage before mayoral elections. We also see confirmation for hypothesis 3 in model 3. Governors are more than four percentage points more likely to buy coverage in core support municipalities.

The results for models 4-6, predicting the amount of coverage governors purchase, show a similar set of results to the coverage purchase decision models. We no longer see confirmation for hypothesis 1, however. Although governors are more likely to purchase coverage before gubernatorial elections, the amount they purchase is not significantly larger. We do see confirmation for hypothesis 2 in models 5 and 6. The interaction on mayor election year and governor and mayor co-partisanship is significant and positive in models 5 and 6, and indicates that governors spend approximately $23,000 MXN in mayoral election years when they are politically aligned with the mayor. Otherwise, they generally spend on average about $15,000 MXN less during mayoral election years (according to model 6). During mayoral elections, governors are incentivized to help co-party municipalities, and

are otherwise not purchasing coverage. They spend nearly the same amount, $23,000 MXN, in core support municipalities, confirming hypothesis 3.

We focus next on the actual disbursements to farmers. Table 4.3 models 1-3 show results for the decision to disburse funds to farmers and models 4-6 for the amount to disburse to farmers. We find confirmation for hypothesis 4 that governors increase disbursements before gubernatorial elections across all the models. Governors not only increase the probability that they transfer insurance funds before gubernatorial elections but also increase the amount they disburse, in areas they choose to disburse to. On average, they are almost three percentage points more likely to disburse and disburse about $73,000 MXN more before gubernatorial elections.

We do not find confirmation for hypothesis 5 across any of the models. Although the coefficient on the interaction of mayoral elections and governor and mayor party alignment is positive across the models, it is not statistically significant. When taken in conjunction with the coverage results, this means that governors may be simply buying increased coverage in mayor-governor co-party municipalities to avoid the federal government withholding funds from these areas, but governors are not significantly more likely to actually disburse in these areas. The infrequency with which disbursements occur may also be hampering our ability to discern a statistically meaningful effect. We find confirmation for hypothesis 6 in the models. The result on the interaction of the mayor and president and mayoral election indicate that federal incentives are not significant predictors of disbursement. Moreover, although the results are not statistically significant, the negative interaction effect indicates that if the mayor and president are of the same political party but the governor is not, governors punish these municipalities by withholding funds. Finally, we do not see confirmation for hypothesis 6 on core support municipalities. Disbursements are being driven primarily by electoral cycles.

Models 3 and 4 show that areas with larger populations get more and larger disbursements. It may be that governors need to provide extra compensation in more populous municipalities because there are larger effects from disasters in more concentrated areas. We cannot determine whether the increased spending in more populous areas is due to

need or politics: governors may be shifting resources to these areas to increase vote returns given that governors are voted in a single, at-large district. Areas with less rainfall are also more likely to get disbursements. Governors do tend to disburse more to farmers when they experience a disaster. Experiencing a payout positively predicts both the likeliness and amount of disbursements. For every million MXN in payouts governors receive, they are approximately six percentage points more likely to disburse and will disburse on average 274,000 MXN to the municipality in which the payout occurred.

Table 4.3: State Insurance Disbursement Decision 2006-2011

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	OLS	OLS	OLS
	Disburse Dummy	Disburse Dummy	Disburse Dummy	Disburse Amount	Disburse Amount	Disburse Amount
Governor Election Year	0.025***	0.027***	0.027***	70334.179***	72504.795***	72918.128***
	(0.01)	(0.01)	(0.01)	(24550.77)	(24344.53)	(24319.47)
Mayor Election Year	0.008	0.002	0.002	-2829.814	4076.459	4179.464
	(0.01)	(0.01)	(0.01)	(14381.13)	(27727.79)	(27748.57)
Mayor Election*Mayor-Gov CoParty		0.021	0.021		2553.056	2135.704
		(0.01)	(0.01)		(32335.92)	(32485.67)
Mayor-Governor CoParty		-0.010	-0.010		-1329.914	-1714.473
		(0.01)	(0.01)		(27434.92)	(27347.83)
Mayor Election*Mayor-Pres CoParty		-0.019	-0.019		-32524.470	-32670.016
		(0.01)	(0.01)		(43006.43)	(42996.34)
Mayor-President CoParty		0.002	0.002		10076.575	10135.528
		(0.01)	(0.01)		(30783.93)	(30766.44)
Governor Core			-0.003			19995.388
			(0.02)			(52048.35)
Population (thousands)	0.001	0.001	0.001	3378.162**	3376.131**	3368.667**
	(0.00)	(0.00)	(0.00)	(1568.23)	(1565.37)	(1567.47)
Annual Rainfall (thousands mm)	-0.020*	-0.020*	-0.020*	-50654.367***	-50613.014***	-50092.281***
	(0.01)	(0.01)	(0.01)	(18821.59)	(18745.62)	(18795.18)
Payout Amount (millions MXN)	0.054***	0.054***	0.055***	274258.151***	274250.772***	274116.094***
	(0.01)	(0.01)	(0.01)	(37749.76)	(37749.18)	(37815.66)
Constant	-0.009	-0.006	-0.004	-148374.583*	-151725.271*	-160794.158*
	(0.04)	(0.04)	(0.04)	(85513.89)	(87847.52)	(91358.74)
Municipality Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10197	10197	10197	10197	10197	10197
R Squared	0.2257	0.2262	0.2262	0.2528	0.2529	0.2529

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Models 1-3 shows the results for states' disbursement decisions and 4-6 for the amount to disburse. Standard errors in parentheses clustered at the municipality level. Data cover 2,438 municipalities between 2006 and 2011. All figures are in Mexican pesos. The exchange rate was approximately 12.43 MXN per US dollar in 2011.

The main outcome of interest is the decision to disburse payments to farmers, which we see are driven by gubernatorial election cycles. However, there are reasons other than political manipulation that could explain why election timing might effect the amount of insurance disbursements. Governors may increase spending prior to elections if the weather is worse, if they have larger budgets, if there are more eligible farmers, or if the economy is faltering in those years. As state level elections are not synchronized across states, we can discard macro-level economic explanations for electoral cycles.

We rule out the possibility that weather, differences in eligible farmers, and budgets underlie our results using placebo tests in Table 4.4. Model 1 shows that there is no association between weather and political variables. We construct a measure of the amount of rainfall that fell during the pertinent insurance windows using daily rainfall data. The windows refer to the amount of days in which rainfall should be counted after the insurance contract starts. Payments are triggered if total rainfall in a window does not meet a threshold. We determine what the pertinent crops are for a given municipality by ascertaining whether one of the four major covered crops (maize, beans, sorghum, and barley) were ever insured in that municipality. If so, we average the dates of the windows specified in the insurance contract for that municipality, for that crop. Windows tend to be very constant within a municipality over time, making the average a relatively accurate gauge of the amount of rainfall during the actual windows, in each municipality year. We aggregate the amount of rainfall for each of the pertinent crops, across the windows, in a municipality, over a year. We then determine whether a payment would have been trigerred in a municipality if insurance had been purchased. The variables is equal to one if the amount of rainfall is either below the threshold for drought insurance or above the threshold for excess rainfall insurance, and zero otherwise.

Although this measure should be highly correlated with most disasters in Mexico that are covered by CADENA (droughts and flooding) this measure does not capture other types of extreme weather events that governors can insure against, such as frost or hurricanes. It also will not perfectly capture livestock disaster, although it is likely to be highly correlated (triggers for livestock are calculated using satellite data on vegetation). The annual rainfall

measure is predictably highly positively correlated with this measure.

In model 2 we test we test whether, if governors had purchased full coverage (e.g., insured every eligible hectare), then their "idealized" payouts from insurance companies would be correlated with political variables. To construct the "idealized" payout we multiply the payout rate by the number of eligible hectares (total hectares owned by farmers that meet the eligibility criteria of farming fewer than 20 hectares) in a municipality, for instances in which the rainfall trigger is met (as described above). We see in model 2 that the amount of an idealized payout has no association with the electoral timing variables, confirming that weather events are not driving the results. The idealized payout is highly correlated with actual insurance company payouts.

We also consider whether the number of eligible hectares, which could potentially be manipulated by politicians, varies with election cycles in model 3. We find no evidence that changes in eligibility are driving our results. Finally, we look to see whether municipal budgets might vary with political cycles to determine whether governors could be redistributing funds because municipalities are experiencing budget deficits during gubernatorial election years. In model 4 we see that the interaction of mayor election year and mayor and governor party alignment is significant, but the coefficient is negative and is only significant at the ten percent level. Note that the different number of observations across the models is due to the fact that eligible hectare data are limited.

Figures 4.4 below provide further evidence of the existence of electoral cycles in governors' insurance disbursement decisions. The figures plot the coefficients in the actual disbursement models of every year in the election cycle (where governors are elected every six years), excluding the dummy for the year after a gubernatorial election, and controlling for all the same covariates as in the models above (see Table 4.3 models 3 and 6). It also shows results for a model of the idealized payout amount, including the same variables. Whereas the coefficients on the election timing variables for the idealized payout amount model are never significantly different from zero, in the actual disbursement amount model both the gubernatorial election year and two years prior are positive and significant.

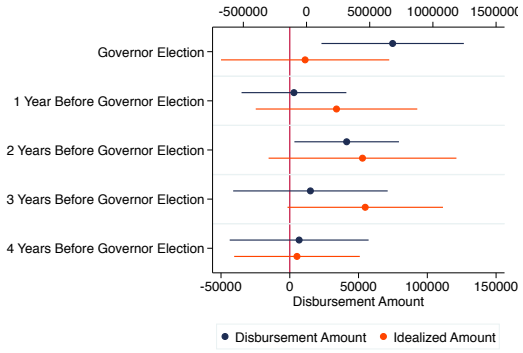

Figure 4.4: Actual and Idealized Disbursement Amount

A final set of tools available to governors is the ability to make an emergency appeal for funds, in the form of direct payments, in the event that they did not purchase insurance coverage and experience a natural disaster. As explained above, this procedure requires verification of a disaster by CONAGUA and the release of funds by the Ministry of Finance. Hence, we think that both the states' and federal government's incentives will be important in this decision. Table 4.5 models 1-3 shows the results for whether direct payments are distributed and model 4-6 for the amount of direct payments distributed.

Across all the models, we see confirmation for hypotheses 8 and 9. Governors increase direct payments before both gubernatorial and presidential elections. The coefficient on presidential election year is particularly large, increasing the probability of giving direct payments by nearly 11 percentage points. The coefficient on gubernatorial election year is similar in magnitude to the disbursement model, showing an increase of 2.8 percentage points. The amount that direct payments increase in those years is also large. Before presidential elections, direct payments increase by $570,000 MXN and before gubernatorial elections they increase by $130,000 MXN. We do not see confirmation for hypotheses 10 or 11, however. We expected direct payments to increase during mayoral elections if there was governor and mayor co-partisanship. Although we see that mayor and governor co-party municipalities are significantly more likely to get direct payments (models 1-3), this effect is not significanlty different in mayoral election years. Thus, governors are always more likely to give direct payments to co-partisan municipalities. We similarly

do not see a significant effect for the interaction of mayor election years and mayor and president co-party municipalities. The interaction effect is positive in models 1-3, however, contrary to the disbursement results. We see confirmation for hypothesis 12 in model 3. Governors are more likely to make direct payments to core support municipalities: core support municipalities on average are three percentage points more likely to receive direct payments. Although the coefficient on core support municipalities is positive in model 6 it is not signficant, indicating that the likelihood of receiving direct payments increases in these municipalities but the amount is not signficantly different than in other areas.

In models 4-6 we see that direct payments increase during mayoral election years. Because of the presence of interaction effects in models 5 and 6, this result means that direct payments will increase in mayoral election years in municipalities where there is no party alignment or where all three levels of government are aligned (mayor, governor, and president). It is possible that the state and federal government can agree to make direct payments in areas where there is clearly agreement, or that do not clearly favor the president's or governors' party at the expense of the other. However, we see in models 5 and 6 that areas where there is mayor and president political alignment, but not governor, receive less in direct payments. Governors may request direct payments for areas with less damages, when governors are not aligned with the mayor, but there is president and mayor party alignment. Finally, we see that governors are more likely to make direct payments in areas that had increases in rainfall, contrary to where disbursements are made.

Table 4.4: Placebo Tests 2006-2011

	(1) OLS Idealized Trigger	(2) OLS Idealized Amount	(3) OLS Eligible Hectares	(4) OLS Municipal Budget
Governor Election Year	0.001	-74730.614	-99.193	-4.494
	(0.01)	(347804.23)	(102.50)	(3.53)
Mayor Election Year	0.000	356176.906	96.765	0.488
	(0.01)	(276124.18)	(110.42)	(4.63)
Mayor Election*Mayor-Gov CoParty	-0.006	-23831.798	-141.788	-9.260*
	(0.01)	(289765.37)	(113.24)	(4.96)
Mayor-Governor CoParty	0.008	302031.487	-61.290	3.585
	(0.01)	(302307.81)	(92.19)	(3.01)
Mayor Election*Mayor-Pres CoParty	-0.010	182012.990	50.311	-4.440
	(0.01)	(374806.83)	(107.23)	(6.01)
Mayor-President CoParty	0.007	-40640.023	-56.847	-4.191
	(0.01)	(379065.37)	(121.43)	(2.97)
Governor Core	0.002	230735.202	-40.095	-3.691
	(0.01)	(409716.12)	(127.22)	(3.56)
Population (thousands)	-0.000	124410.525***	42.120*	9.125***
	(0.00)	(30897.59)	(23.86)	(1.90)
Annual Rainfall (thousands mm)	0.029**	-47198.949	262.185***	0.086
	(0.01)	(306002.65)	(89.45)	(2.92)
Payout Amount (millions MXN)	0.001	435748.745***	20.697	0.471
	(0.00)	(103356.57)	(39.84)	(0.83)
Constant	0.492***	-7539983.954***	2123.749	-397.514***
	(0.02)	(1957775.29)	(1325.41)	(111.96)
Municipality Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Observations	10197	9232	8467	9047
R Squared	0.0054	0.0937	0.0298	0.3868

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Model 1-3 shows the results for states' disbursement decisions and 4-6 for the amount to disburse. Standard errors in parentheses clustered at the municipality level. Data cover 2,438 municipalities between 2006 and 2011. All figures are in Mexican pesos. The exchange rate was approximately 12.43 MXN per US dollar in 2011.

Table 4.5: Direct Payment Decisions 2003-2012

	(1) OLS Payment Dummy	(2) OLS Payment Dummy	(3) OLS Payment Dummy	(4) OLS Payment Amount	(5) OLS Payment Amount	(6) OLS Payment Amount
President Election Year	0.097***	0.100***	0.106***	562348.856***	563353.678***	570035.172***
	(0.01)	(0.01)	(0.01)	(54978.63)	(55896.64)	(56389.25)
Governor Election Year	0.028***	0.029***	0.028***	131923.746***	132227.290***	130787.800***
	(0.01)	(0.01)	(0.01)	(31575.26)	(32839.57)	(32866.78)
Mayor Election Year	0.007	0.010	0.011	145694.036***	183557.215***	185047.491***
	(0.01)	(0.01)	(0.01)	(20190.93)	(36484.47)	(36543.75)
Mayor Election*Mayor-Gov CoParty		-0.006	-0.006		-44144.090	-44159.670
		(0.01)	(0.01)		(46426.77)	(46427.48)
Mayor-Governor CoParty		0.024***	0.022***		20497.298	18699.987
		(0.01)	(0.01)		(20711.94)	(20816.94)
Mayor Election*Mayor-Pres CoParty		0.002	0.002		-48724.288	-48705.456
		(0.01)	(0.01)		(47659.82)	(47658.98)
Mayor-Pres CoParty		-0.003	-0.002		-43361.207*	-42494.662*
		(0.01)	(0.01)		(23607.52)	(23684.79)
Governor Core			0.031***			34503.881
			(0.01)			(33018.85)
Population (millions)	0.316	0.296	0.276	1265859.581	1131783.854	1110098.659
	(0.26)	(0.27)	(0.26)	(1181773.01)	(1175431.86)	(1180876.31)
Municipal Rainfall (millions)	21.959***	21.456***	21.520***	57821109.489***	58551881.463***	58622162.943***
	(3.92)	(3.95)	(3.99)	(13155030.27)	(13064811.54)	(13078183.42)
Constant	0.061***	0.051***	0.033*	-74954.251	-69286.246	-88935.096
	(0.02)	(0.02)	(0.02)	(66760.29)	(66957.54)	(66510.83)
Municipality Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15560	15560	15560	15560	15560	15560
R Squared	0.0744	0.0752	0.0763	0.0475	0.0481	0.0482

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Model 1-3 shows the results for states' decision to transfer direct payments to farmers and model 4-6 the amount of direct payments. Standard errors in parentheses clustered at the municipality level. Data cover 2,438 municipalities between 2003 and 2012. All figures are in Mexican pesos. The exchange rate was approximately 12.43 MXN per US dollar in 2011.

4.7 Conclusion

In this paper we find consistent evidence of electoral cycles in Mexican governors agricultural disaster insurance coverage and farmer transfers. We also find evidence of governors' distribution towards core support and politically aligned municipalities. Many of the patterns of distribution that scholars considered as strategies that the PRI used to maintain hegemony remain in use today. This is surprising given the increase in democratization in Mexico. For example, to maintain political power politicians should theoretically shift focus to distributing towards swing districts, where more viable political opponents reside. It may also be that we are discerning the PRI's continued use of certain methods of distribution (e.g., to core or to politically aligned districts) whereas other parties, which have gained many offices since democratization, may not be using these strategies but we are nevertheless picking up the general effect.

Governors are also responding to political dynamics created by Mexico's federal structure. We see that despite governors having sole discretion over the allocation of all insurance payouts they receive, they purchase more in areas that are politically important to them. Governors will want to ensure that they, and not the federal government, have control over distribution in these areas, particularly if they are not politically aligned with the federal government. The strategic interaction between different levels of government has not been well studied in the political science literature.

Providing index insurance through the government can increase insurance coverage and avoid problems with marketing index insurance to individuals. However, we show that in Mexico, public provision of insurance (traditional and index-based) is susceptible to political targeting. We show that states purchase more coverage prior to gubernatorial elections, to increase the probability that they will receive insurance payouts prior to elections. We also present evidence that politicians retain part of the disaster insurance payments they receive. When they disburse funds, they disburse more prior to gubernatorial elections. We also find evidence of political manipulation in direct payments, which are triggered by emergency appeals requiring both state and federal government input. In these cases, we find

that election cycles from the federal down to the local level are important determinants of transfers. Nevertheless, the increase in coverage achieved under Mexico's public provision have not been possible under even highly subsidized market-driven index insurance studies. Policymakers should accordingly focus on designing public index insurance programs that decrease room for political discretion.

The dissertation author would like to thank her co-authors on this chapter, Alejandro de la Fuente and Xavier Gine.

Chapter 5

Conclusion

This section considers what policy implications to draw from the three dissertation papers, on how political economy concerns affect the uptake of index insurance. I assess whether governments in developing countries should provide index insurance or whether they should provide individual subsidies. Next, I consider what associated safeguards should be put in place to reduce the probability of non-programmatic distribution.

There is an argument to be made for government intervention in index insurance markets because adoption rates are low despite evidence of large returns. There are at least two benefits from purchasing index insurance. Studies show that index insurance can improve both farmers' ex-post shock coping, making them less reliant on government transfers, and ex-ante risk management, inducing farmers to take greater production risks that give them higher incomes. If purchased by governments, rather than individuals, then in addition to the ex-post shock-coping benefits to farmers, the government will also benefit by being able to smooth their budgets: government level index insurance purchases decrease the likelihood of major outlays following disasters.

Governments in many contexts are already providing citizens with disaster relief. Government disaster relief programs can take the form of safety net programs that provide known compensation year after year or simply ex-post aid. Rather than provide ex-post disaster relief, governments should promote index insurance. Current disaster relief programs are generally more expensive, less efficient, and further subject to delays compared to index insurance programs. Most government relief programs will not spur investment in technologies, like seeds or fertilizers, because farmers cannot be certain they will receive

transfers and the transfer amount is not necessarily correlated with outcomes. If farmers do not think they will be fully compensated if they experience a shock, then they will be unlikely to switch into riskier production techniques. As this dissertation showed, government disaster relief programs can decrease incentives to take up a more efficient private index insurance product.

If governments do decide to intervene in index insurance markets they can either subsidize individual insurance purchases or purchase index insurance on behalf of farmers. Government purchase of index insurance is likely to vastly increase coverage compared to even large subsidies. Studies show that even small fees for other technologies in developing countries, like bed nets or water disinfectants, can substantially decrease take-up (Kremer and Miguel (2007); Cohen and Dupas (2010); Ashraf, Berry and Shapiro (2007); Kremer et al. (2011); Evans, Kremer and Ngatia (2008); Duflo et al. (2007)). And, compared to familiar everyday products, there are likely to be many additional barriers to index insurance take-up, like low trust in the product, low financial literacy, and risk aversion that could still hamper adoption of even highly subsidized index insurance.

Public provision is, however, likely to be subject to political manipulation, as shown in this dissertation using the case of Mexico. One method to decrease political manipulation is to decrease the scope for clientelistic practices and other forms of non-programmatic distributive politics by basing insurance purchases and benefits distribution on objective criteria and formula. Within the context of insurance this will mean that governments will need to use objective criteria and formulas to determine farmer eligibility, how much coverage to purchase, and how much to distribute.

Governments can identify beneficiaries according to need using objective measures, similar to those used for identifying eligibility in many cash transfer programs. To prevent discretion in the coverage decision, they should be required to purchase full insurance coverage for all eligible beneficiaries. Governments will need to follow formulas to determine how much full coverage is in each area. Finally, governments should be required to distribute all insurance payments in the location and year in which a disaster occurred. The aim should be to decrease scope for corruption as well as discretion in the transfer decision. These three

measures should decrease the government's discretionary capacity to use index insurance programs for political objectives.

Professional bureaucracies should be set up to administer the index insurance programs. Bureaucracies' ability to better target social programs, like insurance, will often be predicated on their autonomy. In many autocracies, as was the case in Mexico before 2000, the system is premised on extreme delegation to the president and the federal bureaucracy. The central government enjoys a virtual free hand to decide policy and resource allocation, and federal bureaucracies serve as their agents with great discretion in program decisions. Legislators and party leaders seldom exercise any control or oversight over the executive branch, but expect political rents in return (Diaz-Cayeros, Estévez and Magaloni (N.d.)).

Institutional arrangements, like the introduction of veto players and decentralization, can create the conditions that give more independence to bureaucratic agencies. Giving greater power to legislators will strengthen their oversight capabilities and reduce presidential discretion. Similarly, decentralization can also curb the power of central governments. Decentralization empowers local politicians who gain control over resource distribution at the local level. Theoretically, local politicians should be more accountable to the locality's political and economic interests. Furthermore, if resource distribution from the federal to the local level is determined by formula, then this decreases central government discretion further.

Whereas institutional changes like professional bureaucracies and decentralization require large political changes, that can engender conditions for decreasing non-programmatic spending, adopting formula-based programs can be done quickly, with less political bargaining, and on a program-by-program basis. Policymakers and international agencies can thus pressure governments to adopt government level index insurance programs with clear criteria for eligibility, formulas for allocating coverage, and requirements on distributing payments.

Government level index insurance is likely to increase coverage compared to marketing insurance and cost less than ex post disaster relief programs. Politically, politicians can still reap the electoral or other political rewards from providing citizens with disaster relief,

in the form of index insurance payments, but must be willing to tie their hands to decrease discretion over its distribution.

Appendix A

Too Certain to Invest? Public Safety Nets and Insurance Markets in Ethiopia

Table A.1: OLS Regression of Year 2 Sales without Sample Weights

	(1)	(2)	(3)	(4)
	Model 1	Model 2	Model 3	Model 4
DV: Insurance Take-up	b/se	b/se	b/se	b/se
PSNP		-401.707**	-460.208**	-444.146**
		(177.55)	(193.42)	(191.61)
Voucher Amount	2.608***	2.690***	2.798***	2.910***
	(0.78)	(0.81)	(0.80)	(0.87)
Total Farm Income			-8.417**	-8.836**
			(3.51)	(3.75)
Value of Agricultural Capital			-6.929***	-4.934**
			(2.08)	(2.15)
Negative Shock			-22.451	-11.827
			(92.61)	(102.59)
Dependency Ratio			538.144*	515.966*
			(299.88)	(269.75)
Officer in Household				104.622
				(145.89)
Female Headed Household				-192.405
				(178.39)
Hectares				-5.049
				(19.44)
Years of Education				-11.908
				(30.35)
Disabled				-309.027
				(197.65)
Constant	98.916	117.735	-0.852	23.898
	(97.79)	(100.65)	(148.02)	(167.56)
N	365	365	365	365
Numberofvillages	25	25	25	25

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Standard errors in parentheses, clustered at the kebele level. Sample includes individuals that received a voucher and reside in kebeles reporting sales in year 2. No sample weight adjustments are included.

Table A.2: OLS Regression of Pooled Sales and PSNP with Sample Weight Adjustment

	(1)	(2)	(3)	(4)
	Model 1	Model 2	Model 3	Model 4
DV: Insurance Take-up	b/se	b/se	b/se	b/se
PSNP		-452.327***	-511.409***	-509.475***
		(123.22)	(158.11)	(157.75)
Voucher Amount	2.419***	2.475***	2.508***	2.469***
	(0.60)	(0.60)	(0.59)	(0.57)
Round	131.118	115.003	137.886	149.834
	(202.06)	(199.97)	(206.96)	(198.70)
Total Farm Income			-7.940**	-8.197**
			(3.67)	(3.71)
Value of Agricultural Capital			-6.314***	-4.477*
			(2.19)	(2.30)
Negative Shock			-16.801	-22.452
			(131.06)	(133.67)
Dependency Ratio			485.256	496.867
			(380.88)	(357.47)
Officer in Household				217.756
				(247.93)
Female Headed Household				33.161
				(202.57)
Hectares				13.547***
				(1.68)
Years of Education				4.761
				(22.28)
Disabled				-224.483
				(147.46)
Constant	-166.194	-109.741	-258.556	-298.388
	(332.73)	(327.55)	(459.01)	(432.04)
N	666	666	666	666
Numberofvillages	32	32	32	32

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Standard errors in parentheses, clustered at the kebele level. Sample includes individuals that received a voucher and reside in kebeles reporting sales in year 1 or year 2. All models have population adjustments using sample weights equal to the inverse of the probability that the observation is included in the sample

Table A.3: OLS Regression of Pooled Sales and PSNP without Sample Weights

	(1)	(2)	(3)	(4)
	Model 1	Model 2	Model 3	Model 4
DV: Insurance Take-up	b/se	b/se	b/se	b/se
PSNP		-345.218***	-374.937***	-370.318***
		(109.82)	(116.73)	(115.20)
Voucher Amount	1.788***	1.793***	1.810***	1.837***
	(0.35)	(0.35)	(0.35)	(0.36)
Round	79.284	70.948	92.941	114.406
	(159.00)	(156.07)	(157.26)	(156.19)
Total Farm Income			-8.401**	-8.682**
			(3.33)	(3.37)
Value of Agricultural Capital			-5.688***	-3.440**
			(1.29)	(1.40)
Negative Shock			-79.005	-80.775
			(62.80)	(62.67)
Dependency Ratio			325.882*	377.525**
			(190.02)	(176.26)
Officer in Household				-121.405
				(103.20)
Female Headed Household				-87.349
				(98.59)
Hectares				14.198***
				(1.31)
Years of Education				-13.610
				(17.27)
Disabled				-305.257**
				(119.28)
Constant	104.539	150.550	100.616	70.795
	(222.24)	(214.93)	(243.91)	(252.64)
N	744	744	744	744
Numberofvillages	32	32	32	32

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Standard errors in parentheses, clustered at the kebele level. Sample includes individuals that received a voucher and reside in kebeles reporting sales in year 1 or year 2. No sample weight adjustments are included.

Table A.4: Logit Model of PSNP Receipt at Household Level without Weights

	(1)	(2)
	Model 1	Model 2
DV: PSNP Receipt	b/se	b/se
Value of Agricultural Capital	-0.043	-0.025
	(0.12)	(0.05)
Total Farm Income	-0.150***	-0.127***
	(0.04)	(0.04)
Negative Shock	0.611***	0.532***
	(0.19)	(0.18)
depratio	0.213	0.222
	(0.27)	(0.26)
Officer in Household		0.391**
		(0.20)
Female Headed Household		0.249
		(0.19)
Hectares		-0.557***
		(0.21)
Years of Education		-0.025
		(0.03)
Disabled		-0.461
		(0.34)
Constant	-1.835***	-1.257***
	(0.26)	(0.27)
N	2397	2397
Numberofvillages	120	120

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Standard errors in parentheses, clustered at the kebele level. Summary statistics shown are for the baseline observations in the private insurance experiment. No sample weight adjustments are included.

Table A.5: Propensity Score Regression of Year 2 Sales and PSNP Households

	(1)
	Model 1
Outcome: Residuals	b/se
Treated	-452.639**
	(226.76)
Constant	104.05
N	365
Numberofvillages	25

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Standard errors in parentheses. Table shows the treatment on the treated, the effect of the safety net policy on private insurance uptake. The model calculates propensity score matching, matching on the determinants of PSNP specified in the PSNP PIM plus households with an officer, that are female headed household, the value of crop inputs they used, the number of hectares they farmed, if they are disabled, whether they are risk averse, their numeracy, and their years of formal education. Sample includes individuals that received a voucher and reside in kebeles reporting sales in year 2.

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