Estimating Moral Hazard in Healthcare Utilization from a Large Scale Policy Experiment:

Universal Healthcare, Not Universal Benefit *

George-Levi Gayle† Peter-John Gordon‡ Devon Lynch§
Prasanthi Ramakrishnan¶

November 1, 2022 Link to Latest Version

Abstract

This paper combines quasi-experimental approaches with a structural model to estimate the level of moral hazard in health care utilization. It uses an unanticipated change in the healthcare system of Jamaica from a means-tested user fee regime to one with 100 percent state funding in 2008 for this purpose. As the poor had free access to medical services in public hospitals, this provides exogenous price variation in the public health sector as compared to the private health sector. Using data from the Jamaica Survey of Living Conditions (JSLC) for the years 2004 to 2012, the paper first uses a non-linear difference-in-difference approach to evaluate the effect of this change on facility usage (public versus private) as well as on frequency of visit. It finds evidence indicating the possibility of a 'crowding out', suggesting that a universal health care policy may lead to redistribution *away* from the poor. The paper then extends Cardon and Hendel (2001) model to allow for choice of type of hospital (public or private) and shows how the quasi-experimental variation allows for identification of the structural parameters of the model. It then uses estimated model to quantify the welfare implications of moral hazard and the level of redistribution away from the poor.

Keywords: Moral hazard, universal health care

JEL Codes: G22, H51, I1, H44, D12, D60

---

*We thank Sean Wang and Dongwei Xu who provided research assistance. All errors are our own.

† Federal Reserve Bank of St. Louis and Department of Economics, Washington University in St. Louis, Campus Box 1208, One Brookings Drive, St. Louis, MO 63130. Email: ggayle@wustl.edu. ‡ Department of Economics, The University of the West Indies Mona, Kingston 7, Jamaica. Email: peterjohn.gordon@uwimona.edu.jm § Department of Economics, University of Massachusetts Dartmouth, 285 Old Westport Road, Dartmouth, MA 02747. Email: dlynch@umassd.edu ¶ Department of Economics, Washington University in St. Louis, Campus Box 1208, One Brookings Drive, St. Louis, MO 63130. Email: p.ramakrishnan@wustl.edu.

1 Introduction

The health care market with its interrelation with the health insurance market is prone to the twin dangers which all insurance systems face, moral hazard and adverse selection. Pauly (1968) highlighted that full health insurance coverage may not be "optimal" given moral hazard i.e. individuals' demand for health care will respond as a result of the lower marginal cost of medical care. Empirically confirming the existence of moral hazard in health utilization has been a classical problem in information and health economics, which suffers from the lack of exogenous price variation. While there are many papers that have attempted to do this such as Cameron et al. (1988), Finkelstein et al. (2012), and Einav et al. (2013), this still remains an active area of research.

A related question to that of moral hazard is that of the provision of universal health care. Universal health care ensures that all individuals can access health care, irrespective of whether they can afford it. Besley and Coate (1991) claim that universal health care can be used as a way of redistribution of income from the rich to the poor. However, it is not clear if this would be the case in practice as the existence of moral hazard would suggest over-consumption of health services leading to long wait-times. Thus, this paper seeks to estimate the welfare cost of moral hazard from access to universal health care and empirically evaluates its re-distributional properties.

We focus on the country of Jamaica, where in 2008, a change in the political administration of the country resulted in a 100 percent state funding policy in health care in public facilities from a means-tested user fees regime. As this was unanticipated, this provides us with a unique natural experiment to evaluate and quantify moral hazard as well as estimate the welfare costs arising from implementing such a policy. The key to identification is the price variation in the public sector as a result of this policy, relative to private sector. Moreover, the poor were already exempt from user-fees in the public facilities, thus, these are our control group as they are unaffected by the change. As Jamaica has a mixed health care system with the co-existence of public and private sector, this is the perfect setting to analyze the question this paper seeks to answer.

We first estimate a non-linear difference-in-difference, following Blundell and Dias (2009). We use data from the Jamaica Survey of Living Conditions between the years 2004 and 2012. This is an annual survey, which provides information on demographic characteristics and health. We find that in the aggregate data, more people choose to visit a private hospital relative to a public hospital. However, we see the opposite occurring in the disaggregated data with a rise in the utilization of public facilities by the rich, relative to the poor. This indicates that the introduction of universal health care might lead to a crowding out effect for the poor and thus, a sub-optimal outcome for them.

We then build a two stage structural model to quantify the welfare costs of such a reform. We extend Cardon and Hendel (2001) to incorporate choice of health facility. In the first stage, the individual chooses whether or not to get insurance after the realization of a private signal about his future uncertain health state. In the second stage, the individual chooses the type of health facility to go to (none, public, private or both) based on the realization of his health state. We do not observe medical expenditure in the data; therefore, we modify health consumption to be a function of the uncertain health state as well as health care consumption by individuals, which depend on the choice of facility. We use a two-step GMM to estimate an over-identified model. Overall, the model fits the data well and we find that the benefit of going to a private health facility is lower than that of a public health facility. We also find some evidence that suggests that private insurance reacted to the removal in user fees.

The key takeaway from our preliminary estimates, is that universal health care may lead to redistribution *away* from the poor, rather than to the poor, contrary to existing literature.

The rest of the paper is organized as follows. Section 2 provides some institutional background to the Jamaica health care system as well as the reform. Section 3 review the literature on moral hazard and universal health care. Section 4 details the data and covers the difference-in-difference methodology and results. Section 5 and 6 presents the model and its empirical specification along with identification. Section 7 presents some preliminary results and Section 8 concludes.

2 Institutional Background

The health care system in Jamaica is mixed, that is, it has both a public and a private component. However, the public network of health facilities is far wider than the private ones - in 1990, there were approximately 5,100 hospital beds in the public institutions compared with 300 in the private sector and this ratio has remained fairly stable over time. While primary health care is accessed through a number of public clinics as well as the public hospitals and from doctors in the private sector, most of the secondary and tertiary care is accessed from the public sector. As one would expect, it is also the case that health care in the private sector is usually more expensive as well. However, private facilities are not necessarily superior in quality, and thus, a strictly separating equilibrium in which higher income persons access health care exclusively in the private sector and lower income persons access health care only in the public sector does not exist empirically.

A cost sharing regime existed in the public health sector in Jamaica prior to 1990 and continued until the first quarter of 2008. Under this regime, consumers of the public health facilities contributed toward the cost of services provided. Fees were set by statue and could only be changed by an affirmative resolution of parliament. There were some categories of patients which were exempt from hospital fees [1]. Prior to 1990, public hospitals were only able to retain 50 percent of fees collected, the remainder going to the Ministry of Health. This figure changed in 1990 to 75 percent, and then in 1998 to 100 percent.

Over the period 1991 to 2002 the percentage of the Jamaican population having health insurance fluctuated between 8 percent and 13 percent, with an average rate of 10.5 percent. The majority of health insurance coverage is obtained as a part of employment benefits. Employed persons receive health insurance through their companies, with the payments for premium shared between the employer and the employee. Employees have the option of including dependents on their insurance policies but this leads to higher payments. A public insurance option was introduced in 2003 (hereafter, 2003 reform) as a part of the pension benefits for social security recipients. This reform caused the number of persons with health insurance to jump to approximately 18 percent in 2004. The average coverage between 2004 and 2010 is 18 percent - the highest coverage was 20 percent in 2007 and the lowest 16 percent in 2012.

In 2007, a general election was scheduled for the month of August. In April, the party in opposition, Jamaica Labour Party (JLP), declared in Parliament that if they formed the next government post election, all user fees from public health facilities would be removed. The argument given by the JLP for this position was to ease the burden on the poor. In May, user fees for children under the age of 18 years were abolished. On August 19, Hurricane Dean, a category 4 storm, hit Jamaica, which led to the postponement of the election to September. This election, one of the closest elections in Jamaica's history up to that point in time[2], was won by JLP. And thus, the new government abolished user fees for everyone and implemented this policy in April 2008. As the outcome of the election was unanticipated, the subsequent change in health regime was unanticipated as well.

[1] These included the indigent, family planning patients, police, fire-fighters and war veterans, prisoners and persons held in places of safety and primary school children in uniform accompanied by a teacher

[2] The JLP got 32 seats in Parliament (49.98% of the popular vote) to the PNP's 28 seats (49.35% of the popular vote).

3 Literature Review

The use of 'moral hazard' in the context of health insurance can be traced back to Arrow (1963). Pauly (1968) highlighted that full health insurance coverage may not be "optimal" given moral hazard. Since then the health sector has become a fertile ground for investigating choices in the presence of asymmetric information and price distortion.

Many papers examine the effect of insurance and heath consumption. Cameron et al. (1988) examines the interrelation between the demand for health insurance and health care. They argue that the decision to acquire insurance is driven in part by the expectation of future health consumption needs. Using empirical data from the Australian Health Survey 1977-1978, they find that health status was the most important determinant of the use of health services, while income was the most important factor determining the demand for health insurance. They also find that for a broad range of health services (doctors, hospitals, medicines) people with more generous insurance coverage had higher usage on average, which was as a result of both moral hazard and adverse selection. Barros, Machado and de Galdeano (2008) estimates the impact of additional coverage on demand of visits to the doctor, diagnostic tests and probability of a visit to the dentist. They focus on the most common health insurance in Portugal, ADSE, which is given to all civil servants and dependents, and thus, insurance can be considered to be independent of health status. They see large positive effects of ADSE: 6 percent increase in number of visits and 16 percent increase in number of tests. These effects are the largest for the 18-30 age group. Using the Oregon health insurance experiment, Finkelstein et al. (2012) find that after one year of the experiment, the treatment group had substantially and significantly higher health care utilization and lower out of pocket medical expenditures.

However, Cameron et al. (1988), do not distinguish between private and public health care use. Savage and Wright (2003) develop a three-period model, where in the first period, an insurance decision is made without any idea of the health status in the subsequent period; in the second period, an individual decides how much private hospital services to consume; and in the third period, after a wait-time, the individual is free to utilize as much public facility as needed. They find that significant effects of moral hazard increased the duration of stay in hospital by a factor of 2 for persons belonging to the family structure couple with dependents; and for persons from the family structure old couple, by a factor of 3.

Yet, due to data limitations, work on quantifying these theoretical predictions has been scarce. Most of the work has been done either using experimental data (which gives exogenous variation in prices) or by developing structural models (which impose explicit restrictions on individual preferences and utility functions). Cardon and Hendel (2001) develop a two-stage model of an expected utility maximizing consumer, where in the first stage, the individual chooses insurance after receiving a signal about future health state; and in the second stage after knowing their true health state, individual chooses health care consumption. They use the 1987 National Medical Expenditure Survey (NMES) data; however, they do not find evidence of asymmetric information in their data.

There has been work focusing on the role of selection. Einav et al. (2013) focuses on quantifying the selection of moral hazard in health insurance. They define moral hazard as the "slope of health care spending with price" and by selection on moral hazard, they refer to component of adverse selection which is driven by heterogeneity in the slope parameter. They present a utility-maximizing model of health insurance, similar to that of Cardon and Hendel (2001); however, the key difference is the focus on the *heterogenous* moral hazard. They use employer-provided health insurance in the United States and estimate substantial heterogeneity in moral hazard and selection in it. On the other hand, Shepard (2016) studies the role of selection when "quality" of insurers varies by their network of covered hospitals, and especially if this network includes the "star" or best regarded hospitals. He finds that plans that covers these hospitals face adverse selection as they attract the sick as well as people who tend to use these costly hospitals. He provides evidence of adverse selection from administrative data from Massachusetts' pioneer health insurance exchange, where all plans had identical rules for cost-sharing and thus, varying only in the provider network, through reduced-form evidence as well as developing a structural model of hospital choice, plan choice with a cost model. He shows that this selection provides a strong disincentive to covering the star hospitals, even after applying the exchange's risk adjustment intended to mitigate selection incentives.

There is significant literature on selection and welfare effects, based on the access to provider networks. Most health care insurers in the US tend to restrict the hospitals from which subsidized care will be provided. Ho (2006) introduces a dataset which lists the hospital networks of every managed care plan in 43 markets across USA and investigates the effect of restricted hospital choice on welfare. She does this in a three step manner: first, a discrete choice model of hospital demand is estimated; second, using these estimated parameters, each consumer's expected utility is calculated from the hospital network for each plan; third, this expected utility is used as an input for estimating a discrete choice model of plan choice. Using this, the welfare from these plans are estimated. In a counterfactual where the switch occurs from the present scenario to one where all plans contract with all hospitals, Ho estimates the welfare gain to be close to a $1.04 billion. Einav, Finkelstein and Cullen (2010) seek to estimate welfare in an insurance market using fewer assumptions about the underlying primitives. This approach however restricts the welfare analysis to factors associate with pricing on existing contracts. Using data from a single firm they find evidence of adverse selection; however, they find that the welfare cost is relatively small.

Using data from a reform carried out by Harvard University in 1995, Culter and Reber (1998) examine how the gains from competitive reforms in the health insurance market combined with adverse selection affects welfare. They concluded that because of adverse selection, the most generous policy could not have been sustained under an equal contribution rule. They further estimated the welfare lost from adverse selection to be between 2 and 4 percent of baseline spending. While the reform reduced Harvard's premium payments by 5 to 8 percent, these saving were more of a redistribution from insurers profits than a saving in resource utilization. They therefore concluded that society was made worst off by the adverse selection losses.

Another issue in this literature is public provision of health care, or universal health care. Besley and Coate (1991) claim that the universal public provision schemes (housing, education, health care etc) can be used as a mechanism to redistribute income from the rich to the poor, even if these provisions are financed by a head tax. For this to occur these services must also be provided by the private sector with a quality difference in favour of the privately provided provision sufficiently great that some individuals while still paying into the public provision will choose to consume privately. Gertler and Sturm (1997) test Besley and Coate's proposition. They argue that by making health insurance mandatory for the non-poor these persons will opt out of the publicly provided health care system which will reduce the cost of providing public health care. Using data from Jamaica they found that persons with health insurance were more likely to demand health care from the private sector. They estimated that expanding health insurance to the top half of the income distribution could potentially result in a reduction in public expenditure of approximately 33 percent, an increase in the share of public expenditure captured by the poor by approximately 25 percent and a shift in the mix of subsidies away from curative treatment to preventive care.

Boone (2015) builds a tractable model of health insurance with adverse selection and moral hazard and analyses the question as to which treatments should be covered by insurance. His theoretical model shows that the basic insurance should cover the problems that suffer the most from adverse selection, and that cost effectiveness of treatments does not play any role in its inclusion in insurance. Card, Dobkin and Maestas (2008) uses a regression discontinuity design to look at the difference in health outcomes before and after the Medicare eligibility age. Their main finding is that Medicare eligibility causes a sharp increase in the use of health care services, with variation in the pattern of gains. Low-cost services such as routine visits to the doctor see a rise with Medicare eligibility for the groups with the lowest insurance rates; whereas for high-cost treatments, there is a rise for the groups with supplemental insurance.

4 Data and Causal Analysis

4.1 Data

We utilize data from the Jamaica Survey of Living Conditions (JSLC), which is an annual survey providing information on six modules - demographic characteristics; household consumption; health; education; housing; and social welfare and related programmes. The survey was conducted for the first time in 1988, and data extends till 2012. As the 2003 reform[3] is likely to introduce noise, we define the pre-reform period as the years 2004 and 2006 and the post-reform period as the years 2009, 2010 and 2012 [4]. The years 2007 and 2008 are considered the reform years and are not included in the estimation. Given that the poorest consumers were already exempt from paying user fees, these are our control group as they are unaffected by this regime change. We define the treatment group as the top four consumption quintiles, whose user fees were suddenly abolished; however, we focus on the top two quintiles. This is primarily due to a probable change in composition of quintiles 2 and 3 as a result of the financial recession in 2008. We define these groups based on annual consumption expenditure.

Table 1 presents the descriptive statistics of our dataset, by the whole sample as well as by quintiles. Each of these is further divided into the the full sample (includes the reform years of 2007 and 2008), pre-reform period and post-reform period. We first focus on the variables of interest for our difference-in-difference, as well as for our model. We see that on average, 18 percent of the population is insured. It falls to 16.7 percent, post-reform. However, there is sharp variation by quintile, with only 11 percent of quintile 1 insured pre-reform, which falls to 7.1 percent post-reform. For quintiles other than 1, there does not seem to be much change with the reform and the number is around 19 percent.

[3]As mentioned in the background section, a public insurance option was introduced in 2003 as a part of the pension benefits for social security recipients.

[4]Years 2005 and 2011 are not included due to non-availability of data in those years.

Table 1: Descriptive Statistics of Our Dataset

Variable	Whole Sample						Quintile 1						Not Quintile 1					
	Full		Pre		Post		Full		Pre		Post		Full		Pre		Post	
	Value	N	Value	N	Value	N	Value	N	Value	N	Value	N	Value	N	Value	N	Value	N
Insured	0.172	61123	0.180	13839	0.167†	32978	0.086	11772	0.114	2592	0.071†	7424	0.192	49351	0.195	11247	0.194	25554
Visited Facility	0.067	61123	0.086	13839	0.053†	32978	0.081	11772	0.111	2592	0.063†	7424	0.064	49351	0.080	11247	0.050†	25554
Visited Private Facility	0.564	4099	0.569	1192	0.608†	1744	0.460	951	0.388	289	0.529†	465	0.595	3148	0.627	903	0.636	1279
Visited Public Facility	0.498	4099	0.496	1192	0.446†	1744	0.594	951	0.664	289	0.523†	465	0.469	3148	0.442	903	0.418	1279
Number of Visits																		
0	93.49	57024	91.48	12647	94.97	31234	92.23	10821	89.02	2303	94.12	6959	93.79	46203	92.04	10344	95.21	24275
1	4.86	2966	6.42	887	3.77	1241	5.88	690	8.08	209	4.48	331	4.62	2276	6.03	678	3.57	910
2	1.20	733	1.53	212	0.91	300	1.35	158	1.97	51	0.99	73	1.17	575	1.43	161	0.89	227
3	0.25	154	0.33	45	0.20	66	0.36	42	0.70	18	0.27	20	0.23	112	0.24	27	0.18	46
4	0.11	68	0.17	23	0.08	25	0.10	12	0.15	4	0.04	3	0.11	56	0.17	19	0.09	22
5	0.08	50	0.08	11	0.07	23	0.09	10	0.08	2	0.11	8	0.08	40	0.08	9	0.06	15
Had Illness	0.095	61052	0.123	13792	0.072†	32970	0.122	11751	0.169	2579	0.090†	7420	0.088	49301	0.113	11213	0.067†	25550
Illness Days	2.486	24844	10.849	1751	1.073†	21346	3.023	5683	11.317	448	1.452†	4902	2.327	19161	10.688	1303	0.960†	16444
	(7.230)		(9.081)		(4.880)		(8.079)		(9.290)		(5.715)		(6.950)		(9.006)		(4.596)	
Inactive Days	1.347	24830	5.921	1738	0.649†	21347	1.511	5678	5.546	443	0.882†	4902	1.299	19152	6.049	1295	0.580†	16445
	(5.105)		(7.882)		(3.951)		(5.407)		(7.610)		(4.608)		(5.012)		(7.971)		(3.731)	
Purchased Medication	0.716	5929	0.742	1723	0.701†	2504	0.621	1491	0.648	449	0.595†	709	0.749	4438	0.776	1274	0.743†	1795
Purchased Medication from Private	0.817	4328	0.792	1324	0.850†	1765	0.694	957	0.629	313	0.762†	421	0.851	3371	0.843	1011	0.878†	1344
Purchased Medication from Public	0.177	4288	0.212	1314	0.134†	1751	0.265	955	0.340	315	0.200†	421	0.152	3333	0.172	999	0.114†	1330
Demographics																		
Female	0.515	61123	0.519	13839	0.504†	32978	0.440	11772	0.436	2592	0.435	7424	0.533	49351	0.538	11247	0.524†	25554
General Health Status (Good+)	0.850	61123	0.825	13839	0.854†	32978	0.760	11772	0.720	2592	0.771†	7424	0.871	49351	0.849	11247	0.878†	25554
General Health Status (Fair)	0.112	61123	0.127	13839	0.110†	32978	0.169	11772	0.184	2592	0.165†	7424	0.098	49351	0.114	11247	0.094†	25554
General Health Status (Poor+)	0.039	61123	0.048	13839	0.036†	32978	0.071	11772	0.096	2592	0.064†	7424	0.031	49351	0.037	11247	0.028†	25554
Quintile 1	0.193	61123	0.187	13839	0.225†	32978	1.000	11772	1.000	2592	1.000	7424	0.000	49351	0.000	11247	0.000	25554
Quintile 2	0.200	61123	0.215	13839	0.209	32978	0.000	11772	0.000	2592	0.000	7424	0.248	49351	0.265	11247	0.270	25554
Quintile 3	0.202	61123	0.199	13839	0.203	32978	0.000	11772	0.000	2592	0.000	7424	0.250	49351	0.245	11247	0.262†	25554
Quintile 4	0.205	61123	0.202	13839	0.195†	32978	0.000	11772	0.000	2592	0.000	7424	0.254	49351	0.249	11247	0.251	25554
Quintile 5	0.200	61123	0.197	13839	0.168†	32978	0.000	11772	0.000	2592	0.000	7424	0.248	49351	0.242	11247	0.217†	25554
Real Annual Consumption Expenditure	483.993	61123	480.831	13839	449.796†	32978	155.882	11772	156.762	2592	154.591†	7424	562.260	49351	555.517	11247	535.560†	25554
	(344.078)		(329.408)		(322.641)		(49.892)		(49.618)		(50.324)		(337.980)		(321.198)		(317.696)	
Age	31.880	61123	31.027	13839	34.864†	32978	40.173	11772	40.453	2592	41.625†	7424	29.902	49351	28.855	11247	32.900†	25554
	(22.171)		(22.309)		(22.132)		(24.099)		(24.523)		(23.515)		(21.212)		(21.182)		(21.315)	
0-18	35.04	21416	37.07	5130	29.79	9825	23.56	2774	23.19	601	21.26	1578	37.77	18642	40.27	4529	32.27	8247
19-45	37.66	23019	37.79	5230	37.76	12454	33.68	3965	33.91	879	33.42	2481	38.61	19054	38.69	4351	39.03	9973
46-99	27.30	16688	25.14	3479	32.44	10699	42.75	5033	42.90	1112	45.33	3365	23.62	11655	21.05	2367	28.70	7334
Highest Grade	9.264	29444	8.999	7953	9.340†	14280	8.401	6888	7.994	1898	8.601†	3864	9.527	22556	9.314	6055	9.614†	10416
	(2.090)		(2.218)		(2.069)		(2.378)		(2.515)		(2.316)		(1.918)		(2.016)		(1.898)	

Standard errors are in parentheses; † refers to the 10 percent (or more) statistical significance of the difference between pre and post within each group.

Source: Jamaica Survey of Living Conditions, various years.

Note: The numbers are the fraction for each category. Whole Sample is specified for the years 2004, 2006, 2007, 2008, 2009, 2010 and 2012. Pre-Reform is specified for the years 2004 and 2006. Post-Reform is specified for the years 2009, 2010 and 2012. The years 2007 and 2008 are dropped since the reform occurred in those years. Visited Private and Public Facility is conditional on visiting a facility.

Close to 7 percent of the sample visits a health facility, and this reduces post-reform. This trend is significant and holds for the whole sample as well as by quintiles. However, conditional on visiting facility, individuals in quintile 1 are more likely to visit a private facility post-reform as opposed to a public facility [5] Although this trends hold true for individuals not in quintile 1, the magnitudes are much smaller and not statistically significant. This appears to be counter-intuitive to the existing literature - given that public facilities are free of cost, there should be over usage of public facilities. With the lower visits to facility, we also see a fall in illness rates as well as illness days across all group, post-reform. In addition, we also have information on medication purchase. The trend is similar to that of visit - medication purchase rises from a private facility while that from a public facility declines.

It is crucial to understand how demographics change and to control for them in the difference-in-difference as well as in the model so as to pick up the true mechanisms. Around 50 percent of the population is female; there appears to be a fall in female population for individuals in quintile 1. There also seems to be an improvement in the number of people reporting their health status as Good or Very Good across all groups, and therefore, fall in the people reporting Fair or worse health status. Poverty does seem to have risen post reform as there is a statistically significant larger number of people in quintile 1. We also see a fall in real annual consumption expenditure across quintiles. The sample also appears to be older, post-reform; which is primarily coming from individuals not in quintile 1. Individuals are also more educated, post-reform, across all groups. Thus, along with the reform, the sample also sees a significant change in composition.

4.2 Framework for Causal Analysis

As documented in Section 2, on April 1, 2008, the government of Jamaica implemented the removal of user fees in the public sector. As this was an unanticipated change, we can assume that any consumer choice variables are unaffected by this policy change and therefore, provides us with a unique natural experiment that will allow for causal inference through a difference-in-difference approach.

Three out of four of our outcome variables are binary choices - say, whether or not an individual went to a private hospital - and therefore, imposing a linear DID framework results in predicted probabilities of going to a private hospital outside the relevant bounds of 0 and 1. We follow the non-linear difference-in-difference approach of Blundell et al.

[5] There are some individuals who visit both private and public health facility; however, this is only 0.4 percent of all observations. Conditioning on visiting facility, this number is 6.1 percent of all observations.

(2004), as presented in Blundell and Dias (2009)[6].

Let y_{it} be the outcome variable and d_{it} be the treatment status for individual i at time t. Let t_0 and t_1 refer to the pre-reform and post-reform period, respectively. Let d_i be the treatment group to which i belongs to, i.e.

$$d_i = \begin{cases} 1 & \text{if} \quad d_{it} = 1 \quad \& \quad t = t_1 \\ 0 & \text{if} \quad d_{it} = 0 \quad \& \quad t = t_1 \\ 0 & \text{if} \quad t = t_0 \end{cases} \tag{1}$$

However, the problem is that we can only observe whether an individual is subject to the policy intervention or not i.e. we can never observe the counterfactual outcome for those in the program had they not participated. Therefore, we either observe y_{it}^0 or y_{it}^1. We can define y_{it} as $y_{it} = d_{it}y_{it}^1 + (1 - d_{it})y_{it}^0$. As the number of our outcome variables are binary in nature, we define y_{it} as:

$$y_{it} = \beta + \alpha_i d_{it} + u_{it} \tag{2}$$

where u_{it} is the unobserved component. We ignore covariates for ease of notation and allow for heterogeneous effects across individuals. We make the following standard assumption for employing the difference in difference approach.

Assumption 1 (DID)**.** *The difference in the error terms is independent of treatment, or the common trends assumption:*

$$\mathbb{E}[u_{it_1} - u_{it_0}|d_i = 1] = \mathbb{E}[u_{it_1} - u_{it_0}|d_i = 0] = \mathbb{E}[u_{it_1} - u_{it_0}]$$

Therefore, we can define u_{it} as $u_{it} = \eta_i + m_t + \varepsilon_{it}$ with $\mathbb{E}(\varepsilon_{it}|d_{it}) = 0$ where η_i is an unobservable individual fixed effect and m_t is an aggregate macro shock. This does not rule out selection on the unobservables but rather excludes the possibility of any selection based on transitory individual-specific effects.

Assumption 2 (DID-NL-1)**.** *ε_{it} follows a distribution F where F is invertible, denoted by F^{-1}.*

Assumption 3 (DID-NL-2)**.** *Instead of allowing an individual specific effect η_i, we restrict it to a group-specific effect.*

$$\eta_i = \eta_{d_i}$$

[6]There are additional papers on estimating non-linear DID frameworks, specifically Athey and Imbens (2006)

Running a standard probit or logit by imposing F to be normal or logistic does not help us as we have additional error terms on which we have not imposed any restrictions, as we can see from the equation below:

$$y_{it} = \mathbb{1}[\beta + \alpha^{ATE} d_{it} + \underbrace{u_{it} + (\alpha_i - \alpha^{ATE}) d_{it}}_{u'_{it}} > 0] \tag{3}$$

Assumption 1 implies that the poor and rich (our control and treatment group) had parallel trends in terms of the dependent variable, if the reform had not occurred. Assumptions 2 and 3 impose that distribution function of the error term is invertible and that we only identify group-specfic effects (poor/rich) rather than individual-specific effects.

Following (Blundell and Dias, 2009), we can define the parameter of interest as $\tilde{\alpha}^{ATT}$ which measures the average impact among the treated on the *inverse transformation* of expected outcomes - this is not the same as the ATT as F^{-1} is non-linear and we impose heterogeneity of treatment effects. Thus, we estimate in the sample:

$$A\hat{T}T = \bar{y}^1_{t_1} - F\{F^{-1}(\bar{y}^1_{t_1}) - \widehat{\tilde{\alpha}^{ATT}}\} \tag{4}$$

where

$$\widehat{\tilde{\alpha}^{ATT}} = [F^{-1}(\bar{y}^1_{t_1}) - F^{-1}(\bar{y}^1_{t_0})] - [F^{-1}(\bar{y}^0_{t_1}) - F^{-1}(\bar{y}^0_{t_0})] \tag{5}$$

This helps us recover ATT, even in the case of non-linear outcome variables. The same procedure can also be applied in the case of count data, where the error term is distributed as a Negative Binomial distribution. In this case, F is the exponential distribution, and thus, the previous argument follows through.

4.3 Specification

The specification for the difference-in-difference regression is:

$$y_{i,t} = \alpha_0 + \sum_{r=2}^{5} \alpha_1^r q^r_{i,t} + \alpha_2 pr_{i,t} + \sum_{r=2}^{5} \alpha_3^r q^r_{i,t} * pr_{i,t} + \boldsymbol{\alpha_4 X_{i,t}} + \boldsymbol{\alpha_5 X_{i,t}} * pr_{i,t} + \epsilon_{i,t} \tag{6}$$

where $q^r_{i,t}$ is the quintile of individual i in time t, $pr_{i,t}$ takes the values 1 if after the year 2008 and 0 if before 2007, $X_{i,t}$ are the controls (sex, age, age-squared, indicator for insurance status, general health dummies and insurance quintile dummies).

4.4 Results

We present the results for the following outcome variables y_{it} - whether or not to get insurance, number of visits to a health facility, if a health facility was visited (any, public and private) - in Table 2 [7]. For the Number of Visits, we use a Negative Binomial regression while we run logit regressions for the rest. Visit to Public and Private facilities are conditional on visiting. We also compare these with the traditional linear ones in Appendix Tables B.2. In addition, we also present results to medication purchase in Appendix Table B.3 and B.4.

From Table 2, we see that relative to quintile 1, quintiles 2 to 5 are more likely to get insurance, post-reform. However, we do not see significant difference in the number of visits pre- and post-reform for the other quintiles, or in the visit to a health facility. However, we see that there is a shift of facility usage from private to public by all quintiles, relative to quintile 1, post reform. Moreover, this effect is the strongest for Quintile 5. Therefore there does appear to be a substitution effect of private to public facility post-reform. This phenomenon of more people choosing private hospital in the aggregate data but the opposite occurring in disaggregated data indicate the possibility of a crowding out effect. When we break the data by quintiles, we see that relative to poor, higher quintiles are going to the public hospitals. This implies that the poor are getting crowded out. Therefore, it appears to be the case that the people for whom prices change post reform (higher quintiles) are reacting to it and thus, leading to a sub-optimal outcome for the poor.

Table 2: Difference-in-Difference Regressions for Individual Choices

	Insurance	Number of Visits		Visited Facility		Visited Private*		Visited Public*	
		(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Effect of Reform by Consumption Quintile (Control: Quintile 1)									
Quintile 2	0.039***	0.002	-0.008	-0.004	-0.009	-0.169***	-0.168***	0.138***	0.139**
	[0.0136]	[0.0099]	[0.0109]	[0.0067]	[0.0073]	[0.0508]	[0.0550]	[0.0529]	[0.0579]
Quintile 3	0.065***	-0.009	-0.014	-0.010	-0.010	-0.200***	-0.259***	0.140**	0.211***
	[0.0133]	[0.0105]	[0.0118]	[0.0070]	[0.0076]	[0.0539]	[0.0595]	[0.0557]	[0.0618]
Quintile 4	0.056***	0.000	-0.011	-0.003	-0.007	-0.143**	-0.177***	0.160***	0.179***
	[0.0126]	[0.0108]	[0.0123]	[0.0071]	[0.0079]	[0.0563]	[0.0633]	[0.0576]	[0.0654]
Quintile 5	0.092***	-0.004	-0.010	-0.008	-0.009	-0.185***	-0.191***	0.192***	0.203***
	[0.0122]	[0.0115]	[0.0139]	[0.0075]	[0.0086]	[0.0634]	[0.0737]	[0.0632]	[0.0745]
Observations	46817	46714	46714	46817	46817	2936	2936	2936	2936
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Insurance Dummies	-	No	Yes	No	Yes	No	Yes	No	Yes

* these are conditional on visiting a facility; Standard errors are in parentheses; $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$

Note: For number of visits, a negative binomial regression was run since it is count data. For all other columns, logit regressions were run since each dependent variable was an indicator (1 if visited health facility, 0 otherwise). Pre-Reform is specified for the years 2004 and 2006. Post-Reform is specified for the years 2009, 2010 and 2012. The years 2007 and 2008 are dropped since the reform occurred in those years. The controls used are: sex, age, age^2, indicator for insurance status, illness length (in days), inactive length (in days), general health index. Insurance dummies implies inclusion of insurance quintile dummies. Full regressions are presented in Appendix Table B.1.

In addition, we run the following event study to check if Assumption 1 holds for the

[7] The full regression is in Appendix Table B.1

above analysis.

$$y_{i,t} = \sum_{r=1}^{5} \sum_{s=-3}^{3} \alpha_s^r d_{i,t}^s q_{i,t}^r + \boldsymbol{\alpha_4 X_{i,t}} + \epsilon_{i,t} \tag{7}$$

where $d_{i,t}^s$ takes the value 1 for $t = s$, $q_{i,t}^r$ is the quintile of individual i in time t, $X_{i,t}$ are the controls (sex, age, age-squared, insurance dummy (if visit decision), general health dummies). We then test if the differences between Quintile 1 and Quintile 2 to 5 are different for the periods $t = -3, t = -2$ and $t = -1$ using joint F-tests. Table 3 presents these results for each quintile. We see that the parallel trends assumption holds for all the cases at a 10 percent level of significance, except for Quintile 5 for the regression of insurance choice and Quintile 3 for the regression of Private Health Facility.

Table 3: F Statistics for Parallel Trends Assumption

	Insurance	Visit to Facility			
		Number	Any	Private	Public
Quintile 2	0.002 (0.998, 2)	0.428 (0.652, 2)	0.404 (0.668, 2)	1.737 (0.176, 2)	1.093 (0.335, 2)
Quintile 3	0.240 (0.786, 2)	0.877 (0.416, 2)	1.268 (0.281, 2)	3.001 (0.050, 2)	1.008 (0.365, 2)
Quintile 4	0.981 (0.375, 2)	0.657 (0.519, 2)	0.006 (0.994, 2)	0.084 (0.919, 2)	0.109 (0.897, 2)
Quintile 5	3.194 (0.041, 2)	0.438 (0.645, 2)	1.788 (0.167, 2)	0.056 (0.945, 2)	0.085 (0.919, 2)
R-Squared	0.231	0.136	0.167	0.613	0.552
Observations	61123	60995	61123	4099	4099

Note: The F-statistics is shown along with the p-value and the degrees of freedom in the parentheses. Linear regressions were run with the controls: sex, age, age^2, indicator for insurance status, general health index. Full regressions are presented in Appendix Table B.5 and B.6.

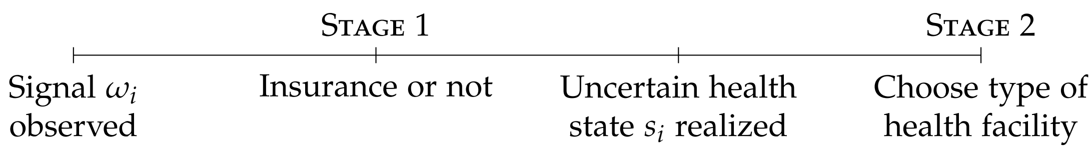
From the empirical findings, we see that the reform leads to redistribution *away* from the poor. However, this does not necessarily imply that there was reduction in welfare as the decision to visit a health facility is a choice of an individual and is a result of maximizing behaviour. Not only that, there is also a change in the insurance take-up decision, which would affect visit decision. Thus, modelling the individual decisions will be key to analysing individual welfare, and more importantly, in providing alternative policy recommendations.

5 Model

We consider a model of health care insurance and health care choices, in terms of type of facility, to quantify the welfare estimates of the 2008 reform. We extend the model of

Cardon and Hendel (2001) (CH) to allow for choice of health facility - private or public. Our model is a two-stage decision model of an expected-utility maximizing consumer. In the first stage, the individual receives a private signal about his future health state and chooses whether or not to get insurance. In the second stage, the individual chooses the type of health facility to go to, after the realization of an uncertain health state (Figure 1). The model incorporates the natural experiment directly into the set up, thus, providing us clean identification of the effect of moral hazard.

Figure 1: Model Timeline



Consumers choose whether or not to get insured ($j = 0$ (uninsured), 1 (insured)) based on the private signal they receive about their health state. As we do not have data on health care expenditures, we only allow for the choice of health facility - public and/or private. Let d_i^P and d_i^G be indicators for visiting a private and public health facility, respectively. Therefore, the individual chooses from the following options: $k \in \{N, P, G\}$ where N indicates that the individual chose not to go to any facility ($d_i^P = 0, d_i^G = 0$), P indicates private facility only ($d_i^P = 1, d_i^G = 0$). As we do have few cases of where an individual chooses to go to both public and private facility, we group it in G which indicates at least public facility ($d_i^P \geq 0, d_i^G = 1$).

Preferences Individuals' preferences are given by $U(m_{ik}, h_{ik}, \nu_{ik}, q_i, d_R, s_i, j)$ where m_{ik} is a composite good, h_{ik} is health consumption, ν_{ik} is the non-pecuniary benefit from choice k. These are conditional on the realization of an uncertain health state s_i drawn from a distribution F, an indicator for post-reform period d_R, an indicator for quintile 1 q_i and choice of insurance j. As we do not observe medical expenditures in the data, we define $h_i = f(k) - s_i$ where $f(k)$ is the health care consumption by an individual. Individuals can invest in their health by going to a health facility and can compensate for the random health state. This imposes that health care consumption $f(k)$ is a perfect substitute for the s_i.

We define $f(k) = \theta_{ik} d_i^k$ where θ_{ik} are health care derived from private and/or public health facility respectively. We will define it as the following:

$$\theta_{ik} = \begin{cases} \theta_i^P & \text{if } k = P \\ \theta_i^G & \text{if } k = G \\ 0 & \text{if } k = N \end{cases} \tag{8}$$

where θ_i^P and θ_i^G are parameters we can estimate from the data. Thus, if an individual choose not to go to any health facility, then he did not invest in any health consumption.

Based on our assumption that $f(k)$ and s_i are perfect substitutes, this would imply that post-reform when all public health facilities can be accessed free of charge, each individual will choose only to go to a public health facility. Therefore, to rationalize the data, we introduce non pecuniary benefit of going to a public and/or private health facility ν_{ik}. This could be thought of as the benefit of not having to wait in a line, having access to pleasant surroundings for a private health facility or that it might be easier to get an appointment at a private health facility and so on. Thus, we assign choice specific non-pecuniary benefits - $\{\nu_{i,P}, \nu_{i,G}, \nu_{i,N}\}$ [8], which we define in the following manner:

$$\nu_{ik} = \beta_k X_i + \epsilon_{ik} \tag{9}$$

where X_i are the demographics of the individual, ϵ_{ik} are choice-specific taste shocks for individual i and choice k. From this, we estimate the average non-pecuniary benefit for each choice, relative to the average non-pecuniary benefit of choosing none (which can be normalized to zero). We allow for this benefit to vary pre- and post-reform. Imposing additive separability of utility from non-pecuniary benefit, we can rewrite the utility of a consumer to be $U_{ik}(m, h, q_i, X_i, d_R, s, j) + \epsilon_{ik}$.

We solve this model through backward induction. In Stage 2, we solve for the optimal decision rule (i.e. choice of health facility) of the individual, given their insurance choice and health state realization. We then solve for Stage 1 to choose optimal insurance, assuming rational behaviour in Stage 2.

[8] These will be allowed to vary by pre- and post-reform in the next set of estimation results

5.1 Stage 2

The individual's optimal decision is to the choose the option k that maximizes utility, given s_i, j and d_R.

$$\delta_i(m,h,q_i,X_i,d_R,j,s,\epsilon) = \text{argmax}_{k\in\{N,G,P\}} U_{ik}(m,h,q_i,X_i,d_R,j,s) + \epsilon_{ik} \tag{10}$$

$$\text{subject to } m_{ik} + C_j(k,d_R,q_i) = y(q_i) - p_j(d_R) \tag{11}$$

$$h_{ik} = \theta_{ik} d_k - s_i \tag{12}$$

$\delta_i(m,h,q_i,X_i,d_R,j,s,\epsilon)$ is the optimal decision rule of the individual. $Z_j = [p_j, C_j]$ define the characteristics of being insured $j = 1$ and uninsured $j = 0$, where p_j is premium and $C_j(k,d_R,q_i)$ are the out-of-pocket expenditures under choice j, depending on choice of health facility (k), reform indicator d_R and income quintile q_i which can take the values from 1 to 5 (1 being poorest and 5 being richest). $y(q_i)$ refers to the income quintile of i. In terms of the insurance policy characteristics, we have $Z_0 = [0, C_0]$ (uninsured characteristics) and $Z_1 = [p, C_1]$ (insured characteristics).

Thus, we can define the indirect utility of i holding policy j as:

$$U^*_{ij}(s_i,q_i,X_i,d_R) = \int \sum_k \mathbb{1}(\delta_i(m,h,q_i,X_i,d_R,j,s,\epsilon) = k)[U_{ik}(m,h,q_i,X_i,d_R,j,s) + \epsilon_{ik}]d\epsilon \tag{13}$$

It is important to note here that we will use m_{ik} and $m_{ik}(y(q_i), Z_j, d_R)$ interchangeably; similarly for h_{ik} and $h_{ik}(s_i)$.

5.2 Stage 1

Individuals can only choose whether to get insurance, and not from a menu of policy options. Self selection into insurance is captured by assuming that each consumer i gets a signal ω_i about s_i before purchasing insurance, as in CH. We also allow for a choice specific shock a_{ij}. The expected utility of choosing j, given a_{ij}, ω_i, and d_R.

$$\begin{aligned} V_{ij}(\omega_i,q_i,X_i,d_R,a_{ij}) &\equiv \underbrace{\mathbb{E}(U^*_{ij}(s_i,q_i,X_i,d_R)|\omega_i)}_{\bar{V}_{ij}(\omega_i,q_i,X_i,d_R)} + a_{ij} = \\ &\int_{s\in supp(s_i)} U^*_{ij}(m,h,q_i,X_i,d_R,j,s)\pi_i(ds|\omega_i,X_i) + a_{ij} \end{aligned} \tag{14}$$

where $V_{ij}(\omega_i, q_i, X_i, d_R, a_{ij})$ is the individual i's expected utility from policy j, given ω_i and a_{ij} and conditional on q_i, X_i and d_R. π_i is distribution of s_i conditional on ω_i and demographics X_i. Therefore, the individual's optimal choice is on the basis of what maximizes her expected utility, given her private information:

$$W_i(\omega_i, q_i, X_i, d_R, a_{ij}) = \max_j V_{ij}(\omega_i, q_i, X_i, d_R, a_{ij}) \tag{15}$$

where $W_i(\omega_i, q_i, X_i, d_R, a_{ij})$ is the valuation function of the individual.

5.3 Welfare Calculation

We define the social welfare function as:

$$\mathcal{W}(q_i, X_i, d_R) = \sum_{i=1}^{N} \lambda_i \int_{\omega_i} \int_{a_{ij}} W_i(\omega_i, q_i, X_i, d_R, a_{ij}) d\omega_i da_{ij} \tag{16}$$

where λ_i is weight attached to an individual by the social planner. With this welfare calculation, we could analyse the changes in welfare to answer the following counterfactuals:

- What if those who have insurance had to pay for public health facilities?
- What if we changed the threshold at which health care utilization is free?
- What if individuals paid for health care according to their ability to pay?
- What if the co-payment varied with consumption quintiles?
- What if insurance was mandatory for all, with government subsidizing the poor?

6 Specification, Identification and Estimation

6.1 Empirical Specification

Preferences Following CH, we assume the following second order approximation as the functional form for our utility function.

$$U(m_{ik}, h_{ik}) \approx \phi_1 m_{ik} + \phi_2 h_{ik} + \phi_3 m_{ik} h_{ik} + \phi_4 m_{ik}^2 + \phi_5 h_{ik}^2 \tag{17}$$

To estimate preferences for risk, the indirect utilities in (13) are transformed by a CARA utility function: $-\exp\left[-rU_{ij}^*(s_i, q_i, X_i, d_R)\right]$.

We specify the out-of-pocket expenditures $C_j(k, d_R, q_i)$ as:

$$C_j(k, d_R, q_i = 1) = \begin{cases} c_j^{P,d_R} & \text{if } k = \{P\} \\ 0 & \text{if } k = \{G, N\} \end{cases} \tag{18}$$

$$C_j(k, d_R, q_i \neq 1) = \begin{cases} c_j^{P,d_R} & \text{if } k = \{P\} \\ c_j^{q,G} & \text{if } k = \{G\} \ \&\ d_R = 0 \\ 0 & \text{if } (k = \{G\} \ \&\ d_R = 1) \text{ or } (k = \{N\}) \end{cases} \tag{19}$$

where $c_j^{q,G}$ varies by quintile q (2-5). The above specification presents our identification argument in a clear manner where we use the exogenous variation in prices to pin down the welfare costs of moral hazard. We can think of c_j^P and c_j^G as average costs (or co-payments) that i pays for accessing the private or public health facility, conditional on insurance ($j = \{0, 1\}$).

Uncertainty and Shocks The distribution of s_i[9] is:

$$s_i = \frac{\exp(Y)}{1 + \exp(Y)} \tag{20}$$

where $Y = (K(X_i) + \omega_i + \xi_i)$. $K(X_i)$ is a deterministic function of demographics, $\omega_i \sim \mathcal{N}(0, \sigma_\omega^2)$ and $\xi_i \sim \mathcal{N}(0, \sigma_\xi^2)$. We will impose the additional restriction that the deterministic function K is linear i.e. $K(X_i) = \gamma_d X_i$. In CH, K is also assumed to be linear and X_i consisted of age, age^2, sex, region of the country, race dummy and white collar worker dummy. We will include age, age^2, sex, health status and consumption quintile (to proxy for socio-economic class).

After observing ω_i but prior to realization of s_i, the consumer has 2 alternatives - being insured or not. We impose the following assumption on taste shocks a_{ij} - insurance-specific taste shocks a_{ij} are independent (over i and j) and identically distributed Type 1 Extreme Value. We also assume choice-specific taste shocks ϵ_{ik}, which form the non-pecuniary benefit, are independent (over i and k) and identically distributed Type 1 Extreme Value. Given our errors are Type 1 EV, we know that we will have to impose location and scale normalizations. Although not presented here, we do normalize with respect to not going to any facility.

[9] We derive the density of s_i, conditional on ω_i and X_i in Appendix A.1.

6.2 Solving the Model Explicitly

6.2.1 Stage 2

We can rewrite the consumer's problem in Stage 2 by substituting (17) in (10)-(12):

$$\max_{k\in\{N,G,P\}} \phi_1 m_{ik}(y(q_i), Z_j, d_R) + \phi_2 h_{ik}(s_i) + \phi_3 m_{ik}(y(q_i), Z_j, d_R) h_{ik}(s_i)$$
$$+ \phi_4 m_{ik}(y(q_i), Z_j, d_R)^2 + \phi_5 h_{ik}(s_i)^2 + \nu_{ik} \tag{21}$$
$$\text{subject to } m_{ik} = y(q_i) - p_j(d_R) - C_j(k, d_R, q_i) \tag{22}$$
$$h_{ik} = \theta_{ik} d_k - s_i \tag{23}$$

Once we substitute for m_i and h_i in (21), we have a problem of unconstrained optimization. However, contrary to CH, our choice variable is not a continuous variable. In our case, we have 3 choices - going to a public hospital only (G), going to a private hospital only (P), and going to none (N). Let the total utility be defined as $\overline{U_{ik}}(m, h, q_i, X_i, d_R, j, s)$. Thus, we can define utility in the following manner.

$$\overline{U_{ik}}(m, h, q_i, X_i, d_R, j, s) = U_{ik}(m, h, q_i, X_i, d_R, j, \omega, \xi) + \epsilon_{ik} \tag{24}$$

As we know, the consumer's problem is different depending on the quintile. Individuals in quintile 1 do not have any change in the problem they solve; whereas individuals in quintiles other than 1 are exposed to the reform. We explicitly write out the utilities received from the four possible cases, conditional on the quintile an individual belongs to, by substituting (18) and (19) into (11). The derivation is presented in Appendix A.3. For individuals in quintile $\neq 1$, the reform changes the parameters. Therefore, we define the parameters for Quintile 1 and $\neq 1$ separately. The parameters are presented in Tables 4 and 5.

Given choice-specific shocks are Type 1 EV, we have closed form expressions for the choice probabilities of health facility.

$$p(k|q_i, X_i, d_R, j, \omega, \xi) = \frac{\exp(U_{ik}(m, h, q_i, X_i, d_R, j, \omega, \xi))}{\sum_{k'\in\{N,G,P\}} \exp(U_{ik'}(m, h, q_i, X_i, d_R, j, \omega, \xi)))} \tag{25}$$

However, ω_i and ξ_i is observable only to the individual and not to the econometrician. Therefore, we will have to integrate over ω_i, ξ_i and choice-specific shocks a_{ij}. Let λ be the set that satisfies the following condition: $\omega | V_{ij}(\omega_i, a_{ij}) \geq V_{ij'}(\omega_i, a_{ij'}) \; \forall j' \in \{0, 1\}$

$$p(k, j | q_i, X_i, d_R) = \int \int \int_{\omega \in \lambda} p(k | q_i, X_i, d_R, j, \omega, \xi) \frac{1}{\sigma_\omega \sigma_\xi} \phi(\frac{\omega}{\sigma_\omega}) \phi(\frac{\xi}{\sigma_\xi}) f(a) \, d\omega d\xi da \tag{26}$$

This can be re-written as[10]

$$p(k, j | q_i, X_i, d_R) = \int \int P_{ij}(\omega_i, q_i, X_i, d_R) p(k | q_i, X_i, d_R, j, \omega, \xi) \frac{1}{\sigma_\omega \sigma_\xi} \phi\left(\frac{\omega}{\sigma_\omega}\right) \phi\left(\frac{\xi_i}{\sigma_\xi}\right) d\omega d\xi \tag{27}$$

Moreover, we also have closed form solutions to the ex-ante value function as given in (13) due to the choice specific errors being Type 1 EV. In our case, this is defined as:

$$U^*_{ij}(\omega, \xi, q_i, X_i, d_R) = \ln\left(\sum_{k \in \{N, G, P\}} \exp(U_{ik}(m, h, q_i, X_i, d_R, j, \omega, \xi))\right) + \gamma \tag{28}$$

where γ is the Euler's constant.

Thus, for all individuals, we can rewrite (25) in the form of the above differences.

6.2.2 Stage 1

Given that the taste shocks are Type 1 EV, the probability that an individual i chooses to be insured ($j = 1$), conditional on the signal ω_i is:

$$P_{i1}(\omega_i, q_i, X_i, d_R) = \frac{\exp\left(V_{i1}(\omega_i, q_i, X_i, d_R)\right)}{\exp(V_{i0}(\omega_i, q_i, X_i, d_R)) + \exp(V_{i1}(\omega_i, q_i, X_i, d_R))} \tag{29}$$

However, since the econometrician doesn't observe ω_i, therefore, we will integrate over ω_i.

$$P_{i1}(q_i, X_i, d_R) = \int P_{i1}(\omega_i, q_i, X_i, d_R) \frac{1}{\sigma_\omega} \phi(\frac{\omega_i}{\sigma_\omega}) d\omega_i \tag{30}$$

[10] This is derived in Appendix A.2.

Table 4: Parameters as defined in the Raw Utilities (Quintile 1)

	Coefficient on	N	P	G
Quintile 1, Pre-Reform				
$\alpha^{j,k}_{1,q_1}(d_R=0)$	Constant	$\phi_4 {p^0_j}^2 - \phi_1 p^0_j$	$\phi_2\theta^P_i - \phi_1 c^{P,0}_j - \phi_3\theta^P_i p^0_j - \phi_3\theta^P_i c^{P,0}_j + \phi_4(c^{P,0}_j)^2 + 2\phi_4 p^0_j c^{P,0}_j + \phi_5(\theta^P_i)^2$	$\phi_2\theta^G_i - \phi_3 p^0_j \theta^G_i + \phi_5(\theta^G_i)^2$
$\alpha^{j,k}_{2,q_1}(d_R=0)$	$y(q_i)$	$\phi_1 - 2\phi_4 p^0_j$	$\phi_3\theta^P_i - 2\phi_4 c^{P,0}_j$	$\phi_3\theta^G_i$
$\alpha^{j,k}_{3,q_1}(d_R=0)$	$y(q_i)^2$	ϕ_4		
$\alpha^{j,k}_{4,q_1}(d_R=0)$	s_i	$\phi_2 - \phi_3 p^0_j$	$-\phi_3 c^{P,0}_j + 2\phi_5\theta^P_i$	$2\phi_5\theta^G_i$
$\alpha^{j,k}_{5,q_1}(d_R=0)$	s_i^2	ϕ_5		
$\alpha^{j,k}_{6,q_1}(d_R=0)$	$s_i y(q_i)$	ϕ_3		
Quintile 1, Post-Reform				
$\alpha^{j,k}_{1,q_1}(d_R=1)$	Constant	$\phi_4 {p^1_j}^2 - \phi_1 p^1_j$	$\phi_2\theta^P_i - \phi_1 c^{P,1}_j - \phi_3\theta^P_i p^1_j - \phi_3\theta^P_i c^{P,1}_j + \phi_4(c^{P,1}_j)^2 + 2\phi_4 p^1_j c^{P,1}_j + \phi_5(\theta^P_i)^2$	$\phi_2\theta^G_i - \phi_3 p^1_j \theta^G_i + \phi_5(\theta^G_i)^2$
$\alpha^{j,k}_{2,q_1}(d_R=1)$	$y(q_i)$	$\phi_1 - 2\phi_4 p^1_j$	$\phi_3\theta^P_i - 2\phi_4 c^{P,1}_j$	$\phi_3\theta^G_i$
$\alpha^{j,k}_{3,q_1}(d_R=1)$	$y(q_i)^2$	ϕ_4		
$\alpha^{j,k}_{4,q_1}(d_R=1)$	s_i	$\phi_2 - \phi_3 p^1_j$	$-\phi_3 c^{P,1}_j + 2\phi_5\theta^P_i$	$2\phi_5\theta^G_i$
$\alpha^{j,k}_{5,q_1}(d_R=1)$	s_i^2	ϕ_5		
$\alpha^{j,k}_{6,q_1}(d_R=1)$	$s_i y(q_i)$	ϕ_3		

Table 5: Parameters as defined in the Raw Utilities (Quintile $\neq$ 1)

	Coefficient on	N	P	G
Quintile ≠ 1, Pre-Reform				
$\alpha^{j,k}_{1,q_0}(d_R=0)$	Constant	$\phi_4 {p_j^0}^2 - \phi_1 p_j^0$	$\phi_2\theta_i^P - \phi_1 c_j^{P,0} - \phi_3\theta_i^P p_j^0 - \phi_3\theta_i^P c_j^{P,0} + \phi_4(c_j^{P,0})^2 + 2\phi_4 p_j^0 c_j^{P,0} + \phi_5(\theta_i^P)^2$	$-\phi_1 c_j^{q,G} + \phi_2\theta_i^G - \phi_3\theta_i^G p_j - \phi_3\theta_i^G c_j^{q,G} + \phi_4(c_j^{q,G})^2 + 2\phi_4 p_j^0 c_j^{q,G} + \phi_5(\theta_i^G)^2$
$\alpha^{j,k}_{2,q_0}(d_R=0)$	$y(q_i)$	$\phi_1 - 2\phi_4 p_j^0$	$\phi_3\theta_i^P - 2\phi_4 c_j^{P,0}$	$\phi_3\theta_i^G - 2\phi_4 c_j^{q,G})$
$\alpha^{j,k}_{3,q_0}(d_R=0)$	$y(q_i)^2$	ϕ_4		
$\alpha^{j,k}_{4,q_0}(d_R=0)$	s_i	$\phi_2 - \phi_3 p_j^0$	$-\phi_3 c_j^{P,0} + 2\phi_5\theta_i^P$	$-\phi_3 c_j^{q,G} + 2\phi_5\theta_i^G$
$\alpha^{j,k}_{5,q_0}(d_R=0)$	s_i^2	ϕ_5		
$\alpha^{j,k}_{6,q_0}(d_R=0)$	$s_i y(q_i)$	ϕ_3		
Quintile ≠ 1, Post-Reform				
$\alpha^{j,k}_{1,q_0}(d_R=1)$	Constant	$\phi_4 {p_j^1}^2 - \phi_1 p_j^1$	$\phi_2\theta_i^P - \phi_1 c_j^{P,1} - \phi_3\theta_i^P p_j^1 - \phi_3\theta_i^P c_j^{P,1} + \phi_4(c_j^{P,1})^2 + 2\phi_4 p_j^1 c_j^{P,1} + \phi_5(\theta_i^P)^2$	$\phi_2\theta_i^G - \phi_3 p_j^1\theta_i^G + \phi_5(\theta_i^G)^2$
$\alpha^{j,k}_{2,q_0}(d_R=1)$	$y(q_i)$	$\phi_1 - 2\phi_4 p_j^1$	$\phi_3\theta_i^P - 2\phi_4 c_j^{P,1}$	$\phi_3\theta_i^G$
$\alpha^{j,k}_{3,q_0}(d_R=1)$	$y(q_i)^2$	ϕ_4		
$\alpha^{j,k}_{4,q_0}(d_R=1)$	s_i	$\phi_2 - \phi_3 p_j^1$	$-\phi_3 c_j^{P,1} + 2\phi_5\theta_i^P$	$2\phi_5\theta_i^G$
$\alpha^{j,k}_{5,q_0}(d_R=1)$	s_i^2	ϕ_5		
$\alpha^{j,k}_{6,q_0}(d_R=1)$	$s_i y(q_i)$	ϕ_3		

As in CH, to estimate preferences for risk, the indirect utilities in (13) are transformed by a CARA utility function: $-\exp\left[-rU^{*}_{ij}(s_i, d_R)\right]$. Thus[11],

$$\mathcal{U}^{*}_{ij}(\omega, \xi, q_i, X_i, d_R) = -\exp[-r\gamma]\left(\sum_{k\in\{N,G,P\}} \exp(U_{ik}(m, h, q_i, X_i, d_R, j, \omega, \xi))\right)^{-r} \tag{31}$$

Claim 1. *The probability that an individual i chooses to be insured is given by:*

$$P_{i1}(\omega_i, q_i, X_i, d_R) = \frac{\exp\left(\bar{V}_{i1}(\omega_i, q_i, X_i, d_R)\right)}{\exp(\bar{V}_{i0}(\omega_i, q_i, X_i, d_R)) + \exp(\bar{V}_{i1}(\omega_i, q_i, X_i, d_R))} \tag{32}$$

where $\bar{V}_{i1}(\omega_i, q_i, X_i, d_R)$ and $\bar{V}_{i0}(\omega_i, q_i, X_i, d_R)$ are described in Appendix A.5. It is important to note that: $\alpha^{j=1,N}_{b,q}(d_R) = \alpha^{j=0,N}_{b,q}(d_R) = \alpha_{b,q}(d_R) \forall b \in \{3, 5, 6\}$.

Proof. In Appendix A.5 □

6.3 Identification

Let us now see which variables can be identified from Stage 2 (assuming γ_d is known). From equations (A.39)-(A.48), we will be able to identify $\alpha^{j,k}_{1,q}, \alpha^{j,k}_{2,q} \forall j = \{0, 1\}, k = \{P, G\}$ and $(\beta^{d_R}_{k} - \beta^{d_R}_{N})\ \forall k \in \{P, G\}$.

Proposition 1. *Given γ_d, all other parameters are identified.*

Proof. In Appendix A.6. □

From Stage 1, r is pinned down by the variation in the choice of lotteries of insurance versus non-insurance. We have 4 moment conditions for the probability of insurance - two before and after reform and two for quintile 1 and not quintile 1. These are for each demographic type. Therefore, if we have γ_d to be a $m \times 1$ vector, then we have $4m$ conditions. Thus, as long as $m \geq 2$, $m + 1$ parameters are identifiable.

6.4 Estimation

In CH, a restriction was that the health care expenditures were observed only if policy j was chosen. In our case, the choice of private or public hospital is conditional on the type of insurance policy chosen. To estimate the parameters of the model, we construct a

[11]The derivation is provided in Appendix A.4

method-of-moments estimator. For each individual i, we observe the following indicators: choosing insurance or not I_{i1}, choosing to visit a public hospital I_{ij}^{G}, choosing to visit a private hospital I_{ij}^{P}, and choosing to not visit any hospital I_{ij}^{N} where $j \in \{0, 1\}$ for insurance choice. Let $I_{d_R}^{i}$ be the indicator of whether or not an individual is in the reform years or not. Let I_{q_i} be the indicator for if an individual is in Quintile 1 or not. The vector of parameters θ to be estimated are:

$$\{\sigma_w, \sigma_\xi, \phi_1, \phi_2, \phi_3, \phi_4, \phi_5, \theta_i^P, \theta_i^G, c_j^{P,d_R}, c_j^{q,G}, p_1^{d_R}, r, \beta_k^{d_R}, \gamma_d\}$$

(where $j \in \{0, 1\}$, $d_R \in \{0, 1\}$, $q \in \{2, 3, 4, 5\}$ and $k \in \{P, G, N\}$). We also define $\theta_1 = \theta \setminus r$. Given X_i is defined as a $N \times 7$ vector, this gives us a total of 59 parameters to be estimated. Thus, we can form a vector of prediction errors for each individual using predicted and actual values:

$$u_i(\theta, q_i, X_i) = \begin{bmatrix} P_{i1}(\theta, q_i, X_i, d_R = 1) - I_{d_R}^{i}.I_{q_i} I_{i1} \\ p(k, j|\theta_1, q_i, X_i, d_R = 1) - I_{d_R}^{i}.I_{q_i} I_{ij}^{k} \\ \vdots \\ P_{i1}(q_i, X_i, d_R = 0) - (1 - I_{d_R}^{i}).I_{q_i} I_{i1} \\ p(k, j|\theta_1, q_i, X_i, d_R = 0) - (1 - I_{d_R}^{i}).I_{q_i} I_{ij}^{k} \\ \vdots \end{bmatrix} \tag{33}$$

where $k \in \{G, P, N\}$ and $j \in \{0, 1\}$. Thus, for each individual (given quintile), we have two sets of moment conditions depending on the reform indicator. Therefore, our final set of moment conditions are:

$$u_i(\theta, X_i) = \begin{bmatrix} u_i(\theta, q_i = 1, X_i) \\ u_i(\theta, q_i = 0, X_i) \end{bmatrix} \tag{34}$$

If the model is correctly specified, the error terms have mean zero at the true parameter vector θ_0 i.e. $\mathbb{E}[u_i|X_i, \theta_0] = 0$. [12] Therefore, our estimator is:

$$\theta = \arg\min_{\theta} \ \mathbb{E}[X' u(\theta, X)]^T \ W \ \mathbb{E}[X' u(\theta, X)] \tag{35}$$

[12] CH derives the full set of moment conditions by assuming there exists a set of instruments W_i such that $\mathbb{E}[u_i|W_i, \theta_0] = 0$. They use the following variables as instruments: age, age squared, sex, race dummies, region dummies and a constant.

The sample analogue of (35) is [13]

$$\hat{\theta} = \arg\min_{\theta} \left[\frac{1}{N} \sum_{i=1}^{N} X_i' u_i(\theta, X_i) \right]^T W_N \left[\frac{1}{N} \sum_{i=1}^{N} X_i' u_i(\theta, X_i) \right] \tag{37}$$

7 Discussion

7.1 Structural Estimates

We estimate the model using a two-step GMM: the first stage is calculated by using an identity matrix as the weight matrix; the second stage uses the optimal weight matrix (as calculated from the first stage) to arrive at the optimal parameters. We use an over-identified model with 170 moments, in the following categories for pre- and post-reform:

1. Conditional on Each Quintile
2. Conditional on Female, for Quintile 1 and Quintile 2-5 (combined)
3. Conditional on Age Group (19-45 and 46-99), for Quintile 1 and Quintile 2-5 (combined)
4. Conditional on General Health Status (Fair and Poor), for Quintile 1 and Quintile 2-5 (combined)

For each category, we calculate the probability of insurance, the joint probability of insurance and not going to a hospital, insurance and going to a private facility, insurance and going to a public facility, no insurance and not going to a hospital, no insurance and going to a private facility. Tables 6 and 7 present the preliminary parameter estimates from estimating over-identified model. We see that utility from public health facility is marginally higher than that of a private health facility. While the costs of private health facility for individuals with no insurance falls post-reform, it rises for those with insurance. On the other hand, the insurance premium falls post-reform. This could be an indication of the private health facilities reacting to the removal of user fees. The demographic attributes with the strongest positive effects are age and sex.

[13] The standard errors can be calculated using the following formula,

$$\text{Var}(\hat{\theta}) = D_0 W D_0 \tag{36}$$

where $D_0 = \frac{\partial \hat{\mathbb{E}}[X' u(\theta, X)]}{\partial \theta'}$ evaluated at $\hat{\theta}$, $\hat{S} = \hat{\mathbb{E}}[X' u(\hat{\theta}, X)(X' u(\hat{\theta}, X))']$ and $W = \hat{S}^{-1}$. Moreover, due to the well-known problems with the optimal weighting matrix (Altonji and Segal, 1996), we choose W to be a diagonal matrix. Therefore, we calculate the standard errors using $D_0^{'} W D_0)^{-1} D_0^{'} W \Omega W D_0 (D_0^{'} W D_0)^{-1}$, where Ω is the variance-covariance matrix at the optimal parameters.

Table 6: Parameter Estimates

S.No	Parameter	Estimate
1	S.D. of ω σ_ω	0.001
2	S.D. of ξ σ_ξ	4.689
3	Utility Parameters - ϕ_1	-0.528
4	Utility Parameters - ϕ_2	-0.099
5	Utility Parameters - ϕ_3	-0.011
6	Utility Parameters - ϕ_4	0.469
7	Utility Parameters - ϕ_5	-1.511
8	Utility from Private Health Facility θ_i^P	2.409
9	Utility from Public Health Facility θ_i^G	2.614
10	Cost of Private Health Facility, Given No Insurance, Pre-Reform $c_0^{P,0}$	1.337
11	Cost of Private Health Facility, Given Insurance, Pre-Reform $c_1^{P,0}$	0.034
12	Cost of Private Health Facility, Given No Insurance, Post-Reform $c_0^{P,1}$	0.448
13	Cost of Private Health Facility, Given Insurance, Post-Reform $c_1^{P,0}$	0.182
14	Cost of Public Health Facility, Given No Insurance, Quintile 2 $c_0^{2,G}$	2.602
15	Cost of Public Health Facility, Given No Insurance, Quintile 3 $c_0^{3,G}$	2.646
16	Cost of Public Health Facility, Given No Insurance, Quintile 4 $c_0^{4,G}$	2.234
17	Cost of Public Health Facility, Given No Insurance, Quintile 5 $c_0^{5,G}$	0.304
18	Cost of Public Health Facility, Given Insurance, Quintile 2 $c_1^{2,G}$	1.321
19	Cost of Public Health Facility, Given Insurance, Quintile 3 $c_1^{3,G}$	1.508
20	Cost of Public Health Facility, Given Insurance, Quintile 4 $c_1^{4,G}$	1.370
21	Cost of Public Health Facility, Given Insurance, Quintile 5 $c_1^{5,G}$	1.079
22	Insurance Premium, Pre-Reform p_1^0	0.788
23	Insurance Premium, Post-Reform p_1^1	0.750
24	Risk Parameter r	2.151

Note: This table presents the main parameter estimates from the model presented in Section 5. The model is estimated on a sample of 46817 individuals between 2004 and 2012, excluding the years of 2007 and 2008.

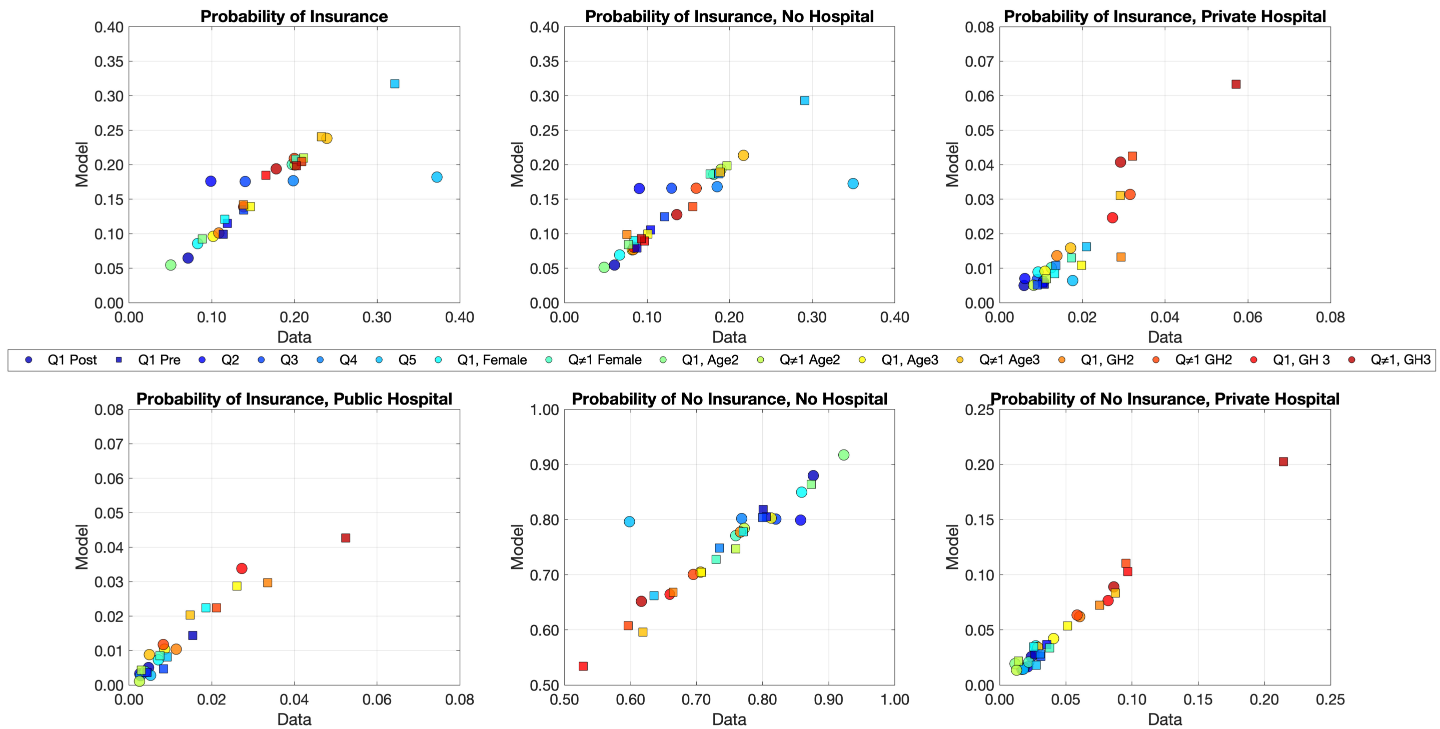
Table 7: Parameter Estimates (For Demographics)

S. No.	Parameter	Estimate				
		Private (Pre-Reform) (β_P)	Private (Post-Reform) (β_P)	Public (Pre-Reform) (β_G)	Public (Post-Reform) (β_G)	γ_d (From $K(X_i)$)
1	Constant	0.183	1.381	-0.239	0.677	2.678
2	Quintile 1	-0.568	-1.688	0.046	0.934	2.590
3	Age	2.352	1.560	4.912	3.000	-0.194
4	Age^2	-1.404	-0.744	-2.276	-1.613	0.688
5	Sex	0.939	0.640	0.273	0.721	-0.079
6	General Health Status (Good+)	-1.450	-2.284	-1.533	-1.961	-5.208
7	General Health Status (Fair)	-0.274	-0.395	-0.774	-0.666	-2.403

Note: This table presents the parameter estimates from the non-pecuniary benefits and the demographic characteristics from the model presented in Section 5. The model is estimated on a sample of 46817 individuals between 2004 and 2012, excluding the years of 2007 and 2008.

Using these parameter estimates, we present the model fit in Figure 2 for each of the following: probability of insurance, the joint probability of insurance and not going to a hospital, insurance and going to a private facility, insurance and going to a public facility, no insurance and not going to a hospital, no insurance and going to a private facility. The x-axis represents the empirical moments while the y-axis represents the model generated moments. The model can be said to have good fit if the majority of the moments lie on the 45-degree line. Broadly, we do well in fitting the moments. We under-predict the probability of insurance and the probability of insurance & no hospital for Quintile 5.

Figure 2: Model Fit

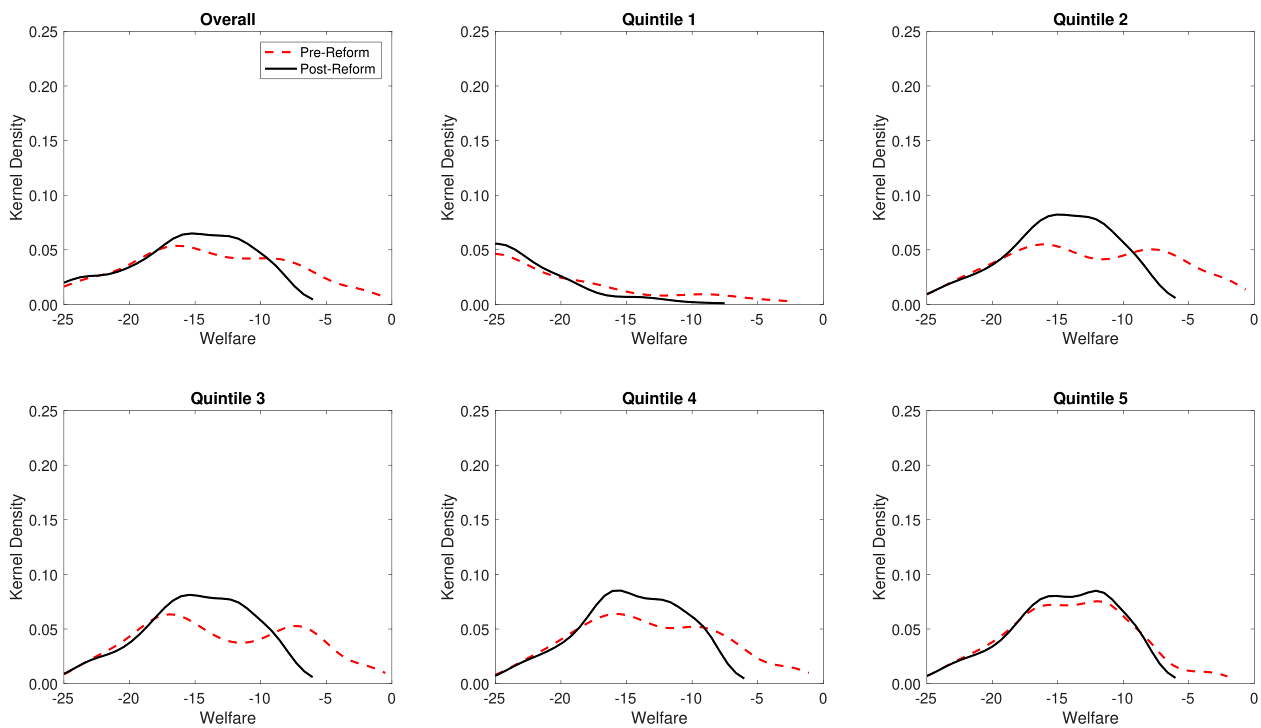


Notes: The figure shows the moments as estimated from the model using the parameters in Tables in 6 and 7 and the empirical moments. If the data points lie on the 45 degree line, then that implies that the data moments and model moments are close to each other.

7.2 Welfare Analysis - Ongoing

As we allow for changes in parameters pre- and post-reform, we, present estimate kernel densities of welfare, pre and post-reform. We present the results for the entire sample as well as by quintiles in Figure 3. These pictures hint at a shift of the distribution to the left, indicating that there was a fall in welfare. However, this section is ongoing as the true picture will be seen after we compare welfare to a normalization pre- and post-reform.

Figure 3: Welfare Density - Overall



8 Conclusion

This paper focusses on estimating the level of moral hazard in healthcare utilization. This is a much researched topic but empirically confirming it has been difficult due to the lack of exogenous price variation. We use a change in the user fees regime of Jamaica, where the regime was abolished and replaced by 100 percent state funding in 2008. This gave us a unique natural experiment, as the poorest quintiles already had access to free public healthcare and thus, act as the control group.

We use data from Jamaica Survey of Living Conditions and estimate a non-linear difference-in-difference regression to evaluate the effect of this reform on number of visits, facility usage as well as medication purchase. Interestingly, we see a crowding out effect for the poor - in the aggregate data, we see more people choosing a private hospital; however, we see the opposite occurring in the disaggregated data. This implies that there might be a sub-optimal outcome for the poor from a universal healthcare policy. To estimate welfare implications of this policy, we set up a structural model, following Cardon and Hendel (2001). In the first stage, the individual chooses insurance after the realization of a signal about future health state. In the second stage, the individual chooses the type of health facility to go to, based on the uncertain health state observed.

We estimate this model using a two-step GMM. As expected, the utility from going to a private health facility is lower than that of a public health facility. Overall, we do well in fitting the model to the data. Using these estimates, we estimate aggregate welfare where each individual is weighted equally. The next steps are to compare the welfare using a normalization as well as use different welfare measures and then to run counterfactuals to understand what other policies might have improved welfare.

References

Abaluck, Jason, and Jonathan Gruber. 2016. "Evolving choice inconsistencies in choice of prescription drug insurance." *American Economic Review*, 106(8): 2145–84.

Altonji, Joseph G, and Lewis M Segal. 1996. "Small-sample bias in GMM estimation of covariance structures." *Journal of Business & Economic Statistics*, 14(3): 353–366.

Aron-Dine, Aviva, Liran Einav, and Amy Finkelstein. 2013. "The RAND health insurance experiment, three decades later." *Journal of Economic Perspectives*, 27(1): 197–222.

Arrow, Kenneth J. 1963. "Uncertainty and the Welfare Economics of Medical Care." *The American Economic Review*, 53(5): 941–973.

Athey, Susan, and Guido W Imbens. 2006. "Identification and inference in nonlinear difference-in-differences models." *Econometrica*, 74(2): 431–497.

Barros, Pedro Pita, Matilde P. Machado, and Anna Sanz de Galdeano. 2008. "Moral hazard and the demand for health services: A matching estimator approach." *Journal of Health Economics*, 27(4): 1006 – 1025.

Besley, Timothy, and Stephen Coate. 1991. "Public provision of private goods and the redistribution of income." *American Economic Review*, 81(4): 979–984.

Blomquist, Sören, and Vidar Christiansen. 1999. "The political economy of publicly provided private goods." *Journal of Public Economics*, 73(1): 31–54.

Blundell, Richard, and Monica Costa Dias. 2009. "Alternative approaches to evaluation in empirical microeconomics." *Journal of Human Resources*, 44(3): 565–640.

Blundell, Richard, Monica Costa Dias, Costas Meghir, and John Van Reenen. 2004. "Evaluating the employment impact of a mandatory job search program." *Journal of the European economic association*, 2(4): 569–606.

Boone, Jan. 2015. "Basic versus supplementary health insurance: Moral hazard and adverse selection." *Journal of Public Economics*, 128: 50 – 58.

Bundorf, M Kate, Jonathan Levin, and Neale Mahoney. 2012. "Pricing and welfare in health plan choice." *American Economic Review*, 102(7): 3214–48.

Cameron, A Colin, Pravin K Trivedi, Frank Milne, and John Piggott. 1988. "A microeconometric model of the demand for health care and health insurance in Australia." *The Review of Economic Studies*, 55(1): 85–106.

Card, David, Carlos Dobkin, and Nicole Maestas. 2008. "The Impact of Nearly Universal Insurance Coverage on Health Care Utilization: Evidence from Medicare." *American Economic Review*, 98(5): 2242–58.

Cardon, James H, and Igal Hendel. 2001. "Asymmetric informationin health insurance: evidencefrom the National Medical Expenditure Survey." *The RAND Journal of Economics*, 32(3): 408–427.

Chandra, Amitabh, Amy Finkelstein, Adam Sacarny, and Chad Syverson. 2016. "Health Care Exceptionalism? Performance and Allocation in the US Health Care Sector." *American Economic Review*, 106(8): 2110–44.

Cochrane, John H. 1995. "Time-consistent health insurance." *Journal of Political Economy*, 103(3): 445–473.

Culter, David M., and Sarah J. Reber. 1998. "Paying for Health Insurance: The Trade-Off between Competition and Adverse Selection." *The Quarterly Journal of Economics*, 113(2): 433–466.

Cutler, David M. 1994. "A Guide to Health Care Reform." *Journal of Economic Perspectives*, 8(3): 3–17.

Cutler, David M., Amy Finkelstein, and Kathleen McGarry. 2008. "Preference Heterogeneity and Insurance Markets: Explaining a Puzzle of Insurance." *American Economic Review*, 98(2): 157–62.

Einav, Liran, Amy Finkelstein, and Mark R. Cullen. 2010. "Estimating Welfare in Insurance Markets Using Variation in Prices*." *The Quarterly Journal of Economics*, 125(3): 877–921.

Einav, Liran, Amy Finkelstein, Stephen P. Ryan, Paul Schrimpf, and Mark R. Cullen. 2013. "Selection on Moral Hazard in Health Insurance." *American Economic Review*, 103(1): 178–219.

Feldman, Roger. 1994. "The welfare economics of a health plan merger." *Journal of Regulatory Economics*, 6(1): 67–86.

Feldman, Roger D., and Bryan E. Dowd. 1982. "Simulation of a Health Insurance Market with Adverse Selection." *Operations Research*, 30(6): 1027–1042.

Feldstein, Martin S. 1973. "The Welfare Loss of Excess Health Insurance." *Journal of Political Economy*, 81(2, Part 1): 251–280.

Finkelstein, Amy, Sarah Taubman, Bill Wright, Mira Bernstein, Jonathan Gruber, Joseph P. Newhouse, Heidi Allen, Katherine Baicker, and Oregon Health Study Group. 2012. "THE OREGON HEALTH INSURANCE EXPERIMENT: EVIDENCE FROM THE FIRST YEAR." *The Quarterly Journal of Economics*, 127(3): 1057–1106.

Gaynor, Martin, Kate Ho, and Robert J. Town. 2015. "The Industrial Organization of Health-Care Markets." *Journal of Economic Literature*, 53(2): 235–84.

Gertler, Paul, and Roland Sturm. 1997. "Private health insurance and public expenditures in Jamaica." *Journal of Econometrics*, 77(1): 237 – 257.

Handel, Benjamin R. 2013. "Adverse Selection and Inertia in Health Insurance Markets: When Nudging Hurts." *American Economic Review*, 103(7): 2643–82.

Handel, Benjamin R., and Jonathan T. Kolstad. 2015. "Health Insurance for "Humans": Information Frictions, Plan Choice, and Consumer Welfare." *American Economic Review*, 105(8): 2449–2500.

Hoel, Michael, and Erik Magnus Sæther. 2003. "Public health care with waiting time: the role of supplementary private health care." *Journal of Health Economics*, 22(4): 599 – 616.

Ho, Katherine. 2006. "The welfare effects of restricted hospital choice in the US medical care market." *Journal of Applied Econometrics*, 21(7): 1039–1079.

Pauly, Mark V. 1968. "The economics of moral hazard: comment." *American economic review*, 58(3): 531–537.

Pauly, Mark V., and Bradley J. Herring. 2000. "An efficient employer strategy for dealing with adverse selection in multiple-plan offerings: an MSA example." *Journal of Health Economics*, 19(4): 513 – 528.

P.M.M., Wynand, Van De Ven, and Randall P. Ellis. 2000. "Chapter 14 - Risk Adjustment in Competitive Health Plan Markets." In *Handbook of Health Economics*. Vol. 1 of *Handbook of Health Economics*, , ed. Anthony J. Culyer and Joseph P. Newhouse, 755 – 845. Elsevier.

Savage, Elizabeth, and Donald J Wright. 2003. "Moral hazard and adverse selection in Australian private hospitals: 1989–1990." *Journal of Health Economics*, 22(3): 331 – 359.

Shepard, Mark. 2016. "Hospital Network Competition and Adverse Selection: Evidence from the Massachusetts Health Insurance Exchange." National Bureau of Economic Research Working Paper 22600.

Smith, Vernon L. 1968. "Optimal Insurance Coverage." *Journal of Political Economy*, 76(1): 68–77.

Waters, Hugh R. 1999. "Measuring the impact of health insurance with a correction for selection bias—a case study of Ecuador." *Health Economics*, 8(5): 473–483.

Appendices

A Specification Appendix

A.1 Density of s_i

We know that from (20), $s_i = \frac{\exp(Y)}{1+\exp(Y)}$ where $Y = K(X_i) + \omega_i + \xi_i$. We know that $\omega_i \sim \mathcal{N}(0, \sigma_\omega^2)$ and $\xi_i \sim \mathcal{N}(0, \sigma_\xi^2)$. We already know ω_i at this stage. Therefore, $Y \sim \mathcal{N}(K(X_i) + \omega_i, \sigma_\xi^2)$. Thus, the distribution of $f(s_i|\omega_i)$ is:

$$
\begin{aligned}
f(s|\omega) &= \frac{1}{\sigma_\xi\sqrt{2\pi}}\frac{1}{s(1-s)}\exp -\frac{(\log(\frac{s}{1-s}) - \mu)^2}{2\sigma_\xi^2} && \text{(A.1)}\\
&= \frac{1}{\sigma_\xi\sqrt{2\pi}}\frac{1}{s(1-s)}\exp -\frac{(\log(\exp Y) - \mu)^2}{2\sigma_\xi^2} && \text{(A.2)}\\
&= \frac{1}{\sigma_\xi\sqrt{2\pi}}\frac{1}{s(1-s)}\exp -\frac{(Y - \mu)^2}{2\sigma_\xi^2} && \text{(A.3)}\\
&= \frac{1}{\sigma_\xi\sqrt{2\pi}}\frac{1}{s(1-s)}\exp -\frac{(\xi_i)^2}{2\sigma_\xi^2} && \text{(A.4)}
\end{aligned}
$$

For $d(s|\omega, X)$

$$
d(s|\omega, X) = \frac{\exp(Y)}{(1+\exp Y)^2}d\xi = s(1-s)d\xi \tag{A.5}
$$

Thus,

$$
\begin{aligned}
f(s|\omega)d(s|\omega, X) &= \frac{1}{\sigma_\xi\sqrt{2\pi}}\frac{1}{s(1-s)}\exp -\frac{(\xi_i)^2}{2\sigma_\xi^2}s(1-s)d\xi && \text{(A.6)}\\
&= \frac{1}{\sigma_\xi\sqrt{2\pi}}\exp -\frac{(\xi_i)^2}{2\sigma_\xi^2}d\xi && \text{(A.7)}\\
&= \frac{1}{\sigma_\xi}\phi(\frac{\xi}{\sigma_\xi})d\xi && \text{(A.8)}
\end{aligned}
$$

A.2 Deriving (27)

We can rewrite (26) as the following:

$$p(k,j|q_i,X_i,d_R) = \int\int\int \mathbb{1}(\omega \in \lambda) p(k|q_i,X_i,d_R,j,\omega,\xi) \frac{1}{\sigma_\omega \sigma_\xi} \phi\left(\frac{\omega}{\sigma_\omega}\right) \phi\left(\frac{\xi_i}{\sigma_\xi}\right) f(a)\, d\omega d\xi da \tag{A.9}$$

Let us take the case of insurance ($j = 1$).

$$\begin{aligned} p(k,j=1|\theta_1,q_i,X_i,d_R) &= \int\int\int \mathbb{1}(V_{i1}(\omega_i,a_{i1}) \geq V_{i0}(\omega_i,a_{i0})) p(k|q_i,X_i,d_R,j=1,\omega,\xi) \\ &\quad \frac{1}{\sigma_\omega \sigma_\xi} \phi\left(\frac{\omega}{\sigma_\omega}\right) \phi\left(\frac{\xi_i}{\sigma_\xi}\right) f(a)\, d\omega d\xi da \qquad \text{(A.10)} \\ &= \int\int \left(\int \mathbb{1}(V_{i1}(\omega_i,a_{i1}) \geq V_{i0}(\omega_i,a_{i0})) f(a) da\right) p(k|q_i,X_i,d_R,j=1,\omega,\xi) \\ &\quad \frac{1}{\sigma_\omega \sigma_\xi} \phi\left(\frac{\omega}{\sigma_\omega}\right) \phi\left(\frac{\xi_i}{\sigma_\xi}\right) d\omega d\xi \qquad \text{(A.11)} \\ &= \int\int P_{i1}(\omega_i,q_i,X_i,d_R) p(k|q_i,X_i,d_R,j=1,\omega,\xi) \frac{1}{\sigma_\omega \sigma_\xi} \phi\left(\frac{\omega}{\sigma_\omega}\right) \phi\left(\frac{\xi_i}{\sigma_\xi}\right) d\omega d\xi \qquad \text{(A.12)} \end{aligned}$$

And similarly, in the case of non-insurance ($j = 0$):

$$\begin{aligned} p(k,j=0|\theta_1,q_i,X_i,d_R) = \int\int & [1 - P_{i1}(\omega_i,q_i,X_i,d_R)] p(k|q_i,X_i,d_R,j=1,\omega,\xi) \times \\ & \frac{1}{\sigma_\omega \sigma_\xi} \phi\left(\frac{\omega}{\sigma_\omega}\right) \phi\left(\frac{\xi_i}{\sigma_\xi}\right) d\omega d\xi \end{aligned} \tag{A.13}$$

A.3 Solving the Model - Stage 2

Using (17), let us first write out the utilities received from the four possible cases, conditional on the quintile an individual belongs to, by substituting (18) and (19) into (11) (m_{ik}). While we know $s_i = -\exp\left(K(X_i) + \omega_i + \xi_i\right)$, we choose not to substitute at this point and substitute in the end.

I. Individuals in Quintile 1

Case 1: Do Not Visit Hospital ($k = \{N\}, d_i^P = 0, d_i^G = 0$)

$$
\begin{aligned}
U_{iN}(m,h,q_i,X_i,d_R,j,s) &= \phi_1(y(q_i) - p_j) + \phi_2 s_i + \phi_3 s_i(y(q_i) - p_j) + \phi_4(y(q_i) - p_j)^2 + \\
&\phi_5 s_i^2 + \beta_N X_i \qquad \text{(A.14)}\\
&= \phi_1 y(q_i) - \phi_1 p_j + \phi_2 s_i + \phi_3 s_i y(q_i) - \phi_3 s_i p_j + \phi_4 y(q_i)^2 \\
&+ \phi_4 p_j^2 - 2\phi_4 y(q_i) p_j + \phi_5 s_i^2 + \beta_N X_i \qquad \text{(A.15)}\\
&= (\phi_4 p_j^2 - \phi_1 p_j) + (\phi_1 - 2\phi_4 p_j) y(q_i) + \phi_4 y(q_i)^2 + \\
&(\phi_2 - \phi_3 p_j) s_i + \phi_5 s_i^2 + \phi_3 s_i y(q_i) + \beta_N X_i \qquad \text{(A.16)}\\
&= \alpha_{1,q_1}^{j,N}(d_R) + \alpha_{2,q_1}^{j,N}(d_R) y(q_i) + \alpha_{3,q_1}^{j,N}(d_R) y(q_i)^2 + \alpha_{4,q_1}^{j,N}(d_R) s_i \\
&+ \alpha_{5,q_1}^{j,N}(d_R) s_i^2 + \alpha_{6,q_1}^{j,N}(d_R) s_i y(q_i) + \beta_N X_i \qquad \text{(A.17)}
\end{aligned}
$$

Case 2: Visit Only Private Hospital ($k = \{P\}, d_i^P = 1, d_i^G = 0$)

$$
\begin{aligned}
U_{iP}(m,h,q_i,X_i,d_R,j,s) &= \phi_1(y(q_i) - p_j - c_j^P) + \phi_2 \theta_i^P + \phi_2 s_i + \phi_3 \theta_i^P (y(q_i) - p_j - c_j^P) \\
&+ \phi_3 s_i (y(q_i) - p_j - c_j^P) + \phi_4 (y(q_i) - p_j - c_j^P)^2 + \phi_5 (\theta_i^P)^2 \\
&+ \phi_5 s_i^2 + 2\phi_5 \theta_i^P s_i + \beta_P X_i \qquad \text{(A.18)}\\
&= \phi_1 y(q_i) - \phi_1 p_j - \phi_1 c_j^P + \phi_2 \theta_i^P + \phi_2 s_i + \phi_3 \theta_i^P y(q_i) \\
&- \phi_3 \theta_i^P p_j - \phi_3 \theta_i^P c_j^P + \phi_3 s_i y(q_i) - \phi_3 s_i p_j - \phi_3 s_i c_j^P + \phi_4 y(q_i)^2 \\
&+ \phi_4 p_j^2 + \phi_4 (c_j^P)^2 - 2\phi_4 y(q_i) p_j + 2\phi_4 p_j c_j^P - 2\phi_4 c_j^P y(q_i) \\
&+ \phi_5 (\theta_i^P)^2 + \phi_5 s_i^2 + 2\phi_5 \theta_i^P s_i + \beta_P X_i \qquad \text{(A.19)}\\
&= (\phi_4 p_j^2 - \phi_1 p_j) + (\phi_2 \theta_i^P - \phi_1 c_j^P - \phi_3 \theta_i^P p_j - \phi_3 \theta_i^P c_j^P \\
&+ \phi_4 (c_j^P)^2 + 2\phi_4 p_j c_j^P + \phi_5 (\theta_i^P)^2) + [(\phi_1 - 2\phi_4 p_j) \\
&+ \phi_3 \theta_i^P - 2\phi_4 c_j^P)] y(q_i) + \phi_4 y(q_i)^2 + [(\phi_2 - \phi_3 p_j) - \phi_3 c_j^P \\
&+ 2\phi_5 \theta_i^P) s_i + \phi_5 s_i^2 + \phi_3 s_i y(q_i) + \beta_P X_i \qquad \text{(A.20)}\\
&= \alpha_{1,q_1}^{j,N}(d_R) + \alpha_{1,q_1}^{j,P}(d_R) + (\alpha_{2,q_1}^{j,N}(d_R) + \alpha_{2,q_1}^{j,P}(d_R)) y(q_i) \\
&+ \alpha_{3,q_1}^{j,N}(d_R) y(q_i)^2 + (\alpha_{4,q_1}^{j,N}(d_R) + \alpha_{4,q_1}^{j,P}(d_R))] s_i + \alpha_{5,q_1}^{j,N}(d_R) s_i^2 \\
&+ \alpha_{6,q_1}^{j,N}(d_R) s_i y(q_i) + \beta_P X_i \qquad \text{(A.21)}
\end{aligned}
$$

Case 3: Visit Only Public Hospital ($k = \{G\}, d_i^P = 0, d_i^G = 1$)

$$\begin{aligned}
U_{iG}(m,h,q_i,X_i,d_R,j,s) &= \phi_1(y(q_i)-p_j) + \phi_2\theta_i^G + \phi_2 s_i + \phi_3(y(q_i)-p_j)\theta_i^G \\
&+ \phi_3 s_i(y(q_i)-p_j) + \phi_4(y(q_i)-p_j)^2 + \phi_5(\theta_i^G)^2 + \phi_5 s_i^2 \\
&+ 2\phi_5\theta_i^G s_i + \beta_G X_i && \text{(A.22)} \\
&= \phi_1 y(q_i) - \phi_1 p_j + \phi_2\theta_i^G + \phi_2 s_i + \phi_3 y(q_i)\theta_i^G - \phi_3 p_j\theta_i^G \\
&+ \phi_3 s_i y(q_i) - \phi_3 s_i p_j + \phi_4 y(q_i)^2 + \phi_4 p_j^2 - 2\phi_4 y(q_i)p_j + \phi_5(\theta_i^G)^2 \\
&+ \phi_5 s_i^2 + 2\phi_5\theta_i^G s_i + \beta_G X_i && \text{(A.23)} \\
&= [(\phi_4 p_j^2 - \phi_1 p_j) + \phi_2\theta_i^G - \phi_3 p_j\theta_i^G + \phi_5(\theta_i^G)^2] \\
&+ [(\phi_1 - 2\phi_4 p_j) + \phi_3\theta_i^G]y(q_i) + \phi_4 y(q_i)^2 + [(\phi_2 - \phi_3 p_j) \\
&+ 2\phi_5\theta_i^G]s_i + \phi_5 s_i^2 + \phi_3 s_i y(q_i) + \beta_G X_i && \text{(A.24)} \\
&= \alpha_{1,q_1}^{j,N}(d_R) + \alpha_{1,q_1}^{j,G}(d_R) + (\alpha_{2,q_1}^{j,N}(d_R) + \alpha_{2,q_1}^{j,G}(d_R))y(q_i) \\
&+ \alpha_{3,q_1}^{j,N}(d_R)y(q_i)^2 + (\alpha_{4,q_1}^{j,N}(d_R) + \alpha_{4,q_1}^{j,G}(d_R))s_i + \alpha_{5,q_1}^{j,N}(d_R)s_i^2 \\
&+ \alpha_{6,q_1}^{j,N}(d_R)s_i y(q_i) + \beta_G X_i && \text{(A.25)}
\end{aligned}$$

For individuals in Quintile 1, Stage 2 doesn't change pre and post-reform. Therefore, $\forall k \in \{N, P, G\}$ and $\forall a \in \{1,2,3,4,5,6\}$

$$\alpha_{a,q_1}^{j,k}(d_R = 0) = \alpha_{a,q_1}^{j,k}(d_R = 1) = \alpha_{a,q_1}^{j,k} \tag{A.26}$$

II. Individuals not in Quintile 1

Case 1: Do Not Visit Hospital ($k = \{N\}, d_i^P = 0, d_i^G = 0$)

$$\begin{aligned}
U_{iN}(m,h,q_i,X_i,d_R,j,s) &= \phi_1(y(q_i)-p_j) + \phi_2 s_i + \phi_3 s_i(y(q_i)-p_j) + \phi_4(y(q_i)-p_j)^2 + \\
&\phi_5 s_i^2 + \beta_N X_i && \text{(A.27)} \\
&= \phi_1 y(q_i) - \phi_1 p_j + \phi_2 s_i + \phi_3 s_i y(q_i) - \phi_3 s_i p_j + \phi_4 y(q_i)^2 \\
&+ \phi_4 p_j^2 - 2\phi_4 y(q_i)p_j + \phi_5 s_i^2 + \beta_N X_i && \text{(A.28)} \\
&= (\phi_4 p_j^2 - \phi_1 p_j) + (\phi_1 - 2\phi_4 p_j)y(q_i) + \phi_4 y(q_i)^2 + \\
&(\phi_2 - \phi_3 p_j)s_i + \phi_5 s_i^2 + \phi_3 s_i y(q_i) + \beta_N X_i && \text{(A.29)} \\
&= \alpha_{1,q_0}^{j,N}(d_R) + \alpha_{2,q_0}^{j,N}(d_R)y(q_i) + \alpha_{3,q_0}^{j,N}(d_R)y(q_i)^2 + \alpha_{4,q_0}^{j,N}(d_R)s_i \\
&+ \alpha_{5,q_0}^{j,N}(d_R)s_i^2 + \alpha_{6,q_0}^{j,N}(d_R)s_i y(q_i) + \beta_N X_i && \text{(A.30)}
\end{aligned}$$

Case 2: Visit Only Private Hospital ($k = \{P\}, d_i^P = 1, d_i^G = 0$)

$$\begin{aligned}
U_{iP}(m,h,q_i,X_i,d_R,j,s) &= \phi_1(y(q_i) - p_j - c_j^P) + \phi_2\theta_i^P + \phi_2 s_i + \phi_3\theta_i^P(y(q_i) - p_j - c_j^P) \\
&+ \phi_3 s_i(y(q_i) - p_j - c_j^P) + \phi_4(y(q_i) - p_j - c_j^P)^2 + \phi_5(\theta_i^P)^2 \\
&+ \phi_5 s_i^2 + 2\phi_5\theta_i^P s_i + \beta_P X_i \qquad \text{(A.31)} \\
&= \phi_1 y(q_i) - \phi_1 p_j - \phi_1 c_j^P + \phi_2\theta_i^P + \phi_2 s_i + \phi_3\theta_i^P y(q_i) \\
&- \phi_3\theta_i^P p_j - \phi_3\theta_i^P c_j^P + \phi_3 s_i y(q_i) - \phi_3 s_i p_j - \phi_3 s_i c_j^P + \phi_4 y(q_i)^2 \\
&+ \phi_4 p_j^2 + \phi_4(c_j^P)^2 - 2\phi_4 y(q_i) p_j + 2\phi_4 p_j c_j^P - 2\phi_4 c_j^P y(q_i) \\
&+ \phi_5(\theta_i^P)^2 + \phi_5 s_i^2 + 2\phi_5\theta_i^P s_i + \beta_P X_i \qquad \text{(A.32)} \\
&= (\phi_4 p_j^2 - \phi_1 p_j) + (\phi_2\theta_i^P - \phi_1 c_j^P - \phi_3\theta_i^P p_j - \phi_3\theta_i^P c_j^P \\
&+ \phi_4(c_j^P)^2 + 2\phi_4 p_j c_j^P + \phi_5(\theta_i^P)^2) + [(\phi_1 - 2\phi_4 p_j) \\
&+ \phi_3\theta_i^P - 2\phi_4 c_j^P)]y(q_i) + \phi_4 y(q_i)^2 + [(\phi_2 - \phi_3 p_j) - \phi_3 c_j^P \\
&+ 2\phi_5\theta_i^P)s_i + \phi_5 s_i^2 + \phi_3 s_i y(q_i) + \beta_P X_i \qquad \text{(A.33)} \\
&= \alpha_{1,q_0}^{j,N}(d_R) + \alpha_{1,q_0}^{j,P}(d_R) + (\alpha_{2,q_0}^{j,N}(d_R) + \alpha_{2,q_0}^{j,P}(d_R))y(q_i) \\
&+ \alpha_{3,q_0}^{j,N}(d_R)y(q_i)^2 + (\alpha_{4,q_0}^{j,N}(d_R) + \alpha_{4,q_0}^{j,P}(d_R))s_i + \alpha_{5,q_0}^{j,N}(d_R)s_i^2 \\
&+ \alpha_{6,q_0}^{j,N}(d_R)s_i y(q_i) + \beta_P X_i \qquad \text{(A.34)}
\end{aligned}$$

Case 3: Visit Only Public Hospital ($k = \{G\}, d_i^P = 0, d_i^G = 1$)

$$\begin{aligned}
U_{iG}(m,h,q_i,X_i,d_R,j,s) &= \phi_1(y(q_i) - p_j - c_j^G) + \phi_2\theta_i^G + \phi_2 s_i + \phi_3(y(q_i) - p_j - c_j^G)\theta_i^G \\
&+ \phi_3 s_i(y(q_i) - p_j - c_j^G) + \phi_4(y(q_i) - p_j - c_j^G)^2 + \phi_5(\theta_i^G)^2 \\
&+ \phi_5 s_i^2 + 2\phi_5\theta_i^G s_i + \beta_G X_i \qquad \text{(A.35)} \\
&= \phi_1 y(q_i) - \phi_1 p_j - \phi_1 c_j^G + \phi_2\theta_i^G + \phi_2 s_i + \phi_3\theta_i^G y(q_i) \\
&- \phi_3\theta_i^G p_j - \phi_3\theta_i^G c_j^G + \phi_3 s_i y(q_i) - \phi_3 s_i p_j - \phi_3 s_i c_j^G + \phi_4 y(q_i)^2 \\
&+ \phi_4 p_j^2 + \phi_4(c_j^G)^2 - 2\phi_4 y(q_i)p_j + 2\phi_4 p_j c_j^P - 2\phi_4 y(q_i)c_j^G \\
&+ \phi_5(\theta_i^G)^2 + \phi_5 s_i^2 + 2\phi_5\theta_i^G s_i + \beta_G X_i \qquad \text{(A.36)} \\
&= (\phi_4 p_j^2 - \phi_1 p_j) + (-\phi_1 c_j^G + \phi_2\theta_i^G - \phi_3\theta_i^G p_j \\
&- \phi_3\theta_i^G c_j^G + \phi_4(c_j^G)^2 + 2\phi_4 p_j c_j^G + \phi_5(\theta_i^G)^2) \\
&+ [(\phi_1 - 2\phi_4 p_j) + (\phi_3\theta_i^G - 2\phi_4 c_j^G)]y(q_i) + \phi_4 y(q_i)^2 \\
&+ [(\phi_2 - \phi_3 p_j) + (-\phi_3 c_j^G + 2\phi_5\theta_i^G)]s_i + \phi_5 s_i^2 \\
&+ \phi_3 s_i y(q_i) + \beta_G X_i \qquad \text{(A.37)} \\
&= \alpha_{1,q_0}^{j,N}(d_R) + \alpha_{1,q_0}^{j,G}(d_R) + (\alpha_{2,q_0}^{j,N}(d_R) + \alpha_{2,q_0}^{j,G}(d_R))y(q_i) \\
&+ \alpha_{3,q_0}^{j,N}(d_R)y(q_i)^2 + (\alpha_{4,q_0}^{j,N}(d_R) + \alpha_{4,q_0}^{j,G}(d_R))s_i + \alpha_{5,q_0}^{j,N}(d_R)s_i^2 \\
&+ \alpha_{6,q_0}^{j,N}(d_R)s_i y(q_i) + \beta_G X_i \qquad \text{(A.38)}
\end{aligned}$$

Since we normalize everything with respect to the case of not going to a public or private facility, we calculate the differences and now substitute in for s_i.

I. Individuals in Quintile 1, Pre-Reform

$$\begin{aligned}
&U_{iP}(m,h,q_i,X_i,d_R = 0,j,\omega,\xi) - U_{iN}(m,h,q_i,X_i,d_R = 0,j,\omega,\xi) \\
&\quad = \alpha_{1,q_1}^{j,P}(d_R = 0) + \alpha_{2,q_1}^{j,P}(d_R = 0)y(q_i) + \alpha_{4,q_1}^{j,P}(d_R = 0)(-\exp(K(X_i) + \omega_i + \xi_i)) \\
&\quad + (\beta_P - \beta_N)X_i \qquad \text{(A.39)} \\
&U_{iG}(m,h,q_i,X_i,d_R = 0,j,\omega,\xi) - U_{iN}(m,h,q_i,X_i,d_R = 0,j,\omega,\xi) \\
&\quad = \alpha_{1,q_1}^{j,G}(d_R = 0) + \alpha_{2,q_1}^{j,G}(d_R = 0)y(q_i) + \alpha_{4,q_1}^{j,G}(d_R = 0)(-\exp(K(X_i) + \omega_i + \xi_i)) \\
&\quad + (\beta_G - \beta_N)X_i \qquad \text{(A.40)}
\end{aligned}$$

II. Individuals in Quintile 1, Post-Reform

$$
\begin{aligned}
&U_{iP}(m, h, q_i, X_i, d_R = 1, j, \omega, \xi) - U_{iN}(m, h, q_i, X_i, d_R = 1, j, \omega, \xi) \\
&\quad = \alpha^{j,P}_{1,q_1}(d_R = 1) + \alpha^{j,P}_{2,q_1}(d_R = 1) y(q_i) + \alpha^{j,P}_{4,q_1}(d_R = 1)(-\exp(K(X_i) + \omega_i + \xi_i)) \\
&\quad + (\beta_P - \beta_N) X_i && \text{(A.41)} \\
&U_{iG}(m, h, q_i, X_i, d_R = 1, j, \omega, \xi) - U_{iN}(m, h, q_i, X_i, d_R = 1, j, \omega, \xi) \\
&\quad = \alpha^{j,G}_{1,q_1}(d_R = 1) + \alpha^{j,G}_{2,q_1}(d_R = 1) y(q_i) + \alpha^{j,G}_{4,q_1}(d_R = 1)(-\exp(K(X_i) + \omega_i + \xi_i)) \\
&\quad + (\beta_G - \beta_N) X_i && \text{(A.42)} \\
& && \text{(A.43)}
\end{aligned}
$$

III. Individuals not in Quintile 1, Pre-Reform

$$
\begin{aligned}
&U_{iP}(m, h, q_i, X_i, d_R = 0, j, \omega, \xi) - U_{iN}(m, h, q_i, X_i, d_R = 0, j, \omega, \xi) \\
&\quad = \alpha^{j,P}_{1,q_0}(d_R = 0) + (\alpha^{j,P}_{2,q_0}(d_R = 0)) y(q_i) + \alpha^{j,P}_{4,q_0}(d_R = 0)(-\exp(K(X_i) + \omega_i + \xi_i)) \\
&\quad + (\beta_P - \beta_N) X_i && \text{(A.44)} \\
&U_{iG}(m, h, q_i, X_i, d_R = 0, j, \omega, \xi) - U_{iN}(m, h, q_i, X_i, d_R = 0, j, \omega, \xi) \\
&\quad = \alpha^{j,G}_{1,q_0}(d_R = 0) + \alpha^{j,G}_{2,q_0}(d_R = 0) y(q_i) + \alpha^{j,G}_{4,q_0}(d_R = 0)(-\exp(K(X_i) + \omega_i + \xi_i)) \\
&\quad + (\beta_G - \beta_N) X_i && \text{(A.45)} \\
& && \text{(A.46)}
\end{aligned}
$$

IV. Individuals not in Quintile 1, Post-Reform

$$
\begin{aligned}
&U_{iP}(m, h, q_i, X_i, d_R = 1, j, \omega, \xi) - U_{iN}(m, h, q_i, X_i, d_R = 1, j, \omega, \xi) \\
&\quad = \alpha^{j,P}_{1,q_0}(d_R = 1) + (\alpha^{j,P}_{2,q_0}(d_R = 1)) y(q_i) + \alpha^{j,P}_{4,q_0}(d_R = 1)(-\exp(K(X_i) + \omega_i + \xi_i)) \\
&\quad + (\beta_P - \beta_N) X_i && \text{(A.47)} \\
&U_{iG}(m, h, q_i, X_i, d_R = 1, j, \omega, \xi) - U_{iN}(m, h, q_i, X_i, d_R = 1, j, \omega, \xi) \\
&\quad = \alpha^{j,G}_{1,q_0}(d_R = 1) + \alpha^{j,G}_{2,q_0}(d_R = 1) y(q_i) + \alpha^{j,G}_{4,q_0}(d_R = 1)(-\exp(K(X_i) + \omega_i + \xi_i)) \\
&\quad + (\beta_G - \beta_N) X_i && \text{(A.48)}
\end{aligned}
$$

With the differences, we can explicitly write out each probability:

I. Individuals in Quintile 1, Pre-Reform

$$p(k = P|q_1 = 1, q_i, X_i, d_R = 0, j, s)$$
$$= \frac{\exp(\alpha^{j,P}_{1,q_1}(d_R = 0) + \alpha^{j,P}_{2,q_1}(d_R = 0)y(q_i) + \alpha^{j,P}_{4,q_1}(d_R = 0)s_i + (\beta_P - \beta_N)X_i)}{1 + \sum_{k' \in \{G,P\}} \exp(U_{ik'}(m, h, q_i, X_i, d_R = 0, j, s) - U_{iN}(m, h, q_i, X_i, d_R = 0, j, s))} \tag{A.49}$$

$$p(k = G|q_1 = 1, q_i, X_i, d_R = 0, j, s)$$
$$= \frac{\exp(\alpha^{j,G}_{1,q_1}(d_R = 0) + \alpha^{j,G}_{2,q_1}(d_R = 0)y(q_i) + \alpha^{j,G}_{4,q_1}(d_R = 0)s_i + (\beta_G - \beta_N)X_i)}{1 + \sum_{k' \in \{G,P\}} \exp(U_{ik'}(m, h, q_i, X_i, d_R = 0, j, s) - U_{iN}(m, h, q_i, X_i, d_R = 0, j, s))} \tag{A.50}$$

II. Individuals in Quintile 1, Post-Reform

$$p(k = P|q_1 = 1, q_i, X_i, d_R = 1, j, s)$$
$$= \frac{\exp(\alpha^{j,P}_{1,q_1}(d_R = 1) + \alpha^{j,P}_{2,q_1}(d_R = 1)y(q_i) + \alpha^{j,P}_{4,q_1}(d_R = 1)s_i + (\beta_P - \beta_N)X_i)}{1 + \sum_{k' \in \{G,P\}} \exp(U_{ik'}(m, h, q_i, X_i, d_R = 1, j, s) - U_{iN}(m, h, q_i, X_i, d_R = 1, j, s))} \tag{A.51}$$

$$p(k = G|q_1 = 1, q_i, X_i, d_R = 1, j, s)$$
$$= \frac{\exp(\alpha^{j,G}_{1,q_1}(d_R = 1) + \alpha^{j,G}_{2,q_1}(d_R = 1)y(q_i) + \alpha^{j,G}_{4,q_1}(d_R = 1)s_i + (\beta_G - \beta_N)X_i)}{1 + \sum_{k' \in \{G,P\}} \exp(U_{ik'}(m, h, q_i, X_i, d_R = 1, j, s) - U_{iN}(m, h, q_i, X_i, d_R = 1, j, s))} \tag{A.52}$$

III. Individuals not in Quintile 1, Pre-Reform

$$p(k = P|q_1 = 0, q_i, X_i, d_R = 0, j, s)$$
$$= \frac{\exp(\alpha_{1,q_0}^{j,P}(d_R = 0) + (\alpha_{2,q_0}^{j,P}(d_R = 0))y(q_i) + \alpha_{4,q_0}^{j,P}(d_R = 0)s_i + (\beta_P - \beta_N)X_i)}{1 + \sum_{k' \in \{G,P\}} \exp(U_{ik'}(m, h, q_i, X_i, d_R = 0, j, s) - U_{iN}(m, h, q_i, X_i, d_R = 0, j, s))} \tag{A.53}$$

$$p(k = G|q_1 = 0, q_i, X_i, d_R = 0, j, s)$$
$$= \frac{\exp(\alpha_{1,q_0}^{j,G}(d_R = 0) + \alpha_{2,q_0}^{j,G}(d_R = 0)y(q_i) + \alpha_{4,q_0}^{j,G}(d_R = 0)s_i + (\beta_G - \beta_N)X_i)}{1 + \sum_{k' \in \{G,P\}} \exp(U_{ik'}(m, h, q_i, X_i, d_R = 0, j, s) - U_{iN}(m, h, q_i, X_i, d_R = 0, j, s))} \tag{A.54}$$

$$\tag{A.55}$$

IV. Individuals not in Quintile 1, Post-Reform

$$p(k = P|q_1 = 0, q_i, X_i, d_R = 1, j, s)$$
$$= \frac{\exp(\alpha_{1,q_0}^{j,P}(d_R = 1) + (\alpha_{2,q_0}^{j,P}(d_R = 1))y(q_i) + \alpha_{4,q_0}^{j,P}(d_R = 1)s_i + (\beta_P - \beta_N)X_i)}{1 + \sum_{k' \in \{G,P\}} \exp(U_{ik'}(m, h, q_i, X_i, d_R = 1, j, s) - U_{iN}(m, h, q_i, X_i, d_R = 1, j, s))} \tag{A.56}$$

$$p(k = G|q_1 = 0, q_i, X_i, d_R = 1, j, s)$$
$$= \frac{\exp(\alpha_{1,q_0}^{j,G}(d_R = 1) + \alpha_{2,q_0}^{j,G}(d_R = 1)y(q_i) + \alpha_{4,q_0}^{j,G}(d_R = 1)s_i + (\beta_G - \beta_N)X_i)}{1 + \sum_{k' \in \{G,P\}} \exp(U_{ik'}(m, h, q_i, X_i, d_R = 1, j, s) - U_{iN}(m, h, q_i, X_i, d_R = 1, j, s))} \tag{A.57}$$

A.4 Deriving (31)

We know that,

$$\mathcal{U}_{ij}^*(\omega, \xi, q_i, X_i, d_R) = -\exp\left[-r\left\{\ln\left(\sum_{k \in \{N,G,P\}} \exp(U_{ik}(m, h, q_i, X_i, d_R, j, \omega, \xi))\right) + \gamma\right\}\right] \tag{A.58}$$

We can simplify (A.58) to get to 31 by using $\exp(A+B) = \exp(A).\exp(B)$.

$$\mathcal{U}^{*}_{ij}\omega,\xi,d_R) = -\exp\left[-r\ln\left(\sum_{k\in\{N,G,P\}}\exp(U_{ik}(m,h,q_i,X_i,d_R,j,\omega,\xi))\right) - r\gamma\right] \tag{A.59}$$

$$= -\exp\left[-r\ln\left(\sum_{k\in\{N,G,P\}}\exp(U_{ik}(m,h,q_i,X_i,d_R,j,\omega,\xi))\right)\right].\exp[-r\gamma] \tag{A.60}$$

$$= -\exp\left[\ln\left(\sum_{k\in\{N,G,P\}}\exp(U_{ik}(m,h,q_i,X_i,d_R,j,\omega,\xi))\right)^{-r}\right].\exp[-r\gamma] \tag{A.61}$$

$$= -\exp[-r\gamma]\left(\sum_{k\in\{N,G,P\}}\exp(U_{ik}(m,h,q_i,X_i,d_R,j,\omega,\xi))\right)^{-r} \tag{A.62}$$

A.5 Proof of Claim 1

Using (14) and (31), we can write,

$$\bar{V}_{ij}(\omega_i,q_i,X_i,d_R) = \int_{\xi\in supp(\xi)} -\exp[-r\gamma]\left(\sum_{k\in\{N,G,P\}}\exp(U_{ik}(m,h,q_i,X_i,d_R,j,\omega,\xi))\right)^{-r} \times \frac{1}{\sigma_\xi}\phi\left(\frac{\xi_i}{\sigma_\xi}\right)d\xi \tag{A.63}$$

Let us focus on the term $\left(\sum_{k\in\{N,G,P\}}\exp(U_{ik}(m,h,q_i,X_i,d_R,j,\omega,\xi))\right)^{-r}$. We can rewrite the other choices as, $\forall k\in\{P,G\}$:

$$\exp(U_{ik}(m,h,q_i,X_i,d_R,j,\omega,\xi)) = \exp(U_{iN}(m,h,q_i,X_i,d_R,j,\omega,\xi) + \{U_{ik}(m,h,q_i,X_i,d_R,j,\omega,\xi) - U_{iN}(m,h,q_i,X_i,d_R,j,\omega,\xi)\}) \tag{A.64}$$

$$= \exp(U_{iN}(m,h,q_i,X_i,d_R,j,\omega,\xi)).\exp(\{U_{ik}(m,h,q_i,X_i,d_R,j,\omega,\xi) - U_{iN}(m,h,q_i,X_i,d_R,j,\omega,\xi)\}) \tag{A.65}$$

Therefore,

$$(\sum_{k\in\{N,G,P\}} \exp(U_{ik}(m,h,q_i,X_i,d_R,j=1,\omega,\xi)))^{-r} = (\exp(U_{iN}(m,h,q_i,X_i,d_R,j,\omega,\xi))$$
$$+ \sum_{k\in\{G,P\}} \exp(U_{iN}(m,h,q_i,X_i,d_R,j,\omega,\xi)).\exp(\{U_{ik}(m,h,q_i,X_i,d_R,j,\omega,\xi)$$
$$- U_{iN}(m,h,q_i,X_i,d_R,j,\omega,\xi)\}))^{-r} \tag{A.66}$$
$$= (\exp(U_{iN}(m,h,q_i,X_i,d_R,j,\omega,\xi))^{-r}.$$
$$[1 + \sum_{k\in\{G,P\}} \exp(\{U_{ik}(m,h,q_i,X_i,d_R,j,\omega,\xi) - U_{iN}(m,h,q_i,X_i,d_R,j,\omega,\xi)\})])^{-r} \tag{A.67}$$

Let us write out the second component in greater detail.

$$\exp(U_{iP}(m,h,q_i,X_i,d_R,j,\omega,\xi) - U_{iN}(m,h,q_i,X_i,d_R,j,\omega,\xi)) = \exp(\alpha^{j,P}_{1,q} + \alpha^{j,P}_{2,q}y(q_i) + \alpha^{j,P}_{4,q}s_i$$
$$+ (\beta_P - \beta_N)X_i)$$
$$= \exp(\alpha^{j,P}_{1,q})\exp(\alpha^{j,P}_{2,q}y(q_i))\exp(-\alpha^{j,P}_{4,q}\exp\{\gamma_d X_i\}.\exp\{\omega_i\}.\exp\{\xi_i)\})$$
$$\exp((\beta_P - \beta_N)X_i)) \tag{A.68}$$

$$\exp(U_{iG}(m,h,q_i,X_i,d_R,j,\omega,\xi) - U_{iN}(m,h,q_i,X_i,d_R,j,\omega,\xi)) = \exp(\alpha^{j,G}_{1,q} + \alpha^{j,G}_{2,q}y(q_i) + \alpha^{j,G}_{4,q}s_i$$
$$+ (\beta_G - \beta_N)X_i) \tag{A.69}$$
$$= \exp(\alpha^{j,G}_{1,q})\exp(\alpha^{j,G}_{2,q}y(q_i))\exp(\alpha^{j,G}_{4,q}\exp\{\gamma_d X_i\}.\exp\{\omega_i\}.\exp\{\xi_i)\})$$
$$\exp((\beta_G - \beta_N)X_i)) \tag{A.70}$$

Therefore, we can condense and write the second component as the following:

$$\sum_{k\in\{G,P\}} \exp(\{U_{ik}(m,h,q_i,X_i,d_R,j,\omega,\xi) - U_{iN}(m,h,q_i,X_i,d_R,j,\omega,\xi)\}) \tag{A.71}$$
$$= \sum_{k\in\{G,P\}} \exp(\alpha^{j,k}_{1,q})\exp((\alpha^{j,k}_{2,q}y(q_i))\exp((\alpha^{j,k}_{4,q}\exp\{\gamma_d X_i\}.\exp\{\omega_i\}.\exp\{\xi_i)\})$$
$$\exp((\beta_k - \beta_N)X_i)) \tag{A.72}$$

Now, let us focus on the first component.

$$\begin{aligned}\exp(U_{iN}(m,h,q_i,X_i,d_R,j,\omega,\xi)) &= \exp(\alpha^{j,N}_{1,q}(d_R)+\alpha^{j,N}_{2,q}(d_R)y(q_i)+\alpha^{j,N}_{3,q}(d_R)y(q_i)^2 \\ &+\alpha^{j,N}_{4,q}(d_R)\exp\{\gamma_d X_i\}.\exp\{\omega_i\}.\exp\{\xi_i)\} \\ &+\alpha^{j,N}_{5,q}(d_R)\exp\{2\gamma_d X_i\}.\exp\{2\omega_i\}.\exp\{2\xi_i)\} \\ &+\alpha^{j,N}_{6,q}(d_R)\exp\{\gamma_d X_i\}.\exp\{\omega_i\}.\exp\{\xi_i)\}y(q_i)+\beta_N X_i) \end{aligned} \tag{A.73}$$

$$\begin{aligned} &= \exp(\alpha^{j,N}_{1,q}(d_R)).\exp(\alpha^{j,N}_{2,q}(d_R)y(q_i)).\exp(\alpha^{j,N}_{3,q}(d_R)y(q_i)^2) \\ &.\exp(\alpha^{j,N}_{4,q}(d_R)\exp\{\gamma_d X_i\}.\exp\{\omega_i\}.\exp\{\xi_i)\}). \\ &\exp(\alpha^{j,N}_{5,q}(d_R)\exp\{2\gamma_d X_i\}.\exp\{2\omega_i\}.\exp\{2\xi_i)\}). \\ &\exp(\alpha^{j,N}_{6,q}(d_R)\exp\{\gamma_d X_i\}.\exp\{\omega_i\}.\exp\{\xi_i)\}y(q_i)).\exp(\beta_N X_i) \end{aligned} \tag{A.74}$$

Thus, we can rewrite (A.67) as:

$$(\sum_{k\in\{N,G,P\}}\exp(U_{ik}(m,h,q_i,X_i,d_R,j=1,\omega,\xi)))^{-r} \tag{A.75}$$

$$\begin{aligned} &= (\exp(U_{iN}(m,h,q_i,X_i,d_R,j,\omega,\xi))^{-r}. \\ &[1+\sum_{k\in\{G,P\}}\exp(\alpha^{j,k}_{1,q})\exp((\alpha^{j,k}_{2,q}y(q_i))\exp((\alpha^{j,k}_{4,q}\exp\{\gamma_d X_i\}.\exp\{\omega_i\}.\exp\{\xi_i)\}) \\ &\exp((\beta_k-\beta_N)X_i))]^{-r} \end{aligned} \tag{A.76}$$

$$\begin{aligned} &= (\exp(\alpha^{j,N}_{1,q}(d_R)).\exp(\alpha^{j,N}_{2,q}(d_R)y(q_i)).\exp(\alpha^{j,N}_{3,q}(d_R)y(q_i)^2) \\ &.\exp(\alpha^{j,N}_{4,q}(d_R)\exp\{\gamma_d X_i\}.\exp\{\omega_i\}.\exp\{\xi_i)\}). \\ &\exp(\alpha^{j,N}_{5,q}(d_R)\exp\{2\gamma_d X_i\}.\exp\{2\omega_i\}.\exp\{2\xi_i)\}). \\ &\exp(\alpha^{j,N}_{6,q}(d_R)\exp\{\gamma_d X_i\}.\exp\{\omega_i\}.\exp\{\xi_i)\}y(q_i)).\exp(\beta_N X_i))^{-r} \\ &[1+\sum_{k\in\{G,P\}}\exp(\alpha^{j,k}_{1,q})\exp((\alpha^{j,k}_{2,q}y(q_i))\exp((\alpha^{j,k}_{4,q}\exp\{\gamma_d X_i\}.\exp\{\omega_i\}.\exp\{\xi_i)\}) \\ &\exp((\beta_k-\beta_N)X_i))]^{-r} \end{aligned} \tag{A.77}$$

Thus, we can write the value of insurance and no insurance as the following:

$$
\begin{aligned}
V_{i1}(\omega_i, q_i, X_i, d_R) = \int_{\xi \in supp(\xi)} & - \exp[-r\gamma](\exp(\alpha_{1,q}^{j=1,N}(d_R)). \exp(\alpha_{2,q}^{j=1,N}(d_R)y(q_i)). \exp(\alpha_{3,q}^{j=1,N}(d_R)y(q_i)^2) \\
& . \exp(\alpha_{4,q}^{j=1,N}(d_R) \exp\{\gamma_d X_i\}. \exp\{\omega_i\}. \exp\{\xi_i)\}). \\
& \exp(\alpha_{5,q}^{j=1,N}(d_R) \exp\{2\gamma_d X_i\}. \exp\{2\omega_i\}. \exp\{2\xi_i)\}). \\
& \exp(\alpha_{6,q}^{j=1,N}(d_R) \exp\{\gamma_d X_i\}. \exp\{\omega_i\}. \exp\{\xi_i)\} y(q_i)). \exp(\beta_N X_i))^{-r} \\
& [1 + \sum_{k \in \{G,P\}} \exp(\alpha_{1,q}^{j=1,k}) \exp((\alpha_{2,q}^{j=1,k} y(q_i)) \exp((\alpha_{4,q}^{j=1,k} \exp\{\gamma_d X_i\}. \exp\{\omega_i\}. \exp\{\xi_i)\}) \\
& \exp((\beta_k - \beta_N)X_i))]^{-r} \pi_i(ds|\omega_i, X_i) \qquad \text{(A.78)}
\end{aligned}
$$

$$
\begin{aligned}
V_{i0}(\omega_i, q_i, X_i, d_R) = \int_{\xi \in supp(\xi)} & - \exp[-r\gamma](\exp(\alpha_{1,q}^{j=0,N}(d_R)). \exp(\alpha_{2,q}^{j=0,N}(d_R)y(q_i)). \exp(\alpha_{3,q}^{j=0,N}(d_R)y(q_i)^2) \\
& . \exp(\alpha_{4,q}^{j=0,N}(d_R) \exp\{\gamma_d X_i\}. \exp\{\omega_i\}. \exp\{\xi_i)\}). \\
& \exp(\alpha_{5,q}^{j=0,N}(d_R) \exp\{2\gamma_d X_i\}. \exp\{2\omega_i\}. \exp\{2\xi_i)\}). \\
& \exp(\alpha_{6,q}^{j=0,N}(d_R) \exp\{\gamma_d X_i\}. \exp\{\omega_i\}. \exp\{\xi_i)\} y(q_i)). \exp(\beta_N X_i))^{-r} \\
& [1 + \sum_{k \in \{G,P\}} \exp(\alpha_{1,q}^{j=0,k}) \exp((\alpha_{2,q}^{j,k} y(q_i)) \exp((\alpha_{4,q}^{j=0,k} \exp\{\gamma_d X_i\}. \exp\{\omega_i\}. \exp\{\xi_i)\}) \\
& \exp((\beta_k - \beta_N)X_i))]^{-r} \pi_i(ds|\omega_i, X_i) \qquad \text{(A.79)}
\end{aligned}
$$

A.6 Proof of Proposition 1

Using Tables 4 and 5, we see that:

$$\alpha^{j,G}_{2,q_0}(d_R = 1) - \alpha^{j,G}_{2,q_0}(d_R = 0) = 2\phi_4 c^G_j \tag{A.80}$$

$$\alpha^{j,G}_{2,q_0}(d_R = 1) = \phi_3 \theta^G_i \tag{A.81}$$

$$\alpha^{j,N}_{2,q_0}(d_R = 1) = \phi_1 - 2\phi_4 p_j \tag{A.82}$$

$$\alpha^{j,G}_{1,q_0}(d_R = 1) - \alpha^{j,G}_{1,q_0}(d_R = 0) = [\phi_1 c^G_j + \phi_3 \theta^G_i c^G_j - \phi_4 (c^G_j)^2 - 2\phi_4 p_j c^G_j] \tag{A.83}$$

$$= c^G_j [\phi_1 - 2\phi_4 p_j + \phi_3 \theta^G_i - \phi_4 c^G_j] \tag{A.84}$$

$$= c^G_j [\alpha^{j,N}_{2,q_0}(d_R = 1) + \alpha^{j,G}_{2,q_0}(d_R = 1) - \frac{\alpha^{j,G}_{2,q_0}(d_R = 1) - \alpha^{j,G}_{2,q_0}(d_R = 0)}{2}] \tag{A.85}$$

$$= \frac{c^G_j}{2}[2\alpha^{j,N}_{2,q_0}(d_R = 1) + \alpha^{j,G}_{2,q_0}(d_R = 1) + \alpha^{j,G}_{2,q_0}(d_R = 0)] \tag{A.86}$$

$$\boxed{c^G_j = \frac{2(\alpha^{j,G}_{1,q_0}(d_R = 1) - \alpha^{j,G}_{1,q_0}(d_R = 0))}{2\alpha^{j,N}_{2,q_0}(d_R = 1) + \alpha^{j,G}_{2,q_0}(d_R = 1) + \alpha^{j,G}_{2,q_0}(d_R = 0)]}} \tag{A.87}$$

Now that we have identified c^G_j, we know:

$$\boxed{\phi_4 = \frac{\alpha^{j,G}_{2,q_0}(d_R = 1) - \alpha^{j,G}_{2,q_0}(d_R = 0)}{2c^G_j}} \tag{A.88}$$

Let us look at the following two equations:

$$\alpha^{j,N}_{1,q_0}(d_R = 1) = \phi_4 p^2_j - \phi_1 p_j \tag{A.89}$$

$$\alpha^{j,N}_{2,q_0}(d_R = 1) = -2\phi_4 p_j + \phi_1 \tag{A.90}$$

Since we already know ϕ_4, the above 2 equations have two unknowns and could have a solution (not linear, so therefore not necessarily a unique solution). Substituting for ϕ_1

from the second equation into the first, we get:

$$\alpha^{j,N}_{1,q_0}(d_R = 1) = \phi_4 p_j^2 - (\alpha^{j,N}_{2,q_0}(d_R = 1) + 2\phi_4 p_j)p_j \tag{A.91}$$

$$\alpha^{j,N}_{1,q_0}(d_R = 1) = -\phi_4 p_j^2 - \alpha^{j,N}_{2,q_0}(d_R = 1)p_j \tag{A.92}$$

$$\phi_4 p_j^2 + \alpha^{j,N}_{2,q_0}(d_R = 1)p_j + \alpha^{j,N}_{1,q_0}(d_R = 1) = 0 \tag{A.93}$$

Using the quadratic formula, we get:

$$\boxed{p_j = \frac{-\alpha^{j,N}_{2,q_0}(d_R = 1) \pm \sqrt{\alpha^{j,N}_{2,q_0}(d_R = 1)^2 - 4\phi_4 \alpha^{j,N}_{1,q_0}(d_R = 1)}}{2\phi_4}} \tag{A.94}$$

Once we have p_j, we can substitute into (A.90) to get ϕ_1. We have now identified: $c_j^G, p_j, \phi_1, \phi_4$.

Now, we proceed assuming that γ_d is known.

$$\alpha^{j,G}_{4,q_0}(d_R = 1) - \alpha^{j,G}_{4,q_0}(d_R = 0) = \phi_3 c_j^G \tag{A.95}$$

$$\boxed{\phi_3 = \frac{\alpha^{j,G}_{4,q_0}(d_R = 1) - \alpha^{j,G}_{4,q_0}(d_R = 0)}{c_j^G}} \tag{A.96}$$

Now that we have ϕ_3, we can use the following equation:

$$\alpha^{j,G}_{2,q_0}(d_R = 0) = \phi_3 \theta_i^G \tag{A.97}$$

$$\boxed{\theta_i^G = \frac{\alpha^{j,G}_{2,q_0}(d_R = 0)}{\phi_3}} \tag{A.98}$$

Using θ_i^G, we can identify ϕ_5:

$$\boxed{\phi_5 = \frac{\alpha^{j,G}_{4,q_0}(d_R = 0)}{2\theta_i^G}} \tag{A.99}$$

We can use the following set of two equations to identify c_j^P and θ_i^P.

$$\alpha_{2,q_1}^{j,P}(d_R = 0) = \phi_3\theta_i^P - 2\phi_4 c_j^P \tag{A.100}$$

$$\alpha_{4,q_1}^{j,P}(d_R = 0) = 2\phi_5\theta_i^P - \phi_3 c_j^P \tag{A.101}$$

Solving two equations for two unknowns, we get:

$$\boxed{c_j^P = \frac{2\phi_5\alpha_{2,q_1}^{j,P}(d_R = 0) - \phi_3\alpha_{4,q_1}^{j,P}(d_R = 0)}{\phi_3^2 - 4\phi_4\phi_5}} \tag{A.102}$$

We can substitute c_j^P in (A.101) to get θ_i^P.

We can identify ϕ_2 from the following equation since all other parameters are known:

$$\boxed{\phi_2 = \frac{\alpha_{1,q_0}^{j,G}(d_R = 1) + \phi_3 p_j\theta_i^G - \phi_5(\theta_i^G)^2}{\theta_i^G}} \tag{A.103}$$

B Appendix Tables

Table B.1: Visit to Health Facility

	Insurance	Number of Visits		Visited Facility		Visited Private*		Visited Public*	
		(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)
Sex	0.007	0.017***	0.017***	0.015***	0.015***	-0.030	-0.029	-0.010	-0.010
	[0.0060]	[0.0052]	[0.0053]	[0.0036]	[0.0036]	[0.0284]	[0.0283]	[0.0292]	[0.0291]
Age	0.001**	-0.002***	-0.002***	-0.002***	-0.002***	0.002	0.002	-0.003*	-0.003*
	[0.0005]	[0.0004]	[0.0004]	[0.0003]	[0.0003]	[0.0019]	[0.0019]	[0.0020]	[0.0020]
Age Squared	0.000	0.000***	0.000***	0.000***	0.000***	0.000	0.000	-0.000	-0.000
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Consumption Quintile (Control: Quintile 1)									
Quintile 2	0.020*	0.001	0.011	0.005	0.012**	0.205***	0.185***	-0.198***	-0.177***
	[0.0111]	[0.0074]	[0.0082]	[0.0054]	[0.0059]	[0.0384]	[0.0424]	[0.0401]	[0.0450]
Quintile 3	0.047***	0.014*	0.019**	0.010*	0.012*	0.282***	0.298***	-0.218***	-0.233***
	[0.0110]	[0.0081]	[0.0091]	[0.0057]	[0.0062]	[0.0414]	[0.0467]	[0.0432]	[0.0486]
Quintile 4	0.111***	0.004	0.014	0.002	0.007	0.252***	0.250***	-0.259***	-0.243***
	[0.0103]	[0.0082]	[0.0094]	[0.0057]	[0.0063]	[0.0423]	[0.0491]	[0.0436]	[0.0509]
Quintile 5	0.190***	0.018**	0.026**	0.010	0.016**	0.374***	0.368***	-0.351***	-0.348***
	[0.0100]	[0.0089]	[0.0108]	[0.0060]	[0.0069]	[0.0472]	[0.0568]	[0.0475]	[0.0579]
General Health Status (Control: Very Poor (5))									
General Health Dummy 1	-0.001	-0.251***	-0.251***	-0.170***	-0.169***	0.205***	0.200***	-0.329***	-0.327***
	[0.0316]	[0.0146]	[0.0147]	[0.0118]	[0.0119]	[0.0764]	[0.0762]	[0.0858]	[0.0862]
General Health Dummy 2	-0.026	-0.179***	-0.179***	-0.128***	-0.127***	0.247***	0.247***	-0.339***	-0.341***
	[0.0314]	[0.0129]	[0.0129]	[0.0112]	[0.0114]	[0.0685]	[0.0682]	[0.0784]	[0.0786]
General Health Dummy 3	-0.020	-0.059***	-0.060***	-0.044***	-0.043***	0.184***	0.183***	-0.267***	-0.268***
	[0.0316]	[0.0112]	[0.0113]	[0.0108]	[0.0110]	[0.0642]	[0.0640]	[0.0747]	[0.0750]
General Health Dummy 4	-0.023	-0.017	-0.016	-0.006	-0.005	0.223***	0.221***	-0.293***	-0.292***
	[0.0338]	[0.0115]	[0.0116]	[0.0114]	[0.0116]	[0.0670]	[0.0666]	[0.0769]	[0.0770]
Post Reform	-0.111**	-0.062***	-0.055**	-0.027*	-0.024	0.369***	0.392***	-0.508***	-0.535***
	[0.0448]	[0.0212]	[0.0214]	[0.0163]	[0.0165]	[0.1118]	[0.1125]	[0.1189]	[0.1199]
Sex*Post Reform	-0.001	0.007	0.007	-0.001	-0.001	0.043	0.047	0.013	0.008
	[0.0073]	[0.0069]	[0.0069]	[0.0045]	[0.0045]	[0.0365]	[0.0365]	[0.0374]	[0.0374]
Age*Post Reform	0.002***	0.002***	0.002***	0.001**	0.001**	-0.003	-0.004	0.006**	0.006**
	[0.0006]	[0.0005]	[0.0005]	[0.0003]	[0.0003]	[0.0025]	[0.0025]	[0.0026]	[0.0026]
Age Squared*Post Reform	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***	0.000	0.000	-0.000	-0.000*
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Quintile 2*Post Reform	0.039***	0.002	-0.008	-0.004	-0.009	-0.169***	-0.168***	0.138***	0.139**
	[0.0136]	[0.0099]	[0.0109]	[0.0067]	[0.0073]	[0.0508]	[0.0550]	[0.0529]	[0.0579]
Quintile 3*Post Reform	0.065***	-0.009	-0.014	-0.010	-0.010	-0.200***	-0.259***	0.140**	0.211***
	[0.0133]	[0.0105]	[0.0118]	[0.0070]	[0.0076]	[0.0539]	[0.0595]	[0.0557]	[0.0618]
Quintile 4*Post Reform	0.056***	0.000	-0.011	-0.003	-0.007	-0.143**	-0.177***	0.160***	0.179***
	[0.0126]	[0.0108]	[0.0123]	[0.0071]	[0.0079]	[0.0563]	[0.0633]	[0.0576]	[0.0654]
Quintile 5*Post Reform	0.092***	-0.004	-0.010	-0.008	-0.009	-0.185***	-0.191***	0.192***	0.203***
	[0.0122]	[0.0115]	[0.0139]	[0.0075]	[0.0086]	[0.0634]	[0.0737]	[0.0632]	[0.0745]
General Health Dummy 1*Post Reform	0.008	0.040**	0.039**	0.023	0.022	-0.088	-0.088	0.207*	0.210*
	[0.0433]	[0.0193]	[0.0194]	[0.0152]	[0.0153]	[0.1070]	[0.1067]	[0.1153]	[0.1154]
General Health Dummy 2*Post Reform	0.019	0.013	0.012	0.010	0.009	-0.185*	-0.188*	0.258**	0.266**
	[0.0431]	[0.0180]	[0.0180]	[0.0146]	[0.0148]	[0.0988]	[0.0983]	[0.1074]	[0.1073]
General Health Dummy 3*Post Reform	0.018	0.001	0.001	-0.004	-0.005	-0.116	-0.120	0.182*	0.190*
	[0.0435]	[0.0169]	[0.0170]	[0.0143]	[0.0145]	[0.0943]	[0.0939]	[0.1033]	[0.1033]
General Health Dummy 4*Post Reform	0.018	0.004	0.003	-0.012	-0.013	-0.251**	-0.245**	0.345***	0.342***
	[0.0462]	[0.0175]	[0.0176]	[0.0150]	[0.0152]	[0.0976]	[0.0970]	[0.1063]	[0.1060]
Insurance Dummy		0.032***	0.064***	0.025***	0.045***	0.090***	0.081	-0.097***	-0.080
		[0.0062]	[0.0128]	[0.0044]	[0.0104]	[0.0327]	[0.0622]	[0.0326]	[0.0660]
Insurance Dummy*Post Reform		0.006	-0.024	0.003	-0.007	0.145***	0.019	-0.120***	0.003
		[0.0082]	[0.0168]	[0.0056]	[0.0127]	[0.0443]	[0.0846]	[0.0436]	[0.0877]
Insurance Quintile 2			-0.059***		-0.041***		0.134		-0.116
			[0.0196]		[0.0151]		[0.1092]		[0.1060]
Insurance Quintile 3			-0.024		-0.009		-0.086		0.079
			[0.0187]		[0.0147]		[0.0968]		[0.1007]
Insurance Quintile 4			-0.046**		-0.023*		0.002		-0.056
			[0.0183]		[0.0139]		[0.0952]		[0.0993]
Insurance Quintile 5			-0.034*		-0.026*		0.011		-0.005
			[0.0186]		[0.0134]		[0.0969]		[0.0974]
Insurance Quintile 2*Post Reform			0.052**		0.026		-0.005		-0.010
			[0.0265]		[0.0187]		[0.1423]		[0.1392]
Insurance Quintile 3*Post Reform			0.025		-0.002		0.401***		-0.434***
			[0.0250]		[0.0181]		[0.1420]		[0.1425]
Insurance Quintile 4*Post Reform			0.049**		0.016		0.216		-0.134
			[0.0244]		[0.0173]		[0.1350]		[0.1343]
Insurance Quintile 5*Post Reform			0.028		0.007		0.094		-0.106
			[0.0244]		[0.0167]		[0.1302]		[0.1287]
Observations	46817	46714	46714	46817	46817	2936	2936	2936	2936
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Insurance Quintile Dummies	-	No	Yes	No	Yes	No	Yes	No	Yes
Illness Length+Activity									

Note: For number of visits, a negative binomial regression was run since it is count data. For all other columns, logit regressions were run since each dependent variable was an indicator (1 if visited health facility, 0 otherwise). Pre-Reform is specified for the years 2004 and 2006. Post-Reform is specified for the years 2009, 2010 and 2012. The years 2007 and 2008 are dropped since the reform occurred in those years. The controls used are: sex, age, age^2, indicator for insurance status, general health index. Insurance dummies implies inclusion of insurance quintile dummies. Visited Private and Visited Public are conditional on visiting a health facility.

Table B.2: Visit to Health Facility

	Number of Visits		Visited Facility		Visited Private*		Visited Public*		Insurance	
	Linear	Logit	Linear	GLM	Linear	Logit	Linear	Logit	Linear	Logit
Without Insurance Dummies										
Quintile 2	-0.005	0.002	-0.009	-0.004	-0.176***	-0.169***	0.136**	0.138***	0.020**	0.039***
	[0.0126]	[0.0099]	[0.0084]	[0.0067]	[0.0534]	[0.0508]	[0.0534]	[0.0529]	[0.0099]	[0.0136]
Quintile 3	-0.019	-0.009	-0.014*	-0.010	-0.207***	-0.200***	0.138**	0.140**	0.039***	0.065***
	[0.0131]	[0.0105]	[0.0083]	[0.0070]	[0.0551]	[0.0539]	[0.0560]	[0.0557]	[0.0106]	[0.0133]
Quintile 4	-0.010	0.000	-0.007	-0.003	-0.150***	-0.143**	0.159***	0.160***	0.028**	0.056***
	[0.0133]	[0.0108]	[0.0084]	[0.0071]	[0.0570]	[0.0563]	[0.0574]	[0.0576]	[0.0115]	[0.0126]
Quintile 5	-0.018	-0.004	-0.014	-0.008	-0.198***	-0.185***	0.192***	0.192***	0.087***	0.092***
	[0.0138]	[0.0115]	[0.0086]	[0.0075]	[0.0589]	[0.0634]	[0.0605]	[0.0632]	[0.0131]	[0.0122]
Observations	46714	46714	46817	46817	2936	2936	2936	2936	46817	46817
With Insurance Dummies										
Quintile 2	-0.020	-0.008	-0.016*	-0.009	-0.177***	-0.168***	0.136**	0.139**		
	[0.0126]	[0.0109]	[0.0085]	[0.0073]	[0.0594]	[0.0550]	[0.0592]	[0.0579]		
Quintile 3	-0.029**	-0.014	-0.016*	-0.010	-0.271***	-0.259***	0.211***	0.211***		
	[0.0133]	[0.0118]	[0.0084]	[0.0076]	[0.0630]	[0.0595]	[0.0635]	[0.0618]		
Quintile 4	-0.024*	-0.011	-0.012	-0.007	-0.183***	-0.177***	0.178***	0.179***		
	[0.0138]	[0.0123]	[0.0086]	[0.0079]	[0.0669]	[0.0633]	[0.0672]	[0.0654]		
Quintile 5	-0.027*	-0.010	-0.017*	-0.009	-0.192***	-0.191***	0.197***	0.203***		
	[0.0141]	[0.0139]	[0.0090]	[0.0086]	[0.0718]	[0.0737]	[0.0739]	[0.0745]		
Observations	46714	46714	46817	46817	2936	2936	2936	2936		
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		

* these are conditional on visiting a facility; Standard errors are in parentheses; $^{*}p < 0.1$,** $p < 0.05$,*** $p < 0.01$
Note: The numbers presented here are the effect of reform on consumption quintiles, relative to the control group of Quintile 1.

Table B.3: Medication Purchase

	(a)	(b)	(a)	(b)	(a)	(b)
Effect of Reform by Consumption Quintile (Control: Quintile 1)						
Quintile 2	-0.032	-0.067	-0.076**	-0.107***	0.048	0.074*
	[0.0383]	[0.0413]	[0.0365]	[0.0395]	[0.0362]	[0.0397]
Quintile 3	-0.047	-0.059	-0.119***	-0.118***	0.095**	0.106**
	[0.0424]	[0.0457]	[0.0385]	[0.0420]	[0.0387]	[0.0421]
Quintile 4	0.036	-0.003	-0.041	-0.062	0.034	0.030
	[0.0450]	[0.0501]	[0.0436]	[0.0484]	[0.0405]	[0.0458]
Quintile 5	0.002	0.023	0.044	-0.022	-0.065	0.007
	[0.0477]	[0.0558]	[0.0500]	[0.0563]	[0.0510]	[0.0584]
Observations	4227	4227	3089	3089	3065	3065
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Insurance Dummies	No	Yes	No	Yes	No	Yes

Standard errors are in parentheses; $^{*}p < 0.1$,** $p < 0.05$,*** $p < 0.01$
Note: Logit regressions were run since each dependent variable was an indicator (1 if visited health facility for medication purchase, 0 otherwise). Pre-Reform is specified for the years 2004 and 2006. Post-Reform is specified for the years 2009, 2010 and 2012. The years 2007 and 2008 are dropped since the reform occurred in those years. The controls used are: sex, age, age^2, indicator for insurance status, illness length (in days), inactive length (in days), general health index. Insurance dummies implies inclusion of insurance quintile dummies.

Table B.4: Medication Purchase

	Linear	Logit	Linear	Logit	Linear	Logit
Without Insurance Dummies						
Quintile 2	-0.024	-0.032	-0.122***	-0.076**	0.084*	0.048
	[0.0421]	[0.0383]	[0.0461]	[0.0365]	[0.0450]	[0.0362]
Quintile 3	-0.028	-0.047	-0.164***	-0.119***	0.135***	0.095**
	[0.0427]	[0.0424]	[0.0453]	[0.0385]	[0.0438]	[0.0387]
Quintile 4	0.049	0.036	-0.106**	-0.041	0.080*	0.034
	[0.0424]	[0.0450]	[0.0443]	[0.0436]	[0.0455]	[0.0405]
Quintile 5	0.015	0.002	-0.050	0.044	0.027	-0.065
	[0.0449]	[0.0477]	[0.0467]	[0.0500]	[0.0454]	[0.0510]
Observations	4227	4227	3089	3089	3065	3065
With Insurance Dummies						
Quintile 2	-0.064	-0.067	-0.163***	-0.107***	0.122**	0.074*
	[0.0464]	[0.0413]	[0.0514]	[0.0395]	[0.0500]	[0.0397]
Quintile 3	-0.046	-0.059	-0.174***	-0.118***	0.157***	0.106**
	[0.0481]	[0.0457]	[0.0519]	[0.0420]	[0.0504]	[0.0421]
Quintile 4	0.012	-0.003	-0.130**	-0.062	0.088*	0.030
	[0.0476]	[0.0501]	[0.0511]	[0.0484]	[0.0524]	[0.0458]
Quintile 5	0.034	0.023	-0.101*	-0.022	0.093*	0.007
	[0.0539]	[0.0558]	[0.0555]	[0.0563]	[0.0537]	[0.0584]
Observations	4227	4227	3089	3089	3065	3065
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors are in parentheses; $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

Note: The numbers presented here are the effect of reform on consumption quintiles, relative to the control group of Quintile 1.

Table B.5: Event Study Analysis for Parallel Trends

	Insurance	Visit to Facility				Medication Purchase		
		Number	Any	Private	Public	Any	Private	Public
Sex	0.006**	0.020***	0.016***	-0.001	0.000	0.024**	-0.006	0.006
	[0.0030]	[0.0030]	[0.0019]	[0.0152]	[0.0154]	[0.0119]	[0.0119]	[0.0118]
Age	0.002***	-0.002***	-0.002***	0.002	-0.002	-0.002**	0.002**	0.000
	[0.0002]	[0.0003]	[0.0002]	[0.0010]	[0.0010]	[0.0008]	[0.0008]	[0.0008]
Age Squared	-0.000	0.000***	0.000***	0.000	-0.000	0.000***	-0.000	-0.000
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
Insurance Dummy		0.041***	0.033***	0.142***	-0.141***	0.083***	0.036***	-0.036***
		[0.0048]	[0.0030]	[0.0170]	[0.0176]	[0.0132]	[0.0127]	[0.0129]
General Health Dummy 1	0.013	-0.538***	-0.337***	0.164***	-0.223***	-0.211***	0.087**	-0.154***
	[0.0212]	[0.0506]	[0.0257]	[0.0474]	[0.0476]	[0.0332]	[0.0402]	[0.0422]
General Health Dummy 2	-0.004	-0.510***	-0.316***	0.132***	-0.186***	-0.179***	0.076**	-0.131***
	[0.0212]	[0.0506]	[0.0257]	[0.0447]	[0.0449]	[0.0305]	[0.0385]	[0.0408]
General Health Dummy 3	0.000	-0.317***	-0.178***	0.123***	-0.162***	-0.095***	0.059	-0.107***
	[0.0214]	[0.0512]	[0.0260]	[0.0432]	[0.0434]	[0.0293]	[0.0377]	[0.0403]
General Health Dummy 4	-0.009	-0.126**	-0.053*	0.082*	-0.099**	-0.067**	0.040	-0.067
	[0.0225]	[0.0539]	[0.0276]	[0.0448]	[0.0450]	[0.0303]	[0.0389]	[0.0416]
Event = -3 × Quintile 1	0.036	0.583***	0.374***	0.115*	0.976***	0.756***	0.511***	0.474***
	[0.0230]	[0.0523]	[0.0267]	[0.0609]	[0.0586]	[0.0456]	[0.0557]	[0.0565]
Event = -3 × Quintile 2	0.057**	0.579***	0.380***	0.255***	0.832***	0.818***	0.686***	0.361***
	[0.0227]	[0.0511]	[0.0264]	[0.0627]	[0.0628]	[0.0458]	[0.0530]	[0.0558]
Event = -3 × Quintile 3	0.076***	0.601***	0.384***	0.332***	0.786***	0.877***	0.780***	0.238***
	[0.0233]	[0.0521]	[0.0265]	[0.0674]	[0.0677]	[0.0471]	[0.0484]	[0.0502]
Event = -3 × Quintile 4	0.165***	0.570***	0.363***	0.340***	0.760***	0.922***	0.730***	0.309***
	[0.0241]	[0.0516]	[0.0264]	[0.0718]	[0.0717]	[0.0478]	[0.0547]	[0.0581]
Event = -3 × Quintile 5	0.296***	0.595***	0.381***	0.451***	0.674***	0.911***	0.694***	0.326***
	[0.0259]	[0.0524]	[0.0269]	[0.0705]	[0.0730]	[0.0493]	[0.0573]	[0.0592]
Event = -2 × Quintile 1	0.024	0.613***	0.405***	0.109*	0.953***	0.709***	0.534***	0.414***
	[0.0231]	[0.0522]	[0.0273]	[0.0595]	[0.0596]	[0.0454]	[0.0548]	[0.0555]
Event = -2 × Quintile 2	0.045**	0.603***	0.399***	0.372***	0.717***	0.846***	0.728***	0.279***
	[0.0229]	[0.0518]	[0.0268]	[0.0610]	[0.0620]	[0.0446]	[0.0504]	[0.0524]
Event = -2 × Quintile 3	0.077***	0.600***	0.393***	0.436***	0.738***	0.910***	0.721***	0.280***
	[0.0232]	[0.0515]	[0.0267]	[0.0628]	[0.0647]	[0.0456]	[0.0526]	[0.0535]
Event = -2 × Quintile 4	0.127***	0.608***	0.395***	0.361***	0.698***	0.879***	0.780***	0.279***
	[0.0237]	[0.0526]	[0.0267]	[0.0621]	[0.0626]	[0.0431]	[0.0466]	[0.0524]
Event = -2 × Quintile 5	0.234***	0.603***	0.388***	0.464***	0.622***	0.914***	0.753***	0.248***
	[0.0242]	[0.0528]	[0.0265]	[0.0612]	[0.0631]	[0.0441]	[0.0494]	[0.0500]
Event = -1 × Quintile 1	0.032	0.611***	0.408***	0.147**	0.936***	0.704***	0.558***	0.394***
	[0.0234]	[0.0520]	[0.0272]	[0.0635]	[0.0634]	[0.0449]	[0.0546]	[0.0556]
Event = -1 × Quintile 2	0.054**	0.624***	0.405***	0.278***	0.810***	0.805***	0.621***	0.392***
	[0.0230]	[0.0521]	[0.0269]	[0.0639]	[0.0647]	[0.0459]	[0.0543]	[0.0566]
Event = -1 × Quintile 3	0.079***	0.623***	0.403***	0.272***	0.834***	0.881***	0.753***	0.332***
	[0.0234]	[0.0519]	[0.0269]	[0.0618]	[0.0620]	[0.0428]	[0.0483]	[0.0535]
Event = -1 × Quintile 4	0.156***	0.625***	0.399***	0.408***	0.708***	0.950***	0.743***	0.283***
	[0.0236]	[0.0524]	[0.0266]	[0.0599]	[0.0607]	[0.0398]	[0.0478]	[0.0509]
Event = -1 × Quintile 5	0.285***	0.606***	0.390***	0.511***	0.635***	0.867***	0.825***	0.205***
	[0.0243]	[0.0518]	[0.0266]	[0.0585]	[0.0619]	[0.0439]	[0.0444]	[0.0469]
Event = 0 × Quintile 1	0.045*	0.605***	0.392***	0.103	1.003***	0.836***	0.512***	0.379***
	[0.0241]	[0.0533]	[0.0278]	[0.0770]	[0.0730]	[0.0614]	[0.0801]	[0.0760]
Event = 0 × Quintile 2	0.037	0.577***	0.373***	0.085	1.032***	0.854***	0.493***	0.412***
	[0.0228]	[0.0516]	[0.0266]	[0.0689]	[0.0642]	[0.0576]	[0.0737]	[0.0704]
Event = 0 × Quintile 3	0.062***	0.584***	0.380***	0.107*	0.999***	0.809***	0.695***	0.368***
	[0.0228]	[0.0515]	[0.0264]	[0.0635]	[0.0615]	[0.0512]	[0.0581]	[0.0609]
Event = 0 × Quintile 4	0.082***	0.582***	0.372***	0.070	1.034***	0.843***	0.725***	0.224***
	[0.0227]	[0.0517]	[0.0263]	[0.0653]	[0.0636]	[0.0496]	[0.0544]	[0.0509]
Event = 0 × Quintile 5	0.199***	0.591***	0.381***	0.261***	0.839***	0.795***	0.747***	0.295***
	[0.0231]	[0.0513]	[0.0263]	[0.0603]	[0.0597]	[0.0447]	[0.0494]	[0.0518]
Event = 1 × Quintile 1	-0.006	0.611***	0.397***	0.288***	0.817***	0.700***	0.633***	0.321***
	[0.0224]	[0.0515]	[0.0266]	[0.0589]	[0.0594]	[0.0442]	[0.0518]	[0.0518]
Event = 1 × Quintile 2	0.058**	0.587***	0.387***	0.297***	0.758***	0.725***	0.750***	0.210***
	[0.0231]	[0.0516]	[0.0267]	[0.0654]	[0.0656]	[0.0492]	[0.0542]	[0.0518]
Event = 1 × Quintile 3	0.085***	0.605***	0.396***	0.229***	0.894***	0.918***	0.710***	0.221***
	[0.0233]	[0.0519]	[0.0267]	[0.0647]	[0.0633]	[0.0465]	[0.0535]	[0.0501]
Event = 1 × Quintile 4	0.139***	0.585***	0.380***	0.291***	0.800***	0.927***	0.713***	0.299***
	[0.0238]	[0.0515]	[0.0265]	[0.0673]	[0.0672]	[0.0485]	[0.0555]	[0.0566]
Event = 1 × Quintile 5	0.308***	0.617***	0.398***	0.549***	0.565***	0.944***	0.874***	0.167***
	[0.0251]	[0.0521]	[0.0269]	[0.0597]	[0.0623]	[0.0459]	[0.0411]	[0.0452]

Note: Linear regressions were run since each dependent variable was an indicator (1 if medication purchase, 0 otherwise), except for number of visits. The controls used are: sex, age, age^2, indicator for insurance status, general health index.

Table B.6: Event Study Analysis for Parallel Trends

	Insurance	Visit to Facility				Medication Purchase		
		Number	Any	Private	Public	Any	Private	Public
Event = 2 × Quintile 1	-0.048**	0.565***	0.364***	0.098	0.973***	0.696***	0.618***	0.349***
	[0.0228]	[0.0521]	[0.0271]	[0.0709]	[0.0707]	[0.0539]	[0.0650]	[0.0650]
Event = 2 × Quintile 2	-0.015	0.570***	0.371***	0.133*	0.956***	0.862***	0.667***	0.327***
	[0.0234]	[0.0520]	[0.0269]	[0.0772]	[0.0769]	[0.0577]	[0.0645]	[0.0653]
Event = 2 × Quintile 3	0.042*	0.559***	0.358***	0.296***	0.809***	0.813***	0.712***	0.343***
	[0.0241]	[0.0519]	[0.0267]	[0.0797]	[0.0801]	[0.0605]	[0.0640]	[0.0696]
Event = 2 × Quintile 4	0.088***	0.562***	0.359***	0.227***	0.900***	0.921***	0.840***	0.191***
	[0.0249]	[0.0517]	[0.0267]	[0.0842]	[0.0839]	[0.0596]	[0.0476]	[0.0543]
Event = 2 × Quintile 5	0.293***	0.575***	0.369***	0.334***	0.785***	0.864***	0.822***	0.166***
	[0.0269]	[0.0529]	[0.0271]	[0.0763]	[0.0783]	[0.0567]	[0.0482]	[0.0478]
Event = 3 × Quintile 1	-0.009	0.515***	0.332***	0.295***	0.756***	0.701***	0.689***	0.276***
	[0.0217]	[0.0508]	[0.0259]	[0.0610]	[0.0609]	[0.0440]	[0.0508]	[0.0509]
Event = 3 × Quintile 2	0.027	0.545***	0.350***	0.381***	0.680***	0.810***	0.731***	0.270***
	[0.0218]	[0.0508]	[0.0259]	[0.0588]	[0.0592]	[0.0423]	[0.0486]	[0.0495]
Event = 3 × Quintile 3	0.073***	0.546***	0.350***	0.484***	0.588***	0.831***	0.745***	0.257***
	[0.0219]	[0.0510]	[0.0259]	[0.0579]	[0.0586]	[0.0420]	[0.0491]	[0.0500]
Event = 3 × Quintile 4	0.135***	0.552***	0.353***	0.530***	0.568***	0.952***	0.830***	0.220***
	[0.0222]	[0.0508]	[0.0259]	[0.0586]	[0.0603]	[0.0430]	[0.0446]	[0.0482]
Event = 3 × Quintile 5	0.301***	0.544***	0.345***	0.498***	0.623***	0.956***	0.775***	0.218***
	[0.0230]	[0.0509]	[0.0260]	[0.0621]	[0.0648]	[0.0447]	[0.0489]	[0.0488]
Observations	61123	60995	61123	4099	4099	5929	4328	4288
R^2	0.231	0.136	0.167	0.613	0.552	0.733	0.828	0.221

Note: Linear regressions were run since each dependent variable was an indicator (1 if medication purchase, 0 otherwise), except for number of visits. The controls used are: sex, age, age^2, indicator for insurance status, general health index.