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Abstract

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This dissertation consists of three chapters, which study issues of development within the context of China and India. The first two study the causes and consequences of one of the most important historical events in 20-th century Chinese history, the Great Proletarian Cultural Revolution. The third chapter reports findings from a field experiment focused on studying the role of self control in chronic illness management.

In Chapter 1, I investigate the determinants of political violence during the Cultural Revolution in rural China. With its purported goals of tackling inequality and forestalling a "capitalist restoration," the decade of 1966-1976 witnessed widespread violence, much of it directed towards the educated elite. Using a unique county-level dataset on collective killings, coupled with original economic data collected from archives of regional gazetteers, I investigate the reasons why some regions experienced high levels of violence, while others did not. Empirical results show that the extent of violence is positively correlated with male/female gender ratio, as well as agricultural output at the time of conflict, while being negatively correlated with ethnoliguistic fractionalization.

In Chapter 2, I investigate the economic legacies of the Cultural Revolution in rural China. Building on the work from Chapter 1, I study the extent to which this historic event yielded different trajectories of development across regions in China. To address endogeneity concerns, I control for pre-revolution outcomes and exploit transitory shocks to agricultural income during the period of violence as an instrument. Empirical results show that more revolutionary regions were slower to industrialize, had lower levels of education and per-capita output. These effects are large in magnitude, detectable more than thirty years later, and in some cases begin to decline at longer time horizons. Trust-based informal lending appears to have been adversely affected, while the timing of policy reforms does not.

In Chapter 3,[1] we study the issue of self control in the context of chronic illness management. In particular, we construct a simple model of preventive health behavior under present-biased time preferences, and show how beliefs about future time preferences (sophistication, partial naivete, and perfect naivete) affect how agents are predicted to use,

[1] This is joint work with Edward Miguel, Benjamin Handel and Gautam Rao.

under-use or misuse different types of commitment contracts. We propose a type of commitment contract that has the potential to benefit not just sophisticated agents, but also naifs. We conduct a field experiment in northern India, to evaluate the effectiveness of these contracts at increasing the share of patients who actively manage their hypertension by visiting a doctor regularly. Preliminary analysis reveals (i) the commitment contracts have a meaningful impact on preventive care utilization and (ii) that even with commitment contracts preventive health care utilization could still be substantially increased.

To My Grandparents

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Chapter 1

Political Violence during the Cultural Revolution

1.1 Introduction

The Cultural Revolution was a major social-political movement that took place in China between 1966 and 1976. Intended as a campaign to consolidate the communist revolution of 1949 by "cleansing the class ranks" of "bourgeois elements," it resulted in political violence on a massive scale. In its 1981 *Resolution on Party History*, the CCP's Central Committee acknowledged the period as responsible for "the most severe setback and the heaviest losses suffered by the Party, the state and the people since the founding of the People's Republic."

While the significance of this period is widely acknowledged, precise estimates of the number of lives lost have been hard to come by. Existing estimates range from 250,000 to 1.5 million deaths, while the total number of victims, including those imprisoned and otherwise persecuted, is believed to be closer to 30 million. Using archives of local histories published during the 1980s, recent research has further documented the extremely uneven geographic distribution of violence (Walder and Su (2003)[34]). While provinces in the north and southwest experienced high levels of fatalities, regions in the east generally escaped with less extreme forms of conflict (Figure 1). This paper explores how regional characteristics, both economic and otherwise, can predict the variation in revolutionary intensity, focusing in particular on the rural experience.

With its purported goals of tackling inequality and forestalling a "capitalist restoration," the "Great Proletarian Cultural Revolution" was a catastrophic event for large sections of the population, especially members of the educated elite. All across China, because of their perceived lack of commitment to socialism, individuals with so-called "bad class backgrounds" (e.g. former landlords, rich peasants, intellectuals) were particularly at risk (Su (2011)[30]). Like other revolutionary episodes, the Cultural Revolution's implementation relied heavily on the mass mobilization of youth. Indeed, the "Red Guards" played a key role in identifying and "struggling against" the "class enemies" of their own communities.

Certain exceptions notwithstanding, anecdotal accounts of the period have often identified the perpetrators as young men. To the extent that gender ratios within the relevant age group vary across locations, we can examine the effect of this on the incidence of violence.

Another salient feature of the population structure of a given location is its ethnic composition. Esteban and Ray (2008)[12] and Esteban et al. (2012)[11] study the relationship between class and ethnic conflict. In particular, they argue that the prevalence of ethnic conflicts around the world can often be the manifestation of underlying class conflicts. The Cultural Revolution presents an interesting context to test this theory, since it was conceived as class struggle, but in some cases (e.g. inner mongolia) turned into ethnic struggle. The availability of the relative sizes of different ethnic groups within each county allows for a systematic examination of this hypothesis.

Besides demographic characteristics, local economic conditions is another potential determinant of violence exposure. Since the seminal work of Miguel et al. (2004) [25], there has been numerous studies documenting how transitory shocks to agricultural income can affect conflict participation (e.g. Jia (2010)[17], Dell (2012)[8]). Most of them find a positive correlation between weather-induced adverse shocks and the incidence of violence. The theoretical relationship between income shocks and violence, however, is ambiguous (see Fearon (2008)[13], Dal Bó and Dal Bó (2011)[7], Besley and Persson (2011)[3]). On the one hand, adverse income shocks may lower the opportunity cost of participating in violence. On the other hand, such shocks also reduce the potential surplus available to be gained through violence.

In this paper, I use recently-digitized archival data on revolutionary intensity, together with multiple rounds of census data, to empirically examine the importance of these potential determinants of political violence at the county level.

To summarize the main findings, population characteristics do appear to be significant factors. In particular, areas with a higher male-to-female gender ratio among 15-24 year-olds in 1970 indeed experienced greater levels of violence. Ethnolinguistic fractionalization is positively correlated with the number of killings across provinces, although this correlation turns negative once we restrict the comparison to counties within the same province. In terms of the impact of local economic conditions, areas with abnormal levels of precipitation (i.e. either drought or flooding) during the late-1960s experienced *less* violence. This latter result differs from those found in some earlier studies (e.g. Miguel et al. (2004) [25]).[1] The context of the revolution may help us make sense of this pattern. Specifically, it is important to remember that participating in revolutionary activities carried no obvious economic benefit. This is in sharp contrast to the other episodes of political violence analyzed in the literature, where the ultimate objective is the capturing of resources. As a result, individuals and local governments focused on dealing with agricultural shortages may well have diverted their efforts and attention away from the revolution.

The remainder of the paper is organized as follows. Section 2 discusses the history of the

[1] See Dube and Vargas (2013) [9] for an empirical examination of different types of income shocks and their implications for conflict.

Cultural Revolution. Section 3 describes the data and empirical strategy. Section 4 reports the main findings, and Section 5 concludes.

1.2 Historical Background

The "Great Proletarian Cultural Revolution" was a complex social upheaval that began as a struggle between Mao Zedong and other senior party leaders for influence within the Chinese Communist Party (CCP) and went on to affect all of China with its call for "continuing revolution. (Spence (1990)[29])" Similar to other revolutionary movements in China and elsewhere, it had the objective of overthrowing politically-powerful individuals to reshape the nature of government and its policies. Specifically, it took aim at moderate party cadres who were "taking the capitalist road." Unlike other episodes, however, the call for radical change came from within the party, and the movement placed an unprecedented emphasis on culture, broadly defined. This meant that even people without political power can become "class enemies" because of their professions, interests or backgrounds.

Origins of the Revolution

Numerous factors, both international and domestic, may have contributed to the Cultural Revolution's conception (MacFarquhar and Schoenhals (2009)[21]). Internationally, the Soviet Union was seen to have abandoned Marxism-Leninism after the death of Stalin. A series of anti-Soviet polemics issued in the mid-1960s in China denounced Khrushchev's "phoney communism," outlining "proof that the proletariat was under attack from the bourgeoisie." In particular, these expositions criticized the USSR's promotion of material incentives, tolerance of large income differentials and the substitution of capitalist management for socialist planning. This mixture of "revisionist" policies were considered a betrayal to the revolutionary ideals, and Mao Zedong and his allies may have been determined to prevent the same "capitalist restoration" from occurring in China. Meanwhile, closer to home, this was a period of military tension across the Taiwanese Strait, with the Nationalist Party still harboring hopes of ultimate victory in the Chinese Civil War. To the extent that potential support for the Guomindang still existed in the mainland, the Cultural Revolution was also designed to deal that support a final blow.

It would be a mistake, however, to imply that the Revolution was launched in response to overseas events alone. For domestically, China had only recently recovered from the Great Leap Forward and the Famine of 1959-1961 that claimed the lives of tens of millions (Yang (2012)[36]; Meng et al. (2010)[24]). Partially acknowledging the role of government in causing the hardship of the preceding years, Mao was a passive figure in the years leading up to 1966, spending more time away from Beijing. During his leave of absence, the party leadership endorsed more conservative policies that attempted to breathe new life into the agricultural sector. Some of these initiatives, such as the partial restoration of family farm-

ing and rural markets, while effective,[2] would undoubtedly have been objectionable to an ideological purist such as Mao.

Finally, there were also concerns that the CCP was becoming too bureaucratic, with its members taking advantage of their privileged positions for personal gain. Rather than resolving such cases internally to preserve the prestige of the party, Mao favored open criticism and the involvement of the people to expose and punish the members of the ruling class who disagreed with him, framing this as a genuine socialist campaign involving the central struggle of the proletariat versus the bourgeoisie (Spence (1990)[29]).

Ultimately it is this combination of events, together with Mao's concern for his legacy, that gave birth to the Cultural Revolution. In August 1966, a directive entitled the "Decision of the Central Committee of the Chinese Communist Party Concerning the Great Proletarian Cultural Revolution" (a.k.a. the Sixteen Points) was issued to define the revolution's goals:

> *"Although the bourgeoisie has been overthrown, it is still trying to use the old ideas, culture, customs and habits of the exploiting classes to corrupt the masses, capture their minds and endeavor to stage a come-back. The proletariat must do the opposite... and change the mental outlook of society. At present, our objective is to struggle against and overthrow those persons in authority who are taking the capitalist road, to criticize and repudiate the reactionary bourgeois academic "authorities" and the ideology of the bourgeoisie, to transform education, literature, art and all other parts of the superstructure not in correspondence with the socialist economic base, so as to facilitate the consolidation and development of the socialist system".*

Popular Participation

The implementation of such an ambitious program required popular participation. To this end, China's youth was called upon to become the next generation of revolutionaries. Beginning in Beijing, countless "Red Guard" organizations formed across the country within a few months (Walder (2009)[33]; Perry (1997)[28]; Howe (1981)[15]). Schools and universities were closed for years, during which students were instructed to study communist classics, to identify and struggle against class enemies from their own communities, even families. Teachers and professors were frequently the targets of such struggles, due to their status as "reactionary bourgeois academics."

Many of China's cultural treasures also came under attack during the "Destroy the Four Olds" campaign,[3] as they were deemed to be incompatible with the socialist system. Instead, numerous revolutionary ballets were commissioned as part of an elaborate propaganda operation. Furthermore, many local government officials were ousted from office during

[2]Per-capita GDP grew at 14.9% and 15.4% in 1964 and 1965 respectively.

[3]These were Old Customs, Old Culture, Old Habits, and Old Ideas respectively.

violent power seizures, with new "revolutionary committees" formed as replacements (Vogel(1971)[31]; Walder and Su (2003) [34]).

Meanwhile, purges were carried out in the highest ranks of the Communist Party, with the removal of Liu Shaoqi and Deng Xiaoping the most prominent. Both had played influential roles in reviving the economy after the Great Famine. As the nation's president, Liu was labeled "the biggest capitalist roader in the Party," leading to his arrest in 1968. Regularly beaten at public denunciation meetings, and denied medicine for his illnesses, he died in November 1969. Compared to Liu, Deng's treatment was much milder. Sent to rural Jiangxi province to work as a factory worker for four years, he was eventually brought back into national politics in early 1970s (Joseph et al. (1991)[18]).

By the summer of 1967, there was widespread breakdown of order throughout the country's major urban centers, with violent clashes between opposing worker and student factions. As Mao later noted,[4] "everywhere people were fighting, dividing into two factions; there were two factions in every factory, in every school, in every province, in every county; every ministry was like that, the Foreign Ministry was in chaos... In July and August 1967, nothing could be done; there was massive upheaval throughout the country."

The reasons behind this overwhelming response has been a central topic of inquiry among Cultural Revolution scholars (Meisner (1999)[22]). A popular theory emphasizes the Party's repressive policies during the preceding decades. In particular, the CCP had devised effective methods of control that involved assigning class labels to each person, and giving the boss of each work unit nearly unlimited control over and knowledge of the lives of all the workers accountable to him or her. As a result, it has been argued, freedom of expression was denied, people were totally dependent on their bosses and were obliged to sacrifice and remain completely obedient to the Chinese nation, and only Party members exercised direct influence over their own lives. Thus, to the youth of the day, the Cultural Revolution represented a release from their shackles, frustrations, and feelings of powerlessness. It also gave them the freedom to exact revenge on those whom they believed exercised undue influence over them or whom they had been told were "class enemies."

Rural Rustification

In an attempt to end the urban unrest of 1967, a large-scale rural rustification program was initiated in part to discharge the Red Guards (Bernstein (1977)[2]). Also known as Mao's mass send-down movement, it was framed as a necessary exercise so that urban youth could be re-educated by the poor peasants through farm labor. It also served the purposes of reducing unemployment in urban areas, as well as increasing agricultural output (Zhou and Hou (1999)[37]). Some were no doubt inspired by the revolutionary and patriotic propaganda and went to the countryside voluntarily. However, most did not, and coercion in the form of threatened job loss for parents was used to ensure compliance (Li et al. (2010)[19]). From 1967 until 1978, an estimated 17 million urban youths were sent down to rural areas. The

[4] *Jianguo Yilai Mao Zedong wengao*,13:163

vast majority returned to cities after a few years, although roughly 5 percent stayed on permanently.

Disruptions to Education

The rural rustificaiton movement was not the only program that affected the educational opportunities of China's youth during this period. Starting in 1966, all primary schools in urban China were closed for 2-3 years, and secondary- and tertiary-level institutions were closed for much longer. Some primary and middle schools reopened in 1968-69, so those who would have completed primary school in 1966-68 were able to go on to high school and children aged 7-9 began primary school. However, teachers were not allowed to follow the standard curriculum, and instead students were asked to study Mao Zedong Thought and learn farming and manual labor. Those of normal graduation age for middle- or high- school were given diplomas even though they did not complete a traditional middle- or high-school education. High schools stopped admitting new students during 1966-72, and when they finally reopened, their curriculum focused on factory and farm work.

Universities were closed from 1966 to 1970-71, although those who had entered university before the Revolution and had not completed their degrees were allowed to stay there without formal teaching until 1970-71. They were then given a university degree and assigned jobs. After 1970-71, universities began to admit students, with new admission criteria based on the political attitudes or family background of the students, which favored unskilled workers, peasants, soldiers, party cadres, or students whose parents were from these groups. Admission was not based on academic merit, and no high-school graduates were allowed to go to college directly. As in the lower-level schools, students in universities did not receive the education provided by a normal curriculum; instead political study was given emphasis.

"Cleansing the Class Ranks"

While the chaos of urban areas in 1967 has been studied extensively, the extent of violence in rural areas has only become apparent within the last decade (Su (2011)[30]). Contrary to conventional wisdom, rural China suffered at least as much during the Cultural Revolution, although during a slightly later period.

Following the formation of the new "revolutionary committees," the Revolution entered its bloodiest phase in rural counties as the "cleansing of the class ranks" campaign got underway in 1968. As with many other policy directives during this period, the central leadership's instructions left plenty of room for local interpretation. Consequently, "in some places it became a massive pogrom against people of exploiting class backgrounds; in some places a campaign of retribution and murder against factional rivals; and in still others a campaign of torture and murder to uncover wholly imaginary mass conspiracies that could involve tens of thousands. (MacFarquhar and Schoenhals (2009)[21])"

In southwestern Yunnan province, according to calculations made by the provincial authorities in August 1969, 448,000 people were targeted in the province as a whole. Of these,

some 15,000 were "cleansed" as either "bourgeois" or "counter-revolutionary" elements, with 6,979 dying in the process.[5] In eastern Hebei, more than 84,000 individuals were persecuted on suspicion of being members of an underground Guomindang network: tortured during interrogation, 2,955 of them died, and 763 suffered permanent injuries.[6] In Zhejiang, an estimated 100,000 people were "arrested, detained, dragged out, and struggled" during the course of the movement and a total of 9,198 officially "hounded to death."[7]

In Inner Mongolia, there was a campaign against deposed regional leader Ulanfu's "anti-party clique" and the ferreting out of suspected members of a "New Inner Mongolian People's Party," an alleged "counter-revolutionary" underground organization of ethnic separatists with clandestine links to Outer Mongolia and the Soviet Union. Most of the people at the receiving end of these local campaigns were of Mongolian descent. A post-Cultural Revolution Central Document, *Zhongfa* [1981] 28, noted that in Inner Mongolia

> *the number of people that were put in prison, criticized, struggled, isolated, and investigated in direct connection with the three big unjust cases totaled 790,000. Of these, 22,900 died and 120,000 were maimed. While "ferreting out and eliminating" additional enemies, some 8,000 herdsmen living close to the border with Outer Mongolia were forcibly resettled farther inland, and this caused the death of an additional 1,000 people.*

Though the precise dynamics of conflict differed across regions, more educated individuals suffered disproportionately almost everywhere. Another common theme of violence in rural areas is the lack of external intervention. Unlike the street battles of urban centers, the People's Liberation Army were absent, and the majority of perpetrators and victims were from the same communities.

Return to Order

The terrors of 1968 and 1969 coincided with changes at the top of the CCP leadership that would foreshadow the end of the revolution, and thereby restore order to much of the country by the early 1970s. A key turning point was the downfall of Lin Biao in late 1971. As Defense Minister and the de facto head of the People's Liberation Army, Lin was one of the protagonists of the Cultural Revolution. He was instrumental in the promotion of Mao's personality cult, directing the compilation of his book of quotations (also known as

[5] *Zhongguo gongchandang Yunnan sheng zheng jun tong qun zuzhi shi ziliao 1926.11-1987.10* (Materials on the History of the CCP Organization, Government, Military, United Front, and Mass Organizations in Yunnan Province, November 1926 - October 1987)(Beijing: Zhonggong dangshi chubanshe, 1994), p.231

[6] Jin Chunming, Huang Yuchong, and Chang Huimin, *"Wenge" shiqi guaishi guaiyu*, pp. 386-387.

[7] Cheng Chao and Wei Haoben, *Zhejiang "Wenge" jishi*, p.104

The Little Red Book[8]). By 1969, he was officially appointed Mao's successor at the National Party Congress.

Little over a year later, however, Lin's political future as heir apparent was in doubt, following the promotion of numerous civilian officials to the Politburo. Ambiguities over the succession process finally culminated in a failed assassination attempt on Mao Zedong by Lin and his supporters in September 1971. The events that transpired next have been the subject of lengthy debate, with the official narrative being that Lin and his family died in a plane crash while fleeing to the USSR.

Whatever the actual version of events, Lin Biao's demise served to discredit the wider political movement by highlighting glaring inconsistencies in the official propaganda, which had hailed him as a "true Marxist revolutionary" and Mao's "closest comrade in arms." His apparent defection therefore marked a "major turning point" that "objectively proclaimed the theoretical and practical defeat of the Cultural Revolution."

By 1974, China's two most powerful leaders, Zhou Enlai and Mao Zedong, were chronically ill and unable to govern effectively. The four remaining leaders of the Revolution, led by Mao's wife Jiang Qing, engaged in an internal power struggle with more moderate, pragmatic Party leaders such as Deng Xiaoping.

Soon after Mao's death in September 1976, Hua Guofeng, the CCP's second-in-command, seized power and arrested the four remaining leaders of the Revolution, the so-called "Gang of Four" and finally marked the end of the tumultuous decade.

1.3 Data and Empirical Strategy

While the CCP's Central Committee formally acknowledged in its 1981 *Resolution on Party History* that the "Cultural Revolution was responsible for the most severe setback and the heaviest losses suffered by the Party, the state and the people since the founding of the People's Republic," there does not yet exist a centralized and publicly-available source of information on the violence that occurred in the different regions.

Regional Gazetteers

Instead, our analysis uses a county-level dataset digitized from regional gazetteers published during the late-1980s (Walder and Su (2003)[34]). These are book-length volumes of local history, and contain a wealth of information about a wide range of subjects (e.g. local geography, economics, politics, and so on), including the county's experience during the Cultural Revolution. The tradition of producing regional gazetteers in China dates back to the Han dynasty (202BC-220AD), when local gentries became invested in their production as a source of information and local pride. While the quality and content of gazetteers vary across regions, most local governments devoted significant resources for this purpose. They

[8]One of the most printed books in history, more than a billion copies of "Quotations from Chairman Mao Zedong" was circulated between 1964 and 1976, according to official statistics.

were often years in the making, with a designated team of dozens involved. As a result, China scholars have often relied on these publications for different research projects across the social sciences (e.g. Chen et al. (2013)[6]).

The casualty numbers reported in these publications are the consequence of a central policy directive, issued in 1978, that called for the rehabilitation of victims in "false, innocent, and wrongful" cases during the Cultural Revolution. Specifically, each county government was instructed to form a delicately-named "Resolving Remaining Historical Problems Committee," headed by top party leaders, to investigate relevant cases. The findings were later used to compensate remaining family members, as well as to prosecute perpetrators of the crimes. There is large variation in the amount of detail that is included in these histories. Some devote tens of pages to describing the events that unfolded, while others simply acknowledge their existence.

The gazetteer of Lingui county in Guangxi province provides one example that is typical of areas with detailed records of the killings[9]:

> *In the name of "cleansing the class ranks" and "mass dictatorship," indiscriminate killings took place across the county. Between mid-June and August [of 1968], 1,991 people were killed as members of "Assassination Squads," "Anti-Communist Army of Patriots," and other "black groups." Among them were 326 cadres, 79 workers, 53 students, 68 ordinary urban residents, 547 peasants, and 918 Four-Type elements (landlords, rich peasants, counter-revolutionaries, and bad elements) and their children. Among the 161 brigades [of the county], only Wenquan in Huixian and Dongjiang in Wantian did not indiscriminately detain and kill.*

Other Data Sources

In addition to these archives, the analysis uses multiple rounds of census data, covering both the period before the Cultural Revolution (the most recent year being 1964) and the period afterwards (1982, 1990 and 2000). These data provide information on numerous county characteristics (e.g. geographic size, population structure, ethnic minority groups, etc.), as well as economic outcomes (e.g. per-capita income). These are merged with the archival data to construct a panel for 1692 rural counties.

Data on monthly precipitation and temperature from 1950 to 2010 come from the University of Delaware's Center for Climatic Research.[10] This widely-used dataset (sometimes referred to as the Matsuura and Willmot data) provides climate information for each 0.5 degree * 0.5 degree grid cell. Spatial averages corresponding to administrative boundaries of Chinese counties are then computed using the ArcGIS software.

[9] Lingui xianzhi (Beijing: Fangzhi chubanshe, 1996), p.492.

[10] See: `http://climate.geog.udel.edu/~climate/html_pages/archive.html#gcd`

Empirical Strategy

As Figure 1 indicates, there is a great deal of variation in the geographic distribution of revolutionary intensity. In particular, the southern provinces of Guangxi, Guangdong and Yunnan experienced the most violence. There was also relatively more violence in the north-east and inner Mongolia. The central and eastern regions, on the other hand, appear to have been more peaceful.

To explore the significance of various factors in determining the extent of violence, we run the following estimating equation:

$$CR_{c,p} = \alpha + \beta Precip_{c,p,1968/9} + \gamma' X_{c,p} + \mu_p + \epsilon_{c,p} \tag{1.1}$$

where $CR_{c,p}$ is the number of casualties in county c of province p, $Precip_{c,p,1968/9}$ is the absolute deviation of precipitation in 1968 and 1969 from the county's long-run average, while $X_{c,p}$ is a vector of county characteristics including population size in 1964, fraction of non-agricultural population in 1964, gender ratio among 15-24 year-olds in 1970, area size, an index of ethnolinguistic fractionalization, as well as long-run average precipitation and temperature. μ_p is a province fixed-effects term.

The choice of 1968/9 for the climate variables is based on the fact that they were the worst years of violence for the counties in our sample (Su (2011)[30]). Knowledge of the timing of conflict also allows us to use climate realizations from alternative years as placebo tests.

The ethnolinguistic fractionalization index is constructed as follows: consider a society composed of $K \geq 2$ different ethnic groups and let p_k indicate the share of group k in the total population. The ELF index is given by $1 - \sum_{k=1}^{K} p_k^2$.

Given the exogenous nature of climate realizations, the specification here also serves as the first-stage IV regression in Chapter 2 as I examine the economic legacies of this period.

1.4 Results

Before discussing the regression results, there are a few points worth noting in the summary statistics reported in Table 1. First, the counties in our baseline sample is predominantly rural, where the average fraction of non-agricultural population in 1964 is only 8.2%. In terms of the casualty figures, the mean number of reported fatalities is 86 persons (with a standard deviation of 276), while the mean number of victims is 4860. The latter represents approximately 2% of the total population in 1964. In terms of ethnic diversity, our sample is relatively homogeneous, with an average ELF value of 0.136.

Table 2 reports regression results examining the determinants of violence. First, areas with a larger population in 1964 had more deaths. Second, areas with worse-than-normal harvests in 1968/9 suffered *less*. This can be seen from the negative coefficient estimate on the "average rainfall deviation in 1968 and 1969" variable. This result differs from those found

in some earlier studies (e.g. Miguel et al. (2004) [25]), which have tended to find a positive relationship between adverse climate shocks and the incidence of violence.[11] The context of the revolution may help us make sense of this pattern. Specifically, it is important to remember that participating in revolutionary activities carried no obvious economic benefit. This is in sharp contrast to the other episodes of political violence analyzed in the literature, where the ultimate objective is the capturing of resources. As a result, individuals and local governments focused on dealing with agricultural shortages may well have diverted their efforts and attention away from the revolution. Finally, as a placebo test, column 3 shows that rainfall deviations in 1964 and 1965 do not predict the level of reported violence.

In addition, areas with a higher male/female gender ratio among 15-24 year-olds in 1970 had significantly more deaths. This is perhaps unsurprising, given the role of the largely-male "Red Guards" as perpetrators. Moreover, this could also be a proxy for backwardness, due to a traditional preference for sons. In other words, areas that were socially and economically more backward may have experienced greater violence. Interestingly, the extent of industrialization in 1964 does not predict the number of fatalities.

In terms of ethnolinguistic fractionalization, more diverse areas experienced *less* violence, once we control for province fixed effects. This runs contrary to the hypothesis that the Culture Revolution may have triggered significant ethnic conflicts along the lines of Esteban and Ray (2008)[12]. Instead, it seems that there was more violence in ethnically-homogeneous areas within any given province.

1.5 Conclusion and Further Work

Using rare data on revolutionary intensity, as proxied by the number of deaths and injuries, this paper examines numerous determinants of political violence during the Cultural Revolution in rural China at the county level. In doing so, it lays the groundwork for the following chapter, which investigates the economic legacies of this period.

The findings suggest that areas with a higher male-to-female gender ratio among 15-24 year-olds in 1970 experienced greater levels of violence. Ethnolinguistic fractionalization is positively correlated with the number of killings across provinces, although this correlation is reversed once we restrict comparison to counties within the same province. Furthermore, areas with a temporary adverse shock to agricultural output during the late-1960s experienced *less* violence, perhaps because individuals and local governments focused on dealing with agricultural shortages have diverted their efforts away from the revolution.

Going forward, more work is needed to investigate heterogeneity in the relationship between agricultural income shocks and the incidence of political violence. Finally, I plan to

[11] The theoretical relationship between income shocks and violence is ambiguous (see Fearon (2008)[13], Dal Bó and Dal Bó (2011)[7], Besley and Persson (2011)[3]). On the one hand, adverse income shocks may lower the opportunity cost of participating in violence. On the other hand, such shocks also reduce the potential surplus available to be gained through violence. See Dube and Vargas (2013)[9] for an empirical examination of different types of income shocks and their implications for conflict.

examine the extent to which different histories of conflict across the regions (e.g. peasant rebellions during the Qing Dynasty, as well as class conflicts during the land reform period in the 1950s) may have shaped their experiences during the Cultural Revolution.

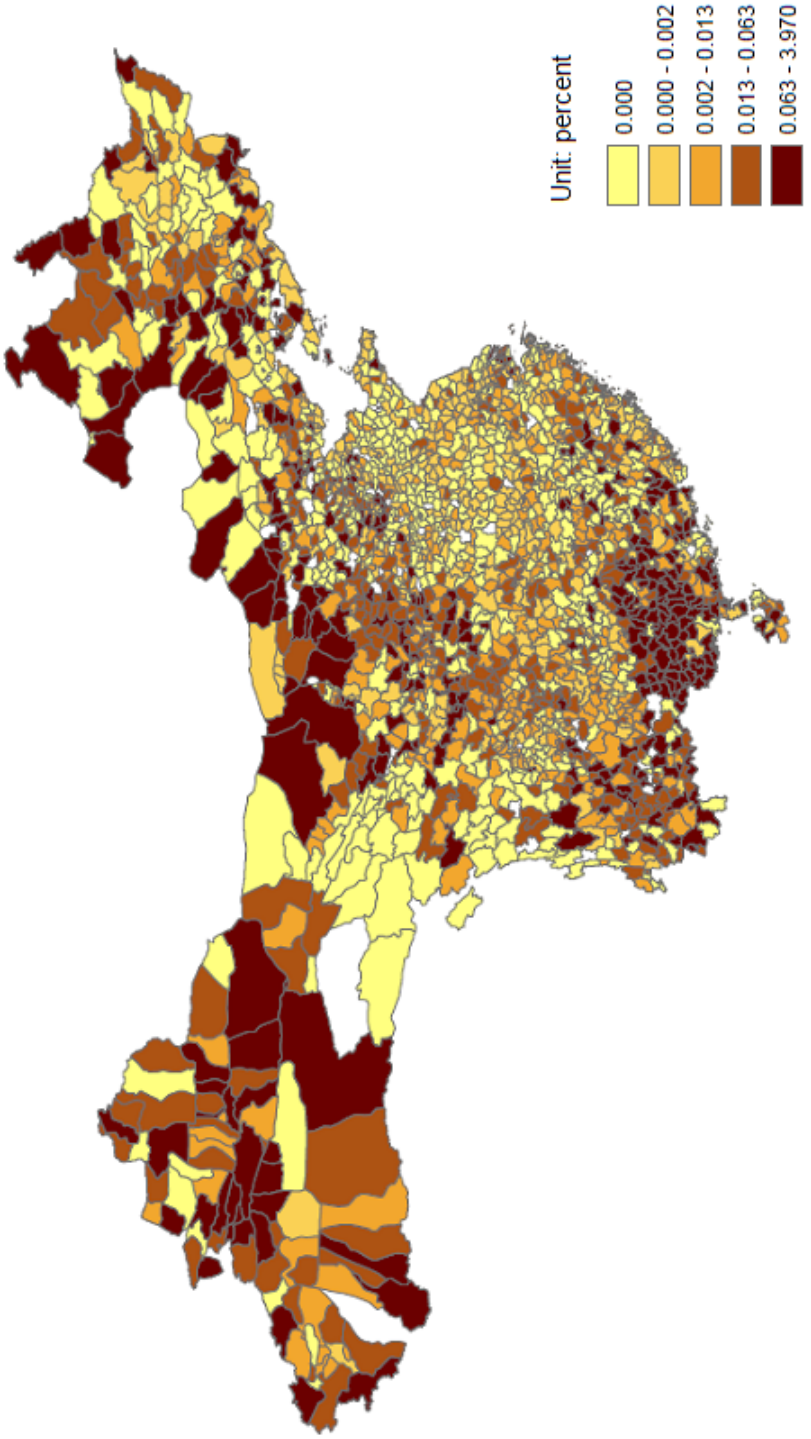

Figure 1.1: Fraction of Population Killed During the Cultural Revolution (quintiles)

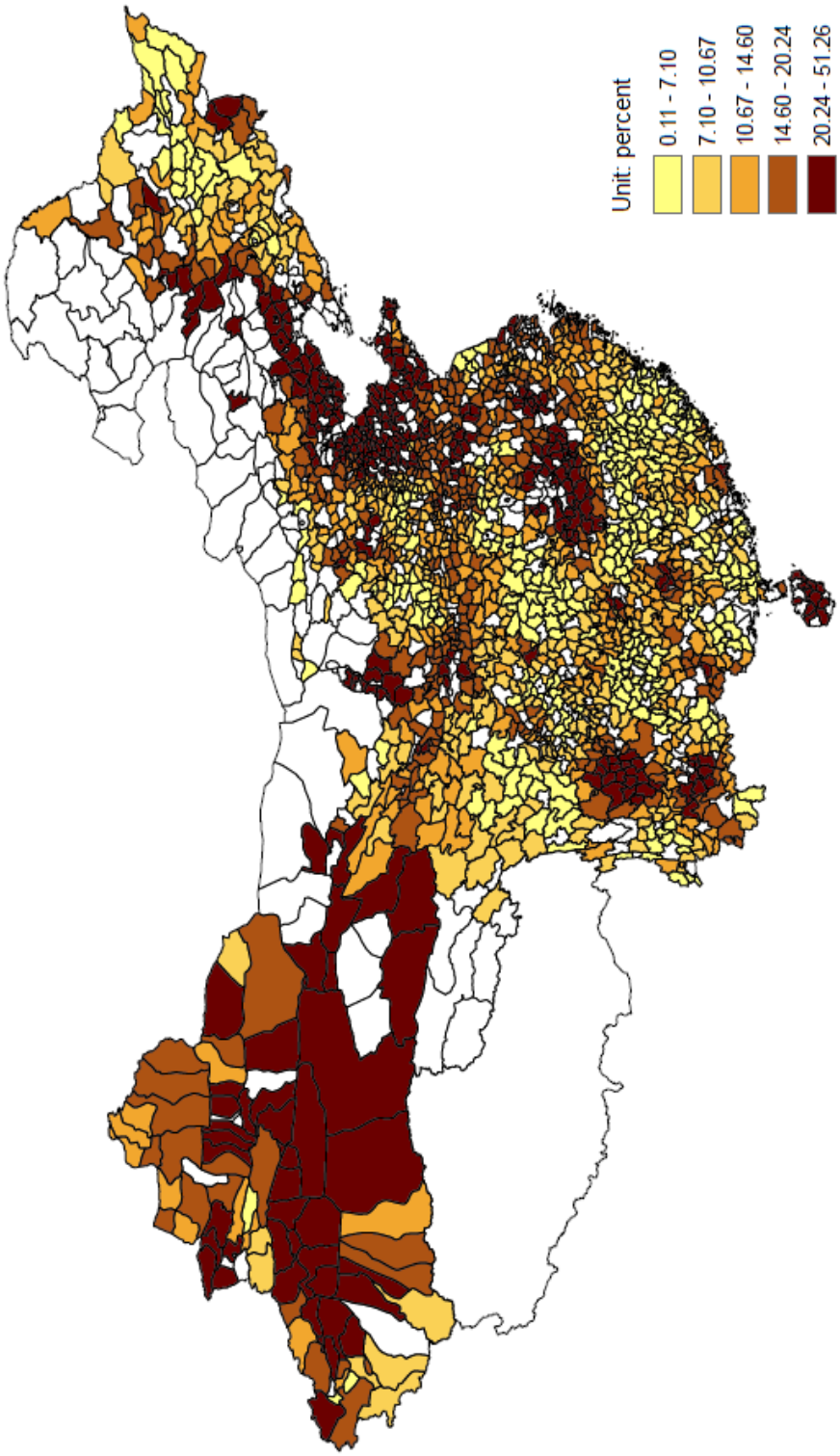

Figure 1.2: Absolute rainfall deviation in 1968/9 from 1950-2010 average (quintiles)

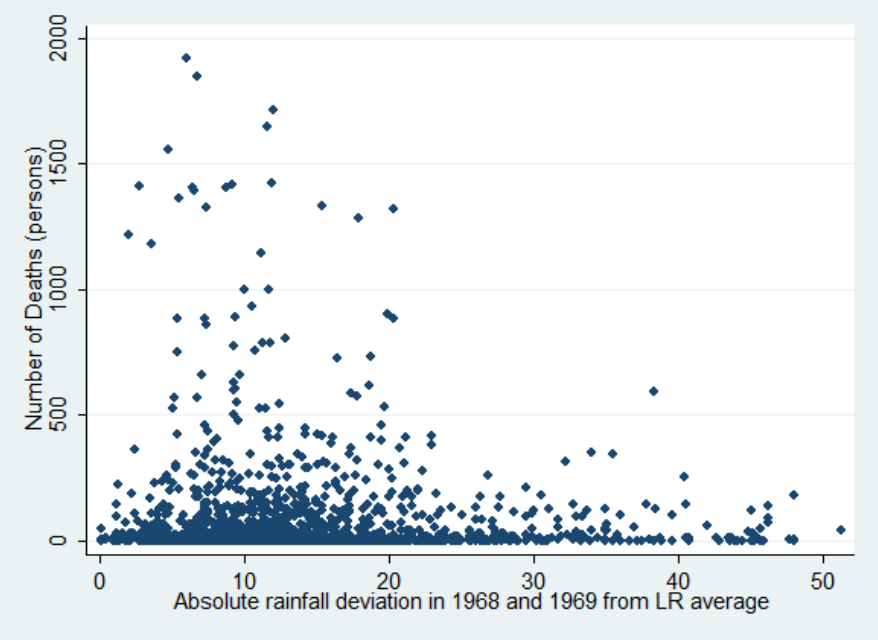

Figure 1.3: Relationship Between Temporary Climate Shocks and Violence

Table 1.1: Summary Statistics

Variable Name	Mean	Std. Dev.	Min.	Max.	N
Panel A: Cultural Revolution Variables					
Number of deaths (1000 persons)	0.086	0.276	0	4.519	1692
Number of victims (1000 persons)	4.86	11.8	0	262.7	1692
Number of deaths in neighboring counties (1000 persons)	0.917	2.307	0	20.43	1692
Panel B: Baseline Economic Outcomes					
Total population in 1964 (1000 persons)	285.4	207.2	3.05	1186.9	1692
Fraction of non-agricultural population in 1964 (percent)	8.16	7.74	1.13	79.79	1692
Panel C: County Characteristics					
Ethnolinguistic fractionalization	0.136	0.211	0	0.812	1686
Male/female ratio among 15-24 year-olds in 1970	1.087	0.077	0.876	1.464	1687
Area size (10000 sq. km)	0.356	0.897	0.004	23.435	1686
Average yearly rainfall 1950-2010 (mm)	947.2	471.7	26.7	2513	1692
Average monthly temperature 1950-2010 (degrees)	12.83	5.67	-6.10	25.29	1692

Table 1.2: Determinants of Cultural Revolution Violence

		OLS	
Dep Var: Number of Deaths (persons)	(1)	(2)	(3)
Absolute rainfall deviation in 1968 and 1969 from LR average	-2.482***	-1.998***	-2.122***
	(0.654)	(0.721)	(0.777)
Ethnolinguistic Fractionalization		-77.093**	-72.136*
		(37.050)	(37.086)
Area size in 1982 (10000 sq. km)		5.662	5.904
		(3.803)	(3.906)
Male/Female Ratio Among 15-24 year-olds in 1970		144.154**	145.942**
		(68.307)	(68.885)
Total Population in 1964 (10000 persons)		1.078***	1.112***
		(0.334)	(0.340)
Fraction of non-agr population in 1964 (percent)		-0.471	-0.447
		(0.549)	(0.554)
Average yearly rainfall 1950-2010 (mm)		0.073	0.084
		(0.048)	(0.052)
Average monthly temperature 1950-2010 (degrees)		1.723	1.538
		(1.660)	(1.647)
Absolute deviation of rainfall in 1965			0.343
			(0.394)
Absolute deviation of rainfall in 1964			0.476
			(0.406)
N	1692	1680	1680
Adj. R^2	0.01	0.33	0.33
F-Stat	14.40	3.76	3.25
Mean of Dep. Var.	86.08	86.08	86.08
Province FE	No	Yes	Yes

Robust standard errors are in parentheses. */**/*** denotes significance at the 10% / 5% / 1% levels. The dependent variable, number of deaths, is the reported number of fatalities for a given county during the Cultural Revolution. Rainfall deviations are computed using the 1950-2010 average for a given county. The years 1968 and 1969 are used due to the timing of violence in rural areas. Gender ratio among 15-24 year-olds in 1970 is used to proxy for the intensity of "Red Guard" activities. Ethnolinguistic fractionalization is measured using the standard ELF index, where a higher number corresponds to greater ethnic diversity.

Chapter 2

Economic Legacies of the Cultural Revolution

2.1 Introduction

The Cultural Revolution is a watershed moment in 20$^{\text{th}}$-century Chinese history. Spanning a decade from 1966 to 1976, it constitutes the final years of Mao Zedong's leadership, and shortly precedes the country's economic liberalization. Intended as a campaign to consolidate the communist revolution of 1949 by "cleansing the class ranks" of "bourgeois elements," its accompanying violence and chaos is widely believed to have left an indelible mark on Chinese society (Esherick et al. (2006)[10]). This paper explores the economic legacies of this period, focusing in particular on the rural experience.

With its purported goals of tackling inequality and forestalling a "capitalist restoration," the "Great Proletarian Cultural Revolution" was a catastrophic event for large sections of the population, especially members of the educated elite. All across China, because of their perceived lack of commitment to socialism, individuals with so-called "bad class backgrounds" (e.g. former landlords, rich peasants, intellectuals) were particularly at risk (Su (2011)[30]). Existing estimates of the number of fatalities range from 250,000 to 1.5 million, while that of victims, including those imprisoned and otherwise persecuted, is closer to 30 million (Walder and Su (2003)[34]). In addition to this targeted violence, there was widespread disruption to the functioning of government services, most notably the closure of schools and universities. Taken together, this has often led to the cohorts growing up during this period being labeled as China's "lost generation" (Chen (1999)[5]).

Although perhaps the most direct, the loss of human capital is only one channel through which the revolution may have affected the country's subsequent economic development. Another potential channel is the erosion of social capital. Violence within communities may have made trust and cooperation more difficult (Nunn and Wantchekon (2011)[27]), thereby worsening the functioning of informal credit and risk-sharing institutions. Yet another potential consequence of exposure to violent conflict is an induced change to one's time and

risk preferences. Previous studies have found that such experiences can cause people to be more impatient and risk-seeking (Voors et al. (2012)[32]; Callen et al. (2011)[4]). This in turn has many important implications for savings and investment decisions.

Finally, the revolution is often thought to have influenced the timing and choice of economic policies during the reform era (Xu (2011)[35]). One key example was the decollectivization of agriculture and the introduction of the "household responsibility system," which made agricultural households the residual claimants of their output, and enabled the return of rural markets. In a seminal paper, Lin (1992)[20] attributes roughly half of the output growth during 1978-1984 to this reform. The decision of when to implement this policy varied substantially across regions. This heterogeneity allows for the testing of two competing hypotheses. On the one hand, if the revolution succeeded in shaping people's ideologies, more revolutionary areas would have been more reluctant to embrace these market-oriented reforms. On the other hand, and contrary to the China envisioned by Mao, the revolution's excesses may have *accelerated* the pace of economic reform, due to a "reactionary backlash" effect, in which case worse-affected areas would have liberalized more quickly.

While there is no shortage of theoretical mechanisms through which the Cultural Revolution may have influenced subsequent economic development, it has not been possible to explore them systematically until now, due to a lack of data. In this paper, I construct an original county-level panel dataset of economic outcomes using regional gazetteers[1] and population censuses, combined with rare data on the extent of violence during the revolution (Walder and Su (2003)[34]). Finally, the analysis also makes use of survey data from the China Household Income Project (CHIP).

A key challenge to estimating the causal impact of revolutionary intensity on economic outcomes is the presence of potential confounding factors. For instance, we may be concerned that more revolutionary regions were more likely to have a history of previous conflicts and were worse off economically to begin with, leading OLS to overestimate the true effects. On the other hand, it is possible that areas with higher educational attainment, and therefore growth potential, suffered disproportionately because of the presence of "bourgeois elements," resulting in an underestimation of the true impacts. To address this, I control for pre-revolution outcomes and province fixed effects in the econometric estimation. Moreover, climate-driven fluctuations in local economic conditions during the violence years, as reported in Chapter 1, provide one source of plausibly exogenous variation.

This relationship between transitory shocks to agricultural income and revolutionary intensity enables the estimation of the latter's impact on subsequent economic outcomes. An instrumental-variables strategy is used to address both omitted variable bias and classical measurement error.[2] A key identifying assumption is that climate shocks in the late-1960s should not have long-term impacts of their own. Reduced-form estimates using climate shocks from nearby, non-revolution years indeed find this to be the case.

[1] These are book-length local histories published during the late 1980s and early 1990s.

[2] In addition, we may be concerned about non-classical measurement error, or reporting bias. See section 4 for robustness checks dealing with this issue.

The empirical results show large and negative effects of revolutionary intensity on economic outcomes, such as the extent of industrialization and per-capita output. These impacts are detectable more than thirty years later, with some beginning to decline at longer time horizons. For instance, an increase in reported deaths of 50 persons is estimated to have caused a 17% decrease in the fraction of population employed in industry in 1982.[3] The magnitude of this effect is reduced to 11% by 1990. Both are significant at the 95% level of confidence. By 2000, the estimated magnitude is further reduced to 3%, and no longer statistically significant.

The effect on per-capita GDP is equally large. Here an increase in reported deaths of 50 persons is associated with a 10% decrease in 1982. Moreover, this effect is persistent, with an estimated magnitude of 15% in 2000. Both results are significant at the 95% level.

In terms of mechanisms, there is evidence to support both the human and social capital channels. First, worse-affected areas tend to have significantly fewer college graduates as a percentage of their population. Second, residents in more revolutionary counties report significantly less mutual lending with other members of their community. As for the timing of policy reforms, I do not find systematic differences along the lines of revolutionary intensity.

In addition to the literature on the relationship between climate shocks and violence,[4] this paper is also closely related to a recent body of work studying the long-run impacts of violent conflict. For instance, Nunn (2008)[26] finds adverse effects of slave exports from Africa during 1400-1900 on the economic performance of these regions in 2000. Similarly, Acemoglu et al. (2011)[1] estimate that Russian cities which experienced the Holocaust more intensely have had worse economic indicators in the post-Soviet era. Dell (2012)[8] studies legacies of the Mexican Revolution, and finds that municipalities with greater insurgent activities redistributed more of their land, are more agricultural, and have lower incomes today. Lastly, there exists a small literature in economics investigating the educational impacts of the Cultural Revolution (see Meng and Gregory (2002)[23] and Giles et al. (2008)[14]), by comparing cohorts with differential exposures to the disruptions. To the best of my knowledge, this is the first paper to exploit spatial heterogeneity in revolutionary intensity as a source of identifying variation. Doing so allows for the examination of a more comprehensive set of economic outcomes, and the incorporation of general equilibrium effects.

A few caveats should accompany the results reported in this paper. First, the Cultural Revolution was a nationwide political movement. To the extent it shaped the economic trajectory of the country as a whole, we are unable to capture it in the analysis, which exploits sub-national variation in revolutionary intensity. Second, this paper focuses on the rural areas, and therefore the findings may not generalize to the urban centers. Third, the estimated impacts should not be interpreted as coming from violence alone, as other aspects of the revolution (such as propaganda, education and economic policies) may well

[3] In the baseline sample, the average number of reported deaths is 86 persons per county, with a standard deviation of 276.

[4] See Hsiang et al. (2013)[16] for a recent survey and meta-analysis.

be correlated with our violence measures. Instead, they ought to be considered as the effects of the revolution as a whole.

The remainder of the paper is organized as follows. Section 2 briefly discusses the revolution's contemporary economic impacts. Section 3 describes the data and empirical strategy. Section 4 reports the main findings, and Section 5 concludes.

2.2 Contemporary Economic Impacts

Besides the political upheaval (see Chapter 1 for a more detailed discussion of the historical background), the Cultural Revolution was also a disastrous time for the country's economy, as regional governments pursued policies that were invariably antagonistic towards private business. The aggregate impact can be seen from Figure 5, which plots the evolution of per-capita GDP for China as a whole from 1952 to 1978.

In Jiangxi province, for instance, the government shut down and dissolved all of the cooperative shops and retail outlets, in order to "eradicate once and for all" any signs of "capitalism." Moreover, it revoked the licenses of all private petty traders. The traders (some 15,900 in number) and about one-third (18,800) of the employees of the dissolved collectively-run shops were relocated to the countryside, where they were assigned jobs in the agricultural sector.

For the country as a whole, the value of total production declined by 9.6 percent in 1967, with industry harder hit than agriculture. The decline continued steadily in 1968, when the industrial output of the southern provinces of Henan, Hubei, and Hunan combined declined by 25 billion yuan. In southwest China, output was down by more than 41 percent; in Yunnan, the output value of state-owned industries dropped by almost two-thirds.

Despite the disruptions, the agricultural sector remained relatively unscathed. In some areas, this was an unintended by-product of a dysfunctional state bureaucracy, as factional fighting made it impossible for government personnel to attend to their tax collection duties.

While the contemporary economic impacts are well documented, the extent to which the Revolution may have permanently shaped the development trajectories of different regions is hitherto unexplored. It is to this task that we now turn.

2.3 Data and Empirical Strategy

While the CCP's Central Committee formally acknowledged in its 1981 *Resolution on Party History* that the "Cultural Revolution was responsible for the most severe setback and the heaviest losses suffered by the Party, the state and the people since the founding of the People's Republic," there does not yet exist a centralized and publicly-available source of information on the violence that occurred in the different regions.

The gazetteers also serve as the primary source of information for baseline economic outcomes (such as the extent of industrialization and population size), as well as the timing

of agricultural policy reforms. Data on these variables are digitized by the author, using the archives from the C.V. Starr East Asian Library of the University of California at Berkeley. Detailed definitions of these variables are included in the data appendix.

In addition to these archives, the analysis uses multiple rounds of census data, covering both the period before the Cultural Revolution (the most recent year being 1964) and the period afterwards (1982, 1990 and 2000). These data provide information on numerous county characteristics (e.g. geographic size, population structure, ethnic minority groups, etc.), as well as economic outcomes (e.g. per-capita income). These are merged with the archival data to construct a panel for 1692 rural counties.

To investigate outcomes related to preferences and trust, I use household-level data from the rural sample of the 2002 wave of the China Household Income Project (CHIP). This is a nationally-representative income-expenditure survey, with an added social-networks module. While the questionnaire is detailed, the number of counties included is small (80 in total).

Finally, data on monthly precipitation and temperature from 1950 to 2010 come from the University of Delaware's Center for Climatic Research.[5] This widely-used dataset (sometimes referred to as the Matsuura and Willmot data) provides climate information for each 0.5 degree * 0.5 degree grid cell. Spatial averages corresponding to administrative boundaries of Chinese counties are then computed using the ArcGIS software.

Empirical Strategy

While the dataset on casualties is extensive in its geographic coverage - over 80% of all counties in mainland China are included in the sample - it likely contains measurement error in the form of under-reporting. For the purposes of our study, it is important that the extent of under-reporting is not correlated with the degree of violence. To check for the robustness of our results to potential reporting bias, I complement the baseline analysis by restricting attention to counties with detailed accounts of the revolution, as proxied by the length of reports in their gazetteers, as well as dropping counties with zero reported fatalities.

As Figure 1 indicates, there is a great deal of variation in the geographic distribution of revolutionary intensity. In particular, the southern provinces of Guangxi, Guangdong and Yunnan experienced the most violence. There was also relatively more violence in the northeast and inner Mongolia. The central and eastern regions, on the other hand, appear to have been more peaceful. The non-random nature of revolutionary intensity makes causal inference challenging. On the one hand, we may be concerned that more revolutionary regions were more likely to have a history of prior conflicts and were worse off economically to begin with, leading to an overestimation of the effects. On the other hand, it is possible that areas with higher educational attainment, and therefore growth potential, suffered disproportionately because of the presence of "bourgeois elements," resulting in an underestimation of the true impacts.

[5] See: `http://climate.geog.udel.edu/~climate/html_pages/archive.html#gcd`

To make progress, the empirical specification controls for pre-revolution outcomes (e.g. the extent of industrialization, size of population) and province fixed effects. Furthermore, temporary fluctuations in local economic conditions during the violence years, as driven by climate shocks, provide a source of plausibly exogenous variation.

In other words, the main estimating equation is the following:

$$Y_{c,p,1982} = \alpha + \beta CR_{c,p} + \gamma' X_{c,p} + \lambda Y_{c,p,1964} + \mu_p + \epsilon_{c,p,1982} \tag{2.1}$$

where $CR_{c,p}$ is the number of casualties in county c of province p, $X_{c,p}$ is a vector of county characteristics, μ_p is a province fixed-effects term, and $Y_{c,p}$ is the outcome of interest (e.g. extent of industrialization, per-capita GDP, education, etc.). The vector of controls include population size in 1964, fraction of non-agricultural population in 1964, gender ratio among 15-24 year-olds in 1970, area size, an index of ethnolinguistic fractionalization, as well as long-run average precipitation and temperature.

Using absolute deviations of precipitation in 1968 and 1969 from the county's long-run average as an instrument for $CR_{c,p}$, we have the following first-stage equation:

$$CR_{c,p} = \alpha + \beta Precip_{c,p,1968/9} + \gamma' X_{c,p} + \lambda Y_{c,p,1964} + \mu_p + \epsilon_{c,p} \tag{2.2}$$

The choice of 1968/9 is based on the fact that they were the worst years of violence for the counties in our sample ([30]).

In order for the IV approach to deliver consistent estimates, we need to assume both exogeneity and excludability of the instrument. Fortunately both assumptions can be tested empirically in our setting through the use of falsification tests. In the case of exogeneity, we can regress various county characteristics and baseline economic outcomes on the instrument. In the case of excludability, we can run regressions of economic outcomes on climate shocks from nearby, but non-revolutionary years as placebos.

To investigate potential regional spillover effects, I also include the number of deaths in neighboring counties from the same prefecture as an explanatory variable in the outcomes regressions. The coefficient estimate on this term can shed light on the extent to which events outside of a given county can affect outcomes within it.

A somewhat mechanical way in which the revolution may have affected economic trajectories is through that of migration. In particular, more educated individuals may have moved away from worse-affected areas to seek refuge from the violence. On the other hand, to the extent that a shortage of skilled labor implied higher factor returns in the 1980s, there may be incentives for such individuals to migrate into the more revolutionary areas during the subsequent period. While theoretically plausible, it is unlikely for migration to have played an important role before the mid-1980s, due to China's strict household registration system (also known as the *hukou* system). To examine possible effects after the system's partial relaxation, I look at the relationship between revolutionary intensity and the fraction of immigrants within the local population in 1990.

To investigate human capital impacts, I use the share of college graduates within the local population in 1982 and 1990 as the main outcomes. This represents a combined measure of the quantity and quality of education available at the primary and secondary levels.

In terms of trust, I make use of survey data from the 2002 wave of the China Household Income Project. In particular, rural households were asked about the extent to which they engage in mutual lending with other households in their villages. Given the imperfect nature of formal credit and insurance markets in these areas, informal lending of this type represents an important financial management tool. The answer to this question is used as a proxy for the level of trust in these communities. Unfortunately there does not exist similar survey data for the pre-revolution period, rendering the findings more correlational in nature. Moreover, due to the small number of counties (80 in total) in the sample, there does not exist a strong first-stage relationship between climate shocks and revolutionary intensity.

Finally, after 1978, the Chinese government pursued much more liberal economic policies. A key reform was the introduction of the so-called "household responsibility" system, whereby agricultural households were allowed to sell their surplus output on local markets. Many China scholars have interpreted this change as a "reactionary backlash" against the ultra-left policies in place during the Cultural Revolution. To investigate this claim, I use data on the timing of the reform's implementation at the county level to study whether more revolutionary areas indeed liberalized earlier.

2.4 Results

Before discussing the regression results, there are a few points worth noting in the summary statistics reported in Table 1. First, the counties in our baseline sample is predominantly rural, where the average fraction of non-agricultural population in 1964 is only 8.2%. This number increases dramatically over time, to more than 26% by 2000. Second, and relatedly, our sample is relatively poor. The average per-capita GDP in 2000 is just under 5,000 RMB, compared to an average per-capita GDP of almost 9,000 RMB for the country as a whole. In terms of the casualty figures, the mean number of reported fatalities is 86 persons (with a standard deviation of 276), while the mean number of victims is 4860. The latter represents approximately 2% of the total population in 1964. In terms of ethnic diversity, our sample is relatively homogeneous, with an average ELF value of 0.136.

Economic Impacts

Before turning our attention to the estimated coefficients, Figures 2 and 3 map the extent of industrialization before and after the Cultural Revolution respectively. While there is a high degree of serial correlation, there are a couple of note-worthy changes. First, the Shandong peninsula south of Beijing appears to have become relatively more industrialized over this period. Second, the southwestern provinces of Yunnan and Guangxi moved in the opposite direction. Interestingly, the former experienced relatively little violence, while the latter

suffered much more heavily. Another way of seeing this relationship is through Figure 6, which plots the kernel densities of the change in industrialization rates separately for areas in the top and bottom quartiles of our deaths measure. The distribution clearly shifts to the right for the less-revolutionary counties.

The econometric results show large and negative effects of revolutionary intensity on economic outcomes, particularly the extent of industrialization and per-capita GDP. These impacts are detectable more than thirty years later, with some beginning to decline at longer time horizons. For instance, an increase in reported deaths of 50 persons is estimated to have caused a 17% decrease in the fraction of population employed in industry in 1982 (see Table 4).[6] The magnitude of this effect is reduced to 11% by 1990. Both are significant at the 95% level of confidence. By 2000, the estimated magnitude is further reduced to 3%, and no longer statistically significant.

The effect on per-capita GDP is equally large. Here an increase in reported deaths of 50 persons is associated with a 10% decrease in 1982. Moreover, this effect is persistent, with an estimated magnitude of 15% in 2000. Both results are significant at the 95% level.

Mechanisms

The most direct mechanism through which the revolution may have affected subsequent economic outcomes is the loss of human capital, considering the identities of the victims. There is some evidence for this mechanism in the findings reported in Table 7. Using the fraction of local population with college education in 1982 as an outcome measure, we find a large and almost statistically-significant impact (t-statistic = 1.63). Specifically an increase in reported fatalities of 50 persons is associated with an 11% decrease in the share of population with college education. As with the industrialization measure, this effect appears to diminish over time, such that by 1990 the point estimate is both smaller and not significant.

Table 8 reports estimates on the potential role of migration in driving economic disparities. While it is impossible to investigate the importance of out-migration with the data available, worse-affected areas do appear to have significantly lower shares of immigrants in their 1990 populations. The point estimate is large and negative - an increase in reported fatalities of 50 persons is associated with a 23% decrease in the share of immigrants.

Table 9 reports results on whether the revolution may have altered the timing of agricultural reforms. This allows us to test the "reactionary backlash" hypothesis against the "ideological persistence" hypothesis. The former predicts a negative relationship (i.e. more revolutionary areas liberalized earlier), while the latter predicts the opposite. Overall, there does not appear to be any evidence for either theory, with the coefficient estimates close to zero.

[6] In the baseline sample, the average number of reported deaths is 86 persons per county, with a standard deviation of 276.

Finally, Table 10 reports correlational evidence in support of the social capital channel. In particular, residents in worse-affected counties engage in significantly less mutual lending with other members of their community in 2002. This result is robust to the inclusion of a large number of household and village controls. Although precisely estimated, the magnitude of the effect is small - an increase in reported fatalities of 50 persons is associated with a 1.3% decrease in the extent of mutual lending.

Placebo Tests and Robustness Checks

As mentioned in the previous section, two assumptions are required for an instrumental-variables strategy to deliver consistent estimates in this context: exogeneity and excludability. To test the former, I regress all available non-climatic county characteristics on the instrument, controlling for province fixed effects. The results are reported in Table 3. None of the observed characteristics are correlated with the IV. It should be noted that the instrument is correlated with the average climatic variables, which are included in all of the outcomes regressions.

As a test for excludability, Table B1 reports reduced-form regressions for all of the outcome variables with significant results, including rainfall deviations from each of three years either side of the revolution as placebos. Overall, rainfall deviations from the non-revolutionary years do not appear to be systematically correlated with our outcome variables. The instrument, on the other hand, does appear to be significantly and positively correlated with all of the outcomes.

Finally, to address concerns of reporting bias in the casualties measure, I first restrict the sample to areas with non-zero fatalities (Table B2), then to areas with relatively detailed coverage of the Revolution in their respective gazetteers (Table B3). In both cases, the point estimates are largely unchanged compared to those obtained from the baseline sample, though they are somewhat less precisely estimated, due to the smaller sample size.

2.5 Conclusion and Further Work

In this paper, I investigate the economic legacies of the Cultural Revolution in rural China. Regions that experienced the revolution more intensely were slower to industrialize, had lower levels of education and per-capita output. These effects were large in magnitude, detectable more than thirty years later, and in some cases begin to decline at longer time horizons. Trust-based informal lending does appear to have been adversely affected, while the timing of policy reforms does not. Taken together, these findings suggest that the Cultural Revolution significantly affected the economic trajectories of the different regions.

Several caveats should accompany these empirical results. First, the Cultural Revolution was a nationwide political movement. To the extent it shaped the economic trajectory of the country as a whole, we are unable to capture it in the analysis, which exploits sub-national variation in revolutionary intensity. Second, this paper focuses on the rural areas,

and therefore the findings may not generalize to the urban centers. Third, the estimated impacts should not be interpreted as coming from violence alone, as other aspects of the revolution (such as propaganda, education and economic policies) may well be correlated with our violence measures. Instead, they ought to be considered as effects of the revolution as a whole.

Going forward, more work is needed to understand the reasons behind why some of the economic consequences documented here are more persistent than others, and how the urban experience differs from that of the rural areas. Given the different nature of conflict in urban locations, where the revolution almost turned into civil war, such a comparison may shed further light on the relevant channels at work.

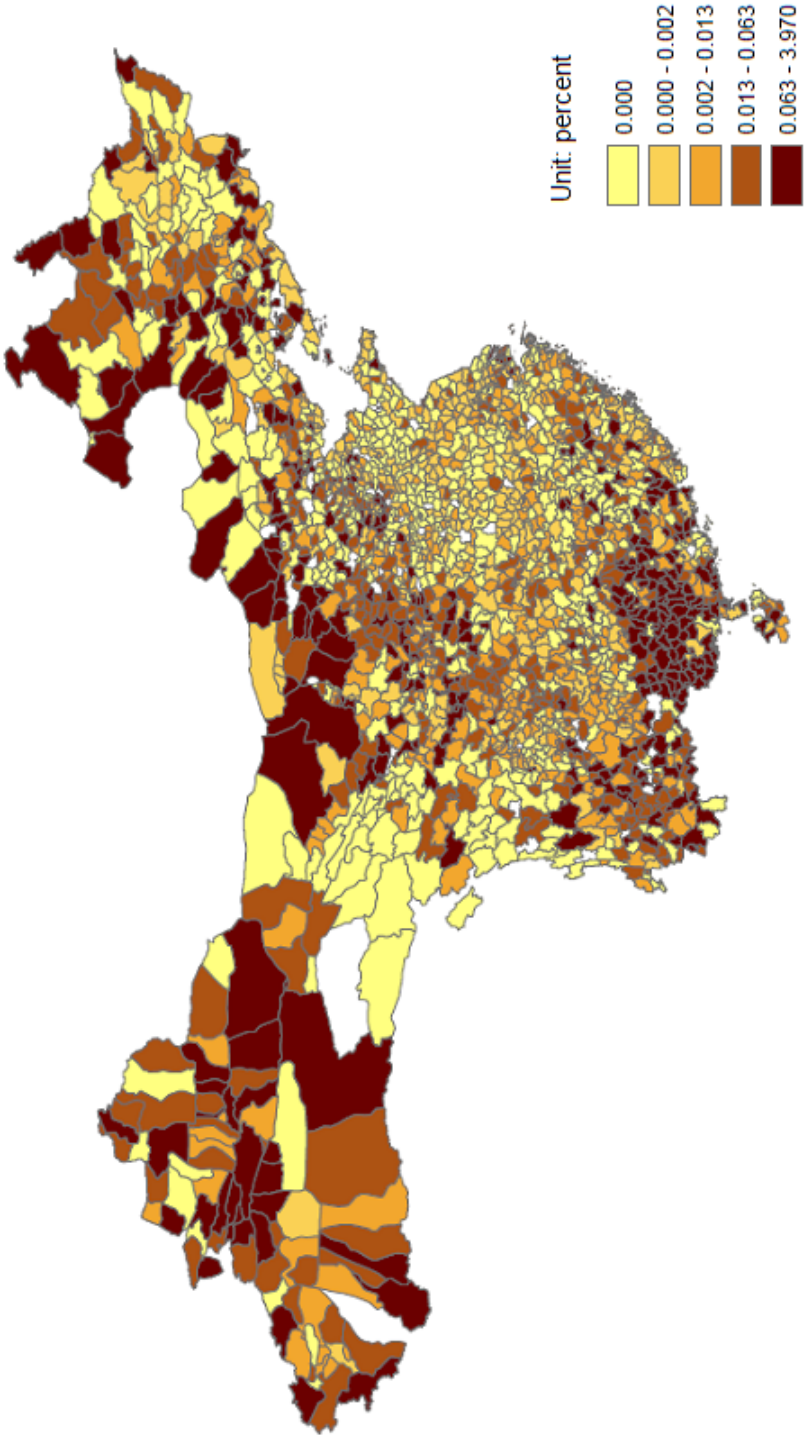

Figure 2.1: Fraction of Population Killed During the Cultural Revolution (quintiles)

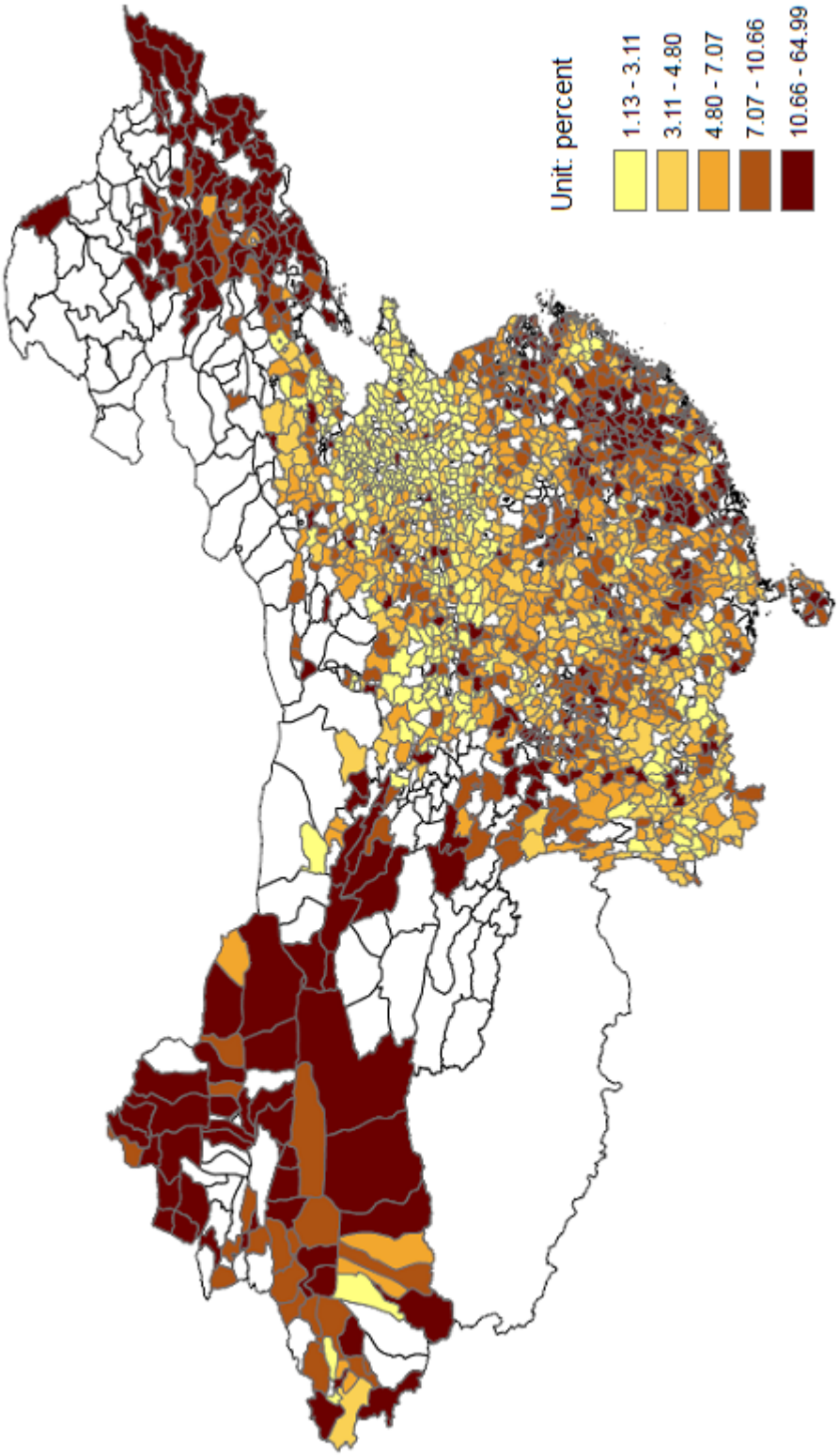

Figure 2.2: Rural Industrialization in 1964 (quintiles)

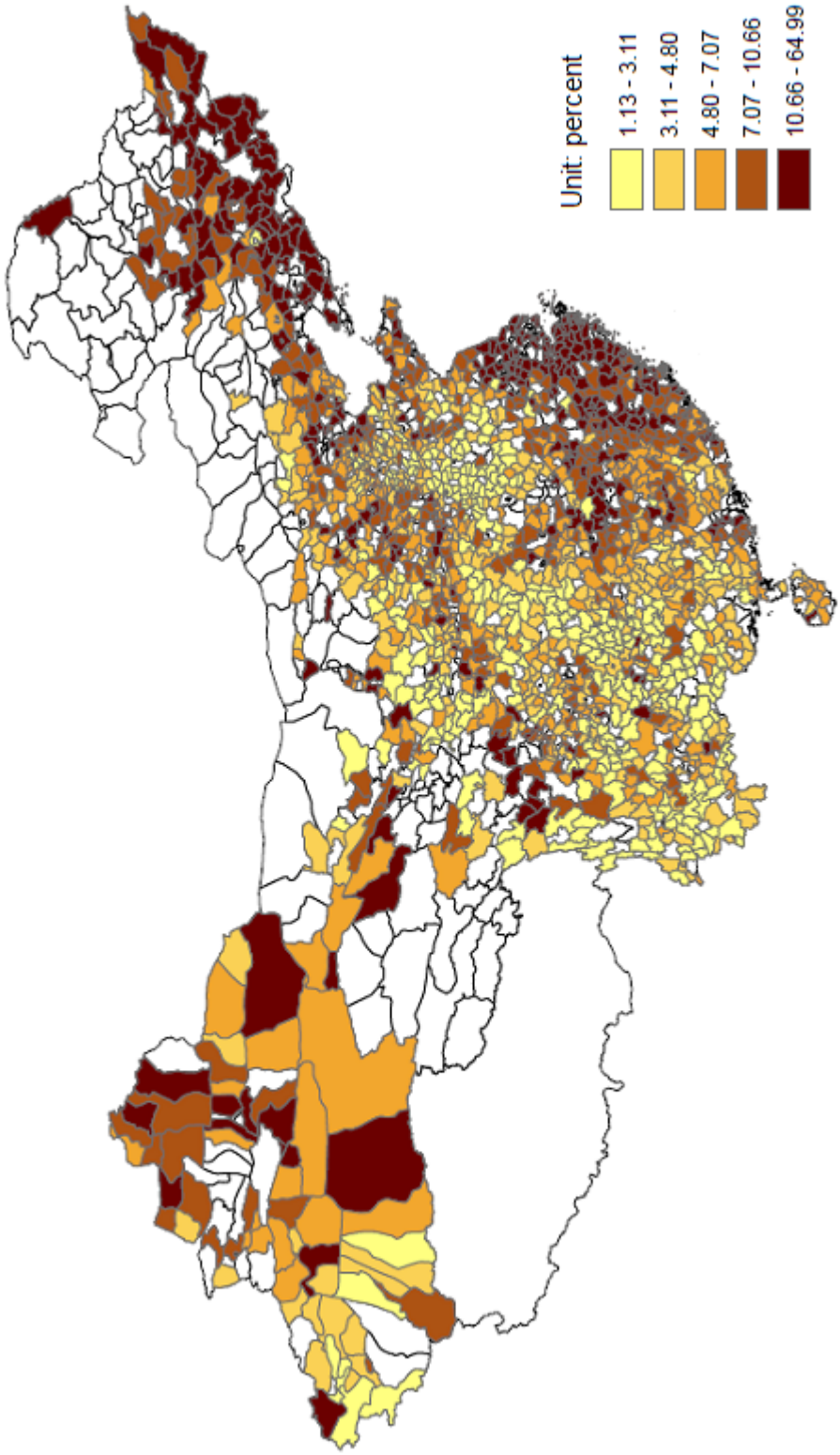

Figure 2.3: Rural Industrialization in 1982 (quintiles)

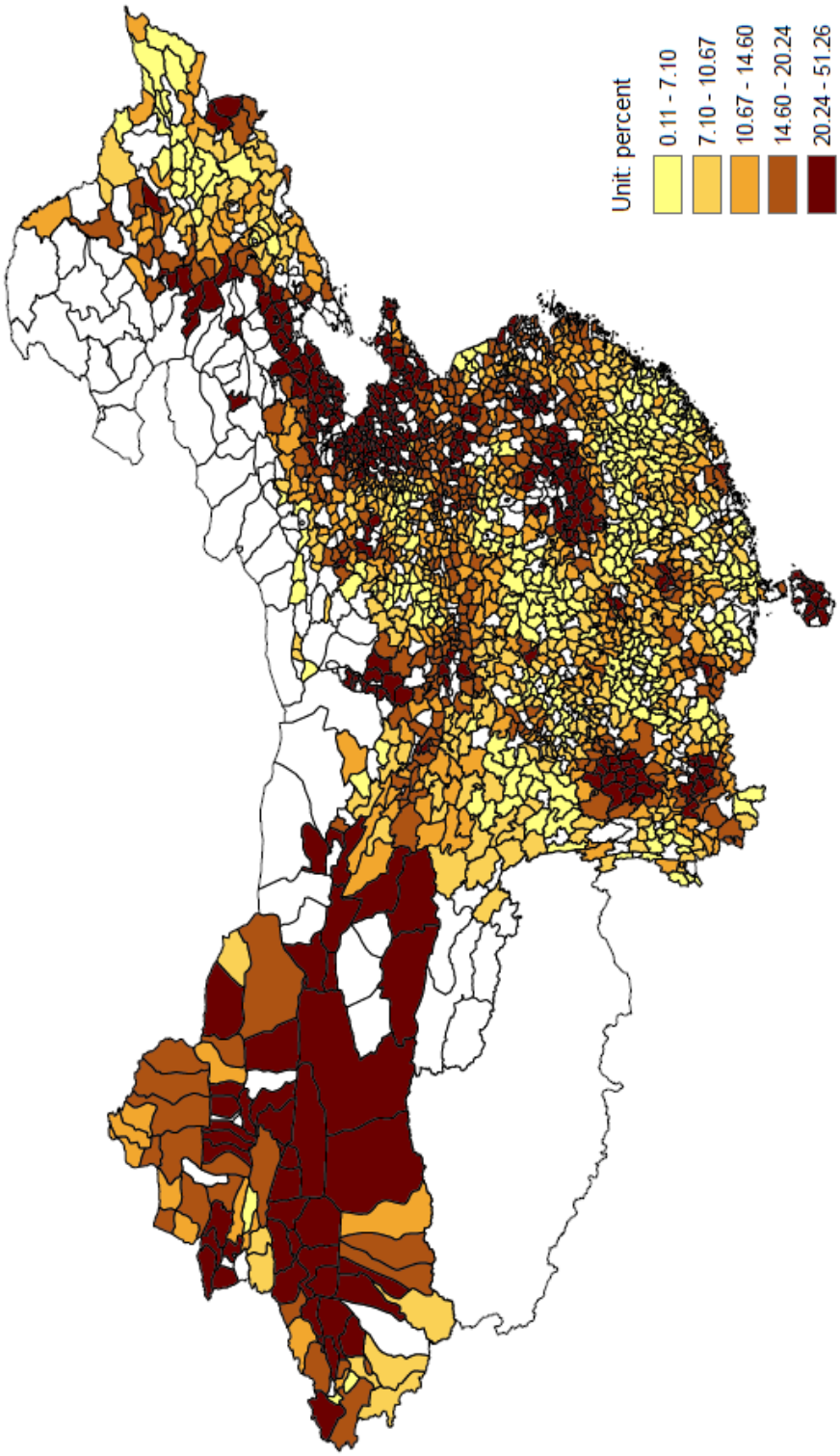

Figure 2.4: Absolute rainfall deviation in 1968/9 from 1950-2010 average (quintiles)

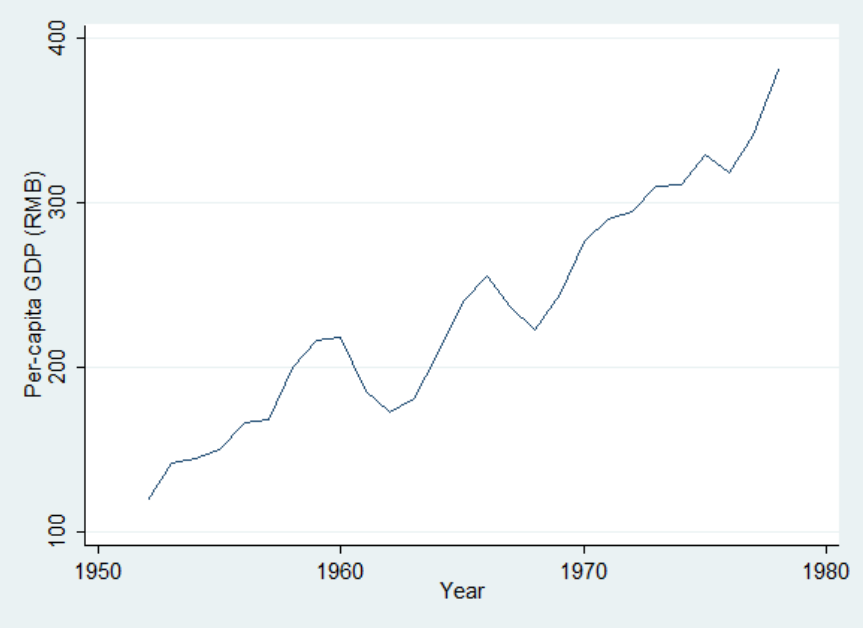

Figure 2.5: Per-capita GDP, 1952 - 1978

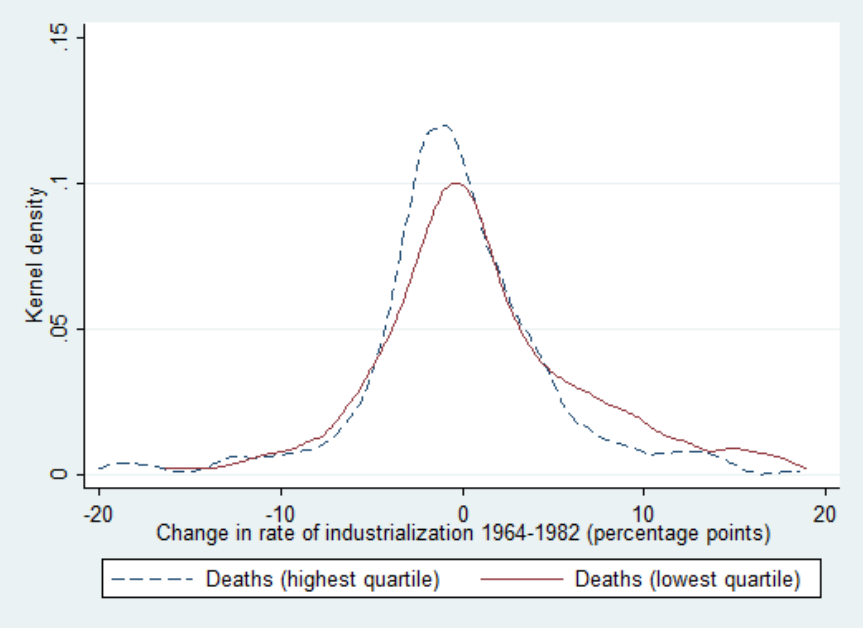

Figure 2.6: Kernel Density Plots of Industrialization by Revolutionary Intensity

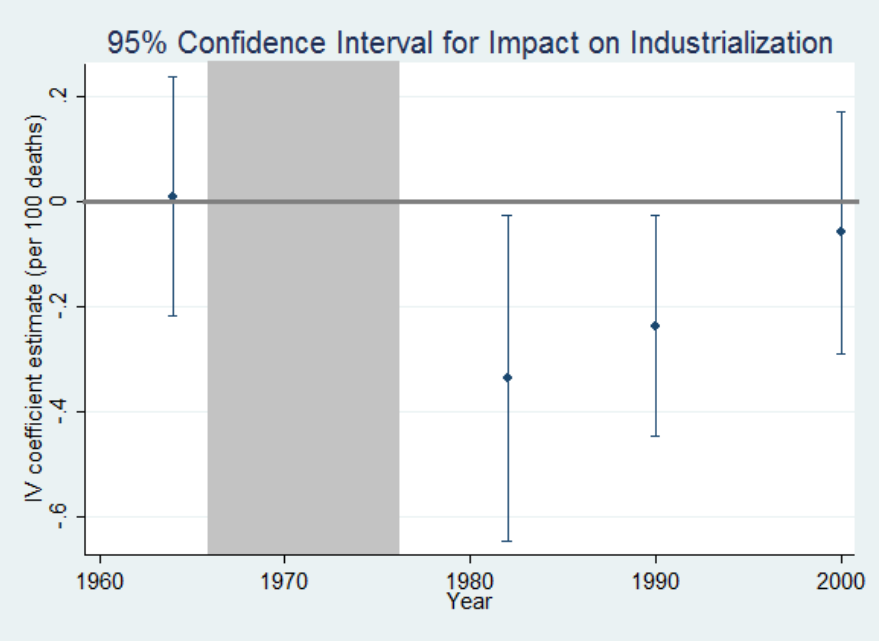

Figure 2.7: IV Estimates of Revolutionary Intensity on Industrialization over time

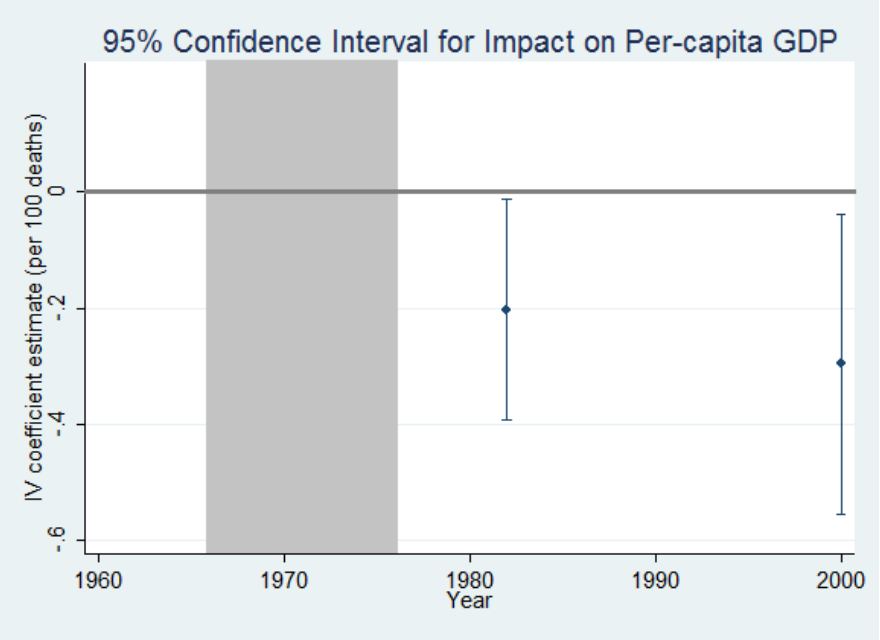

Figure 2.8: IV Estimates of Revolutionary Intensity on Per-capita GDP over time

Table 2.1: Summary Statistics

Variable Name	Mean	Std. Dev.	Min.	Max.	N
Panel A: Cultural Revolution Variables					
Number of deaths (1000 persons)	0.086	0.276	0	4.519	1692
Number of victims (1000 persons)	4.86	11.8	0	262.7	1692
Number of deaths in neighboring counties (1000 persons)	0.917	2.307	0	20.43	1692
Panel B: Baseline Economic Outcomes					
Total population in 1964 (1000 persons)	285.4	207.2	3.05	1186.9	1692
Fraction of non-agricultural population in 1964 (percent)	8.16	7.74	1.13	79.79	1692
Panel C: County Characteristics					
Ethnolinguistic fractionalization	0.136	0.211	0	0.812	1686
Male/female ratio among 15-24 year-olds in 1970	1.087	0.077	0.876	1.464	1687
Area size (10000 sq. km)	0.356	0.897	0.004	23.435	1686
Average yearly rainfall 1950-2010 (mm)	947.2	471.7	26.7	2513	1692
Average monthly temperature 1950-2010 (degrees)	12.83	5.67	-6.10	25.29	1692
Panel D: Post-Revolution Economic Outcomes					
Per capita GDP in 1982 (1000 RMB)	0.453	0.271	0.07	3.517	1686
Per capita GDP in 2000 (1000 RMB)	4.981	3.947	0.667	34.782	1692
Fraction of non-agricultural population in 1982 (percent)	8.84	7.84	0.4	64.8	1686
Fraction of non-agricultural population in 1990 (percent)	19.67	12.45	2.89	86.05	1687
Fraction of non-agricultural population in 2000 (percent)	26.76	13.26	0	100	1506
Fraction of population with college education in 1982 (percent)	0.197	0.164	0.03	3.32	1686
Fraction of population with college education in 1990 (percent)	0.512	0.445	0.04	9.44	1687
Share of immigrants in population in 1990 (percent)	1.99	2.26	0	31.63	1687
Timing of agricultural reform	1980.5	1.08	1977.3	1984	1033

Table 2.2: Climate Shocks and Cultural Revolution Violence (First Stage)

		OLS	
Dep Var: Number of Deaths (persons)	(1)	(2)	(3)
Absolute rainfall deviation in 1968 and 1969 from LR average	-2.482***	-1.998***	-2.122***
	(0.654)	(0.721)	(0.777)
Ethnolinguistic Fractionalization		-77.093**	-72.136*
		(37.050)	(37.086)
Area size in 1982 (10000 sq. km)		5.662	5.904
		(3.803)	(3.906)
Male/Female Ratio Among 15-24 year-olds in 1970		144.154**	145.942**
		(68.307)	(68.885)
Total Population in 1964 (10000 persons)		1.078***	1.112***
		(0.334)	(0.340)
Fraction of non-agr population in 1964 (percent)		-0.471	-0.447
		(0.549)	(0.554)
Average yearly rainfall 1950-2010 (mm)		0.073	0.084
		(0.048)	(0.052)
Average monthly temperature 1950-2010 (degrees)		1.723	1.538
		(1.660)	(1.647)
Absolute deviation of rainfall in 1965			0.343
			(0.394)
Absolute deviation of rainfall in 1964			0.476
			(0.406)
N	1692	1680	1680
Adj. R^2	0.01	0.33	0.33
F-Stat	14.40	3.76	3.25
Mean of Dep. Var.	86.08	86.08	86.08
Province FE	No	Yes	Yes

Robust standard errors are in parentheses. */**/*** denotes significance at the 10% / 5% / 1% levels. The dependent variable, number of deaths, is the reported number of fatalities for a given county during the Cultural Revolution. Rainfall deviations are computed using the 1950-2010 average for a given county. The years 1968 and 1969 are used due to the timing of violence in rural areas. Gender ratio among 15-24 year-olds in 1970 is used to proxy for the intensity of "Red Guard" activities. Ethnolinguistic fractionalization is measured using the standard ELF index, where a higher number corresponds to greater ethnic diversity.

Table 2.3: Exogeneity - Balance Checks

	(1)	(2)	(3)	(4)	(5)
Dep Var:	Population in 1964	Industrialization in 1964	Gender Ratio in 1970	Area size	Ethnolinguistic fractionalization
Absolute rainfall deviation in 1968 and 1969 from LR average	-0.064	0.012	-0.000	0.005	0.001
	(0.049)	(0.024)	(0.000)	(0.004)	(0.001)
N	1692	1692	1687	1686	1686
Adj. R^2	0.36	0.36	0.19	0.22	0.50
Mean of Dep Var.	28.54	8.16	1.09	0.36	0.14
Province FE	Yes	Yes	Yes	Yes	Yes

This table reports OLS regressions of all available non-climatic county characteristics on the instrument, controlling for province fixed effects. Rainfall deviations are computed using the 1950-2010 average for a given county. The years 1968 and 1969 are used due to the timing of violence in rural areas. Industrialization is measured using the fraction of non-agricultural workers in the labor force. Gender ratio in 1970 is the ratio of male to female persons aged 15-24 in 1970. This proxies for the intensity of "Red Guard" activities. Ethnolinguistic fractionalization is measured using the standard ELF index, where a higher number corresponds to greater ethnic diversity. Robust standard errors are in parentheses. */**/*** denotes significance at the 10% / 5% / 1% levels.

Table 2.4: Revolutionary Intensity and Industrialization

		1964			1982	
	OLS	OLS	IV	OLS	OLS	IV
Dep Var: Fraction of non-agricultural workers	(1)	(2)	(3)	(4)	(5)	(6)
Number of deaths (100 persons)	-0.089**	-0.014	0.082	-0.206***	-0.044	-2.973**
	(0.037)	(0.043)	(0.946)	(0.045)	(0.054)	(1.396)
Number of deaths in neighboring counties (100 persons)		-0.008			-0.001	
		(0.008)			(0.008)	
Total Population in 1964 (10000 persons)		-0.048***	-0.049***		0.029***	0.062***
		(0.008)	(0.013)		(0.010)	(0.017)
Male/Female Ratio Among 15-24 year-olds in 1970		-1.592	-1.695		-4.577**	-0.388
		(2.405)	(2.890)		(1.923)	(3.012)
Area size in 1982 (10000 sq. km)		1.402**	1.397**		-0.294	-0.159
		(0.629)	(0.636)		(0.212)	(0.246)
Ethnolinguistic Fractionalization		4.155***	4.270***		-0.223	-2.694
		(1.144)	(1.451)		(0.743)	(1.884)
Average yearly rainfall 1950-2010 (mm)		-0.000	-0.000		0.002***	0.005**
		(0.001)	(0.001)		(0.001)	(0.002)
Average monthly temperature 1950-2010 (degrees)		-0.070	-0.072		-0.103**	-0.089
		(0.071)	(0.073)		(0.050)	(0.067)
Fraction of non-agr population in 1964 (percent)					0.530***	0.516***
					(0.057)	(0.057)
N	1692	1680	1680	1686	1680	1680
Adj. R^2	0.00	0.41	0.41	0.00	0.56	-0.15
Mean of Dep Var.	8.16	8.16	8.16	8.84	8.84	8.84
Province FE	No	Yes	Yes	No	Yes	Yes

Robust standard errors are in parentheses. */**/*** denotes significance at the 10% / 5% / 1% levels. Number of deaths is the reported number of fatalities for a given county during the Cultural Revolution. In columns 3 and 6, this is instrumented using average rainfall deviation in 1968 and 1969 from a given county's 1950-2010 average. The years 1968 and 1969 are used due to the timing of violence in rural areas. Neighboring counties are defined as those from the same prefecture of a given county. Gender ratio among 15-24 year-olds in 1970 is used to proxy for the intensity of "Red Guard" activities. Ethnolinguistic fractionalization is measured using the standard ELF index, where a higher number corresponds to greater ethnic diversity. The 1964 outcome is included as a placebo test.

Table 2.5: Revolutionary Intensity and Industrialization

		1990			2000	
	OLS	OLS	IV	OLS	OLS	IV
Dep Var: Fraction of non-agricultural workers	(1)	(2)	(3)	(4)	(5)	(6)
Number of deaths (100 persons)	-0.355***	-0.079	-4.654**	0.218**	0.080	-1.566
	(0.070)	(0.066)	(2.106)	(0.098)	(0.155)	(3.159)
Number of deaths in neighboring counties (100 persons)		-0.006			-0.041	
		(0.011)			(0.029)	
Total Population in 1964 (10000 persons)		-0.013	0.039		0.147***	0.159***
		(0.014)	(0.027)		(0.017)	(0.028)
Fraction of non-agr population in 1964 (percent)		0.856***	0.835***		0.178***	0.166***
		(0.060)	(0.062)		(0.039)	(0.047)
Male/Female Ratio Among 15-24 year-olds in 1970		-2.601	3.962		-11.047***	-9.361*
		(3.144)	(4.731)		(3.446)	(4.904)
Area size in 1982 (10000 sq. km)		0.668***	0.877**		-0.522	-0.446
		(0.257)	(0.347)		(0.323)	(0.321)
Ethnolinguistic Fractionalization		0.178	-3.664		-7.826***	-8.595***
		(1.126)	(2.895)		(1.623)	(2.284)
Average yearly rainfall 1950-2010 (mm)		0.002**	0.006**		0.006***	0.006***
		(0.001)	(0.003)		(0.001)	(0.002)
Average monthly temperature 1950-2010 (degrees)		-0.169**	-0.148		0.491***	0.509***
		(0.070)	(0.090)		(0.081)	(0.101)
N	1687	1680	1680	1506	1495	1495
Adj. R^2	0.01	0.63	-0.05	0.00	0.53	0.47
Mean of Dep Var.	19.67	19.67	19.67	26.76	26.76	26.76
Province FE	No	Yes	Yes	No	Yes	Yes

Robust standard errors are in parentheses. */**/*** denotes significance at the 10% / 5% / 1% levels. Number of deaths is the reported number of fatalities for a given county during the Cultural Revolution. In columns 3 and 6, this is instrumented using average rainfall deviation in 1968 and 1969 from a given county's 1950-2010 average. The years 1968 and 1969 are used due to the timing of violence in rural areas. Neighboring counties are defined as those from the same prefecture of a given county. Gender ratio among 15-24 year-olds in 1970 is used to proxy for the intensity of "Red Guard" activities. Ethnolinguistic fractionalization is measured using the standard ELF index, where a higher number corresponds to greater ethnic diversity.

Table 2.6: Revolutionary Intensity and Per-capita Output

		1982			2000	
	OLS	OLS	IV	OLS	OLS	IV
Dep Var: Log(GDP/capita)	(1)	(2)	(3)	(4)	(5)	(6)
Number of deaths (100 persons)	-0.010***	0.002	-0.203**	-0.009**	-0.005	-0.297**
	(0.003)	(0.003)	(0.097)	(0.004)	(0.006)	(0.132)
Number of deaths in neighboring counties (100 persons)		-0.001**			-0.001	
		(0.001)			(0.001)	
Total Population in 1964 (10000 persons)		-0.000	0.002*		0.001	0.004***
		(0.001)	(0.001)		(0.001)	(0.002)
Fraction of non-agr population in 1964 (percent)		0.022***	0.021***		0.028***	0.027***
		(0.003)	(0.003)		(0.003)	(0.003)
Male/Female Ratio Among 15-24 year-olds in 1970		-0.584***	-0.285		-0.844***	-0.424
		(0.144)	(0.213)		(0.195)	(0.296)
Area size in 1982 (10000 sq. km)		0.009	0.018		0.011	0.024
		(0.022)	(0.023)		(0.018)	(0.020)
Ethnolinguistic Fractionalization		-0.259***	-0.427***		-0.239***	-0.484***
		(0.065)	(0.137)		(0.083)	(0.186)
Average yearly rainfall 1950-2010 (mm)		0.000	0.000		0.000	0.000
		(0.000)	(0.000)		(0.000)	(0.000)
Average monthly temperature 1950-2010 (degrees)		-0.004	-0.003		0.016***	0.017***
		(0.004)	(0.005)		(0.005)	(0.006)
N	1686	1680	1680	1692	1680	1680
Adj. R^2	0.00	0.41	-0.52	0.00	0.48	-0.55
Mean of Dep Var.	-0.91	-0.91	-0.91	1.38	1.38	1.38
Province FE	No	Yes	Yes	No	Yes	Yes

Robust standard errors are in parentheses. */**/*** denotes significance at the 10% / 5% / 1% levels. Number of deaths is the reported number of fatalities for a given county during the Cultural Revolution. In columns 3 and 6, this is instrumented using average rainfall deviation in 1968 and 1969 from a given county's 1950-2010 average. The years 1968 and 1969 are used due to the timing of violence in rural areas. Neighboring counties are defined as those from the same prefecture of a given county. Gender ratio among 15-24 year-olds in 1970 is used to proxy for the intensity of "Red Guard" activities. Ethnolinguistic fractionalization is measured using the standard ELF index, where a higher number corresponds to greater ethnic diversity.

Table 2.7: Revolutionary Intensity and Education

		1982			1990	
	OLS	OLS	IV	OLS	OLS	IV
Dep Var: Share of population w/ college education	(1)	(2)	(3)	(4)	(5)	(6)
Number of deaths (100 persons)	-0.002***	0.000	-0.044	-0.007***	0.001	-0.071
	(0.001)	(0.001)	(0.027)	(0.002)	(0.003)	(0.065)
Number of deaths in neighboring counties (100 persons)		-0.000			-0.000	
		(0.000)			(0.000)	
Total Population in 1964 (10000 persons)		-0.001***	-0.001**		-0.002***	-0.002**
		(0.000)	(0.000)		(0.000)	(0.001)
Fraction of non-agr population in 1964 (percent)		0.009***	0.009***		0.029***	0.029***
		(0.001)	(0.001)		(0.004)	(0.004)
Male/Female Ratio Among 15-24 year-olds in 1970		-0.006	0.058		-0.046	0.058
		(0.044)	(0.059)		(0.118)	(0.139)
Area size in 1982 (10000 sq. km)		0.007	0.009		-0.002	0.001
		(0.009)	(0.010)		(0.017)	(0.018)
Ethnolinguistic Fractionalization		0.073**	0.035		0.216**	0.155
		(0.031)	(0.047)		(0.086)	(0.121)
Average yearly rainfall 1950-2010 (mm)		0.000	0.000		0.000	0.000
		(0.000)	(0.000)		(0.000)	(0.000)
Average monthly temperature 1950-2010 (degrees)		-0.002	-0.001		0.004	0.004
		(0.001)	(0.001)		(0.003)	(0.004)
N	1686	1680	1680	1687	1680	1680
Adj. R^2	0.00	0.30	-0.08	0.00	0.36	0.23
Mean of Dep Var.	0.20	0.20	0.20	0.51	0.51	0.51
Province FE	No	Yes	Yes	No	Yes	Yes

Robust standard errors are in parentheses. */**/*** denotes significance at the 10% / 5% / 1% levels. Number of deaths is the reported number of fatalities for a given county during the Cultural Revolution. In columns 3 and 6, this is instrumented using average rainfall deviation in 1968 and 1969 from a given county's 1950-2010 average. The years 1968 and 1969 are used due to the timing of violence in rural areas. Neighboring counties are defined as those from the same prefecture of a given county. Gender ratio among 15-24 year-olds in 1970 is used to proxy for the intensity of "Red Guard" activities. Ethnolinguistic fractionalization is measured using the standard ELF index, where a higher number corresponds to greater ethnic diversity.

Table 2.8: Revolutionary Intensity and Migration in 1990

	OLS		IV
Dep Var: Share of immigrants within local population (%)	(1)	(2)	(3)
Number of deaths (100 persons)	-0.042***	0.006	-0.899**
	(0.011)	(0.013)	(0.429)
Number of deaths in neighboring counties (100 persons)		-0.005*	
		(0.002)	
Total Population in 1964 (10000 persons)		-0.013***	-0.003
		(0.003)	(0.006)
Fraction of non-agr population in 1964 (percent)		0.161***	0.157***
		(0.017)	(0.018)
Male/Female Ratio Among 15-24 year-olds in 1970		2.935***	4.249***
		(0.845)	(1.070)
Area size in 1982 (10000 sq. km)		0.203	0.243
		(0.173)	(0.192)
Ethnolinguistic Fractionalization		1.084***	0.338
		(0.338)	(0.637)
Average yearly rainfall 1950-2010 (mm)		-0.000	0.000
		(0.000)	(0.001)
Average monthly temperature 1950-2010 (degrees)		0.034*	0.037*
		(0.019)	(0.022)
N	1687	1680	1680
Adj. R^2	0.00	0.43	-0.37
Mean of Dep Var.	1.99	1.99	1.99
Province FE	No	Yes	Yes

Robust standard errors are in parentheses. */**/*** denotes significance at the 10% / 5% / 1% levels. Columns 1 and 2 are OLS regressions, while column 3 is a 2SLS specification. Number of deaths is the reported number of fatalities for a given county during the Cultural Revolution. In column 3, this is instrumented using average rainfall deviation in 1968 and 1969 from a given county's 1950-2010 average. The years 1968 and 1969 are used due to the timing of violence in rural areas. Neighboring counties are defined as those from the same prefecture of a given county. Gender ratio among 15-24 year-olds in 1970 is used to proxy for the intensity of "Red Guard" activities. Ethnolinguistic fractionalization is measured using the standard ELF index, where a higher number corresponds to greater ethnic diversity.

Table 2.9: Revolutionary Intensity and Economic Liberalization

	OLS		IV
Dep Var: Timing of agricultural reform	(1)	(2)	(3)
Number of deaths (100 persons)	-0.008	-0.004	0.412
	(0.007)	(0.012)	(0.440)
Number of deaths in neighboring counties (100 persons)		-0.002	
		(0.002)	
Total Population in 1964 (10000 persons)		-0.000	-0.005
		(0.002)	(0.006)
Fraction of non-agr population in 1964 (percent)		0.004	0.010
		(0.006)	(0.009)
Male/Female Ratio Among 15-24 year-olds in 1970		-0.952**	-1.410*
		(0.464)	(0.794)
Area size in 1982 (10000 sq. km)		0.083**	0.064*
		(0.035)	(0.037)
Ethnolinguistic Fractionalization		0.170	0.319
		(0.221)	(0.384)
Average yearly rainfall 1950-2010 (mm)		-0.000	-0.000
		(0.000)	(0.001)
Average monthly temperature 1950-2010 (degrees)		-0.012	-0.016
		(0.012)	(0.014)
N	1033	1031	1031
Adj. R^2	-0.00	0.24	-0.72
Mean of Dep Var.	1980.53	1980.53	1980.53
Province FE	No	Yes	Yes

Robust standard errors are in parentheses. */**/*** denotes significance at the 10% / 5% / 1% levels. The dependent variable is the timing of introduction of the "household responsibility" system, which made agricultural households the residual claimants of their output, and enabled the return of rural markets. Columns 1 and 2 are OLS regressions, while column 3 is a 2SLS specification. Number of deaths is the reported number of fatalities for a given county during the Cultural Revolution. In column 3, this is instrumented using average rainfall deviation in 1968 and 1969 from a given county's 1950-2010 average. The years 1968 and 1969 are used due to the timing of violence in rural areas. Neighboring counties are defined as those from the same prefecture of a given county. Gender ratio among 15-24 year-olds in 1970 is used to proxy for the intensity of "Red Guard" activities. Ethnolinguistic fractionalization is measured using the standard ELF index, where a higher number corresponds to greater ethnic diversity.

Table 2.10: Revolutionary Intensity and Mutual Lending in 2002

		OLS	
Dep Var: Mutual Lending	(1)	(2)	(3)
Number of deaths (1000 persons)	-0.797***	-0.718***	-0.698***
	(0.268)	(0.220)	(0.236)
N	5760	5703	5673
Household controls	No	Yes	Yes
Village controls	No	No	Yes
Mean of Dep Var.	2.76	2.76	2.76
R^2	0.012	0.027	0.032

Survey Question: On a scale of 1 to 5 (with 5 being very frequently, and 1 being rarely or never), how often do you and your neighbors lend money to each other? Data comes from the rural sample of the 2002 wave of the China Household Income Project. Number of deaths is the reported number of fatalities for a given county during the Cultural Revolution. Standard errors clustered at the county level are in parentheses. */**/*** denotes significance at the 10% / 5% / 1% levels.

Table 2.11: Data Description

Variable Name	Description	Source(s)
Number of deaths	The total number of reported fatalities during the Cultural Revolution	Regional gazetteers
Number of victims	The total number of reported victims during the Cultural Revolution	Regional gazetteers
Number of deaths in neighboring counties	The total number of reported fatalities during the Cultural Revolution in nearby counties within the same prefecture	Regional gazetteers
Total population in 1964	Population size of a given county in 1964	Population census; Regional gazetteers
Industrialization in 1964	Fraction of non-agricultural population in 1964	Population census; Regional gazetteers
Ethnolinguistic fractionalization	Consider a society composed of $K \geq 2$ different ethnic groups and let p_k indicate the share of group k in the total population. The ELF index is given by $1 - \sum_{k=1}^{K} p_k^2$.	Population census
Gender ratio	Male/Female ratio among 15-24 year-olds in 1970	Population census
Area size	Geographic size of a given county	National Bureau of Statistics
Average rainfall	1950-2010 average rainfall for a given county, computed using ArcGIS	Matsuura and Willmot
Average temperature	1950-2010 average temperature for a given county, computed using ArcGIS	Matsuura and Willmot
GDP	Gross Domestic Product of a given county	National Bureau of Statistics
Immigration	Share of local population that was born outside of a given county	Population census
Timing of policy reform	Timing of implementation of the "household responsibility" system in a given county	Regional gazetteers
Mutual lending	Survey Question: On a scale of 1 to 5 (with 5 being very frequently, and 1 being rarely or never), how often do you and your neighbors lend money to each other?	China Household Income Project 2002

Table 2.13: Exclusion Restriction - Placebo Tests

	OLS				
Dep Var:	GDP.1982	GDP.2000	IND.1982	IND.1990	IMMI.1990
Absolute rainfall deviation in 1968 and 1969 from LR average	0.004***	0.005***	0.039**	0.063**	0.018***
	(0.001)	(0.002)	(0.020)	(0.027)	(0.006)
Absolute deviation of rainfall in 1963	-0.000	-0.000	-0.018*	-0.052***	-0.004
	(0.001)	(0.001)	(0.010)	(0.015)	(0.003)
Absolute deviation of rainfall in 1964	0.001	0.003***	0.048***	0.016	-0.003
	(0.001)	(0.001)	(0.015)	(0.018)	(0.004)
Absolute deviation of rainfall in 1965	0.001	0.002	-0.003	0.009	0.005
	(0.001)	(0.001)	(0.014)	(0.020)	(0.005)
Absolute deviation of rainfall in 1972	-0.002	-0.002	-0.023	0.010	-0.005
	(0.001)	(0.002)	(0.015)	(0.025)	(0.005)
Absolute deviation of rainfall in 1973	-0.001	-0.001	0.019	0.045*	0.008
	(0.001)	(0.002)	(0.015)	(0.025)	(0.006)
Absolute deviation of rainfall in 1974	-0.000	0.003*	-0.027*	-0.011	0.009
	(0.001)	(0.002)	(0.015)	(0.024)	(0.006)
N	1680	1680	1680	1680	1680
Adj. R^2	0.42	0.49	0.57	0.64	0.43
Mean of Dep Var.	-0.91	1.38	8.84	19.67	1.99
Province FE	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes	Yes

This table reports reduced-form estimates for the outcomes that were significant in the baseline sample. Additional controls include population size in 1964, degree of industrialization in 1964, male/female gender ratio among 15-24 year-olds in 1970, area size, ethnic minority county indicator, and long-run climate variables. Rainfall deviations for each of three years before and after the active phase of the Cultural Revolution, 1966-1971, are included as placebo tests. Robust standard errors are in parentheses. */**/*** denotes significance at the 10% / 5% / 1% levels.

Table 2.14: Reporting Bias - Excluding Counties with Zero Reported Deaths

	IV				
Dep Var:	GDP.1982	GDP.2000	IND.1982	IND.1990	IMMI.1990
Number of deaths (100 persons)	-0.167*	-0.264*	-2.295*	-3.286*	-0.533
	(0.097)	(0.141)	(1.385)	(1.963)	(0.366)
Total Population in 1964 (10000 persons)	0.003**	0.005**	0.071***	0.050	-0.003
	(0.002)	(0.002)	(0.022)	(0.031)	(0.006)
Fraction of non-agr population in 1964 (percent)	0.026***	0.027***	0.519***	0.886***	0.153***
	(0.004)	(0.004)	(0.052)	(0.080)	(0.019)
Male/Female Ratio Among 15-24 year-olds in 1970	-0.367	-0.547	-0.832	2.127	3.726***
	(0.252)	(0.357)	(3.351)	(5.119)	(1.175)
Area size in 1982 (10000 sq. km)	0.022*	0.021	-0.222	0.541*	-0.011
	(0.012)	(0.023)	(0.235)	(0.296)	(0.073)
Ethnolinguistic Fractionalization	-0.391***	-0.547**	-2.514	-2.918	0.568
	(0.147)	(0.219)	(1.964)	(2.890)	(0.569)
Average yearly rainfall 1950-2010 (mm)	0.000	0.000	0.007**	0.008**	0.000
	(0.000)	(0.000)	(0.003)	(0.004)	(0.001)
Average monthly temperature 1950-2010 (degrees)	-0.002	0.015**	-0.051	-0.181*	0.022
	(0.005)	(0.007)	(0.076)	(0.103)	(0.022)
N	1180	1180	1180	1180	1180
Adj. R^2	-0.42	-0.64	-0.05	0.16	-0.09
Mean of Dep Var.	-0.93	1.37	8.44	19.28	1.93
Province FE	Yes	Yes	Yes	Yes	Yes
First-stage F-stat	5.27	5.27	5.27	5.27	5.27

This table reports IV estimates when the sample is restricted to counties with non-zero reported fatalities. Number of deaths is the reported number of fatalities for a given county during the Cultural Revolution. This is instrumented using average rainfall deviation in 1968 and 1969 from a given county's 1950-2010 average. The years 1968 and 1969 are used due to the timing of violence in rural areas. Gender ratio among 15-24 year-olds in 1970 is used to proxy for the intensity of "Red Guard" activities. Ethnolinguistic fractionalization is measured using the standard ELF index, where a higher number corresponds to greater ethnic diversity. Robust standard errors are in parentheses. */**/*** denotes significance at the 10% / 5% / 1% levels.

Table 2.15: Reporting Bias - Provinces with Detailed Histories

	IV				
Dep Var:	GDP.1982	GDP.2000	IND.1982	IND.1990	IMMI.1990
Number of deaths (100 persons)	-0.154	-0.324*	-1.455	-2.680	-0.840*
	(0.095)	(0.167)	(1.108)	(1.811)	(0.473)
Total Population in 1964 (10000 persons)	0.002	0.006**	0.048***	0.014	-0.004
	(0.001)	(0.002)	(0.018)	(0.028)	(0.007)
Fraction of non-agr population in 1964 (percent)	0.024***	0.027***	0.583***	0.845***	0.143***
	(0.003)	(0.004)	(0.045)	(0.063)	(0.018)
Male/Female Ratio Among 15-24 year-olds in 1970	-0.397*	-0.362	-2.883	-1.511	3.272**
	(0.236)	(0.393)	(2.761)	(4.726)	(1.280)
Area size in 1982 (10000 sq. km)	0.032**	0.035	-0.311	0.670**	0.057
	(0.014)	(0.025)	(0.213)	(0.294)	(0.088)
Ethnolinguistic Fractionalization	-0.385***	-0.511**	-1.360	-0.709	0.447
	(0.137)	(0.243)	(1.475)	(2.463)	(0.699)
Average yearly rainfall 1950-2010 (mm)	0.000	0.000	0.002	0.005	0.001
	(0.000)	(0.000)	(0.002)	(0.003)	(0.001)
Average monthly temperature 1950-2010 (degrees)	0.000	0.018**	-0.066	-0.092	0.031
	(0.005)	(0.007)	(0.056)	(0.080)	(0.022)
N	1252	1252	1252	1252	1252
Adj. R^2	-0.24	-1.13	0.40	0.37	-0.63
Mean of Dep Var.	-0.97	1.35	8.29	18.63	2.01
Province FE	Yes	Yes	Yes	Yes	Yes
First-stage F-stat	5.09	5.09	5.09	5.09	5.09

This table reports IV estimates when the sample is restricted to provinces with relatively detailed historical accounts. Number of deaths is the reported number of fatalities for a given county during the Cultural Revolution. This is instrumented using average rainfall deviation in 1968 and 1969 from a given county's 1950-2010 average. The years 1968 and 1969 are used due to the timing of violence in rural areas. Gender ratio among 15-24 year-olds in 1970 is used to proxy for the intensity of "Red Guard" activities. Ethnolinguistic fractionalization is measured using the standard ELF index, where a higher number corresponds to greater ethnic diversity. Robust standard errors are in parentheses. */**/*** denotes significance at the 10% / 5% / 1% levels.

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Chapter 3

Self Control and Chronic Illness

3.1 Introduction

Preventive care is considered by many public health experts to be an essential means of improving population health outcomes, while potentially reducing overall health expenditure by preventing or attenuating serious (and expensive) health conditions. Yet inefficient utilization of preventive care is a stylized fact of health markets across a range of countries and contexts. In the US, scholars have identified the roles of consumer information, health externalities, insurance market failures and time preferences in causing an under-utilization of preventive care (Kenkel 2000). In developing countries, preventive care technologies such as vaccinations, anti-malarial bed nets, water purification, and the management of chronic conditions are often vastly underutilized (Dupas 2011).

Recent literature has identified the following three key reasons that consumers might underinvest in preventive care, even in the absence of market failures due to externalities and moral hazard: *(i) time inconsistency, also known as self-control problems or present bias; (ii) a high price elasticity of demand for preventive care, such that even moderate increases in price cause dramatic reductions in demand; and (iii) a lack of information or awareness on the part of consumers.*

This project[1] seeks to carefully identify the importance of these three mechanisms in the context of the rapid growth of hypertension in India. While our analysis focuses on the take up of commitment contracts for preventive care for hypertension, the insights have implications for preventive care utilization for other services as well , e.g., diabetes. To this end, we run a randomized control trial where treatment groups are offered different types of commitment contracts, relative to a control group that only pays for medical care in a typical, linear, fee-for-service manner. The randomized control trial, conducted on a population of approximately 2,000 households in rural Punjab, is also paired with detailed household field surveys and detailed administrative data on health care utilization for each household. The trial has six treatment arms, corresponding to (i) control, (ii) control group with discount

[1]This is joint work with Edward Miguel, Benjamin Handel and Gautam Rao.

coupons, (iii) fixed commitment contract offer, (iv) fixed commitment contract offer with discount, (v) flexible commitment contract (where the consumer chooses the commitment amount), and (vi) flexible commitment contract with discount. We study the implications of such contracts in the context of the rich demographic and health data that the field surveys and administrative data provide. The lessons we learn in this setting have policy relevance throughout the developing world, not least of all for rapidly growing countries such as India and China. But our findings also have implications in countries like the US, where diabetes and cardiovascular disease are major health challenges.

Our intervention was implemented in conjunction with our partner organization E-HealthPoint, which builds and operates community-scale clinics ("E-HealthPoints") and water treatment facilities ("Waterpoints") in rural Punjab. E-HealthPoint brings modern health care to patients through telemedical consultations with qualified doctors, diagnostic testing, and high-quality medicines via a licensed pharmacy. Our analysis focused on participation in preventive health care "camps" run weekly by E-HealthPoint. These camps were designed to focus on hypertension and give patients both preventive treatment, consultation about how to maintain low blood pressure, and, if necessary, hypertensive medications. The commitment contract interventions mentioned above had households pay money up front, and then receive money back for each regularly scheduled visit they successfully made to a health camp. The partnership between E-HealthPoint, a private organization, and our research team has been a very effective partnership for implementing cutting-edge research and economic methods with on-the-ground infrastructure.

This project is one of the first experimental evaluations of the optimal two-part commitment contract (with an upfront lump sum payment and low or negative per visit prices) derived by DellaVigna and Malmendier (2004) and previously only supported by correlational evidence. While other experimental research (such as Ashraf et al. 2006) has studied commitment devices using third-party verifiers of behavior in collaboration with financial institutions, none have studied the kinds of simple and self-enforcing contracts that provide incentives for sophisticated consumers to overcome their time inconsistency problem. Even amongst the few existing experimental studies of time inconsistency in the context of health behavior, little attention has been paid to interventions which might benefit unsophisticated (i.e., overconfident) time-inconsistent consumers. Since unsophisticated consumers are far more likely to procrastinate indefinitely on health investments, such an intervention has the potential for large effects on behavior and welfare. Informed by relevant theory (O'Donoghue and Rabin 1999), we design and evaluate such an intervention: time-limited discounts for the purchase of preventive care. Furthermore, our study is one of the first to rigorously estimate the demand for management and prevention of chronic disorders like hypertension in a developing country context. We go beyond merely estimating the demand for this type of prevention by studying the roles played by information and time preferences in the apparent under-investment in preventive care in developing countries.

Even at this preliminary stage, our results suggest that commitment contracts increase preventive health care utilization. Preliminary analysis shows take-up rates of approximately 14% for different forms of commitment contracts without a paired discount. With a paired

discount, 26% of respondents offered a fixed commitment contract (in which the terms are given to them) take up that contract, while 39% of respondents offered a flexible contract (in which they can set the commitment level) take up that contract. This suggests that discounts and flexibility of the commitment contract are important determinants of participation. Furthermore, and perhaps most importantly, entering into a commitment contract has a meaningful impact on visits to E-HealthPoint health camps. Overall, 28.9% of those who sign up for a commitment contract visit at least one E-HealthPoint health camp (to leverage that commitment) while only 8.9% of those from a control group not offered such a contract do. We provide detailed analysis on many dimensions with respect to commitment contract take up and subsequent health service utilization. Finally, we include a detailed theoretical economic model of commitment contract participation and health care utilization: this will be the basis for future research by the team for this randomized control trial. This future work will directly link theoretical models of commitment to the data we observe in our setting.

Section 2 discusses the setting and design of the study. Section 3 discusses the preliminary results. Section 4 summarizes a theoretical model of commitment contracts and consumer health care utilization. Section 5 concludes with some next steps.

3.2 Study Setting

Hypertension, otherwise known as high blood pressure, is one of the most prevalent chronic diseases across the globe. In 2008, approximately 40% of adults ages 25 and over have been diagnosed with hypertension worldwide, and the disease accounted for at least 45% of deaths due to heart disease (World Health Organization 2013). Growing concerns about the public health consequences of hypertension have taken center stage in global health policy as well. Indeed, the World Health Organization (WHO) declared "control your blood pressure" as the theme for World Health Day 2013, with the goal of focusing attention on prevention and control of hypertension.[2]

In low-income countries such as India, where the public health system is plagued by high absenteeism rates and low service quality (Banerjee and Duflo 2009), the disease burden from hypertension is particularly high. According to the Association of Physicians of India, the prevalence of hypertension in the last 6 decades has grown almost 13-fold nationally in urban areas and almost 8-fold in rural areas.[3] Nevertheless, most hypertensive patients in India go undiagnosed, and few are actually managing their disease. For instance, one study in urban India found that only one-third of the study population were aware of their high

[2]For more details about World Health Day 2013, see http://www.who.int/campaigns/world-health-day/2013/campaign_essentials/en/index.html.

[3]More information on the epidemiology of hypertension is India is available from the Journal of the Association of Physicians of India, February 2013, Volume 61, available online at http://www.japi.org/february_2013_special_issue_hypertension_guidelines/06_epidemiology_of_hypertension.pdf.

blood pressure, and of those who knew they were hypertensive, less than half kept their blood pressure under control (Mohan et al. 2007). Amidst this backdrop of low awareness and treatment of hypertension in India, we leverage recent insights from behavioral economics to examine the determinants of preventive health among hypertensive individuals in a rural setting.

Our study was carried out in 4 rural villages – Doda, Harikekalan, Mallan, and Rajiana – located in the state of Punjab in Northern India. The study was implemented in partnership with E-HealthPoint, an organization which delivers clean drinking water and primary medical care services to rural markets using community health clinics. In particular, E-HealthPoint conducts "Hypertension Days" wherein an experienced doctor from a nearby city visits each village every week to treat hypertension patients.[4] The consultation fee to see the doctor during "Hypertension Days" is Rs. 20 (excluding the cost of medicines, lab tests). During the patient's visit, the doctor takes health measurements (blood pressure, BMI, and waist circumference), provides the patient with information about hypertension, and prescribes an appropriate treatment plan. The doctor also encourages the patient to make dietary and lifestyle changes such as decreasing salt intake and maintaining a healthy weight.

Sample Selection

Since "Hypertension Days" are targeted towards patients with high blood pressure, our study sample consists of individuals above the age of 30 who have hypertension or are at high risk for hypertension. We follow widely accepted medical guidelines and define hypertensive patients as those with systolic blood pressure above 140 or diastolic blood pressure above 90.[5] To identify hypertensive individuals, a team of enumerators first screened all members of a particular household by measuring their blood pressure using an automatic blood pressure measurement device.[6] If the systolic or diastolic blood pressure reading is above the thresholds previously described, the enumerator immediately invites the individual to participate in the study and to complete the baseline survey. In the event that more than one household member has hypertension, the member with the highest stage of hypertension (stage 1 or stage 2), is selected to take part in the study. Furthermore, in the event that more than one household member has the same hypertension stage, the member with the highest systolic blood pressure reading is selected to take part in the study. Finally, high hypertension risk individuals were identified using a hypertension risk score algorithm based on age, gender, family history of hypertension, family history of diabetes, tobacco use, physical activity, and

[4]Note that all individuals, even those without hypertension, are able to see the doctor during "Hypertension Days." However, hypertension patients receive priority, given that the program was launched specifically to address high blood pressure.

[5]Both the Association of Physicians of India and the NIH define hypertension in this manner. For example, see http://www.nlm.nih.gov/medlineplus/ency/article/000468.htm.

[6]Enumerators were trained rigorously in operating the device. The survey team used the Citizen CH-452 model for measuring blood pressure. This model has been validated by the ESH protocol and was selected for the project in consultation with a medical doctor. See http://www.dableducational.org/sphygmomanometers/devices_2_sbpm.html#CitizenCH452.

waist circumference.[7] Across all 4 villages our sample, a total of 20,824 individuals from 4028 households were screened. From the screening, 2004 households with at least one hypertensive member and an additional 276 households with at least one high hypertension risk member were selected for the study, for 2280 total households. Of these 2280 households, 1720 agreed to participate. The main sample for this paper thus consists of these 1720 respondents who completed the baseline survey.

Experimental Design

During the same household visit in which the baseline survey is administered, the respondent was offered a commitment contract or price discount coupons to visit the weekly "Hypertension Day" in their village for 3 times in 6 months. The commitment contracts and coupons were designed to be valid for 3 visits in 6 months since the Indian Hypertension Guidelines recommend that hypertension patients visit the doctor at least every two months to manage their disease.[8] We randomized the type of contract offered to each household, stratified by hamlet and household head's education, by using a computer prior to the enumerator's visit.[9] Specifically, households were randomized into one of following 6 groups with equal probability:

Group 1: Fixed (standard) commitment contracts *without* discount. This group was offered a commitment contract for 3 visits to the "Hypertension Days" during a 6-month period. As part of the contract, the respondent was required to pay in advance for all 3 doctor visits (Rs. 60 or Rs. 20 per visit). The respondent was also asked to pay an additional commitment amount of Rs. 30, which she receives back in equal installments of Rs. 10 each time she visits the doctor. In other words, the respondent pays a total of Rs. 90 up front, and receives Rs. 10 on each of the 3 visits.

Group 2: Fixed (standard) commitment contracts *with* discount. This group was offered a commitment contract identical to that of Group 1, except that the respondent in this group received a 50% discount on the consultation fees for 3 visits, and in some instances, also paid a higher commitment amount of Rs. 45. Thus, the total upfront payment is Rs. 60, i.e., Rs. 30 for consultation fees plus Rs. 30 as the commitment amount, or Rs. 75, i.e., Rs. 30 for consultation fees plus Rs. 45 as the commitment amount.

Group 3: Flexible (self-designed) commitment contracts *without* discount. While the commitment amount is fixed at Rs. 30 or Rs. 45 in Groups 1 and 2, in Group 3, the

[7] This 100-point hypertension risk score algorithm is based on current literature and was developed in consultation with Dr. Sumeet Ahluwahlia and Dr. Hemant Madan.

[8] See http://www.apiindia.org/pdf/hsi_guidelines_ii/managehypert.pdf.

[9] Before commencing the study, we conducted a census in all 4 villages in our sample and collected data on household characteristics. We used this census data to randomize households with a Stata program.

respondent chooses the commitment amount beginning with Rs. 0.[10] As above, the respondent receives this committed amount back in 3 equal installments every time she visits the doctor. The respondent is also required to pay in advance for 3 visits to the "Hypertension Days," so the total upfront payment is Rs. 60 for consultation fees plus the respondent's selected commitment amount.

Group 4: Flexible (self-designed) commitment contracts *with* discount. This group was offered a commitment contract identical to that of Group 3, except that the respondents in this group received a 50% discount on the consultation fees for 3 visits. Hence, the total upfront payment is Rs. 30 for consultation fees plus the respondent's selected commitment amount.

Group 5: Discount coupons. Each respondent in this group received 3 discount coupons. Each coupon provided a 50% discount on the consultation fee. These discount coupons are valid for the same 6-month period as the commitment contracts in Groups 1 to 4.

Group 6: No discount coupons (control). This group was not offered any commitment contracts or discounts on consultation fees. Each respondent only received information about managing hypertension and a flyer with the times and location of "Hypertension Days," but these were provided to all participants in the study.

Respondents in Groups 1 to 4 can avail of their respective commitment contracts in several ways. First, they can accept the commitment contract on the spot with the enumerator, who subsequently collects the payment. Second, respondents can sign up for the commitment contract with E-HealthPoint's village health workers (VHW) and health coordinators (HC), both of whom are well-known in the village since they often go door-to-door to assess the community's health needs. Specifically, about 3 to 4 days after the enumerator offered the commitment contract to a particular household, the VHW and HC visited households in Groups 1 to 4 who had not yet signed up for the contract. The VHW and HC then asked these respondents whether they would like to take up the commitment contract, as well as reminded them about the "Hypertension Days" schedule. Note that the VHW and HC visited *all* households in the study to remind them about "Hypertension Days," including those in the control group, to hold constant any effects the VHW and HC's visit may have. Lastly, respondents in Groups 1 to 4 were also able to sign up for the commitment contracts directly at the "Hypertension Day" clinic at any time during the course of the study.[11]

While both the commitment contracts (Groups 1 to 4) and price discount coupons (Group 5) covered 3 visits to "Hypertension Days," respondents were given the opportunity to renew

[10] In practice, the respondent's chosen commitment amount is rounded up or down so that it is divisible by 3.

[11] Although "Hypertension Days" are only held once a week at the clinic, the clinic is open Mondays through Fridays to sell medicine and conduct lab tests. Each respondent could sign up only for the commitment contract she was originally offered.

these commitment contracts and coupons at the clinic for the remainder of the 6-month program. These renewals were described to respondents when the commitment contracts and discount coupons were initially introduced by enumerators. In the case of commitment contracts, for example, respondents who completed 3 visits in the first 2 months of the program can take up another commitment contract for 3 visits in the remaining 4 months. Similarly, for discount coupons, respondents who have used up all 3 coupons in the first 2 months of the program can ask for another set of 3 coupons, which will be valid for the remaining 4 months.

A final set of treatments were implemented 2 weeks before the conclusion of the 6-month program. In each village, half of the respondents were randomly selected to receive a short reminder about "Hypertension Days." These respondents were personally visited by our team of enumerators, and were informed that there were 2 weeks left until the commitment contracts or price discount coupons expire, if applicable. The other half of the respondents served as control, and did not receive any reminders.

Data Collection

In this study, we use three main data sets in our analysis. First, a baseline survey was conducted prior to presenting the treatments to respondents. The baseline survey collected information on respondent and household characteristics, as well as the respondent's diet profile, smoking and drinking habits, health status, health-seeking behavior, health knowledge, and time and risk preferences.

Second, we collected data on attendance at "Hypertension Days" for all study participants. For the 6-month period in which commitment contracts and price discount coupons were valid, a member of our field staff was present during the weekly "Hypertension Days" in each village to record the household ID number and names of all study participants who came to see the doctor. Furthermore, we collected such attendance data for 1 month after contracts and coupons expired, which allows us to examine treatment effects in a setting where commitment contracts were no longer available.

Finally, an endline survey was conducted in each village 1 week after the commitment contracts and price discount coupons expired. This endline survey asked questions similar to those in the baseline, but in addition, it asked information on doctor visits at the "Hypertension Days" or other health care providers. This survey also included the respondent's weight and waist circumference measurements, as well as dietary and exercise changes.

Summary Statistics and Randomization Checks

Baseline characteristics for our sample are shown in Table 1. Respondents in our sample come from households that have 5.43 members on average and have a median annual household income of Rs. 50000. 60% of our sample is female, and 80% are currently married. Among household heads, the most common occupation is self-employed in agriculture and 45% can both read and write.

A large portion of our respondents also have characteristics that place them at risk for hypertension. For instance, the average age in our sample is 53.6, and the risk of high blood pressure increases with age. The average BMI in our sample is 25.4, where a BMI over 25.0 is generally considered to be overweight.

Despite the poor health status of individuals in our sample, few respondents actually see a doctor other than for illness. Based on self-reports at baseline, while 76% say that they "always" or "frequently" seek health care when they are feeling sick, only 6% of respondents visit the doctor for preventive care. While 71% of our sample are aware that they are hypertensive, only 60% of these individuals (who know that they are hypertensive) are currently taking medication to manage their hypertension. Behavioral barriers may play a critical role in explaining the low demand for health services in our setting. Indeed, 20% of individuals in our baseline data are present-biased, and almost all respondents (69%) strongly agree that they are often impatient.

Results from a randomization check of our commitment contracts and discount treatments is provided in Panels A-C of Table 2. We do not observe any systematic, statistically significant differences between any of our treatment groups and the remainder of the sample across a large number of variables. The few significant differences that we do observe are consistent with what would occur by chance. Results from a randomization check of our reminder treatments is provided in Panel D of Table 2. Again, we do not observe statistically significant differences between the reminder treatment group and the non-reminder group beyond what would occur by chance.

3.3 Preliminary Results

This section describes preliminary results for (i) the baseline survey, (ii) take up of commitment contracts, and (iii) utilization of health care services a function of treatment group and commitment contract take up.

Take Up

Table 3A studies commitment contract take-up by treatment group. A number of clear and interesting patterns emerge. First, take-up for the contracts without a discount is 13.7% (39 out of 284) for the "fixed" contract that specifies the exact contract ahead of time, and 14.1% (40 out of 283) for the "flexible" contract that allows users to specify the amount they commit.

The contracts with discounts have a substantial impact on take-up: for the fixed contract with discount 25.9% (72 out of 278) take up the contract while for the flexible contract 38.6% (112 out of 290) take up the contract. These results suggest that both (i) discounts have a marked impact on take-up and (ii) that the flexible contract and the discount are complementary. People are more likely to take up the contract with discount when they have the option to specify the amount that they commit. In general, those who take up

the flexible contract include a lower commitment amount than that specified by the fixed contract, which could be one reason for the additional take-up for this treatment.

Table 3B breaks down commitment contract participation as a function of hypertension knowledge and practices during the baseline survey. Interestingly, there does not seem to be a meaningful statistical difference in participation between respondents who are unaware of high blood pressure (indicating they may not have hypertension) and respondents who are aware of high blood pressure (hypertensive). This result is interesting since one would expect being aware of high blood pressure to be a driver of take-up. Among respondents who are aware of high blood pressure, those taking medication for hypertension appear to be less likely to participate in commitment contracts than those not taking medication for hypertension, except in the case of the flexible contract with discount (which receives high take-up among both groups). Respondents taking hypertension medication could be more likely to seek preventive health care, which might lead to higher commitment contract participation. However, respondents taking hypertension medication could also already have other health care providers, which might lead to lower participation in commitment contracts specifically for "Hypertension Days."

Table 3C examines take-up as a function of whether the consumer "trusts non-E-Health Point private health clinics in the village," i.e., informal medicine. The table breaks down responses into the following groups: (i) completely or somewhat trust such medicine, (ii) indifferent, (iii) completely or somewhat distrust, and (iv) have not heard of such clinics. About 70% of consumers answer the first category, that they completely or somewhat trust such clinics, and, not surprisingly, this group has take-up rates that mimic those in the population overall. The second and third groups have similar take-up rates, though sample size is small, while the fourth group (no knowledge) has a very low sample size. Note that this table, as with all tables in this section, only includes individuals in the commitment contract treatment groups, not those in the control groups.

Table 3D examines take-up as a function of whether the consumer "trusts E-HealthPoint." 247 consumers completely or somewhat trust E-HealthPoint, 195 are indifferent, 303 completely or somewhat distrust E-HealthPoint, and 140 have not heard of E-HealthPoint. Thus, in general, there is more trust in other private clinics (informal doctors) than in E-HealthPoint, though this could also be related to limited information about E-HealthPoint. There is a relationship between answers to this question and take-up: overall 31.2% of those that trust E-HealthPoint take up a commitment contract across all of the treatments (significantly higher than the 23.2% in the overall population). 28.2% of those who are indifferent take up a contract, while only 18.2% of those who distrust E-HealthPoint do. Among respondents who haven't heard of E-HealthPoint, take-up is is 20.7%, which is lower than among those who are indifferent about E-HealthPoint but higher than among those who distrust E-HealthPoint.

Table 4 presents the results of ordinary least squares regression analysis to give formal statistical support for the conclusions drawn from Table 3. In addition to supporting those conclusions, some new insights emerge when allowing for participation to depend on many of the other demographic variables that we measure in the baseline survey. We find increased

commitment contract take-up for:

- Married consumers offered discounted commitment contracts of either type (fixed or flexible).
- Literate households, for all treatments.
- Those who state that they "trust" E-HealthPoint.
- Those working in occupations other than self-employment in agriculture. This is a big effect, but also has high standard error.

These results reflect the results in Table 3 described above. One broad takeaway is that factors not related to actual health risk can be as, or more, important to the take-up of commitment contracts.

Health Camp Attendance

The next step in the preliminary analysis is to assess the extent to which those who take up a commitment contract use E-HealthPoint services, in the form of health camp visits. Table 5 compares medical care utilization by treatment group to control groups that had no access to commitment contracts.

An immediate, key takeaway is that those who purchase a commitment contract are much more likely to visit E-HealthPoint health camps relative to (i) a control group, (ii) a group offered only service discounts, and (iii) those offered commitment contracts who do not take them up. For those who purchase commitment contracts, across all treatment groups, 28.9% (76 out of 263) visit a health camp at least once. For those offered a commitment contract but who did not take one up, this figure is much lower, 6.2% (54 out of 872). More importantly, the control group with no discount coupons has a level of 8.9% (26 out of 293) while the control group with discount has a level of 14.6% (42 out of 288). These results suggest:

- Commitment contracts are effective in getting people to visit E-HealthPoint for preventive care.
- Even though they are effective, still only 28.9% of people who enter a commitment contract end up visiting E-HealthPoint. The 71.1% of people who do not visit E-HealthPoint give up money when entering the contract, and then never use it. This suggests substantial issues with inter-temporal decision consistency, discussed in the upcoming model section.

It is also interesting to investigate health camp attendance by commitment contract treatment, and several insights emerge. First, respondents who join a commitment contract without a discount are more likely to participate: this is expected since this group is a smaller sample of consumers with higher demand for commitment contracts on average. Further,

flexible contracts, which are more popular than fixed contracts, enroll consumers who are, on average, less likely to visit E-HealthPoint. Again, this is likely because these contracts seem to be more attractive on average, and, in turn, attract a base of consumers less committed to visiting E-HealthPoint for health care at the time they enter into the contract.

Table 6 presents regression analysis of health camp utilization for all survey respondents, including those who do not sign up for a commitment contract and those who never are offered a commitment contract. The analysis reveals that:

- Those given commitment contract offers are more likely to visit E-HealthPoint.
- Those offered flexible commitment contracts with discounts are especially more likely to visit E-HealthPoint (the statistical analysis suggests this more so than Table 5).
- Those receiving a discount treatment are also more likely to visit E-HealthPoint, relative to the control group where no discount or commitment contract is offered.
- Trust in E-HealthPoint is an important predictor of whether someone visits a health camp, conditional on their treatment / control group.
- Females are more likely to visit health camps than males, conditioning on all other variables / treatment groups.

Overall, these results suggest that commitment contracts are effective instruments for getting people to visit E-HealthPoint, though the magnitude of this effect is medium, rather than very large.

Table 7 repeats the analysis of Table 6, but conditions on the set of people who actually sign up for a commitment contract. The results are similar to Table 6: commitment contracts are important predictors of take-up, while females, married individuals, and literate households are more likely to ultimately visit E-HealthPoint. Those who trust E-HealthPoint are more likely to visit.

Health Measures and Behavior

This analysis will be conducted after the endline survey data have been processed completely.

3.4 Model

The simple preliminary empirical analysis above suggests that commitment contracts can have an important impact on preventive health care utilization. It is important to "look under the hood" to determine exactly which aspects of behavior and decision-making guide the effectiveness, or lack thereof, of commitment contracts for increasing preventive health care utilization. This section presents a simple, in progress economic model of preventive health care utilization. The research team will work on this model and connect it to the data over the next several months.

A Simple Model of Health Investments

The diagnosis, monitoring and management of hypertension (like other preventive health behaviors) can be thought of as an investment in personal health. Each involves tradeoffs between initial costs (financial as well as effort and time costs) and potential future benefits from improved health. A simple economic model of health investment helps formalize the three mechanisms mentioned above, and illuminates how they may lead to inefficient levels of preventive health care utilization. Consider an individual who must make decisions in every period about how to allocate scarce resources between consumption of goods and possible preventive care investments. Her decision problem can be represented as the inter-temporal "utility" function:

$$U_t = u\left(h_t, c_t, prevent_t\right) + E_t \sum_{i=1}^{T} D\left(i\right) u\left(h_{t+i}, c_{t+i}, prevent_{t+i}\right),$$

where the utility incurred in each period $u\left(h_t, c_t, prevent_t\right)$ depends directly on present health status h_t, consumption of goods c_t, but also potentially the direct pleasure or discomfort of taking a particular preventive health action $prevent_t$ (such as the discomfort of walking a mile to the clinic for a hypertension test).

In each period, she must decide whether or not to make a preventive health investment ($prevent_t = 1$ or 0). If she does not make the investment, with a probability $\overline{\pi}$ she suffers a negative health shock in the *next* period. However, if she chooses to make the health investment, she reduces her probability of a negative health shock in the next period.

$D\left(i\right)$ is a *discount function* which captures the extent to which the consumer underweights utility experienced in periods in the future from today's perspective. For simplicity, we assume that income in each period is exogenous, equal to W_t. A_t represents consumer financial assets at time t. We close the model with the budget constraint $p_c c_t + p_p prevent_t = W_t + rA_t$, where p_p is the price of preventive health care, p_c is the price of consumption goods, and r is the interest rate on savings. Guided by this broad framework, we will use a series of experiments to explore three main ways in which economic incentives can affect the demand for preventive care and move utilization towards a socially efficient level.

Time Inconsistency or Self Control Problems

Making decisions about preventive health investments involves trading off costs in the present against expected benefits in the future. Thus, any factor that drives a wedge between how present and future costs and benefits are valued might have large effects on preventive behavior. An obvious candidate for such a wedge is "time preferences," which capture the extent to which people discount the future relative to the present while making decisions. In the simple model described above, this corresponds to the function $D\left(i\right)$, the factor by which utility i periods in the future is discounted relative to the present. Clearly, people who discount the future at a higher rate will value preventive care less, all else equal.

However, recent research has explored a more powerful mechanism through which time preferences might affect behavior – the existence of a present bias in time preferences (O'Donoghue and Rabin 1999). Present bias captures the psychology of a discretely greater concern for utility experienced in the present, relative to all future periods of time. This feature is elegantly captured in the quasi-hyperbolic model of time discounting (Phelps and Pollak 1968; Laibson 1997). In this formulation, the present value of a flow of utilities $(u_s)_{s \geq t}$ as of time t is

$$U_t = u_t + \beta \sum_{s=1}^{\infty} \delta^s u_{t+s}$$

Here, the discount factor between today and the next period is $\beta\delta$ while the discount factor between any two consecutive periods in the future is simply δ. If , $\beta < 1$ we have non-constant time discounting – the discount rate between today and tomorrow differs from the discount rate between tomorrow and the day after. This results in *time-inconsistency* – a situation in which an agent systematically chooses to deviate from a plan he had thought perfectly optimal when formulated in the previous period. An illustration would be the (fictional) reviewer who plans to read the grant tomorrow, and does not follow through on this plan when tomorrow actually arrives. Theoretical work by O'Donoghue and Rabin (1999, 2001) has made clear that a crucial role is played by whether the consumer is sophisticated about their present bias. A sophisticated consumer is one who is fully aware of the time inconsistent nature of her preferences. Conversely, an unsophisticated (or "nave") consumer believes that, beginning next period, she will no longer be present biased. Thus, an unsophisticated consumer is overconfident about her future time-inconsistency problem. These two types can be modeled by introducing a parameter $\hat{\beta}$ to represent the agent's beliefs about his future present bias β. Then a sophisticated consumer is characterized by $\hat{\beta} = \beta$ while an unsophisticated consumer believes $\hat{\beta} = 1$. Following O'Donoghue and Rabin (2001), we can also consider partially sophisticated consumers, who merely underestimate their future present bias, $\beta < \hat{\beta} < 1$. The literature has made the following predictions for investment tasks (tasks with immediate utility costs and delayed benefits) under time inconsistency:

1. Sophisticated consumers value commitment: Sophisticated consumers are willing to pay for simple contracts which commit them to future actions by restricting their future choices, often by making certain actions more expensive (Thaler 1980, Laibson 1997). An example would be a smoker who makes a deposit in a savings account which does not allow withdrawals until he verifiably quits smoking (Ashraf et al. 2006). These commitment contracts appeal to the *long-run selves* of sophisticated consumers – they are most effective when the consumer perceives all the costs and benefits as being in the future. The smoker is most likely to make the commitment when the pain of quitting begins tomorrow rather than today.

Ashraf et al. (2006) find that 28% of those offered a costly commitment device to quit smoking accept it. In a quite different setting, Benartzi and Thaler (2004) show that 78% of people offered a soft commitment to increase savings in the future accept the commitment.

2. Overconfident consumers do not value commitment: Since unsophisticated consumers are overconfident about their ability to complete the investment task tomorrow, they do not recognize their need for commitment contracts (O'Donoghue and Rabin 1999). And partially sophisticated consumers (who know they have a time inconsistency problem, but underestimate its magnitude) may even under-commit to a task, accepting a contract which does not provide sufficient incentives to follow through (DellaVigna and Malmendier 2004). They might thus be actively hurt by being offered the commitment device: consider the smoker who deposits money in the commitment account but then fails to quit smoking, thus losing his deposit.

3. Commitment contracts for repeated tasks: When an investment task must be done repeatedly (such as attending a gym, or periodically visiting a clinic to have an illness monitored), sophisticated consumers will benefit from contracts which help them commit to repeating the task. When the contracts are limited to freely chosen fee structures, they will take the form of a two-part tariff, with high lump sum "membership" fees and subsequent per-visit prices chosen well below marginal costs (DellaVigna and Malmendier 2004). These contracts are attractive to the long-run selves of sophisticated consumers, who realize that the low (and possibly negative) marginal price of attendance will incentivize them to attend more, helping overcome their self-control problem. As above, unsophisticated consumers will not value such a contract. In related empirical work, the authors show that such contracts are well represented in such industries as health fitness centers and life insurance. This type of contract is especially relevant to the prevention and treatment of chronic medical conditions.

4. Deadlines: O'Donoghue and Rabin (1999) show that present-biased consumers can be induced to complete tasks more efficiently by using a system of increasing punishments, and particularly by using a deadline beyond which penalties are severe. Such a scheme allows those without self-control problems to find an efficient time to complete the task (say, a day when the opportunity cost of completing the task is low), while preventing those with self-control problems from procrastinating too long. Some empirical evidence supports this theory: in Kenya, Duflo et al. (2011) find that time-limited discounts on the purchase of fertilizers increases the adoption of fertilizer by up to 70%.

Price of High-quality Preventive Care

The price of preventive care p_p faced by individuals may differ dramatically from the long-run marginal social costs of health care provision. This could occur, for example, due to inefficient but profit-maximizing prices set by a monopolistic provider of healthcare services or products. Alternatively, utilization may be lower than socially desirable simply because of a lack of access to quality healthcare. For example, people in far-flung rural areas may simply face insurmountable travel costs in accessing health facilities. And valuable health investments, such as safe drinking water, may simply not be available at all in particularly disadvantaged locations. In such a setting, interventions which increase access to preventive care, either through the introduction of new services or through variation in prices, might

dramatically shift use towards the socially efficient level. Finally, a great deal of evidence suggests that the demand for preventive care is highly "price elastic," especially in developing countries. In other words, even small increases in price above zero can lead to dramatic reductions in demand. In Kenya, Kremer and Miguel (2007) find that take-up of deworming medications drops from 80% to 20% when the price is raised from zero to US$0.30. In Zambia, Ashraf et al. (2010) find that take-up of a water-treatment product drops from 80% to 50% when the price increases from US$0.10 to $0.25.

Information About the Effectiveness of Preventive Care

People's beliefs $\tilde{\pi}$ about the true effectiveness of a particular preventive behavior might be biased. Thus, they might overestimate ($\tilde{\pi} > \pi$) or underestimate ($\tilde{\pi} < \pi$) the extent to which a particular preventive behavior reduces the probability or severity of a future negative health shock, leading to inefficient levels of utilization. In such a setting, an intervention which provides accurate information about preventive health measures could have a large impact.

Empirical evidence suggests that information can sometimes be effective in increasing preventive health investments. Madajewicz et al. (2007) and Jalan and Somanathan (2008) both show that households respond significantly to information about the purity of their drinking water, while Dupas (2011) finds that adolescent girls reduce risky sexual behavior when informed about risks. However, even comprehensive information may have negligible effects in comparison to modest price changes (Kremer and Miguel 2007). The relative effectiveness of information and price changes thus remains an unresolved and interesting question, which we will attempt to answer.

We shall also seek to understand the importance of the source of information about health behavior. In particular, social learning is widely thought to be an important mechanism for the diffusion of technologies (Foster and Rosenzweig 2010), but few studies have rigorously documented its importance in affecting health behavior, especially in less affluent populations. Leonard et al. (2009) use non-experimental evidence to argue that households in rural Tanzania learn about the quality of care offered by different providers from their neighbors' past experiences. Dupas (2010) uses a field experiment to show that social learning increases adoption when people initially underestimate the returns to adoption.

Our final empirical analysis with this model will leverage our randomized control trial, together with measures of information and social networks from our baseline and endline surveys to carefully identify the role of social networks in diffusing information about health behavior.

Time Preferences Model with Commitment Contracts

We model a present biased consumer's decision to sign up for a given commitment contract and subsequently the decision to visit a doctor. In the first stage, the respondent chooses whether to participate in a particular commitment contract. In the second stage, and given

her commitment contract choice, she decides whether to visit the doctor. We assume that the decision to visit a doctor in the absence of commitment contracts depends on three factors: a doctor visit fee f paid at the time of visit, additional effort or monetary costs (e.g., time, transportation) c incurred at the time of visit, and a delayed health benefit b. Of the three factors, this paper focuses on the first component, the fee paid at the time of visit, and varies this component through commitment contracts.

Each commitment contract requires the respondent to pay $f-d+m$ in advance of visiting the doctor, where f is the doctor's visit fee, $d \in [0, f]$ is a possible discount on the doctor visit fee, and m is a non-negative additional commitment amount, which the respondent receives back only upon visiting the doctor. In other words, $m > 0$ creates a negative marginal price for a doctor visit in the future. [12] The decision to visit the doctor with a commitment contract, therefore, depends on three factors: the commitment amount received back m at the time of the visit, additional effort or monetary costs (e.g., time, transportation) c incurred at the time of visit, and a delayed expected health benefit b. We define $\underline{m}$ as the minimum (or only) commitment amount permitted in a commitment contract. Commitment contracts may be either (a) *fixed commitment contracts*, where $m = \underline{m} = m_{fix} \in (0, \infty)$ is a fixed value, or (b) *flexible commitment contracts*, where the respondent may choose any $m \in [0, \infty)$, and thus, $\underline{m} = 0$.

The simplest way to represent the respondent's choices and decisions is with a three-period model. In $t = 0$, the respondent is offered a single commitment contract and decides whether to accept it. If she does, she pays $f - d + m$. In $t = 1$, the respondent decides whether to visit the doctor given her commitment contract decision in $t = 0$. If she decides to visit the doctor without a commitment contract, she incurs costs $c + f$. If she decides to visit the doctor with a commitment contract, she incurs costs $c-m$. In $t = 2$, the respondent receives a health benefit b if she visited the doctor in $t = 1$.

To this three-period model we add exponential and present-bias discounting. A respondent with only exponential discounting has time consistent preferences. A respondent with present bias substantially discounts any time that is not the present, leading to time inconsistent preferences. She may want to visit a doctor at a given time in the future, but does not actually choose to visit a doctor when that time arrives. We use δ to denote the exponential discount rate and β to denote actual present bias.[13] We use $\hat{\beta}$ to denote predicted present bias (i.e., what a respondent at $t = 0$ predicts her present bias will be at $t = 1$). We assume that $\hat{\beta} \in [\beta, 1]$ (i.e., respondents assume they are weakly less time-inconsistent than they actually are) and that $\hat{\beta}$ is constant across periods. Based on β and $\hat{\beta}$, respondents can be classified into several groups that give us some intuition about how they behave. Respondents with $\hat{\beta} = \beta = 1$ are fully time consistent. Respondents with $\hat{\beta} = \beta \in (0, 1)$ are sophisticated in that they know how time inconsistent they will be in the future. Respondents with $\hat{\beta} = 1$ and $\beta \in (0, 1)$ are fully naive in that they incorrectly predict that they will

[12] Note that each commitment contract reduces the effective fee paid at the time of visit to zero or a negative value by requiring a patient to pay the full doctor visit fee in advance. If the patient pays a positive commitment amount, then the effective fee paid at time of visit would be negative.

[13] We assume $\delta, \beta \in (0, 1]$ and that δ, β are constant across periods.

be fully time consistent in the future. Most respondents are probably partially naive with $0 < \beta < \hat{\beta} < 1$ in that they predict they will be somewhat time inconsistent but are overly optimistic about how time inconsistent they will be.

Doctor Visit. We assume that a respondent visits a doctor if the net expected utility of doing so is positive. At $t = 0$, the respondent wants her future self to visit the doctor if:

$$\begin{cases} \beta\delta^2 b - \beta\delta\left(c + f\right) \geq 0 & \text{if not participating in a commitment contract} \\ \beta\delta^2 b - \beta\delta\left(c - m\right) - \left(f - d + m\right) \geq 0 & \text{if participating in a commitment contract} \end{cases} \tag{3.1}$$

In the case without a commitment contract, the first term, $\beta\delta^2 b$, represents the health benefit b discounted from $t = 2$ to $t = 0$. The second term, $-\beta\delta\left(c + f\right)$, represents the effort/monetary cost c incurred and doctor visit fee f, both discounted from $t = 1$ to $t = 0$. In the case with a commitment contract, the first term, $\beta\delta^2 b$, again represents the expected health benefit b discounted from $t = 2$ to $t = 0$. The second term, $-\beta\delta\left(c - m\right)$, represents the effort/monetary cost c incurred and commitment amount m received back, both discounted from $t = 1$ to $t = 0$. Finally, the third term, $-\left(f - d + m\right)$, represents the doctor visit fee f with discount d and commitment amount m paid for the commitment contract at $t = 0$.

At $t = 1$, the respondent actually visits the doctor if:

$$\begin{cases} \beta\delta b - \left(c + f\right) \geq 0 & \text{if not participating in a commitment contract} \\ \beta\delta b - \left(c - m\right) \geq 0 & \text{if participating in a commitment contract} \end{cases} \tag{3.2}$$

In the case without a commitment contract, the first term, $\beta\delta b$, represents the expected health benefit b discounted from $t = 2$ to $t = 1$. The second term, $-\left(c + f\right)$, represents the effort/monetary cost c incurred and doctor visit fee f paid at $t = 1$. In the case with a commitment contract, the first term, $\beta\delta b$, again represents the expected health benefit b discounted from $t = 2$ to $t = 1$. The second term, $-\beta\delta\left(c - m\right)$, represents the effort/monetary cost c incurred and commitment amount m received back at $t = 1$.

In the remainder of the model, we restrict our attention to cases in which the respondent would want her future self to visit a doctor even without a discount – i.e., cases in which the first inequality in Equation 3.1 holds. These respondents are our target population because they want their future selves to visit doctors even without discounts but face present-bias barriers that they might be able to overcome with commitment contracts. Studies that attempt to examine other issues (e.g., respondents face information barriers and perceive the health benefits from doctor visits to be lower than the actual health benefits) might also consider cases in which the respondent wants her future self to visit a doctor even only with a discount.

Commitment Contract Participation. We assume a respondent chooses to participate in a commitment contract if she predicts that participating in the contract will yield a higher expected utility than not participating in the contract. Each respondent who wants her future self to visit a doctor even without a discount falls into one of three following cases, depending on individual and commitment contract characteristics:

- Case 1: $c - \underline{m} < f + c \leq \hat{\beta}\delta b \leq \delta b$: the respondent predicts she will visit a doctor with or without a commitment contract
- Case 2: $c - \underline{m} \leq \hat{\beta}\delta b < f + c \leq \delta b$: the respondent predicts she will visit a doctor with a commitment contract, but not without one
- Case 3: $\hat{\beta}\delta b < c - \underline{m} < f + c \leq \delta b$: the respondent predicts she will visit a doctor with a commitment contract where $m \geq c - \hat{\beta}\delta b$, but not either (a) without a commitment contract or (b) with a commitment contract where $m < c - \hat{\beta}\delta b$

At $t = 0$, the respondent participates in a commitment contract if:

$$\begin{cases} \beta\delta^2 b - \beta\delta\left(c - m\right) - \left(f - d + m\right) \geq \beta\delta^2 b - \beta\delta\left(c + f\right) & \text{if Case 1} \\ \beta\delta^2 b - \beta\delta\left(c - m\right) - \left(f - d + m\right) \geq 0 & \text{if Case 2} \\ \beta\delta^2 b - \beta\delta\left(c - m\right) - \left(f - d + m\right) \geq 0 & \text{if Case 3 and } m \geq c - \hat{\beta}\delta b \\ -\left(f - d + m\right) \geq 0 & \text{if Case 3 and } m < c - \hat{\beta}\delta b \end{cases} \tag{3.3}$$

The left side of the inequality represents the predicted utility if the respondent participates in a commitment contract and the right side of the inequality represents the predicted utility if the respondent does not participate in a commitment contract. A respondent never participates in a commitment contract if Case 3 holds and $m < c - \hat{\beta}\delta b$, since $-\left(f - d + m\right) < 0$ for any values of the parameters. In all cases, if the respondent decides to participate in a commitment contract, she would want to choose the lowest permitted value of m such that the case still holds. Under a fixed commitment contract, the respondent chooses $m = \underline{m} = m_{fix}$, whereas under a flexible commitment contract the respondent chooses $m = \max\left\{c - \hat{\beta}\delta b, \underline{m} = 0\right\}$.

Graphical Representation. In both our graphical representation and experimental design, we restrict the discount on the doctor visit fee to two possible values: $d \in \left\{0, \frac{1}{2}f\right\}$. In *commitment contracts without a discount*, $d = 0$, and in *commitment contracts with a discount*, $d = \frac{1}{2}f$. We use this further simplification to derive respondent behavior in terms of β, $\hat{\beta}$, δ, b, c, f, and m_{fix}. The parameters β, $\hat{\beta}$, δ, b, and c are based on characteristics of individual respondents, whereas the parameters f and m_{fix} are determined by our experimental design.

In Figure 1, we graphically represent a respondent's predictions about her future doctor visit behavior and her actual doctor visit behavior for values of β and $\hat{\beta}$, holding other parameters fixed. The graph represents all respondents who would want their future selves to visit a doctor even without a discount. The horizontal sections represent whether the respondent predicts she will visit a doctor both with and without a commitment contract, only with a commitment contract, or not even with a commitment contract. The vertical sections represent whether the respondent actually visits a doctor both with and without a commitment contract, only with a commitment contract, or not even with a commitment contract.

In Figure 2A, we add the respondent's decision about whether to participate in the commitment contract for our four types of commitment contracts: (a) fixed commitment contracts without a discount, (b) fixed commitment contracts with a discount, (c) flexible commitment contracts without a discount, and (d) flexible commitment contracts with a discount. With this information, we can identify which types of respondents would gain from, lose from, or not be affected by a commitment contract offering. In particular, respondents who participate in commitment contracts and subsequently visit the doctor gain from the commitment contract offering, whereas respondents who participate in commitment contracts and subsequently do not visit the doctor lose from the commitment contract offering. In Figures 2B, 2C, and 2D, we vary values of respondent parameters δ, b, and c, respectively to observe how they affect respondent predictions and behavior. Note that all graphs represent the respondents who would want their future selves to visit a doctor even without a discount, so varying δ, b, and c also changes the sample of respondents who are represented by each graph.

Figure 3 shows a respondent's predicted utility (in Rupees) under no contract and each of four commitment contract types across all possible values of β and $\hat{\beta}$. Figure 4 shows (a) the fraction of respondents who do not want their future selves to visit the doctor without a discount, and (b) of those respondents who do want their future selves to visit the doctor even without a discount, the fraction of respondents by predictions and actual behavior regarding whether they will visit the doctor in cases with and without a commitment contract.

3.5 Discussion and Next Steps

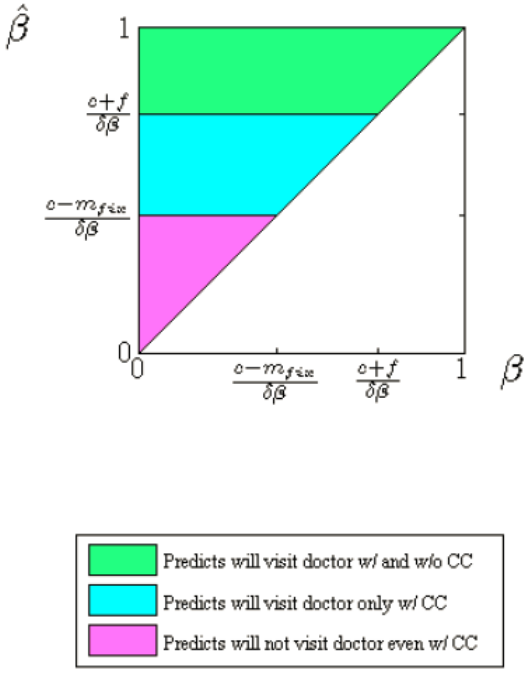
Overall, the preliminary empirical analysis of our intervention is quite informative: it suggests that commitment contracts matter for utilization of health care services, and illustrates forms of commitment contracts that consumers are more or less likely to take up. The unique randomized control trial paired with detailed consumer field surveys and detailed E-HealthPoint administrative data are well suited to study these questions. While this is just preliminary analysis, it highlights the substantial policy and economic insights that this study will lead to, as the analysis is completed. The next steps for the research team, at a high level, are:

- Process endline survey data and integrate it into descriptive / graphical empirical analyses and statistical regression analysis.
- Connect theoretical model in Section 5 to empirical version of that model, which will be studied leveraging the randomized control trial exogenous variation and detailed baseline and endline surveys, as well as health camp administrative data from E-HealthPoint.
- Continue to investigate simple empirical tests with rich data to come up with new insights independent of the behavioral model being studied.

Figure 1A

Respondent Behavior: Predictions

$\delta = 0.95$, b = 100, c = 50, f = 20, $m_{fix} = 10$

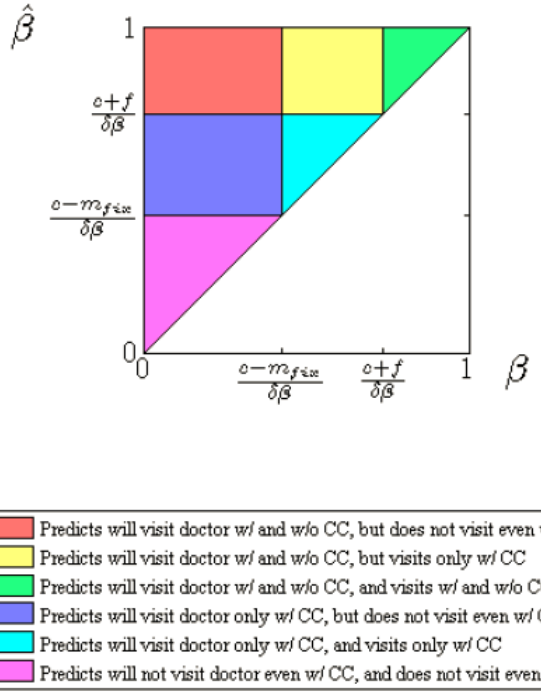


Notes: This figure shows whether a respondent predicts she will visit the doctor in cases with or without a commitment contract (CC) across all possible values of β and β-hat. β is actual present bias, β-hat is predicted present bias, δ is the exponential discount rate, b is the delayed expected health benefit from a doctor visit, c is additional effort or monetary costs (e.g., time, transportation) incurred at the time of a doctor visit, f is the doctor visit fee (paid in advance for a CC), and m_{fix} is the fixed commitment amount paid in advance and received back at the time of a doctor visit under a "fixed" CC. Under a "flexible" CC, the respondent may choose any non-negative commitment amount. The sample is limited to respondents who do want their future selves to visit the doctor even without a discount.

Figure 1B

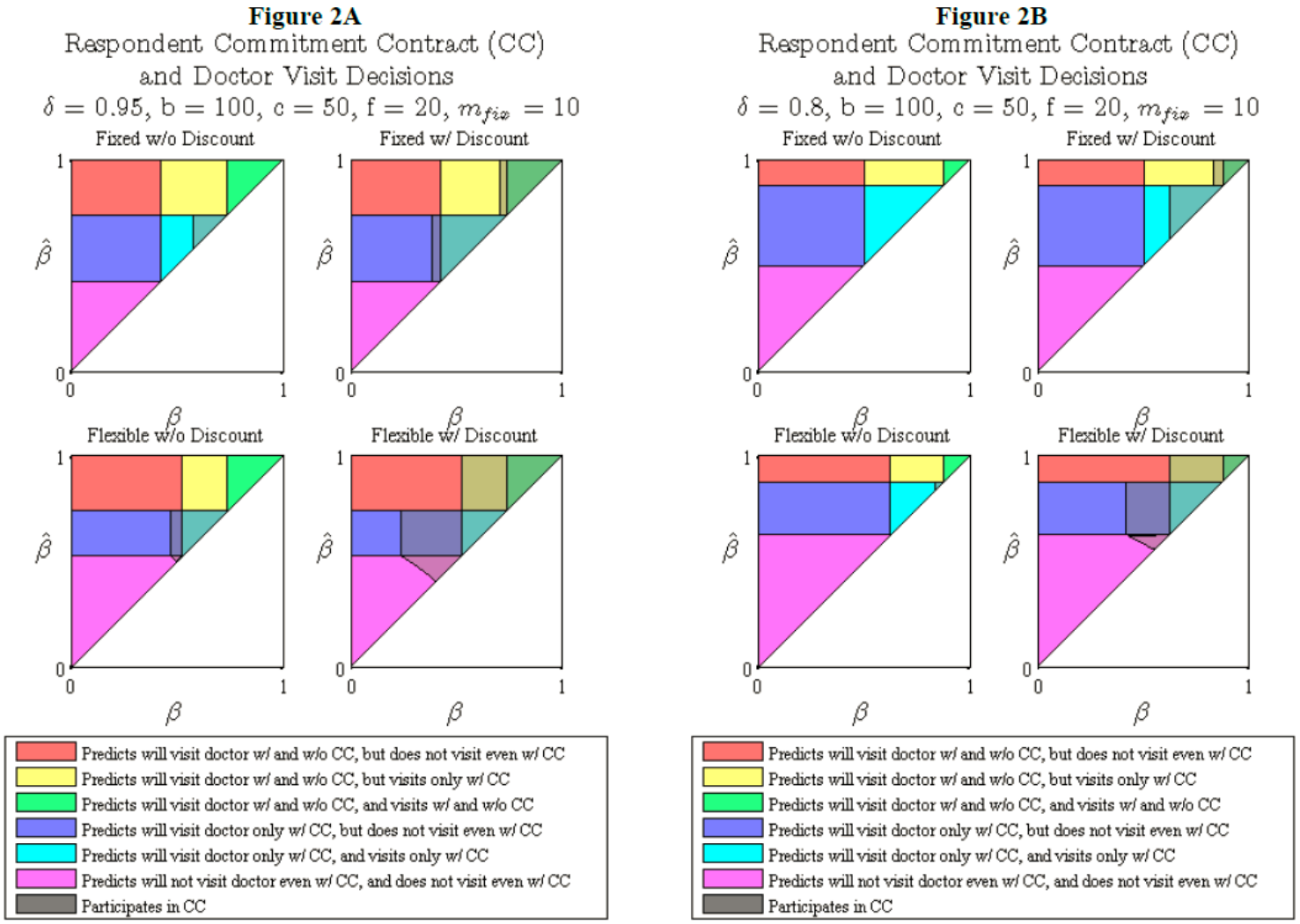
Respondent Behavior: Predictions vs. Actual

$\delta = 0.95$, b = 100, c = 50, f = 20, $m_{fix} = 10$



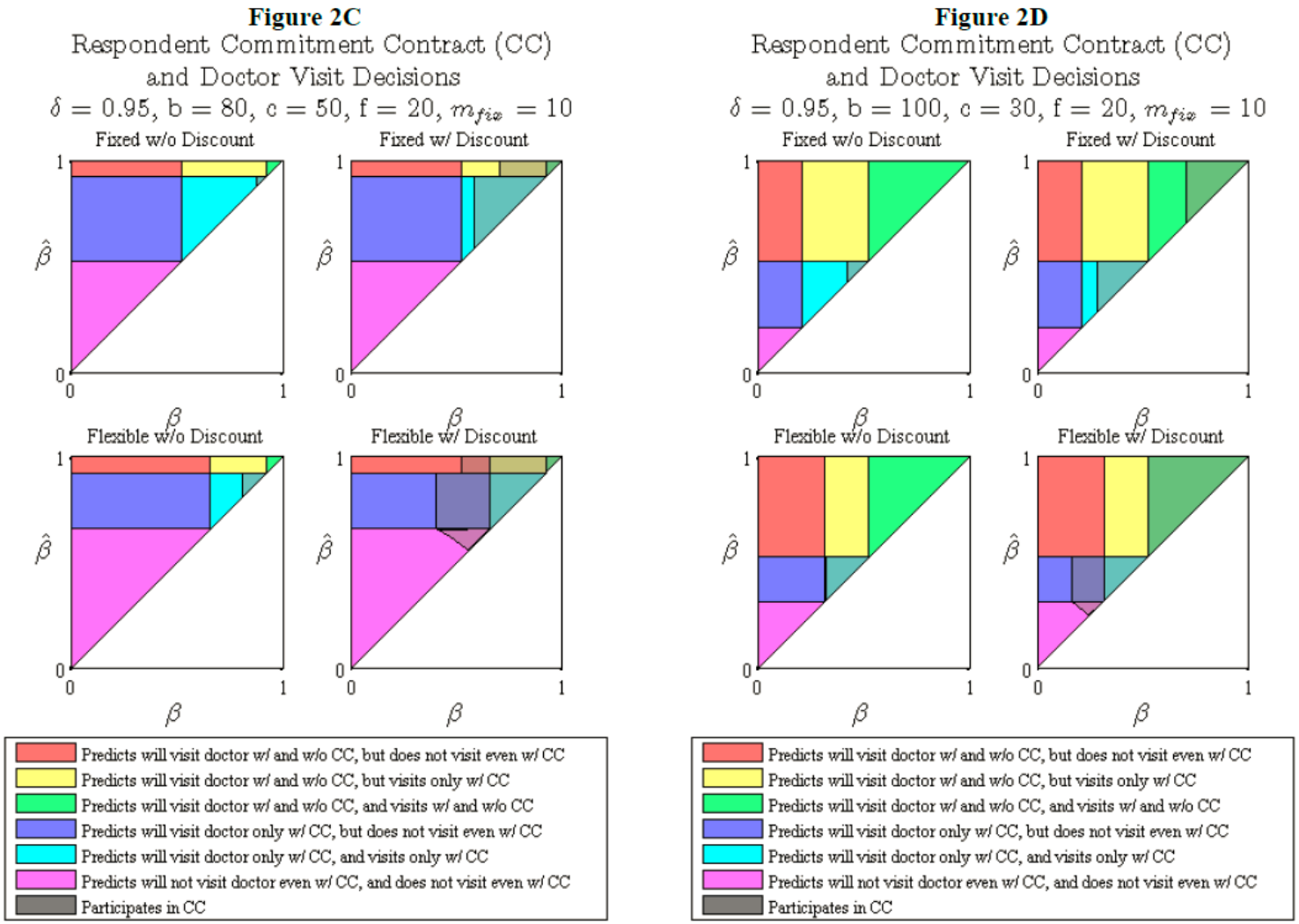
Notes: This figure shows whether a respondent predicts she will visit the doctor in cases with or without a commitment contract (CC) and whether she actually will visit the doctor in cases with or without a commitment contract (CC) across all possible values of β and β-hat. The sample is limited to respondents who do want their future selves to visit the doctor even without a discount.

Figure 3.1: Respondent Behavior: Predicted and Actual



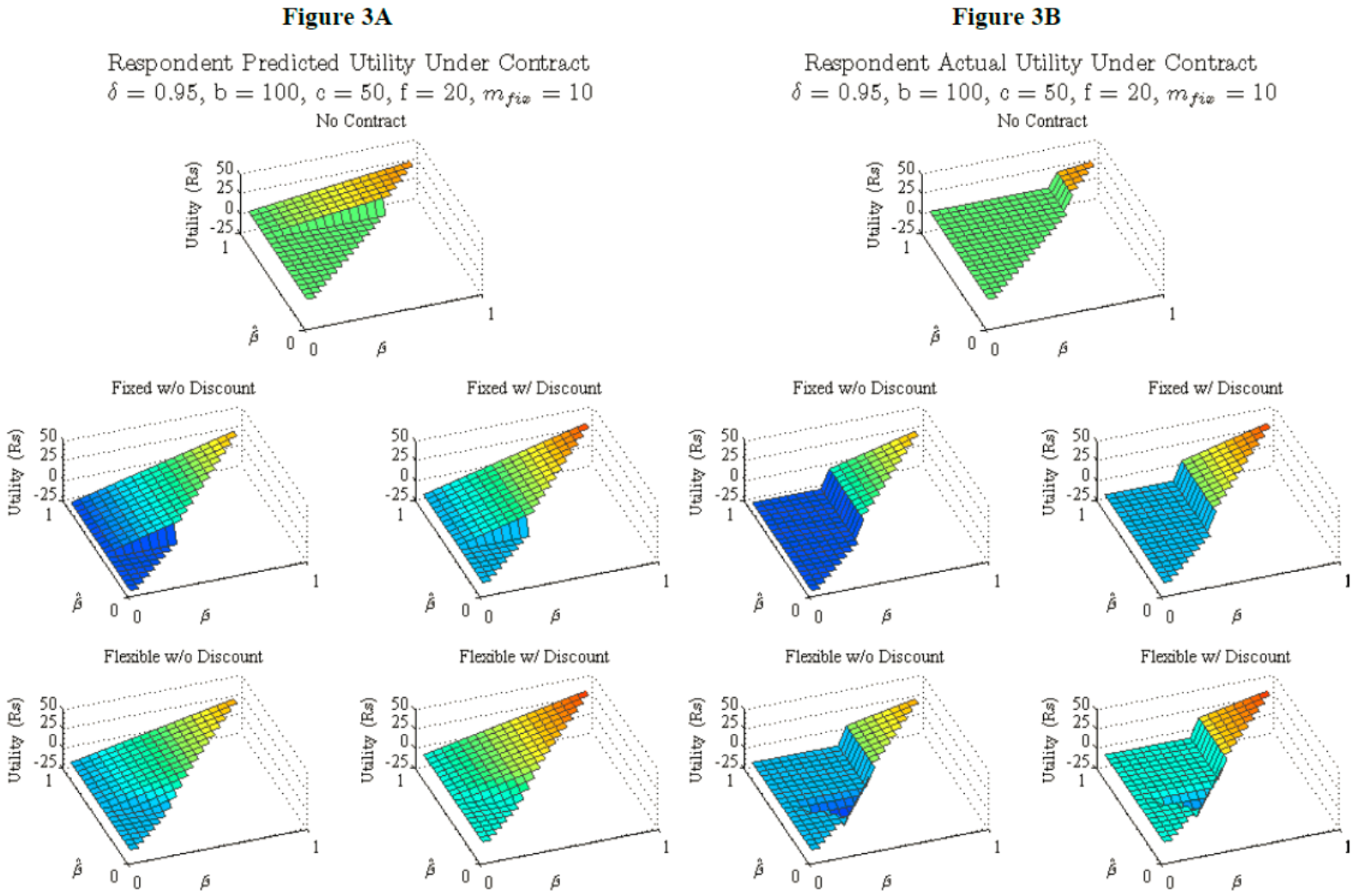
Notes: For each of four CC types, this figure shows whether a respondent predicts she will visit the doctor and whether she will actually visit the doctor in cases with or without the CC across all possible values of β and β-hat. The figure also indicates whether a respondent participates in a CC with gray shading. The discount is 50% of the doctor visit fee f. Panels A-D show the same figure with different values for parameters δ, b, and c. The sample is limited to respondents who do want their future selves to visit the doctor even without a discount.

Figure 3.2: Respondent Commitment Contract and Doctor Visit Decisions



Notes: For each of four CC types, this figure shows whether a respondent predicts she will visit the doctor and whether she will actually visit the doctor in cases with or without the CC across all possible values of β and β-hat. The figure also indicates whether a respondent participates in a CC with gray shading. The discount is 50% of the doctor visit fee f. Panels A-D show the same figure with different values for parameters δ, b, and c. The sample is limited to respondents who do want their future selves to visit the doctor even without a discount.

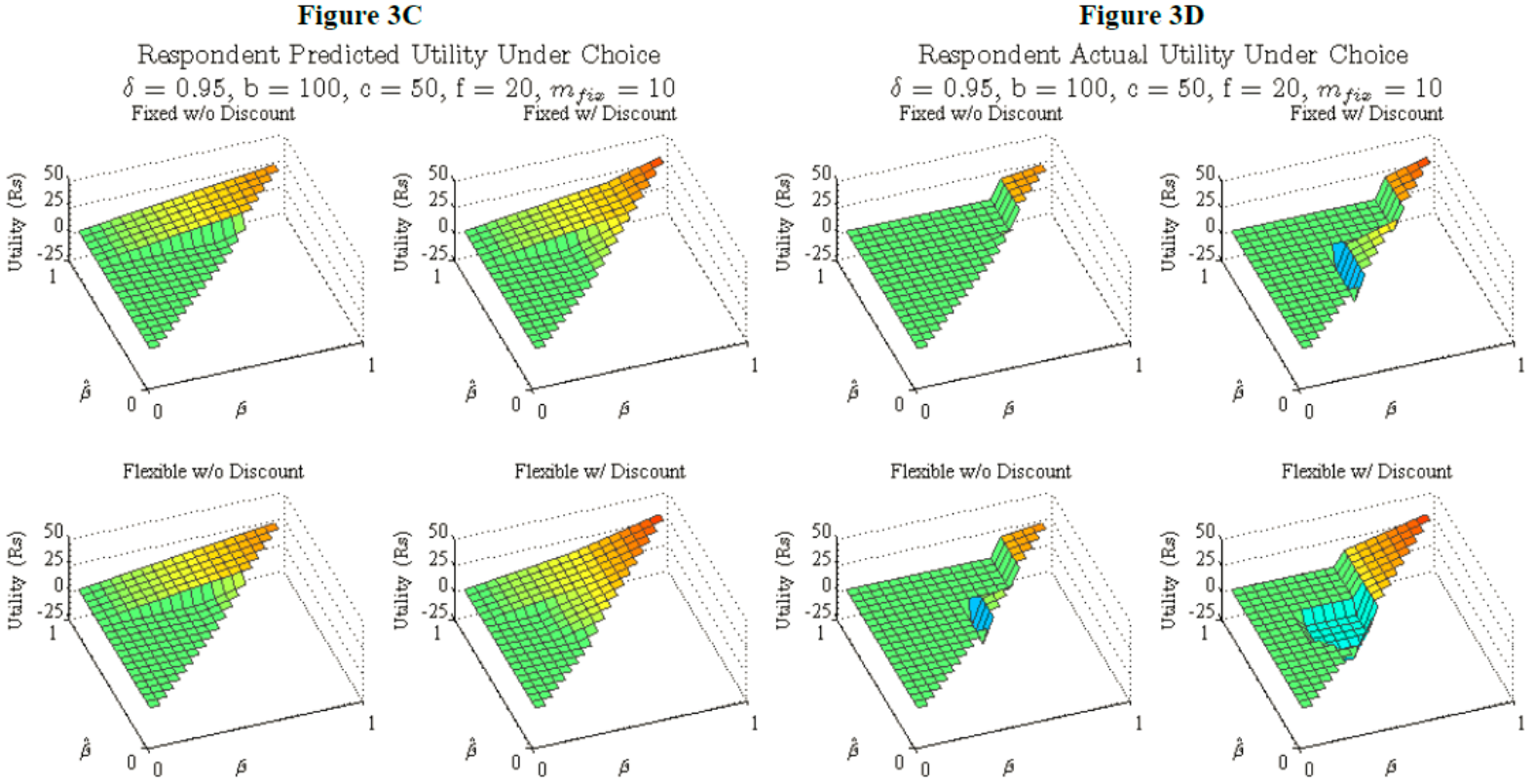
Figure 3.3: Respondent Commitment Contract and Doctor Visit Decisions (continued)



Notes: This figure shows a respondent's predicted utility (in Rupees) under no contract and each of four CC types across all possible values of β and β-hat. δ, b, c, f, and m_{fix} are fixed. Graphs with different values for δ, b, and c are also available. The sample is limited to respondents who do want their future selves to visit the doctor even without a discount.

Notes: This figure shows a respondent's actual utility (in Rupees) under no contract and each of four CC types across all possible values of β and β-hat. δ, b, c, f, and m_{fix} are fixed. Graphs with different values for δ, b, and c are also available. The sample is limited to respondents who do want their future selves to visit the doctor even without a discount.

Figure 3.4: Respondent Utility under Contract: Predicted and Actual

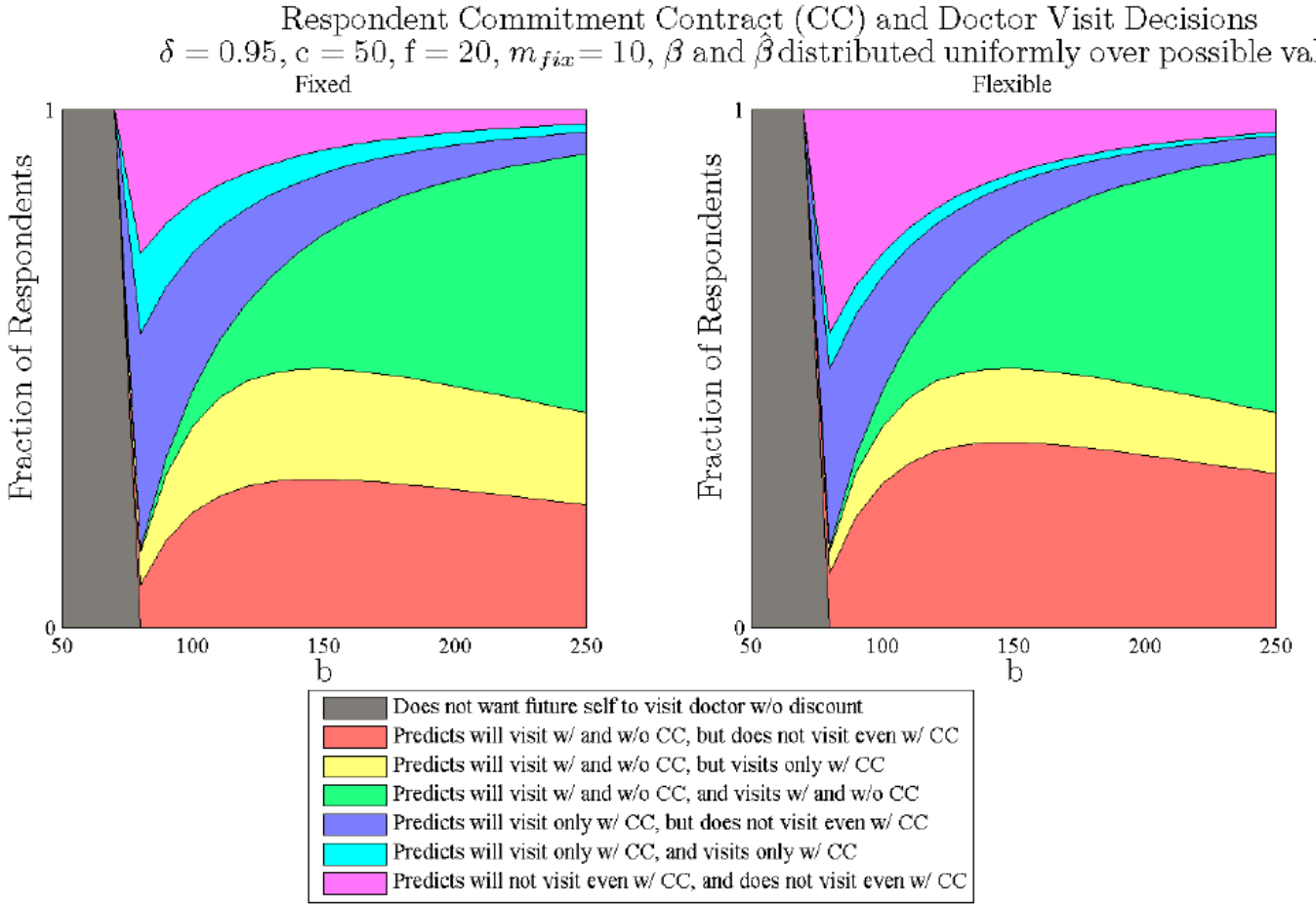


Notes: This figure shows a respondent's predicted utility (in Rupees equivalents) when given the choice between no contract and each of four CC types across all possible values of β and β-hat. Parameters δ, b, c, f, and m_{fix} are fixed. Graphs with different values for parameters δ, b, and c are also available. The sample is limited to respondents who do want their future selves to visit the doctor even without a discount.

Notes: This figure shows a respondent's actual utility (in Rupees equivalents) when given the choice between no contract and each of four commitment contracts (CC) types across all possible values of β and β-hat. Parameters δ, b, c, f, and m_{fix} are fixed. Graphs with different values for parameters δ, b, and c are also available. The sample is limited to respondents who do want their future selves to visit the doctor even without a discount.

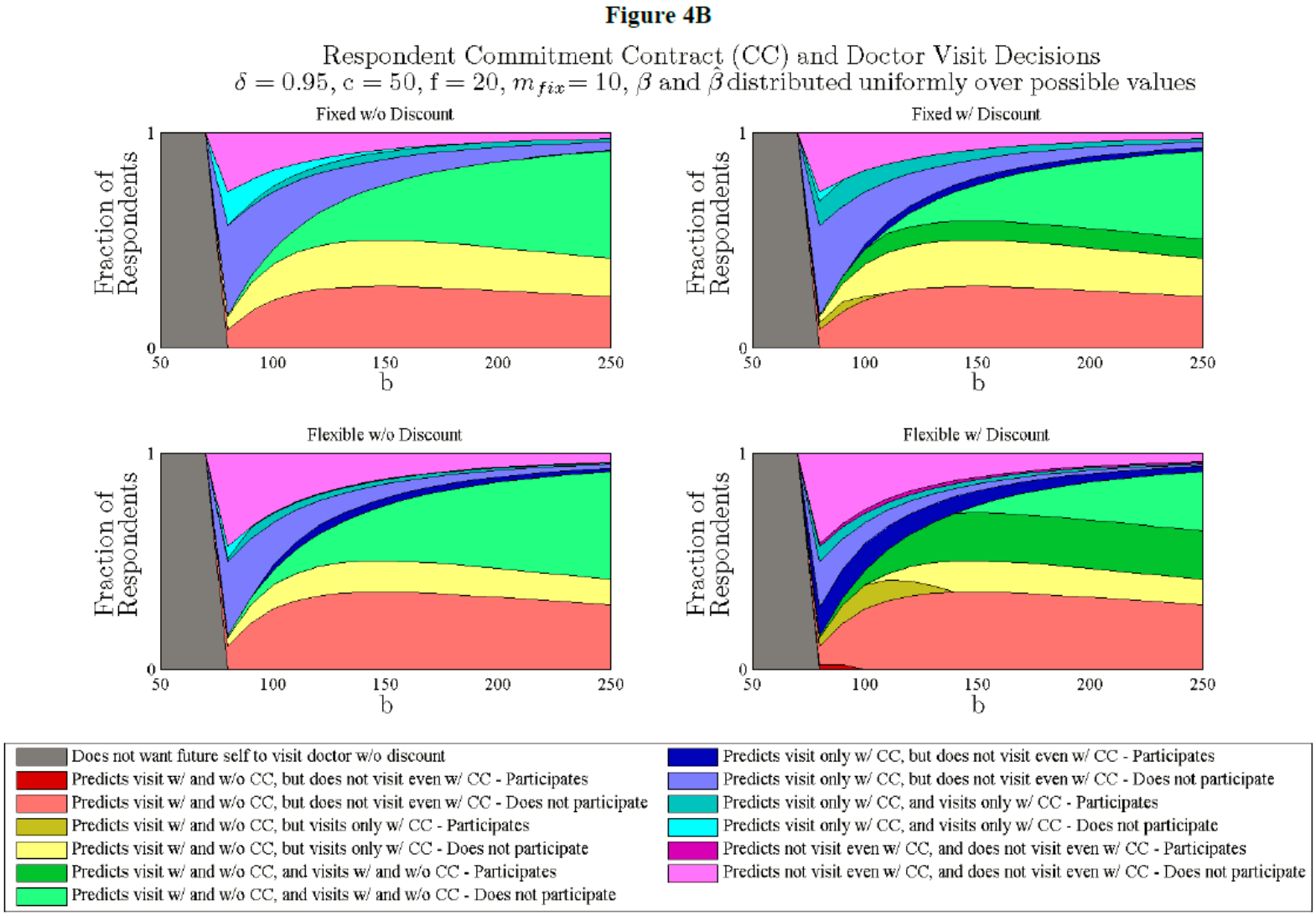
Figure 3.5: Respondent Utility under Choice: Predicted and Actual

Figure 4A



Notes: For fixed and flexible CC types and across a range of health benefit b values, this figure shows (a) the fraction of respondents who do not want their future selves to visit the doctor without a discount, and (b) of those respondents who do want their future selves to visit the doctor even without a discount, the fraction of respondents by predictions and actual behavior regarding whether they will visit the doctor in cases with and without the CC (see groups in Figure 2B). Note that whether a CC offers a discount does not affect the fraction of respondents in each of these groups, but it does affect participation in CCs. β and β-hat are assumed to have a joint uniform distribution over their possible values. Values for parameters δ, c, f, and m_{fix} are fixed in these graphs. Graphs with different values for parameters δ and c are also available.

Figure 3.6: Respondent Commitment Contract and Doctor Visit Decisions



Notes: For each of four CC types and across a range of health benefit b values, this figure shows (a) the fraction of respondents who do not want their future selves to visit the doctor without a discount, and (b) of those respondents who do want their future selves to visit the doctor even without a discount, the fraction of respondents by predictions and actual behavior regarding whether they will visit the doctor and by their participation in the CC (see groups in Figure 3). See Figure 4A for additional details.

Figure 3.7: Respondent Commitment Contract and Doctor Visit Decisions (continued)

Table 1: Summary Statistics
Baseline Respondent and Household Characteristics

	Mean	Std. Dev.	Min	Max	N
Respondent Demographic Characteristics					
Age	53.59	14.34	30	105	1720
Gender (0=Female; 1=Male)	0.40	0.49	0	1	1719
Currently married (0=No; 1=Yes)	0.80	0.40	0	1	1714
Caste (0=General; 1=SC, BC, BT)	0.45	0.50	0	1	934
Literacy (1=Can read and write; 0=Other)	0.35	0.48	0	1	1720
Occupation (1=Agriculture self-emp., 0=Other)	0.14	0.35	0	1	1604
Household (HH) Demographic Characteristics					
HH size	5.43	2.30	1	21	1720
HH head literacy (1=Can read and write; 0=Other)	0.45	0.50	0	1	931
HH head occupation (1=Agriculture self-emp., 0=Other)	0.37	0.48	0	1	906
Respondent Knowledge of and Trust in Health Care					
Heard of village private health clinic (1=Yes; 0=No)	0.98	0.14	0	1	1714
Trust in village private clinic (1=Trust; 5=Distrust)	1.94	1.34	1	5	1661
Heard of village EHP (1=Yes; 0=No)	0.88	0.33	0	1	1714
Trust in village EHP (1=Trust; 5=Distrust)	3.12	1.63	1	5	1122
Respondent Health Practices and Status					
Health visit at least frequently when sick (1=Yes; 0=No)	0.76	0.43	0	1	1714
Health visit when not sick in past year (1=Yes; 0=No)	0.06	0.24	0	1	1715
Know have high blood pressure (BP) (1=Yes; 0=No)	0.71	0.45	0	1	1714
Take medication for high BP (1=Yes; 0=No)	0.43	0.50	0	1	1425
Respondent Time and Risk Preferences					
Present-biased (1=Yes; 0=No)	0.20	0.40	0	1	1470
Time-consistent (1=Yes; 0=No)	0.46	0.50	0	1	1470
Often impatient (1=Agree; 5=Disagree)	1.84	1.41	1	5	1700
Procrastinates (1=Agree; 5=Disagree)	2.83	1.77	1	5	1683
Respondent Health Measures					
Body mass index (BMI)	25.44	10.79	13.3	395.4	1654
Body weight (kg)	64.94	14.66	30.8	164.9	1669
Height (cm)	160.55	10.23	62	189	1654
Waist circumference (cm)	95.95	11.49	43	174	1661
Systolic BP	142.42	24.46	87	264	1710
Diastolic BP	85.85	14.05	37	182	1710

Notes: This table presents the mean, standard deviation, minimum value, maximum value, and sample size (N) for each of these variables. For Caste, 1 refers to scheduled caste (SC), backward caste (BC), or backward tribe (BT). For "1=Trust; 5=Distrust," 1 refers to "Completely Trust" and 5 refers to "Completely Distrust." "Present-biased" refers to being more impatient in the short run (0-1 month). "Time-consistent" refers to being equally patient in the short run (0-1 month) and in the long run (6-7 months). For "1=Agree; 5=Disagree," 1 refers to "Strongly Agree" and 5 refers to "Strongly Disagree."

Table 3.1: Summary Statistics

Table 2A: Randomization Checks for Fixed Commitment Contracts

Baseline Randomization for Fixed Commitment Contracts: Treatment (T) vs. All Other Groups as Comparison (C)

	Fixed CC Without Discount				Fixed CC With Discount			
	T Mean (T s.e.)	C Mean (C s.e.)	Diff. T-C	P-value	T Mean (T s.e.)	C Mean (C s.e.)	Diff. T-C	P-value
Respondent Demographic Characteristics								
Age	53.89	53.52	0.37	0.693	53.61	53.58	0.03	0.977
	(0.84)	(0.38)			(0.86)	(0.38)		
Gender (0=Female; 1=Male)	0.46	0.39	0.07	0.038	0.38	0.41	-0.03	0.410
	(0.03)	(0.01)			(0.03)	(0.01)		
Currently married (0=No; 1=Yes)	0.82	0.80	0.02	0.414	0.81	0.80	0.00	0.867
	(0.02)	(0.01)			(0.02)	(0.01)		
Caste (0=General; 1=SC, BC, BT)	0.44	0.46	-0.02	0.695	0.50	0.44	0.06	0.189
	(0.04)	(0.02)			(0.04)	(0.02)		
Literacy (1=Can read and write; 0=Other)	0.34	0.35	-0.01	0.753	0.36	0.35	0.01	0.730
	(0.03)	(0.01)			(0.03)	(0.01)		
Occupation (1=Agriculture self-emp., 0=Other)	0.13	0.14	-0.01	0.633	0.12	0.15	-0.03	0.224
	(0.02)	(0.01)			(0.02)	(0.01)		
Household (HH) Demographic Characteristics								
HH size	5.53	5.41	0.12	0.410	5.25	5.46	-0.22	0.156
	(0.14)	(0.06)			(0.14)	(0.06)		
HH head literacy (1=Can read and write; 0=Other)	0.44	0.45	-0.01	0.839	0.44	0.45	-0.01	0.856
	(0.04)	(0.02)			(0.04)	(0.02)		
HH head occupation (1=Agriculture self-emp., 0=Other)	0.36	0.37	0.00	0.943	0.36	0.37	-0.01	0.901
	(0.04)	(0.02)			(0.04)	(0.02)		
Respondent Knowledge of and Trust in Health Care								
Heard of village private health clinic (1=Yes; 0=No)	0.98	0.98	-0.01	0.381	0.97	0.98	-0.02	0.052
	(0.01)	(0.00)			(0.01)	(0.00)		
Trust in village private clinic (1=Trust; 5=Distrust)	1.97	1.92	0.05	0.566	1.94	1.93	0.01	0.885
	(0.08)	(0.04)			(0.08)	(0.04)		
Heard of village EHP (1=Yes; 0=No)	0.89	0.88	0.02	0.403	0.85	0.88	-0.03	0.170
	(0.02)	(0.01)			(0.02)	(0.01)		
Trust in village EHP (1=Trust; 5=Distrust)	3.28	3.07	0.21	0.114	3.03	3.12	-0.09	0.524
	(0.12)	(0.05)			(0.13)	(0.05)		
Respondent Health Status and Practices								
Health visit at least frequently when sick (1=Yes; 0=No)	0.74	0.77	-0.03	0.274	0.74	0.77	-0.03	0.369
	(0.03)	(0.01)			(0.03)	(0.01)		
Health visit when not sick in past year (1=Yes; 0=No)	0.06	0.06	0.00	0.944	0.03	0.06	-0.03	0.054
	(0.01)	(0.01)			(0.01)	(0.01)		
Know have high blood pressure (BP) (1=Yes; 0=No)	0.72	0.71	0.02	0.593	0.68	0.72	-0.04	0.211
	(0.03)	(0.01)			(0.03)	(0.01)		
Take medication for high BP (1=Yes; 0=No)	0.39	0.44	-0.05	0.179	0.38	0.44	-0.06	0.106
	(0.03)	(0.01)			(0.03)	(0.01)		
Respondent Time Preferences								
Present-biased (1=Yes; 0=No)	0.20	0.21	0.00	0.902	0.20	0.20	0.00	0.938
	(0.03)	(0.01)			(0.03)	(0.01)		
Time-consistent (1=Yes; 0=No)	0.44	0.47	-0.03	0.465	0.46	0.46	0.00	0.976
	(0.03)	(0.01)			(0.03)	(0.01)		
Often impatient (1=Agree; 5=Disagree)	1.93	1.83	0.10	0.287	1.93	1.83	0.10	0.264
	(0.09)	(0.04)			(0.09)	(0.04)		
Procrastinates (1=Agree; 5=Disagree)	2.70	2.86	-0.15	0.192	2.84	2.83	0.01	0.920
	(0.11)	(0.05)			(0.11)	(0.05)		
Respondent Health Measures								
Body mass index (BMI)	24.58	25.62	-1.04	0.150	25.47	25.44	0.02	0.973
	(0.29)	(0.32)			(0.31)	(0.32)		
Body weight (kg)	64.03	65.07	-1.04	0.288	65.32	64.82	0.51	0.606
	(0.87)	(0.40)			(0.91)	(0.40)		
Height (cm)	161.37	160.33	1.04	0.126	160.03	160.59	-0.56	0.410
	(0.60)	(0.28)			(0.61)	(0.28)		
Waist circumference (cm)	95.18	96.09	-0.91	0.232	96.93	95.75	1.17	0.126
	(0.63)	(0.32)			(0.76)	(0.31)		
Systolic BP	144.59	141.99	2.60	0.104	141.56	142.59	-1.03	0.524
	(1.46)	(0.65)			(1.52)	(0.65)		
Diastolic BP	87.03	85.57	1.46	0.107	84.73	86.02	-1.29	0.158
	(0.82)	(0.37)			(0.77)	(0.37)		

Notes: This table compares each treatment group (T) with all other groups a comparison (C) and reports both the difference and the t-test p-value. For Caste, 1 refers to scheduled caste (SC), backward caste (BC), or backward tribe (BT). For "1=Trust; 5=Distrust," 1 refers to "Completely Trust" and 5 refers to "Completely Distrust." "Present-biased" refers to being more impatient in the short run (0-1 month). "Time-consistent" refers to being equally patient in the short run (0-1 month) and in the long run (6-7 months). For "1=Agree; 5=Disagree," 1 refers to "Strongly Agree" and 5 refers to "Strongly Disagree."

Table 3.2: Randomization Checks for Fixed Commitment Contracts

Table 2B: Randomization Checks for Flexible Commitment Contracts

Baseline Randomization for Flexible Commitment Contracts: Treatment (T) vs. All Other Groups as Comparison (C)

	Flexible CC Without Discount				Flexible CC With Discount			
	T Mean (T s.e.)	C Mean (C s.e.)	Diff. T-C	P-value	T Mean (T s.e.)	C Mean (C s.e.)	Diff. T-C	P-value
Respondent Demographic Characteristics								
Age	53.76	53.55	0.20	0.827	53.14	53.68	-0.54	0.566
	(0.89)	(0.38)			(0.84)	(0.38)		
Gender (0=Female; 1=Male)	0.40	0.41	-0.01	0.835	0.39	0.41	-0.02	0.598
	(0.03)	(0.01)			(0.03)	(0.01)		
Currently married (0=No; 1=Yes)	0.77	0.81	-0.04	0.144	0.79	0.81	-0.01	0.570
	(0.03)	(0.01)			(0.02)	(0.01)		
Caste (0=General; 1=SC, BC, BT)	0.44	0.46	-0.01	0.734	0.46	0.45	0.01	0.898
	(0.04)	(0.02)			(0.04)	(0.02)		
Literacy (1=Can read and write; 0=Other)	0.37	0.34	0.03	0.380	0.31	0.36	-0.04	0.173
	(0.03)	(0.01)			(0.03)	(0.01)		
Occupation (1=Agriculture self-emp., 0=Other)	0.15	0.14	0.01	0.682	0.16	0.14	0.02	0.460
	(0.02)	(0.01)			(0.02)	(0.01)		
Household (HH) Demographic Characteristics								
HH size	5.66	5.38	0.28	0.065	5.51	5.41	0.09	0.541
	(0.14)	(0.06)			(0.14)	(0.06)		
HH head literacy (1=Can read and write; 0=Other)	0.43	0.45	-0.02	0.721	0.43	0.45	-0.02	0.733
	(0.04)	(0.02)			(0.04)	(0.02)		
HH head occupation (1=Agriculture self-emp., 0=Other)	0.41	0.36	0.05	0.219	0.35	0.37	-0.02	0.654
	(0.04)	(0.02)			(0.04)	(0.02)		
Respondent Knowledge of and Trust in Health Care								
Heard of village private health clinic (1=Yes; 0=No)	0.99	0.98	0.00	0.579	0.98	0.98	0.00	0.932
	(0.01)	(0.00)			(0.01)	(0.00)		
Trust in village private clinic (1=Trust; 5=Distrust)	1.95	1.93	0.02	0.823	1.80	1.96	-0.16	0.069
	(0.08)	(0.04)			(0.08)	(0.04)		
Heard of village EHP (1=Yes; 0=No)	0.87	0.88	-0.01	0.540	0.89	0.88	0.01	0.540
	(0.02)	(0.01)			(0.02)	(0.01)		
Trust in village EHP (1=Trust; 5=Distrust)	3.16	3.09	0.06	0.638	3.12	3.10	0.02	0.893
	(0.12)	(0.05)			(0.12)	(0.05)		
Respondent Health Status and Practices								
Health visit at least frequently when sick (1=Yes; 0=No)	0.76	0.76	0.00	0.923	0.78	0.76	0.02	0.387
	(0.03)	(0.01)			(0.02)	(0.01)		
Health visit when not sick in past year (1=Yes; 0=No)	0.05	0.06	0.00	0.761	0.06	0.06	0.00	0.956
	(0.01)	(0.01)			(0.01)	(0.01)		
Know have high blood pressure (BP) (1=Yes; 0=No)	0.71	0.71	0.00	0.984	0.73	0.71	0.03	0.355
	(0.03)	(0.01)			(0.03)	(0.01)		
Take medication for high BP (1=Yes; 0=No)	0.43	0.43	0.00	0.943	0.43	0.43	0.00	0.993
	(0.03)	(0.01)			(0.03)	(0.01)		
Respondent Time Preferences								
Present-biased (1=Yes; 0=No)	0.24	0.20	0.04	0.186	0.17	0.21	-0.04	0.149
	(0.03)	(0.01)			(0.02)	(0.01)		
Time-consistent (1=Yes; 0=No)	0.44	0.47	-0.02	0.530	0.46	0.46	0.00	0.937
	(0.03)	(0.01)			(0.03)	(0.01)		
Often impatient (1=Agree; 5=Disagree)	1.95	1.83	0.12	0.195	1.74	1.87	-0.13	0.154
	(0.09)	(0.04)			(0.08)	(0.04)		
Procrastinates (1=Agree; 5=Disagree)	2.74	2.85	-0.11	0.358	2.76	2.85	-0.09	0.459
	(0.11)	(0.05)			(0.11)	(0.05)		
Respondent Health Measures								
Body mass index (BMI)	25.66	25.40	0.26	0.723	25.18	25.50	-0.32	0.660
	(0.51)	(0.31)			(0.31)	(0.32)		
Body weight (kg)	64.92	64.90	0.02	0.983	64.43	64.99	-0.57	0.560
	(0.84)	(0.40)			(0.87)	(0.40)		
Height (cm)	160.17	160.56	-0.39	0.568	159.97	160.60	-0.63	0.353
	(0.67)	(0.27)			(0.56)	(0.28)		
Waist circumference (cm)	95.97	95.94	0.04	0.961	96.02	95.93	0.09	0.906
	(0.64)	(0.32)			(0.67)	(0.31)		
Systolic BP	143.04	142.30	0.73	0.648	140.60	142.79	-2.18	0.173
	(1.43)	(0.66)			(1.34)	(0.66)		
Diastolic BP	86.53	85.67	0.85	0.348	84.94	85.99	-1.05	0.248
	(0.86)	(0.37)			(0.75)	(0.38)		

Notes: This table compares each treatment group (T) with all other groups a comparison (C) and reports both the difference and the t-test p-value. For Caste, 1 refers to scheduled caste (SC), backward caste (BC), or backward tribe (BT). For "1=Trust; 5=Distrust," 1 refers to "Completely Trust" and 5 refers to "Completely Distrust." "Present-biased" refers to being more impatient in the short run (0-1 month). "Time-consistent" refers to being equally patient in the short run (0-1 month) and in the long run (6-7 months). For "1=Agree; 5=Disagree," 1 refers to "Strongly Agree" and 5 refers to "Strongly Disagree."

Table 3.3: Randomization Checks for Flexible Commitment Contracts

Table 2C: Randomization Checks for Discount Only and Control Treatments

Baseline Randomization for Discount Only and Control: Treatment (T) vs. All Other Groups as Comparison (C)

	Discount Only				Control			
	T Mean (T s.e.)	C Mean (C s.e.)	Diff. T-C	P-value	T Mean (T s.e.)	C Mean (C s.e.)	Diff. T-C	P-value
Respondent Demographic Characteristics								
Age	53.46	53.61	-0.15	0.876	53.66	53.57	0.08	0.929
	(0.86)	(0.38)			(0.84)	(0.38)		
Gender (0=Female; 1=Male)	0.37	0.41	-0.04	0.203	0.43	0.40	0.02	0.460
	(0.03)	(0.01)			(0.03)	(0.01)		
Currently married (0=No; 1=Yes)	0.77	0.81	-0.04	0.153	0.86	0.79	0.06	0.015
	(0.03)	(0.01)			(0.02)	(0.01)		
Caste (0=General; 1=SC, BC, BT)	0.51	0.44	0.06	0.149	0.38	0.47	-0.09	0.034
	(0.04)	(0.02)			(0.04)	(0.02)		
Literacy (1=Can read and write; 0=Other)	0.37	0.34	0.03	0.380	0.34	0.35	-0.01	0.679
	(0.03)	(0.01)			(0.03)	(0.01)		
Occupation (1=Agriculture self-emp., 0=Other)	0.11	0.15	-0.04	0.130	0.18	0.13	0.05	0.042
	(0.02)	(0.01)			(0.02)	(0.01)		
Household (HH) Demographic Characteristics								
HH size	5.23	5.47	-0.24	0.105	5.40	5.44	-0.04	0.799
	(0.14)	(0.06)			(0.13)	(0.06)		
HH head literacy (1=Can read and write; 0=Other)	0.48	0.44	0.04	0.411	0.46	0.44	0.01	0.777
	(0.04)	(0.02)			(0.04)	(0.02)		
HH head occupation (1=Agriculture self-emp., 0=Other)	0.33	0.37	-0.04	0.326	0.38	0.36	0.01	0.736
	(0.04)	(0.02)			(0.04)	(0.02)		
Respondent Knowledge of and Trust in Health Care								
Heard of village private health clinic (1=Yes; 0=No)	0.99	0.98	0.00	0.573	0.99	0.98	0.01	0.113
	(0.01)	(0.00)			(0.00)	(0.00)		
Trust in village private clinic (1=Trust; 5=Distrust)	2.00	1.92	0.09	0.333	1.93	1.93	-0.01	0.926
	(0.09)	(0.04)			(0.08)	(0.04)		
Heard of village EHP (1=Yes; 0=No)	0.89	0.88	0.01	0.556	0.88	0.88	0.00	0.947
	(0.02)	(0.01)			(0.02)	(0.01)		
Trust in village EHP (1=Trust; 5=Distrust)	2.95	3.14	-0.18	0.157	3.09	3.11	-0.02	0.878
	(0.12)	(0.05)			(0.12)	(0.05)		
Respondent Health Status and Practices								
Health visit at least frequently when sick (1=Yes; 0=No)	0.80	0.75	0.05	0.080	0.75	0.77	-0.02	0.474
	(0.02)	(0.01)			(0.03)	(0.01)		
Health visit when not sick in past year (1=Yes; 0=No)	0.05	0.06	0.00	0.749	0.09	0.05	0.04	0.009
	(0.01)	(0.01)			(0.02)	(0.01)		
Know have high blood pressure (BP) (1=Yes; 0=No)	0.75	0.70	0.05	0.108	0.67	0.72	-0.05	0.067
	(0.03)	(0.01)			(0.03)	(0.01)		
Take medication for high BP (1=Yes; 0=No)	0.50	0.42	0.09	0.014	0.45	0.43	0.02	0.594
	(0.03)	(0.01)			(0.03)	(0.01)		
Respondent Time Preferences								
Present-biased (1=Yes; 0=No)	0.22	0.20	0.01	0.622	0.20	0.21	0.00	0.874
	(0.03)	(0.01)			(0.03)	(0.01)		
Time-consistent (1=Yes; 0=No)	0.50	0.45	0.04	0.231	0.47	0.46	0.01	0.848
	(0.03)	(0.01)			(0.03)	(0.01)		
Often impatient (1=Agree; 5=Disagree)	1.70	1.88	-0.18	0.058	1.84	1.85	-0.01	0.884
	(0.08)	(0.04)			(0.08)	(0.04)		
Procrastinates (1=Agree; 5=Disagree)	2.99	2.80	0.19	0.095	2.94	2.81	0.14	0.238
	(0.11)	(0.05)			(0.11)	(0.05)		
Respondent Health Measures								
Body mass index (BMI)	26.66	25.20	1.45	0.045	25.15	25.51	-0.36	0.616
	(1.42)	(0.16)			(0.28)	(0.32)		
Body weight (kg)	65.17	64.84	0.33	0.737	65.51	64.77	0.74	0.444
	(1.00)	(0.39)			(0.84)	(0.40)		
Height (cm)	160.20	160.56	-0.36	0.603	161.21	160.35	0.86	0.197
	(0.69)	(0.27)			(0.59)	(0.28)		
Waist circumference (cm)	96.02	95.93	0.09	0.906	95.57	96.02	-0.46	0.546
	(0.76)	(0.31)			(0.70)	(0.31)		
Systolic BP	141.13	142.68	-1.56	0.331	143.58	142.19	1.39	0.382
	(1.49)	(0.65)			(1.54)	(0.65)		
Diastolic BP	85.59	85.86	-0.27	0.764	86.04	85.77	0.27	0.763
	(0.87)	(0.37)			(0.87)	(0.37)		

Notes: This table compares each treatment group (T) with all other groups a comparison (C) and reports both the difference and the t-test p-value. For Caste, 1 refers to scheduled caste (SC), backward caste (BC), or backward tribe (BT). For "1=Trust; 5=Distrust," 1 refers to "Completely Trust" and 5 refers to "Completely Distrust." "Present-biased" refers to being more impatient in the short run (0-1 month). "Time-consistent" refers to being equally patient in the short run (0-1 month) and in the long run (6-7 months). For "1=Agree; 5=Disagree," 1 refers to "Strongly Agree" and 5 refers to "Strongly Disagree."

Table 3.4: Randomization Checks for Discount Only and Control Treatments

Table 2D: Randomization Checks for Reminder Treatment
Baseline Randomization for Reminder Treatment: Reminder (R) vs. No Reminder (NR)

	Reminders			
	R Mean (R s.e.)	NR Mean (NR s.e.)	Diff. R-NR	P-value
Respondent Demographic Characteristics				
Age	54.24	52.93	1.31	0.061
	(0.51)	(0.48)		
Gender (0=Female; 1=Male)	0.40	0.41	-0.01	0.788
	(0.02)	(0.02)		
Currently married (0=No; 1=Yes)	0.80	0.81	-0.02	0.394
	(0.01)	(0.01)		
Caste (0=General; 1=SC, BC, BT)	0.44	0.47	-0.03	0.410
	(0.02)	(0.02)		
Literacy (1=Can read and write; 0=Other)	0.32	0.38	-0.06	0.012
	(0.02)	(0.02)		
Occupation (1=Agriculture self-emp., 0=Other)	0.13	0.15	-0.02	0.302
	(0.01)	(0.01)		
Household (HH) Demographic Characteristics				
HH size	5.33	5.53	-0.20	0.078
	(0.07)	(0.08)		
HH head literacy (1=Can read and write; 0=Other)	0.44	0.46	-0.02	0.579
	(0.02)	(0.02)		
HH head occupation (1=Agriculture self-emp., 0=Other)	0.38	0.35	0.03	0.369
	(0.02)	(0.02)		
Respondent Knowledge of and Trust in Health Care				
Heard of village private health clinic (1=Yes; 0=No)	0.98	0.98	0.00	0.603
	(0.00)	(0.00)		
Trust in village private clinic (1=Trust; 5=Distrust)	1.96	1.90	0.06	0.328
	(0.05)	(0.05)		
Heard of village EHP (1=Yes; 0=No)	0.89	0.87	0.01	0.418
	(0.01)	(0.01)		
Trust in village EHP (1=Trust; 5=Distrust)	3.13	3.08	0.05	0.609
	(0.07)	(0.07)		
Respondent Health Status and Practices				
Health visit at least frequently when sick (1=Yes; 0=No)	0.74	0.78	-0.04	0.060
	(0.02)	(0.01)		
Health visit when not sick in past year (1=Yes; 0=No)	0.05	0.06	-0.01	0.332
	(0.01)	(0.01)		
Know have high blood pressure (BP) (1=Yes; 0=No)	0.69	0.73	-0.04	0.051
	(0.02)	(0.02)		
Take medication for high BP (1=Yes; 0=No)	0.42	0.44	-0.03	0.283
	(0.02)	(0.02)		
Respondent Time Preferences				
Present-biased (1=Yes; 0=No)	0.20	0.21	0.00	0.912
	(0.02)	(0.01)		
Time-consistent (1=Yes; 0=No)	0.46	0.46	0.00	0.987
	(0.02)	(0.02)		
Often impatient (1=Agree; 5=Disagree)	1.86	1.84	0.02	0.789
	(0.05)	(0.05)		
Procrastinates (1=Agree; 5=Disagree)	2.90	2.76	0.14	0.108
	(0.06)	(0.06)		
Respondent Health Measures				
Body mass index (BMI)	25.77	25.13	0.64	0.231
	(0.49)	(0.22)		
Body weight (kg)	65.27	64.53	0.74	0.306
	(0.52)	(0.51)		
Height (cm)	160.46	160.53	-0.07	0.893
	(0.36)	(0.35)		
Waist circumference (cm)	96.11	95.78	0.32	0.569
	(0.38)	(0.42)		
Systolic BP	143.27	141.58	1.69	0.158
	(0.82)	(0.87)		
Diastolic BP	85.73	85.90	-0.16	0.810
	(0.48)	(0.47)		

Notes: This table compares the reminder group (R) with the no reminder group (NR) and reports both the difference and the t-test p-value. For Caste, 1 refers to scheduled caste (SC), backward caste (BC), or backward tribe (BT). For "1=Trust; 5=Distrust," 1 refers to "Completely Trust" and 5 refers to "Completely Distrust." "Present-biased" refers to being more impatient in the short run (0-1 month). "Time-consistent" refers to being equally patient in the short run (0-1 month) and in the long run (6-7 months). For "1=Agree; 5=Disagree," 1 refers to "Strongly Agree" and 5 refers to "Strongly Disagree."

Table 3.5: Randomization Checks for Reminder Treatment

Table 3A: Commitment Contract Participation by Treatment

	Participants	Total	Percent
Fixed CC Without Discount	39	284	13.7%
Fixed CC With Discount	72	278	25.9%
Flexible CC Without Discount	40	283	14.1%
Flexible CC With Discount	112	290	38.6%
Total	263	1135	23.2%

Table 3B: Commitment Contract Participation by Hypertension at Baseline

	Did Not Know Had High BP			Knew Had High BP			Not Taking Medication for High BP			Taking Medication for High BP		
	Participants	Total	Percent	Participants	Total	Percent	Participants	Total	Percent	Participants	Total	Percent
Fixed CC Without Discount	9	79	11.4%	30	205	14.6%	21	147	14.3%	10	93	10.8%
Fixed CC With Discount	25	91	27.5%	47	187	25.1%	36	144	25.0%	18	88	20.5%
Flexible CC Without Discount	12	82	14.6%	28	201	13.9%	22	129	17.1%	11	96	11.5%
Flexible CC With Discount	29	77	37.7%	83	210	39.5%	52	132	39.4%	44	102	43.1%
Total	75	329	22.8%	188	803	23.4%	131	552	23.7%	83	379	21.9%

Notes: This table divides respondents into whether they knew they had hypertension, i.e., high blood pressure (BP), and if so, whether they took medication for it at baseline.

Table 3C: Commitment Contract Participation by Trust in Private Health Clinic in Village

Trust in Private Health Clinic:	Completely or Somewhat Trust			Indifferent			Completely or Somewhat Distrust			Haven't Heard of Private Health Clinic		
	Participants	Total	Percent	Participants	Total	Percent	Participants	Total	Percent	Participants	Total	Percent
Fixed CC Without Discount	26	177	14.7%	9	67	13.4%	3	31	9.7%	1	7	14.3%
Fixed CC With Discount	44	183	24.0%	17	50	34.0%	9	33	27.3%	0	10	0.0%
Flexible CC Without Discount	25	191	13.1%	8	46	17.4%	6	38	15.8%	0	4	0.0%
Flexible CC With Discount	84	199	42.2%	14	47	29.8%	10	31	32.3%	1	5	20.0%
Total	179	750	23.9%	48	210	22.9%	28	133	21.1%	2	26	7.7%

Notes: This table divides respondents by their trust in the private health clinic in their villages at baseline.

Table 3D: Commitment Contract Participation by Trust in EHP in Village

Trust in EHP:	Completely or Somewhat Trust			Indifferent			Completely or Somewhat Distrust			Haven't Heard of EHP		
	Participants	Total	Percent	Participants	Total	Percent	Participants	Total	Percent	Participants	Total	Percent
Fixed CC Without Discount	12	54	22.2%	10	54	18.5%	6	82	7.3%	5	30	16.7%
Fixed CC With Discount	25	66	37.9%	11	44	25.0%	14	70	20.0%	9	41	22.0%
Flexible CC Without Discount	12	64	18.8%	7	45	15.6%	9	77	11.7%	5	38	13.2%
Flexible CC With Discount	28	63	44.4%	27	52	51.9%	26	74	35.1%	10	31	32.3%
Total	77	247	31.2%	55	195	28.2%	55	303	18.2%	29	140	20.7%

Notes: This table divides respondents by their trust in EHP in their villages at baseline.

Table 3.6: Commitment Contract Participation

Table 4. Predictors for Participation in Commitment Contracts

Dependent Variable: Participation in Commitment Contract (CC)

	Fixed CCs		Flexible CCs		Fixed & Flexible CCs		w/ & w/o Discount	
	w/o Discount	w/ Discount	w/o Discount	w/ Discount	w/ Discount	w/o Discount	Fixed CC	Flexible CC
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Age	-0.003	-0.002	-0.001	0.002	-0.002	0.001	-0.003	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Gender (0=Female; 1=Male)	-0.004	0.036	0.041	0.068	0.024	0.059	0.03	0.062
	(0.07)	(0.13)	(0.09)	(0.05)	(0.04)	(0.06)	(0.06)	(0.07)
Currently married (1=Yes; 0=No)	0.058	0.233*	-0.123	0.163	-0.057	0.22	0.11	0.053
	(0.14)	(0.07)	(0.07)	(0.14)	(0.06)	(0.10)	(0.09)	(0.09)
Household size	-0.008	0.019	-0.014	-0.005	-0.008	0.013	0.004	-0.006
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
HH literate (1=Can read and Write; 0=No)	0.018	0.055	0.065	0.058	0.044*	0.036	0.039**	0.024
	(0.03)	(0.02)	(0.05)	(0.16)	(0.01)	(0.09)	(0.01)	(0.12)
HH occupation (1=Agriculture self-emp., 0=Other)	-0.012	-0.077	-0.01	-0.022	-0.008	-0.055	-0.045	-0.024
	(0.04)	(0.10)	(0.06)	(0.09)	(0.03)	(0.09)	(0.04)	(0.01)
Trust in village private clinic (1=Trust; 5=Distrust)	0.000	-0.002	0.021	-0.083	0.012	-0.043	0.001	-0.031
	(0.02)	(0.03)	(0.04)	(0.03)	(0.01)	(0.02)	(0.02)	(0.02)
Trust in village EHP (1=Trust; 5=Distrust)	-0.029**	-0.038	-0.011	-0.005	-0.025	-0.020*	-0.038*	-0.011
	(0.01)	(0.02)	(0.03)	(0.03)	(0.02)	(0.01)	(0.01)	(0.03)
Know have high blood pressure (BP) (1=Yes; 0=No)	0.091	-0.068	0.081	0.081	0.072	0.009	0.000	0.096
	(0.08)	(0.08)	(0.15)	(0.06)	(0.04)	(0.02)	(0.04)	(0.08)
Take medication for high BP (1=Yes; 0=No)	-0.091	0.002	-0.095	0.032	-0.108	0.037	-0.04	-0.024
	(0.11)	(0.09)	(0.08)	(0.02)	(0.05)	(0.02)	(0.08)	(0.08)
Often impatient (1=Agree; 5=Disagree)	-0.039	0.006	-0.032	-0.02	-0.029	-0.011	-0.016	-0.035
	(0.01)	(0.02)	(0.03)	(0.03)	(0.01)	(0.01)	(0.02)	(0.02)
Tend to procrastinate (1=Agree; 5=Disagree)	-0.002	-0.005	-0.012	-0.026	-0.009	-0.016	-0.004	-0.014
	(0.02)	(0.01)	(0.01)	(0.03)	(0.01)	(0.02)	(0.02)	(0.01)
Body mass index (BMI)	0.003	0.002	0.008	-0.003	0.006	0.000	0.004	0.004
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)
Systolic BP	0.003	0.001	-0.001	0.000	0.002	0.000	0.002	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Diastolic BP	0.001	0.002	-0.002	0.005	-0.001*	0.004*	0.002	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)	0.00	(0.00)	(0.00)	0.00
Sample size	170	177	164	169	334	346	347	333
R-squared	0.157	0.170	0.084	0.108	0.082	0.096	0.125	0.047

Notes: Regressions include village fixed effects. Robust standard errors clustered at village level. "HH literate" refers to whether either the respondent or the household head can both read and write. "HH occupation" refers to the household head's occupation if available, and if not available, the respondent's occupation. For "1=Trust; 5=Distrust," 1 refers to "Completely Trust" and 5 refers to "Completely Distrust." For "1=Agree; 5=Disagree," 1 refers to "Strongly Agree" and 5 refers to "Strongly Disagree." Significance levels: * 5%, ** 1%, and *** 0.1%.

Table 3.7: Predictors for Participation in Commitment Contracts

Table 5: Respondents Who Visited Health Camps at Least Once by Treatment and Commitment Contract (CC) Participation

	All Respondents			Participated in CC			Did Not Participate in CC		
	Visited	Total	Percent	Visited	Total	Percent	Visited	Total	Percent
Fixed CC Without Discount	27	284	9.5%	15	39	38.5%	12	245	4.9%
Fixed CC With Discount	35	278	12.6%	23	72	31.9%	12	206	5.8%
Flexible CC Without Discount	28	283	9.9%	12	40	30.0%	16	243	6.6%
Flexible CC With Discount	40	290	13.8%	26	112	23.2%	14	178	7.9%
CC Subtotal	130	1135	11.5%	76	263	28.9%	54	872	6.2%
Discount Only	42	288	14.6%						
Control	26	293	8.9%						
Total	198	1716	11.5%						

Table 3.8: Health Camp Attendance by Treatment

Table 6. Predictors for Health Camp Visits Across All Respondents

Dependent Variables: Based on Number of Health Camp Visits

Dependent Variable:	At Least 1 Visit		At Least 2 Visits		At Least 3 Visits		Number of Visits	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment: Fixed CC Without Discount	0.005	0.046	0.008	0.020	0.014	0.026*	0.024	0.100
	(0.029)	(0.034)	(0.014)	(0.008)	(0.009)	(0.008)	(0.058)	(0.074)
Treatment: Fixed CC With Discount	0.037	0.039	0.016	0.010	0.008	0.001	0.047	0.035
	(0.021)	(0.040)	(0.012)	(0.022)	(0.003)	(0.004)	(0.026)	(0.047)
Treatment: Flexible CC Without Discount	0.009	0.021	0.022	0.018	0.015***	0.009	0.060	0.053
	(0.036)	(0.037)	(0.015)	(0.024)	(0.001)	(0.019)	(0.070)	(0.108)
Treatment: Flexible CC With Discount	0.048	0.077	0.033**	0.050**	0.018*	0.033	0.131*	0.217**
	(0.022)	(0.025)	(0.004)	(0.004)	(0.005)	(0.015)	(0.041)	(0.025)
Treatment: Discount Only	0.059	0.085	0.022	0.026	0.018	0.017	0.156	0.201
	(0.026)	(0.040)	(0.020)	(0.029)	(0.007)	(0.014)	(0.082)	(0.129)
Age		0.003		0.001		0.000		0.003
		(0.002)		(0.001)		0.000		(0.003)
Gender (0=Female; 1=Male)		-0.041		-0.042*		-0.020		-0.118
		(0.032)		(0.012)		(0.014)		(0.105)
Currently married (1=Yes; 0=No)		0.050		0.044*		0.026		0.082
		(0.040)		(0.013)		(0.011)		(0.101)
Household size		-0.003		-0.002		-0.003		-0.008
		(0.004)		(0.003)		(0.003)		(0.013)
HH literate (1=Can read and Write; 0=No)		-0.008		0.019		0.002		0.017
		(0.016)		(0.010)		(0.010)		(0.049)
HH occupation (1=Agriculture self-emp., 0=Other)		0.013		0.001		0.008		0.062
		(0.010)		(0.011)		(0.016)		(0.032)
Trust in village private clinic (1=Trust; 5=Distrust)		0.011*		0.003		0.003		0.025
		(0.003)		(0.004)		(0.003)		(0.012)
Trust in village EHP (1=Trust; 5=Distrust)		-0.023		-0.011*		-0.006		-0.061
		(0.009)		(0.003)		(0.003)		(0.021)
Know have high blood pressure (BP) (1=Yes; 0=No)		0.013		0.002		0.009		0.012
		(0.047)		(0.032)		(0.014)		(0.136)
Take medication for high BP (1=Yes; 0=No)		0.022		0.012		0.000		0.018
		(0.065)		(0.043)		(0.018)		(0.168)
Often impatient (1=Agree; 5=Disagree)		0.000		0.003		-0.001		0.000
		(0.006)		(0.003)		(0.002)		(0.014)
Tend to procrastinate (1=Agree; 5=Disagree)		-0.010		-0.007		-0.001		-0.034
		(0.011)		(0.006)		(0.003)		(0.023)
Body mass index (BMI)		-0.001		-0.002		-0.001		-0.005
		(0.002)		(0.002)		(0.002)		(0.010)
Systolic BP		0.001		0.000		0.000		0.001
		(0.001)		0.000		0.000		(0.001)
Diastolic BP		0.000		0.000		0.000		0.001
		(0.001)		(0.001)		0.000		(0.002)
Sample size	1684	1018	1684	1018	1684	1018	1684	1018
R-squared	0.010	0.054	0.005	0.038	0.003	0.030	0.007	0.038

Notes: Sample includes all treatment groups and the control (the omitted group). Regressions include village fixed effects. Robust standard errors clustered at village level. "HH literate" refers to whether either the respondent or the household head can both read and write. "HH occupation" refers to the household head's occupation if available, and if not available, the respondent's occupation. For "1=Trust; 5=Distrust," 1 refers to "Completely Trust" and 5 refers to "Completely Distrust." For "1=Agree; 5=Disagree," 1 refers to "Strongly Agree" and 5 refers to "Strongly Disagree." Significance levels: * 5%, ** 1%, and *** 0.1%.

Table 3.9: Predictors for Health Camp Visits

Table 7. Predictors for Health Camp Visits Among Respondents Who Participated in Commitment Contracts

Dependent Variables: Based on Number of Health Camp Visits

Dependent Variable:	At Least 1 Visit		At Least 2 Visits		At Least 3 Visits		Number of Visits	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fixed CC Without Discount & Participated in CC	0.291	0.333	0.201	0.186*	0.145	0.174	0.720	0.788
	(0.099)	(0.124)	(0.074)	(0.043)	(0.065)	(0.064)	(0.265)	(0.296)
Fixed CC With Discount & Participated in CC	0.228**	0.233	0.096	0.078	0.048	0.025	0.368*	0.328
	(0.029)	(0.081)	(0.041)	(0.082)	(0.017)	(0.021)	(0.070)	(0.167)
Flexible CC Without Discount & Participated in CC	0.206	0.161	0.120	0.043	0.041	-0.003	0.347	0.157
	(0.100)	(0.129)	(0.045)	(0.038)	(0.025)	(0.024)	(0.148)	(0.167)
Flexible CC With Discount & Participated in CC	0.145*	0.165*	0.081*	0.085	0.057*	0.080	0.392*	0.479*
	(0.026)	(0.048)	(0.016)	(0.029)	(0.018)	(0.043)	(0.103)	(0.103)
Age		0.004		0.002		0.001		0.006
		(0.003)		(0.001)		(0.001)		(0.007)
Gender (0=Female; 1=Male)		-0.081		-0.068*		-0.047		-0.233
		(0.055)		(0.020)		(0.016)		(0.109)
Currently married (1=Yes; 0=No)		-0.011		0.063		0.060		0.116
		(0.035)		(0.053)		(0.023)		(0.074)
Household size		-0.014		-0.008		-0.005		-0.014
		(0.006)		(0.003)		(0.010)		(0.040)
HH literate (1=Can read and Write; 0=No)		0.050		0.040		0.005		0.145
		(0.044)		(0.035)		(0.021)		(0.121)
HH occupation (1=Agriculture self-emp., 0=Other)		0.002		-0.005		0.020		0.145
		(0.038)		(0.030)		(0.027)		(0.069)
Trust in village private clinic (1=Trust; 5=Distrust)		0.031*		0.009		0.012		0.063
		(0.008)		(0.009)		(0.004)		(0.022)
Trust in village EHP (1=Trust; 5=Distrust)		-0.019		-0.014		-0.009		-0.070
		(0.015)		(0.006)		(0.006)		(0.042)
Know have high blood pressure (BP) (1=Yes; 0=No)		0.021		0.026		0.024		0.134
		(0.089)		(0.067)		(0.027)		(0.247)
Take medication for high BP (1=Yes; 0=No)		0.025		-0.016		-0.008		-0.043
		(0.083)		(0.074)		(0.031)		(0.282)
Often impatient (1=Agree; 5=Disagree)		0.000		-0.005		-0.006		-0.007
		(0.007)		(0.005)		(0.004)		(0.019)
Tend to procrastinate (1=Agree; 5=Disagree)		-0.021		-0.013		-0.003		-0.058
		(0.017)		(0.014)		(0.011)		(0.052)
Body mass index (BMI)		0.003		-0.002		-0.002		-0.002
		(0.003)		(0.001)		(0.002)		(0.010)
Systolic BP		0.001		0.001		0.000		0.002
		(0.001)		(0.001)		(0.000)		(0.001)
Diastolic BP		-0.003		-0.002		-0.001		-0.005
		(0.002)		(0.001)		(0.000)		(0.003)
Sample size	556	334	556	334	556	334	556	334
R-squared	0.085	0.170	0.058	0.122	0.050	0.130	0.066	0.125

Notes: Sample includes all commitment contract treatment groups. The omitted categories for treatments (first four rows) are the corresponding respondents who did not participate in commitment contracts. Regressions include village fixed effects. Robust standard errors clustered at village level. "HH literate" refers to whether either the respondent or the household head can both read and write. "HH occupation" refers to the household head's occupation if available, and if not available, the respondent's occupation. For "1=Trust; 5=Distrust," 1 refers to "Completely Trust" and 5 refers to "Completely Distrust." For "1=Agree; 5=Disagree," 1 refers to "Strongly Agree" and 5 refers to "Strongly Disagree." Significance levels: * 5%, ** 1%, and *** 0.1%.

Table 3.10: Predictors for Health Camp Visits Among Commitment Contract Participants

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