Impacts of Public Insurance on Health Access and Outcomes - Evidence from India

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Abstract

At more than 50%, India has one of the world's highest out-of-pocket healthcare expenditure rates. Historically, low cost healthcare has been provided by the government through public healthcare facilities. Faced with a high demand for tertiary healthcare and an overcrowded public healthcare infrastructure, the central and various state governments adopted a model of public-private-partnership where the government will pay the insurance premium for low-income households who will be covered by the insurance at various government and private hospitals for their tertiary care needs. However, given the wide disparity in quality across private hospitals, it is not clear how such a framework would affect the demand for private healthcare or overall health outcomes. We analyse a pioneering public insurance scheme in India, the Rajiv Aarogyasri program (RAS), introduced by the state of Andhra Pradesh(AP) between 2007 and 2008, on maternal and child health outcomes. India has consistently ranked low in maternal and child health outcomes among its peers and a leading factor contributing to high infant and maternal mortality rates is the low rate of institutional deliveries. Since RAS covers institutional reproductive care, particularly subsidizing private care, we first examine if RAS increases institutional deliveries, particularly in private hospitals. Second, we study if the program led to improvements in key outcome variables that might have come from increased access to institutional care, specifically out-of-pocket costs and infant mortality. Using pooled cross-section data from three waves of District Level Health Survey (DLHS), we estimate a difference-in-differences model, by exploiting variation in the timing of births between 2000-2015 and using contiguous districts in the neighboring states without RAS as a plausible control group. Our tests confirm parallel pre-treatment trends between the treatment and the control districts. We find that deliveries in private hospitals increased, and government hospitals decreased after the introduction of the program. However, even as the use of private facilities increased, we find that out-of-pocket costs declined. Further examination shows that these effects come from households who were more likely to be using government hospitals before the introduction of RAS suggesting a substitution effect of the relative price change – a switch to private from government hospitals. We do not find an overall increase in access to tertiary care, nor any effect on infant mortality. However, heterogeneity analysis reveals that the program likely bridged the gender gap in access to costly private healthcare. Even as we observe a more pronounced decrease in OOP expenses for male births relative to female births, girls are more likely to be born at private facilities following the implementation of RAS, whereas boys' likelihood of being born in private facilities remains unchanged before and after RAS. This suggests that parents were more inclined to opt for costly private institutional deliveries for male children in comparison to female children prior to the introduction of RAS.

Keywords: public health insurance; public-private substitution; maternal and child health

JEL Classification: I13,I18,J18,

1 Introduction

There are two prominent ways in which governments around the world try to improve access to healthcare. One is publicly providing health services at all levels, and another is subsidizing health insurance provided by the private market. The latter category, which often involves targeted subsidies for low-income families (as opposed to universal coverage), is generally called the Social Health Insurance (SHI) policy (Hsiao Shaw, 2007). In this paper, we evaluate the impacts of one such pioneering program in India, the Rajiv Arogyasri Scheme (RAS) public health insurance program implemented in 2007. The program was introduced in the southern state of Andhra Pradesh (AP) in 2007, and continued in both AP and the new state of Telengana, which was carved out of AP. Although the program has a wide-ranging scope, we focus on its impact on maternal and child health outcomes. India has consistently ranked maternal and child health low among its peers (Kassebaum, et al., 2014). One of the factors contributing to high infant and maternal mortality rates was the low rate of institutional deliveries. Indeed, many public programs were introduced to directly target infant and maternal mortality rates, and India has made progress over time (National Health Mission; World Economic Forum, 2021). However, according to one estimate the maternal mortality rate (MMR) from 2004-2006 was 1110 per 100,000 live births in India. At its inception, the RA program covered the treatment of 938 serious conditions, but only at the level of hospital-based tertiary care (Aarogyasri Health Care Trust, 2013). Hence, we specifically study the effect of the RA program on private and public institutional delivery since the RA scheme covered hospital deliveries. We address two research questions. First, we examine if subsidization of tertiary private care, having lowered its relative price compared to government care, increases the use of private care. While private care is generally perceived to be superior in India, the substitution effect is not obvious. Most of the private facilities are built in urban areas and are meant to service the population who could pay the high OOP costs, meaning a large section of the population faced transportation and inconvenience costs (such as follow- up or family visits), limiting the potential use of such facilities

(Debnath and Jain, 2021). Moreover, given that public hospitals were overcrowded before RA was introduced, access to private healthcare might simply increase overall take-up with net increase in healthcare access. Second, we examine if the program led to improvements in key outcome variables that might have come from increased access to better care or overall increase in institutional care. Hence, we estimate if the program lowered out of pocket costs, and improved infant mortality. Using pooled cross-section data from three waves of District Level Health Survey (DLHS), we created annual birth cohorts from 2000-2015. We then combined it with information on the RAS. Erstwhile AP, current day AP and Telangana, is the only state in which the insurance program was implemented, not only around the time of the launch, but also for several years afterward. Leveraging this historical fact, our baseline empirical strategy uses a neighboring or contiguous-units methodology common in a wide range of literature (Boone et al., 2021; Muralidharan and Prakash, 2017). We start with largest geographic units, states, that gives us maximum power. In this setup, we form our control group by combining the geographically-neighboring states. This is a plausible control group for several reasons. First, AP is a southeastern state that shares more cultural traits with other southern states like Karnataka and Tamil Nadu and eastern states like Odissa than northern or western states. For example, Hindi is a dominant language in the rest of India but not in the southern states. Second, these states are similar economically. Finally, there is wide-ranging stylized evidence that health access and outcomes are better in southern states than in their northern counterparts (Kasthuri,2018; Khare,2018). The geographic contiguity offers us exogeneity, and the economic and cultural similarities among these states and the difference between this block and other states provide a plausible balance (as discussed in section 3). Combined with the policy timing, and the year of birth, we employ a difference-in-difference strategy to identify the effects of RA on the residents of erstwhile AP. The biggest threat to this strategy is pre-existing trends. If AP had different trends in outcome variables compared to the control states in the years prior to the program, then any difference we see in the outcomes after the program may be a result of the differential pre-existing trends not a result of the program. We perform several tests to rule these out. Further, the central government had also introduced a few programs, such as the Janani Suraksha Yojana (JSY) and Anganwadi schemes, in 2005 and 1975, respectively, targeting maternal healthcare specifically (De and Timilsina, 2020). While these central programs were available in both treatment and control states, their implementation could vary depending on local governance. Hence, we explicitly control for the presence of these programs in our specifications. In a second approach, we use a narrower comparison group - we compare each district in erstwhile AP with those districts in neighboring states that share a boundary with the district in AP. This is akin to the border-county-pair strategy common in the context of the US, where Outcomes in neighboring counties located on opposite sides of state borders are compared (Dube et al., 2021) Our primary findings can be summarized as follows: we observed an increase in deliveries at private hospitals and a decrease at government hospitals following the implementation of RA. This suggests a potential substitution effect driven by the relative price change, within the entire sample. However, these results vary based on access to hospital networks. The statistically significant results are associated with households residing in areas with only government hospitals or in areas encompassing both government and private hospitals. In other words, these effects are pronounced for households that were more likely to have been utilizing government hospitals before the introduction of RA. The substitution effect is not evident among households situated in areas exclusively served by private hospitals implying that households that predominantly sought private healthcare even before the implementation of RA do not show any switching behavior. These patterns are also observed in healthcare costs. For instance, out-of-pocket (OOP) expenses decreased for households with access to private hospitals nearby. In other words, OOP declined only for those households who were already utilizing private healthcare before RA and can now avail of these services at subsidized rates. Conversely, for those who were primarily utilizing government hospitals prior to RA, there is no notable change in OOP expenses. At best, they transition from free government care to subsidized private care, or they continue with government care. Gender disparities in OOP expenses also align with our primary findings. We observe a more pronounced decrease in OOP expenses for girls than for boys after the implementation of RA. This suggests that parents were more inclined to opt for costly private institutional deliveries for male children in comparison to female children prior to the introduction of RA. Although ex ante we wouldn't anticipate any substantial gender-based differences in newborns due to the illegality of prenatal sex determination, there exists substantial evidence regarding the prevalence of illegal sex-selective abortions in India (Arnold et al., 2004). Indeed, these disparities are also evident in our delivery results. Girls are more likely to be born at private facilities following the implementation of RA, whereas boys' likelihood of being born in private facilities remains unchanged before and after RA. Lastly, we find that the RAS significantly reduced infant and child mortality rates in Andhra Pradesh, with these benefits being specifically attributed to female births. We contribute to three lines of literature. First, rigorous evaluations of the effects of a pioneering social health insurance program like RA are surprisingly sparse. Although there are descriptive studies and research based on smaller samples, evaluation based on a quasi-experimental setup is rare. Since the rollout of the RA program, not only have other states experimented with similar social insurance schemes, but the central government has also come up with national health insurance schemes. Therefore, it is vital to evaluate such a pioneering scheme in terms of its effects on critical health care access and human capital variables. This is one of the first studies to address that gap. Second, instances of private-public partnerships have increased not only in India but also elsewhere in the world. This research contributes to whether leveraging private sector infrastructure improves health access and outcomes. Finally, we add to the rich (but mainly limited to the US) literature on the impacts of insurance expansion on healthcare access, particularly through the lens of maternal and child health.

2 Background

2.1 Health Care Provisions in India

In India, publicly provided healthcare has existed since its independence from the British rule. However, like in most developing countries, public healthcare has suffered from overcrowding, crumbling infrastructure, staff shortage, chronic funding shortfall, lack of equipments and medicines among others (Mavalankar et al., 2003). While the private market co-exists, the high OOP expenditure for private healthcare makes it difficult to access for poor households. Even when available, high cost of insurance products make them unaffordable for poor households. According to the 2007 report of the planning commission, less than 10% of the Indian population was covered by any form of health insurance.

Figure 1. Graph idea - health insurance coverage trend

High OOP may have catastrophic financial consequences like reducing consumption or incurring high debt levels. At more than 50%, India has one of the world's highest OOP healthcare expenditure rates For more than 50 years after India gained independence in 1947, these two mutually exclusive segments of the health care system co-existed, where low-income families could only access overburdened but free inpatient and outpatient care, and families with resources to pay full price access better-attended private facilities. This unequal delivery system led to substantial and rising levels of health inequity that have been widely documented (Joe et al., 2008; Balarajan et al., 2011). During the last two decades, successive state and national governments have introduced free health insurance for poor households with an aim to increase healthcare access. One defining feature of such program is the public-private partnership. The importance of forging such partnerships in developing countries has been a part of global health policy discussions for many years (Sachs, 2001). Since the construction of physical infrastructure is costly and may be saddled with various issues such as bureaucratic delays, political favoritism, and budget constraints, governments at various levels have tried to implement social health insurance where low-income families receive care in private facilities at a substantial or fully subsidized price. A trust or government agency calculates insurance premiums and medical payments. Typically, qualifying families get full subsidization of the premium and access to private inpatient and outpatient facilities for their healthcare needs. Free private insurance can increase healthcare access by (a) providing access to private facilities and (b) freeing up space in public facilities.

2.2 Access to insurance and maternal and child health outcomes

The program was rather unique where a private trust managed taxpayers' funds to reimburse private hospitals and there is no direct comparison of the scheme globally (Nagulapalli, S., Rokkam, S. R. (2015). However, there are other instances where low-income families receive premium subsidies from the government, such as the Medicaid program in the USA. There is a substantial literature on the effects of Medicaid expansion on maternal and child health. Overall, this evidence suggests that Medicaid expansions have benefitted expansions of Medicaid coverage to low-income pregnant women and children (Currie and Duque, 2019). For example, it led to a decline in the infant mortality rate Currie and Gruber (1996); longer eligibility as a child was associated with fewer hospitalizations in adulthood (Wherry et al. 2018); and children whose mothers gained eligibility for antenatal coverage have lower rates of obesity as adults (Miller and Wherry, 2019). Previous research also shows that prenatal coverage may have positive health effects in the short and long run (Yan, 2018; Conway and Cutinova, 2022). Aside from access, an increase in the quality of care also has led to health benefits. For example, in the context of the Mother and Infant Health Project in Ukraine, a program focused on improving the quality of maternal health care, reduced various pregnancy complications (Nizalova And Vyshnya, 2022).

2.3 The Rajiv Aarogyashri Program and previous findings

The RA program's main objective was to provide health services for Below Poverty Level (BPL) families up to a value of Rs 2,0000 (roughly $300 at that time) per year for tertiary surgical and medical treatment of severe medical conditions. The program was conceived against the backdrop of at least two recent developments. First, there were many reports of distressed farmers, some committing suicide due to debt traps. This unfortunate phenomenon brought the lack of healthcare access in rural Andhra Pradesh to the fore (Ghosh, 2006). The second was a rapid proliferation of private healthcare facilities limited to urban areas (Shukla et al. 2011). Rao et al. (2011) provide a detailed description of the program. Here, we outline the salient features relevant to this study. First, private hospitals, government medical colleges, district hospitals, and area hospitals were eligible to enroll, provided that the private facilities were established chains and/or had at least 50 beds. Second, the scheme was implemented and supervised by a public-private partnership called the Aarogyasri Health Care Trust between state government bodies and insurance agencies Star Health and Allied Insurance. Finally, on the demand side, although the program was meant for BPL population, the eligibility cutoff was more lenient than the national definition making almost 90% of the population eligible (Debnath and Jain,2019).

2.4 Public Private Partnership and health access and outcome

Although there is no universal definition of the Public-Private partnerships (PPP), the RAS is aligned to what Koppenjan (2007, p137) defined as "a form of structured cooperation between public and private parties in the planning, construction and/or exploitation of infrastructural facilities in which they share or reallocate risks, costs, benefits, resources and responsibilities. Such partnerships have flourished in India as a means to address problems of access to healthcare (World Economic Forum,2022). The most common form of PPP in India has been the delivery of secondary and tertiary health care through collaboration with private providers (Nundy et al,2021). The use of PPP projects has been widespread in providing preventive and curative healthcare service for infectious diseases and sexually transmitted diseases and for improving health education (Joudyian et al., 2021). While challenges were present during implementation, PPPs have been found to improve access to healthcare. Apart from access, PPP in healthcare has also been found to improve the quality of care (McIntosh, Grabowski, Jack, Nkabane- Nkholongo, Vian, 2015). The success of such collaboration between government and non-state actors depends crucially on the non-state implementers (Das et al,2017).

3 Data and Sample Selection

3.1 Data source and sample selection

Data for our primary analysis come from three rounds of DLHS. These three rounds are DLHS-II (2002-04), DLHS-III (2007-08), and DLHS-IV (2012-13). The focus of DLHS is reproductive and child health, and it contains detailed information on antenatal, natal, and postnatal care and immunization as part of the woman's questionnaire. This module also contains information on other woman-level characteristics. Apart from the woman module, household, and person modules provide information on household and household-member level information. Our primary dependent variables are sourced from the woman module, as are the woman-level control variables. Household-level control variables are obtained from the household module. We link woman data with household data to combine woman, birth, and household characteristics. We further link village data to this linked data, which allows us, in some specifications, to supplement our analysis by incorporating information on the availability of health infrastructure and services in villages.

DLHS-II interviewed 5,07,622 currently married women aged 15-44 years from 6,20,107 households across 593 districts. The sample size for DLHS-III was 6,43,944 ever-married women aged 15-49 years and 1,66,620 unmarried women aged 15-24 years from 7,20,320 households across 601 districts. Finally, for DLHS-IV, the sample size was 3,19,695 ever-married women from 3,78,487 households. We limit our analysis to Andhra Pradesh, Telengana-the treatment states, [2] and the neighboring control states of Orissa, Chattisgarh, Tamil Nadu, Karnataka, and Maharashtra as explained below. Since we analyze respondents' birth histories, it is important to underline the differences in the reference period (questions regarding previous reproductive events) across the three rounds. The reference period has varied across survey rounds owing to the survey execution. For DLHS-II, the reference period is since January 1, 2001; for DLHS-III it is since January 1, 2004; and for DLHS-IV the reference period is since January 1, 2008. The final estimation sample consists of 6,82,001 births to 4,59,016 mothers belonging to 4,04,334 households. The states of Orissa and Chattisgarh were excluded from DLHS-IV, having been surveyed in the Annual Health Surveys (AHS) for the period 2007-2012. We combine data for these two states from the AHS 1st update (reference period: January 2010-December 2010) and the AHS 2nd update (reference period: January 2011-December 2011) with data from DLHS-IV to construct our final data set.

We perform supplementary analysis with the National Family Health Survey (NFHS) data as a robustness check. The NFHS is a nationally representative multiple-round survey conducted throughout India. This survey also captures information on maternal and child health, reproductive health, family planning, nutrition, and access and utilization of health services. Since its inception in 1992-93, there have been five rounds of this survey till 2019-21. Each round of the survey contains information on woman-specific, birth-specific, and household-specific characteristics in separate files.

Information on full birth history for women aged 15-49 years is available in the birth file. The file contains data on mortality for each of the births and pregnancy, delivery, immunization, and child health information for births in the last 5 years (3 years for 1998-99 round). We link the birth history file with the household file to combine mothers, births, and household characteristics. While five rounds of the survey are available, we consider births that have taken place during the period 2001-2013 to maintain consistency with our

[2]The state of Telengana was formed out of the state of Andhra Pradesh on 2 June 2014 through the Andhra Pradesh Reorganisation Act,2014

main analysis. This limits our consideration to three rounds of the survey: round 3(2005-06), round 4(2015-16), and round 5(2019-21). We also consider only the states of Andhra Pradesh and Telengana, and the neighboring states of Orissa, Chattisgarh, Tamil Nadu, Karnataka, and Maharashtra in our analysis. In this case, we are left with a sample of 410797 births to 217135 mothers belonging to 208459 households.

The Aarogysri scheme was introduced in erstwhile undivided Andhra Pradesh in April 2007, and its rollout was completed by July 2008 [3] (Aarogyasri Annual Report,2008-09). Consequently, mothers who gave birth in Andhra Pradesh (parts of which became Telengana in 2014) after July 2008 would be able to avail the benefits of the scheme. Similarly, children born after July 2008 would be able to avail the benefits of the Aarogyasri scheme. Thus our treatment group consists of births that have taken place after July 2008 in Andhra Pradesh and Telengana. The control group consists of all births in the neighbouring states of Orissa, Chattisgarh, Tamil Nadu, Karnataka, and Maharashtra, and births before July 2008 in Andhra Pradesh and Telengana.

3.2 Outcome and control variables

Our primary outcome variables related to the use of delivery care and measures of child health. In delivery care, we look at three variables:

Delivery:pvt: binary variable that indicates whether the mother had her last Delivery in a private facility. In accordance with DLHS coding categories, deliveries in private hospitals/clinics or private Ayush hospitals/clinics have been coded as 1.

Delivery: govt: binary variable that indicates whether the mother had her last Delivery in a government facility. In accordance with DLHS coding categories, deliveries in private hospitals/clinics or government hospitals, dispensaries, health centers, and government Ayush hospitals/clinics have been coded as 1.

[3] Aarogyasri was initially targeted towards the BPL population of the state. However, in 2019, eligibility was expanded to include car owners, landowners, and households with an annual income of less than 5 lakhs (The New Indian Express,2010).

OOP delivery cost: total out-of-pocket cost of Delivery in rupees. This cost includes the cost of transportation, hospitalization, medicines, tests, and other expenses related to Delivery. This variable is available only for DLHS rounds III and IV.

The delivery variables are available for the last birth to a mother within the reference period.

To measure childhood health, we study mortality variables. These variables are as follows:

Infant mortality: binary variable that indicates whether a child died within the first 12 months of its birth. Typically, deaths before 1^st birthday are counted as infant mortality. However, heaping of deaths is noticed at month 12, suggesting an underestimation of deaths through a typical measure of infant mortality (Guide to DHS Statistics DHS-7). To address this concern, we include deaths in the 12^{th} month in the definition of infant mortality in our paper.

3-year mortality: binary variable that indicates whether a child died within the first 3 years of birth.

The measures of mortality are available for all births to a woman within the reference period.

For control variables, we use an index for household amenities, an indicator for whether the household is located in an urban area, an indicator for whether the mother has ever been to school, and an indicator for whether the household is a Hindu household. In addition, we also use locality-level controls for government programs like Janani Suraksha Yojana (JSY) and Anganwadi in some specifications.

4 Empirical specification

The Arogyasri scheme was implemented in the current-day Indian states of Andhra Pradesh and Telangana. The program was rolled out in quick succession across districts over a short span of fifteen months between April 2007 and July 2008. This makes it difficult to use the staggered implementation for identification purposes. There was a concerted effort on part of the state government to increase enrollment of households in to the program so that nearly 58% of the households had Arogyasri insurance cards by the 2012-2014 survey year of DLHS. Further, the rollout prioritized vulnerable districts even within the short span of the phasewise implementation, rendering parallel trends assumptions, between districts that received the program early compared to late receivers, untenable. Hence, we compare the growth in outcomes across cohorts in erstwhile Andhra Pradesh(AP) with those of the neighboring states of Orissa, Maharashtra, Chattisgarh and Tamil Nadu in our baseline specification, estimated using Equation 1. Figure 1 shows the spatial distribution of the control and treatment regions used in this estimation.

$$\mathrm{Y}_{ist} = \beta_1 + \beta_2 \mathrm{Birth}_{i,Post} * \mathrm{AP}_{is} + \alpha_s + \tau_t + X_{ist} + u_{ist} \tag{1}$$

Equation1 is estimated for three outcomes denoting access to healthcare - delivery of child in private hospital, delivery of child in government hospital and out of pocket expenditure incurred during the birth of child. We observe Y for the last child born to every surveyed woman. Hence, Y is observed for each woman i, residing in state s, in the child's birth month-year t. α are the state fixed effects, τ are birth-year fixed effects, and X is a set of characteristics that vary across households or individuals. Specifically, we include an indicator for whether the household resides in the rural of urban region, household religion, household wealth[4] and years of education completed by woman i. Standard errors are clustered at the state-birth year month level. β_2 is the DID estimator. It shows the difference in outcome Y between children born in the treatment state of AP (AP_{is}) and those born in the control states, after the Arogyasri program was launched in April 2007 ($\mathrm{Birth}_{i,POST}$), after eliminating baseline differences in Y between the treatment and control groups based on children who were born before April 2007. Our identifying assumption is that, holding base-

[4]We include the number of various amenities that a household has from a fixed list of 9 amenities covered in the survey. Since different rounds of the survey have used slightly different lists of amenities, we consider the household amenities covered in DLHS-II as the benchmark.

line characteristics fixed, growth in healthcare access (Y) should be orthogonal to whether a woman resides in AP or a neighboring state. This would be violated if there are a) pre-existing differences in trends of Y between the treatment and control states and/or b) other concurrent programs that could affect Y differently across treatment and control states. We conduct pre-trend analysis to address the first point. For the second, two other programs, Janani Suraksha Yojana (JSY) and Anganwadi, could potentially threaten the causal interpretation of our estimates. These programs were introduced across India in 2005 and 1975 respectively. The JSY program was aimed at incentivizing delivery in an institutional setting supervised by professionals (De and Timilsina,2020). The Anganwadi program provides various nutritional and primary healthcare support to pregnant and lactating women and children below 6 years (Ministry of Women and Child Development, 2021). While these are nationwide programs, there could be variations in the quality of their implementation across various states. We explicitly control for the availability of these programs in the PSU in our specifications.

Since healthcare is a state subject, there are wide variations in healthcare infrastructure across various states in India. While state fixed effects eliminate baseline differences across states, differential growth in infrastructure could lead to differences in access to healthcare and health outcomes. Hence, in a second specification we compare districts of treatment and control states that share a common border, as depicted in Figure 1, after eliminating the baseline differences between them. While households residing in districts of control states can have different healthcare infrastructure, the shorter traveling distance means that people in control districts can access healthcare infrastructure in adjacent districts belonging to the treatment state (and vice versa), but they lack the publicly provided health insurance which is provided only to the residents of AP.[5] This specification is estimated using Equation 2.

[5]While households can move to AP in response to the program, finding proof of residency, necessary to register for state level programs, in a different state is a complicated bureaucratic process which takes various documentation to prove long term residence.

$$\text{Y}_{idst} = \beta_1 + \beta_2 \text{Birth}_{i,POST} * \text{AP-District}_{ids} + \alpha_d + \tau_t + X_{idst} + u_{idst} \tag{2}$$

Here, α are the district fixed effects and the other terms are defined exactly as in Equation 1. Standard errors are clustered at the level of state-birth year month.

We also use the sample of border-districts to conduct a contiguous district pair analysis that compares a treatment district to only its adjacent districts, unlike in Equation 2 where the average of all districts in treatment states is compared to the average of all bordering districts in control states. To understand the district-pair fixed effect specification, consider equation 3

$$\text{Y}_{dps} = \sum_{1}^{n} \beta_i D_{P_i} + \gamma D_{\text{AP-District}} + u_{dps} \tag{3}$$

Here, there are n pairs of adjacent districts such that one of the districts in the pair belongs to the treatment state of AP, and the other belongs to a control state. One particular treatment (control) district can appear multiple times in different district-pairs if it shares its border with multiple control (treatment) districts. Then, γ is difference in Y between the treatment (AP) and control (non-AP) district in each district-pair, averaged over all district-pairs. This gives the first difference in a pair fixed effect model. The difference in this measure computed before and after the program implementation, provides the difference in differences estimate in the district-pair fixed effect model. Equation 4 outlines the difference in differences framework that we estimate. It is important to note that since this specification exploits variation within a pair of districts, identification is based on a comparison of very few observations.

$$\text{Y}_{idpst} = \beta_1 + \beta_2 \text{Birth}_{i,POST} * \text{AP-District}_{id} + \alpha_p + \tau_t + X_{idpst} + u_{idpst} \tag{4}$$

Here, α are the district-pair fixed effects.

5 Results

In this section, we estimate the effect of the availability of Aarogyasri on various reproductive care and child health outcomes. In reproductive care, we study outcomes related to delivery care Outcomes studied in child health relate to various measures of child mortality Free health insurance for tertiary care can improve access to delivery in private facilities. It may also reduce out of pocket cost of delivery depending on the approved therapies covered under the insurance. Maternal access to delivery care can have a positive impact on child health indicators. This understanding motivates the analysis of the impact of Aarogyasri on child health outcomes. We broadly find evidence that Aarogyasri significantly improved the use of reproductive care in private facilities and reduced the use of reproductive care in government facilities. We next move on to child health and find evidence of significant improvement in measures of child mortality.

5.1 Use of reproductive care

We study the impact of Aarogyasri on the use of reproductive care relevant the use of delivery care.

Delivery care. Aarogyasri provides access to free tertiary care in impanelled private and government hospitals. These are termed Network Hospitals (NWH). Since tertiary care at government hospitals has always been provided at a low cost, access to free health insurance can be expected to encourage the use of private facilities for tertiary care needs. Following this rationale, we look at the impact of Aarogyasri on use of private facilities for delivery and on the use of government facilities for delivery. Moreover, since Aarogyasri provides cashless tertiary care, it is of interest to examine whether the insurance has led to a decline in out-of-pocket (OOP) cost to the household for tertiary care. In this context, we study the impact of Aarogyasri on out-of-pocket delivery costs.

Table 3 presents the difference-in-difference estimates for delivery in private facilities, delivery in government facilities, and log of OOP delivery cost. The variables **Delivery:pvt**, **Delivery:govt**, and **Log of OOP delivery cost** indicate the probability of whether a mother delivered in a private facility, the likelihood of whether a mother delivered in a government facility, and the log of total out of pocket spending on delivery, respectively. OOP delivery cost includes cost of transportation, hospitalisation,medicines,tests, and other expenses related to delivery.

Panel A presents the results for a Difference-in-Difference based on cross state-cross cohort variation. Panel B presents results for cross neighbouring district-cross cohort variation, while Panel C presents the results for cross-Neighboring District pair-cross-Cohort variation. As per column 1, the availability of Aarogyasri increased the probability of delivery in private facilities. The increase in likelihood of private delivery ranges from 5.5 percentage points (in Panel A) to 7.4 percentage points (in Panel B). Column 2 indicates that Aarogyasri reduced the probability of delivery in government facilities by a range of 8.5 percentage points (Panel A) to 12.3 percentage points (Panel B). Moreover, Aarogyasri led to a decline in OOP delivery cost by 0.55% in Panel A and 0.25% in Panel B.

5.2 Child health

Dimensions of childhood mortality are critical indicators of child health, especially in developing countries. These are also used as measures of overall development (Hill,1991). In this context, we study the impact of Aarogyasri on the following two dimensions of childhood mortality:

Infant mortality: whether a child has died before the 1st birthday

3-year mortality: whether a child has died within three years of life

Table 12 shows the difference-in-difference estimates for the two measures of childhood mortality and total institutional delivery. Column 1 indicates that Aarogyasri has led to a decline in the probability of a child dying within the first year of life by 0.8 percentage points (Panel A). While the coefficient in Panel B is imprecisely estimated, the coefficient size is similar. As per column 2 Aarogyasri has led to a decline in the probability of a child dying within the first three years of life by 0.9 percentage points (Panel A) and 0.8 percentage points in Panel B.

6 Supply Side factors

While our baseline results indicate that the availability of Aarogyasri has improved maternal use of delivery care in private facilities and improved childhood health outcomes, our results can be confounded by the presence of other policies and infrastructure variables. In particular, during the period of our study, a parallel program aimed at improving institutional birth by women was already in operation. Known as Janani Suraksha Yojana (JSY), this conditional cash transfer scheme was introduced in 2005 and incentivized mothers to deliver in institutional settings (De and Timilsina,2020). This raises the possibility that perhaps our results are actually driven by the availability of JSY and not due to Aarogyasri. To address this concern, we perform the same regression for a subset of variables by including the availability of JSY as a control. Moreover, we also control for the availability of Anganwadi services. Since its inception in 1975, the Anganwadi scheme has been implemented with a holistic target of achieving improved child health and education outcomes, alongside improving maternal capabilities of addressing a child's health and nutritional needs (Ministry of Women and Child Development,2021). Among other services, Anganwadi services provide nutrition, health and nutrition education, immunization, and health checkup for children aged 0-6 years and for pregnant and lactating mothers. However, information on JSY and Anganwadi is available only for the rural sample, and therefore, we limit this section of analysis to rural households.

Table 7 presents results for a subset of variables after the inclusion of controls for the availability of private hospital, JSY and Anganwadi in the village. While our baseline results contain three outcomes for delivery care and two outcomes for child health, in this section, we limit our analysis to outcomes for delivery care and infant mortality. Our results remain stable and significant upon the inclusion of controls for JSY, and Anganwadi, across specifications.

7 Heterogeneity

We estimate our baseline model by considering different sub-groups. We look at heterogeneity with respect to three dimensions:

(1) Whether the child is boy or girl

(2) Whether the household is located in an urban area

(3) Whether household belongs to Scheduled Caste-Scheduled Tribe social group

7.1 Delivery in private facility

Table 9 presents the heterogeneity for delivery in private facilities. The expansion in delivery in private facilities is driven by the girl child, the rural households, households belonging to Scheduled Caste-Scheduled Tribe social group, and by households who have only government hospitals in the locality.

7.2 Delivery in government facility

Table 10 presents the heterogeneity for delivery in government facilities. The decline in delivery in government facilities is driven by the girl child, the rural households, households belonging to Scheduled Caste-Scheduled Tribe social group, and by households who have only government hospitals in the locality.

7.3 OOP delivery cost

Table 11 presents the heterogeneity for out of pocket delivery cost. The decline in out of pocket delivery cost is driven by the boy child, and households belonging to Scheduled Caste-

Scheduled Tribe social group. The effect on out of pocket cost is similar for rural and urban households, while the decline is largest for households having both private and government hospitals in the locality.

8 Robustness

Table 8 presents estimates for a subset of outcomes drawn from the National Family Health Survey (NFHS) data. We prefer not to use this dataset for our main results because NFHS has fewer rounds of interviews and hence does not allow us to create continuous birth-year cohorts. It also doe snot have OOP expanse information for rounds IV (2015-16) and V (2019-21) only. Nevertheless, it is possible to create birth cohorts before and after the Arogyashri program.

Column 1 indicates that due to Aarogyasri, the probability that a woman would deliver a child in private facilities increased by 9.6 percentage points (Panel A), 10.1 percentage points (Panel B), and 12.1 percentage points (Panel C). Column 2 indicates that due to Aarogyasri, the probability that a woman would deliver in a government facility declined by 11.6 percentage points (Panel A), 9.1 percentage points (Panel B), and 11.7 percentage points (Panel C). These estimates are mostly comparable with those obtained in our main analysis in Table 3 The congruence between the estimates obtained from the two data sets, across specifications, gives us confidence in our findings.

9 Threats to identification

Our identification strategy is based on the assumption that in the absence of Aarogyasri, change in outcomes of interest over the period of study would have been identical for treatment and control states. This is the parallel trends assumption. We employ two empirical strategies to test the validity of our main identification strategy. We analyze one pseudo-treatment and one pseudo-outcome where we know that the effect of the program should not be significantly different from zero. We also performed a pre-trend analysis similar to Abramitzky and Lavy (2014) and showed that our treatment (AP) and control (neighboring states) groups were not on different time trends in the pre-program period.

9.1 Placebo Analysis – Pseudo Treatment Group

In this section, we estimate pseudo-causal effects that should be equal to zero based on our a priori institutional knowledge. For example, we know that the program did not take place before 2007. Therefore the period: 2001-2006 constitutes our placebo time frame. We assign Aarogyasri to the states of Andhra Pradesh and Telengana in the pseudo-policy year 2003, as it is the mid point of our pseudo analysis period. If our main findings are indeed due to Aarogyasri, then we would not expect to find any effect of pseudo-Aarogyasri.

Table 4 shows the effects of pseudo-Aarogyasri introduced in the pseudo-policy year of 2002 on a subset of outcomes based on the cross-Neighboring-District - cross-Cohort variation. Consistent with our expectation, pseudo-Aarogyasri is not found to have any significant impact on delivery in private facilites, delivery in government facilities, and infant mortality. The pseudo-coefficient on out of pocket expenses is however significant and deserves further examination.

9.2 Placebo Analysis: Pseudo Outcome

In this case, we replicate the primary analysis with the outcome replaced by a pseudo-outcome that is unlikely to be affected by the treatment, and the true value of the estimand for this pseudo-outcome should be zero. Accordingly, the same model, when applied to the pseudo-outcome, should lead to estimates that are close to zero. Our first variable is vaccination, which is a crucial input in child health, but is unlikely to be affected by the program because vaccines are free and widely available. Although there may be some income effects from the availability of tertiary care, it is unlikely to show any significant effect on vaccination. In our data, we define **Full vaccination** as a measure of whether the child has completed three doses of polio, BCG vaccine, measles vaccine, three doses of DPT vaccine, and hepatitis B vaccine. However, since childhood vaccination is not part of tertiary healthcare, we should not expect to find any impact of Aarogyasri on this variable. This analysis would help us to guard against possible spurious results.

Treatment of common childhood health conditions. Pneumonia and Diarrheal diseases are the most common causes of child mortality (National Health Mission). In this section, we combine the experience of pneumonia and diarrhea into a common measure of experiencing a common illness and study the effect of Aarogyasri on the place of treatment for such illness. Thus our dependent variables **Illness treatment: private** and **Illness treatment: government** indicate whether the child has sought treatment for a common illness from a private facility, and from a government facility, respectively. Typically such treatments are not sought from tertiary care facilities. Therefore, we would not expect any impact of insurance on the probability of being treated for pneumonia or diarrhea in a private facility or government facility.

Table 5 presents the impact of Aarogyasri on probabilities of full vaccination, of being treated in a private facility for a common illness, and of being treated in a government facility for a common illness, based on the cross-Neighboring-District - cross-Cohort variation. Consistent with our prior belief, having access to Aarogyasri did not have any significant impact on these variables. This analysis helps in bolstering the position that the impacts observed for the use of delivery care and child health are not spurious.

9.3 Analysis of pre-treatment trends

Another way of testing parallel trends is to check whether the time trends of outputs between treatment and control states are identical in the pre-treatment period. To test for pre-treatment trends, we estimate Equation 5 for 2001-2006.

$$Y_{id} = \beta_0 + \sum_{t=2002}^{2006} \beta_1 \text{Birth year}_{idt} + \sum_{t=2002}^{2006} \beta_{2t} \text{Birth year}_{idt} * \text{AP-District}_{id} + \beta_3 \text{AP-District}_{id} + \alpha_d + u_{id} \tag{5}$$

Here individual-level delivery and child health outcomes have been regressed on a time trend, indicator for treatment district, and the interaction between time trend and treatment state indicator. β_{2t} are the coefficients of interest. We would expect the β_{2t} to not be significant. This would imply treatment and control states have been trending similarly. We present a subset of outcomes. The results are consistent with the proposition that treatment and control states have similar time trends in the pre-treatment period. Figure 2 and Figure 3 show the event study plots for delivery in private facility and government facility respectively. Event study plot for out of pocket delivery cost is shown in Figure 4.

10 Conclusion

In this paper, we have evaluated one of the pioneering social health insurance programs and examined its impact on the behavior of reproductive health seeking in India. The program, Rajiv Arogyashree, was built on a public-private partnership and provided tertiary care to low-income families in the state of Andhra Pradesh. The program has similarities and differences with more established social health insurance programs such as Medicaid in the US. Similar to Medicaid, insured individuals do not pay the premium. They seek care at private facilities, which the government reimburses; in this sense, the program is like a fee-for-service model that Medicaid follows. However, unlike the Medicaid program, the RA reimbursements are limited to tertiary care only. Also, unlike in the US, there is a widespread and robust government-provided healthcare delivery service for the general population, not qualified by age, income, or military service. Together, the program generated the research question as to whether newly insured individuals would prefer to go to a private facility or stay with the government providers.

We find that the program significantly increased access to private health services. For instance reproductive services, such as maternal delivery at private hospital, increased in response to RA. In fact, we find a substitution away from government to private facilities. We also find improvements in some desirable health indicators, such as infant and child mortality rates. However, we find no significant impact of tertiary insurance expansion on routine primary health care, such as child vaccination and treatment for common illnesses, showing limited second-order impacts of tertiary insurance. Finally, we find that the program substantially lowered out-of-pocket costs for families in the treatment state compared to the control states. Reducing out-of-pocket costs and helping families avoid catastrophic medical debts was one of the program's stated objectives. Although a social cost-benefit analysis is required to estimate the full financial impact of the program, it is sufficient to say that it achieved its goal of lowering the financial burden for families.

The RA program incentivized private care by lowering its associated out-of-pocket cost substantially. But it also led to a switch from government facilities to private facilities. One explanation for the private-government switch comes from the pure substitution effect, as the relative price for private facilities fell. Even though government facilities are theoretically free, they may impose other costs since they lack infrastructure or staff. Since private facilities typically provide service to middle- or high-income families who can pay the full price out of pocket and demand timely services and clean and functioning facilities, there is desired quality substitution too.

However, current research also raised concern about the fee-for-service-based private-government partnership. There are moral hazard issues both for providers and users. On the provider side, reimbursements for surgical procedures incentivized private hospitals to recommend and perform non-essential surgeries like hysterectomies. Shukla et al. (2011) show that private hospitals fetch substantial profits from the scheme. Another general criticism is that both central and state governments try to gradually abdicate their responsibility to provide health services through programs like RA (Prasad and Raghavendra, 2012).

Our study has known limitations. Although an accepted practice in the literature, the formation of a control group consisting of neighboring spatial units (county or states) remains somewhat arbitrary. Our eligibility criterion for program participation is based on location and not individual information. Finally, all our variables are self-reported and not verified.

However, the collective evidence points to an empirical confirmation of what canonical economic theory would predict – a fall in relative price will lead to an increase in demand for a good. With the subsidization of private facilities, delivery in those facilities increased. Out-of-pocket costs went down substantially to protect families from the disastrous consequences of medical debt. Health outcomes also improved. However, the program had a limited impact on Primary Health care and did not shield families from expenses coming from those medical services.

11 Reference

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Table 1: Pre-treatment descriptive statistics: Household level variables

	Neighboring states	AP and Telengana	Difference
	Mean (SD)	Mean (SD)	
Household level variables			
Age of mother at interview	32.85 (6.65)	32.01 (6.82)	0.84***
Age of marriage at birth	17.15 (2.90)	15.96 (2.55)	1.20***
Mothers who have ever been to school	0.47 (0.50)	0.36 (0.48)	0.11***
Age of husband at interview	39.18 (7.86)	38.24 (7.93)	0.94***
Husband has ever been to school	0.69 (0.46)	0.54 (0.50)	0.15***
Age of household head	43.51 (11.26)	42.29 (10.90)	1.22***
Household head has ever been to school	0.65 (0.48)	0.50 (0.50)	0.15***
Household amenities index	2.22 (1.92)	2.21 (1.72)	0.008
Household located in urban area	0.31 (0.46)	0.32 (0.47)	-0.008**
Household belongs to Hindu community	0.88 (0.32)	0.85 (0.36)	0.035***
Household belongs to SC-ST community	0.37 (0.48)	0.26 (0.44)	0.11***
N=		217532	

Table 2: Pre-treatment descriptive statistics: birth level variables

	Neighboring states	AP and Telengana	Difference
	Mean (SD)	Mean (SD)	
Birth level variables			
Delivery at any pvt health facility	0.24 (0.43)	0.42 (0.49)	-0.18***
Delivery at any govt health facility	0.32 (0.47)	0.27 (0.44)	0.04***
OOP delivery cost: total	4269.98 (6464.22)	6220.58 (7208.05)	-1950.599***
Neonatal mortality	0.02 (0.16)	0.03 (0.16)	-0.002
1-day mortality	0.01 (0.11)	0.01 (0.12)	-0.001
2-28 day mortality	0.01 (0.11)	0.01 (0.11)	-0.001
Infant mortality	0.03 (0.18)	0.04 (0.20)	-0.004**
3-year mortality	0.04 (0.19)	0.04 (0.20)	-0.004**
Mother's age at birth	23.46 (4.71)	21.90 (3.90)	1.57***
Girl child	0.48 (0.50)	0.49 (0.50)	-0.006
N=		89098	

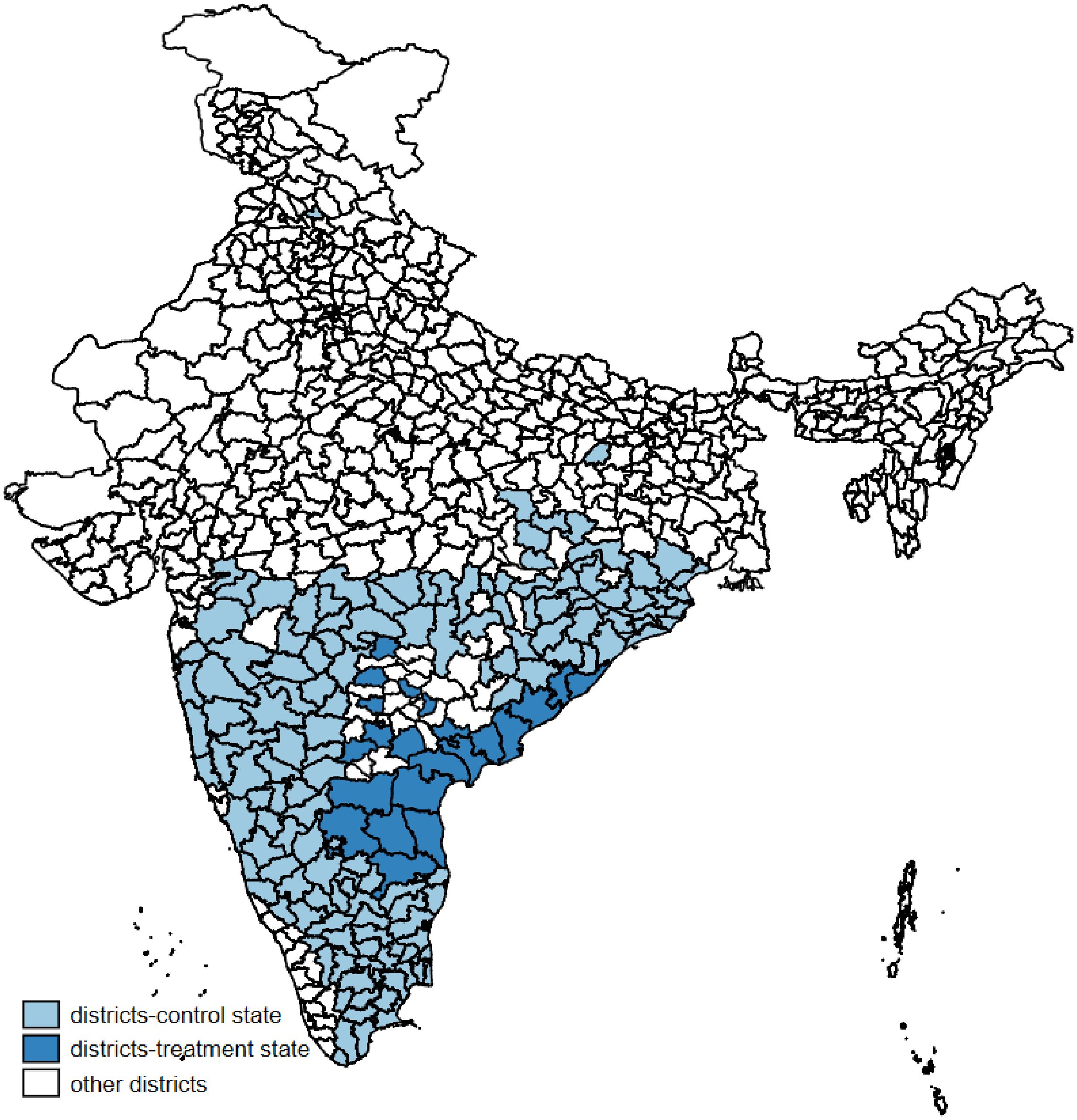

Figure 1: Treatment and Control areas

Table 3: Impact of Aarogyasri on delivery care: main results

	(1) Delivery: pvt facility	(2) Delivery: govt facility	(3) Log of OOP delivery cost
Panel A: Neighbouring states			
Policy state X Born after	0.055******	-0.085******	-0.549******
	(0.008)	(0.008)	(0.057)
Depvar Mean	0.314	0.393	7.660
R-squared	0.198	0.108	0.095
N	136265	136265	67994
State FE	Yes	Yes	Yes
Year of birth FE	Yes	Yes	Yes
Control variables	Yes	Yes	Yes
Panel B: Border districts of neighbouring states			
Border district X Born after	0.074******	-0.123******	-0.253****
	(0.012)	(0.013)	(0.091)
Depvar Mean	0.302	0.396	7.602
R-squared	0.212	0.128	0.128
N	24727	24727	13221
District FE	Yes	Yes	Yes
Year of birth FE	Yes	Yes	Yes
Control variables	Yes	Yes	Yes

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Table 4: Placebo

	(1) Delivery: pvt facility	(2) Delivery: govt facility
Border districts of neighbouring states		
Border district X Pseudo-born after	0.023	-0.026
	(0.019)	(0.018)
Depvar Mean	0.228	0.277
R-squared	0.222	0.110
N	10083	10083
District FE	Yes	Yes
Year of birth FE	Yes	Yes
Control variables	Yes	Yes

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Table 5: Falsification

	(1) Full vaccination	(2) Treatment: pvt facility	(3) Treatment: govt facility
Border districts of neighbouring states			
Border district X Born after	-0.010	0.066	-0.037
	(0.015)	(0.044)	(0.043)
Depvar Mean	0.207	0.626	0.361
R-squared	0.094	0.139	0.104
N	25573	2897	2896
District FE	Yes	Yes	Yes
Year of birth FE	Yes	Yes	Yes
Control variables	Yes	Yes	Yes

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

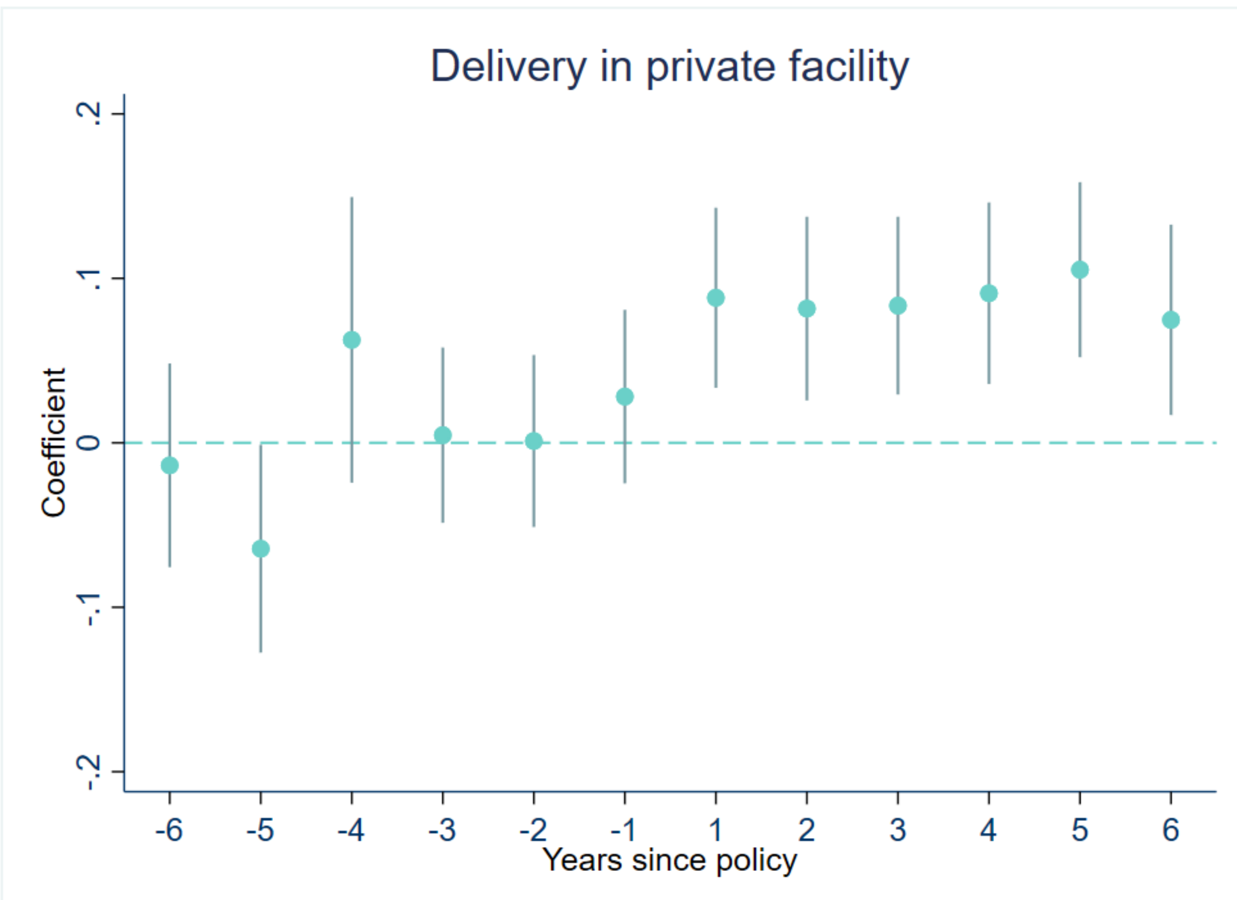

Figure 2: Delivery in private facility

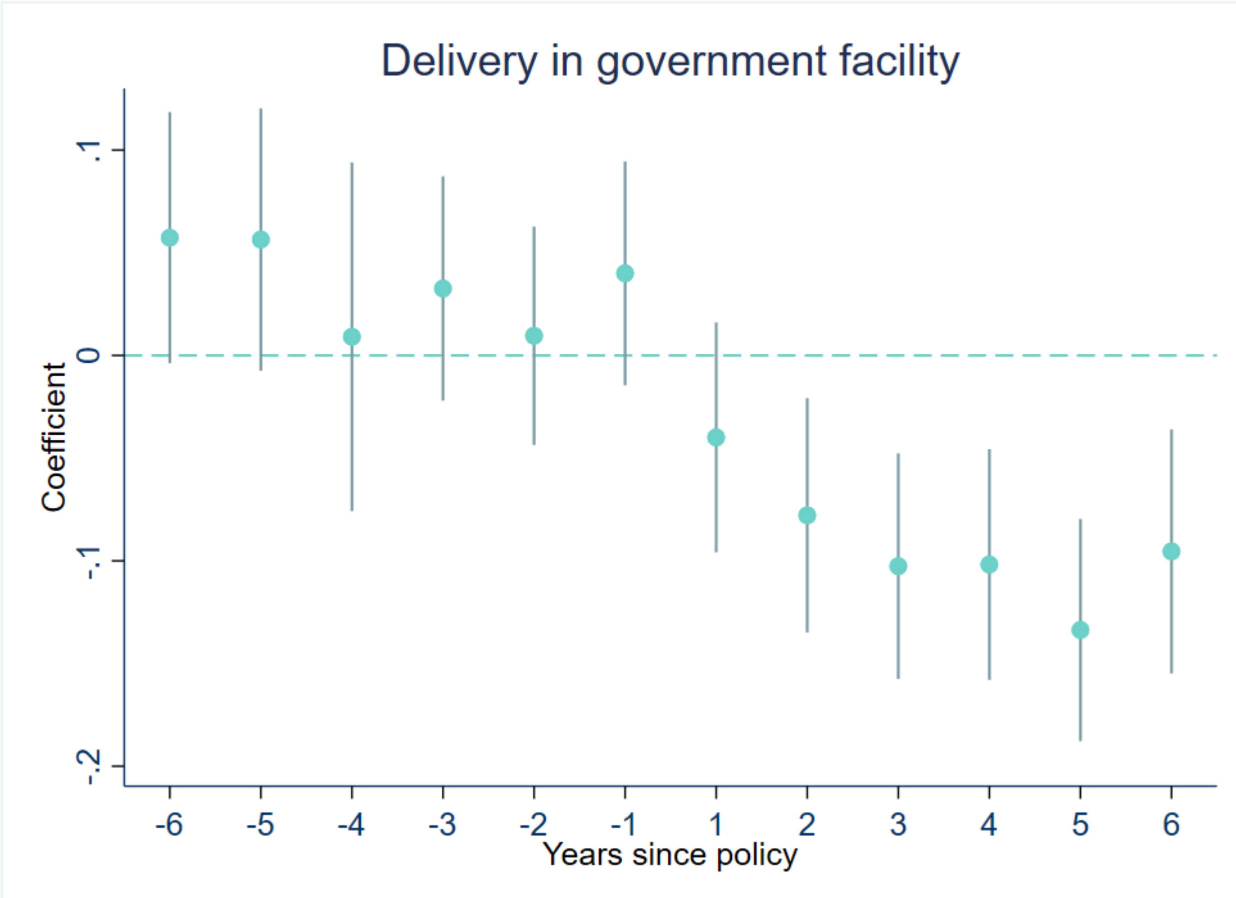

Figure 3: Delivery in government facility

Table 6: Contiguous district pair specification

	(1) Delivery: pvt facility	(2) Delivery: govt facility	(3) Log of OOP delivery cost
Border district X Born after	0.066***	-0.147***	-0.339***
	(0.012)	(0.013)	(0.098)
Depvar Mean	0.302	0.396	7.602
R-squared	0.207	0.112	0.104
N	24727	24727	13221
Contiguous district pair FE	Yes	Yes	Yes
Year of birth FE	Yes	Yes	Yes
Control variables	Yes	Yes	Yes

Standard errors in parentheses
* $p<0.10$, ** $p<0.05$, *** $p<0.01$

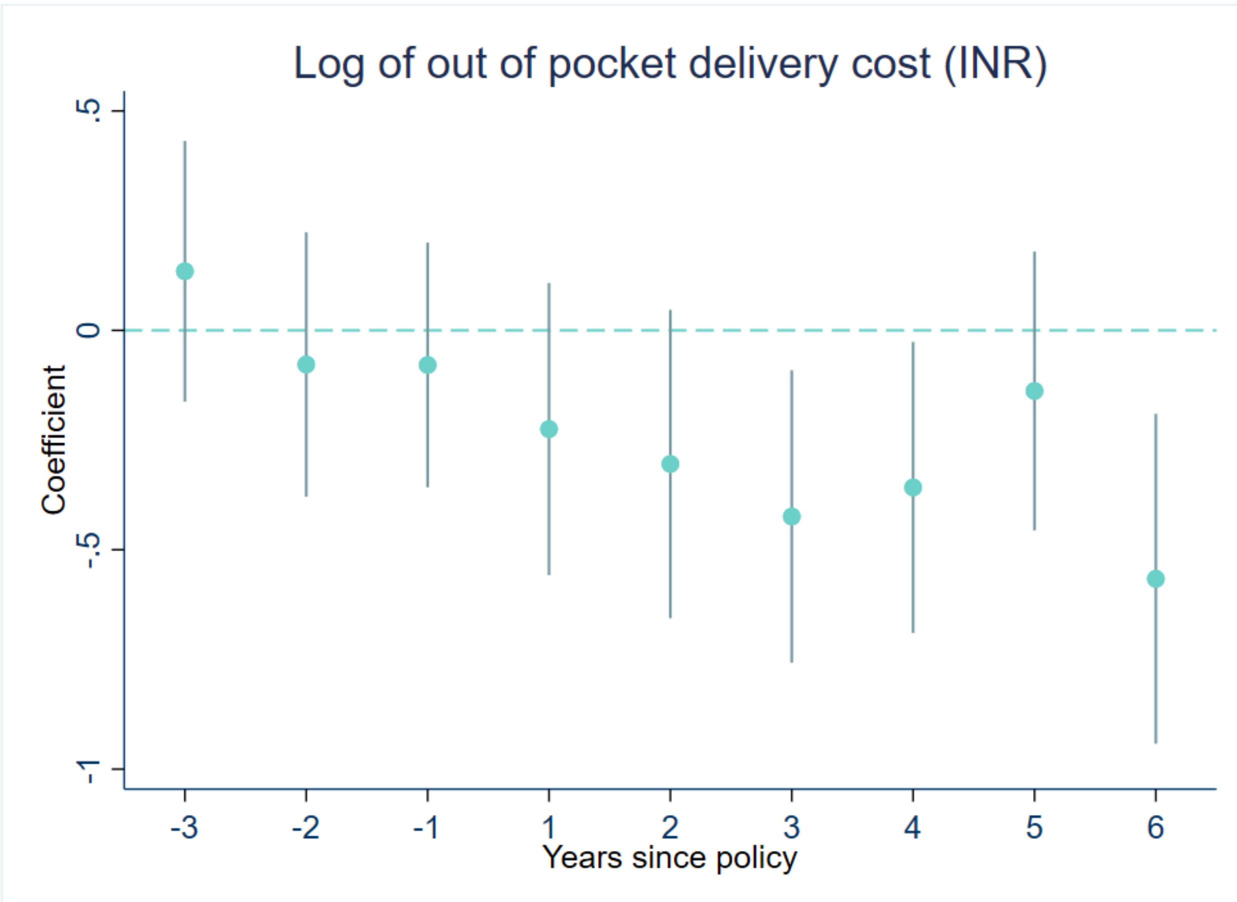

Figure 4: Out of pocket costs of delivery

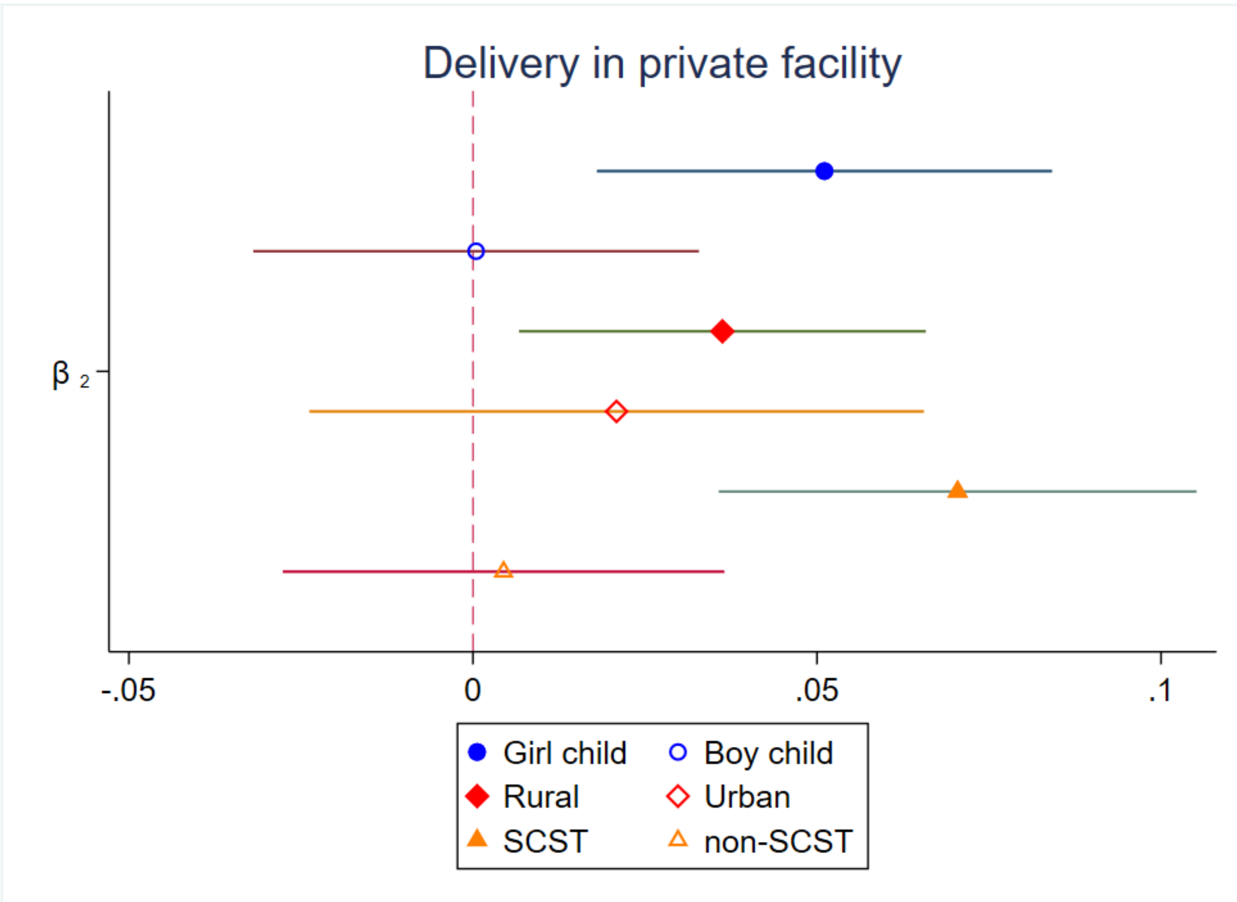

Figure 5: Heterogeneity of delivery in private facilities

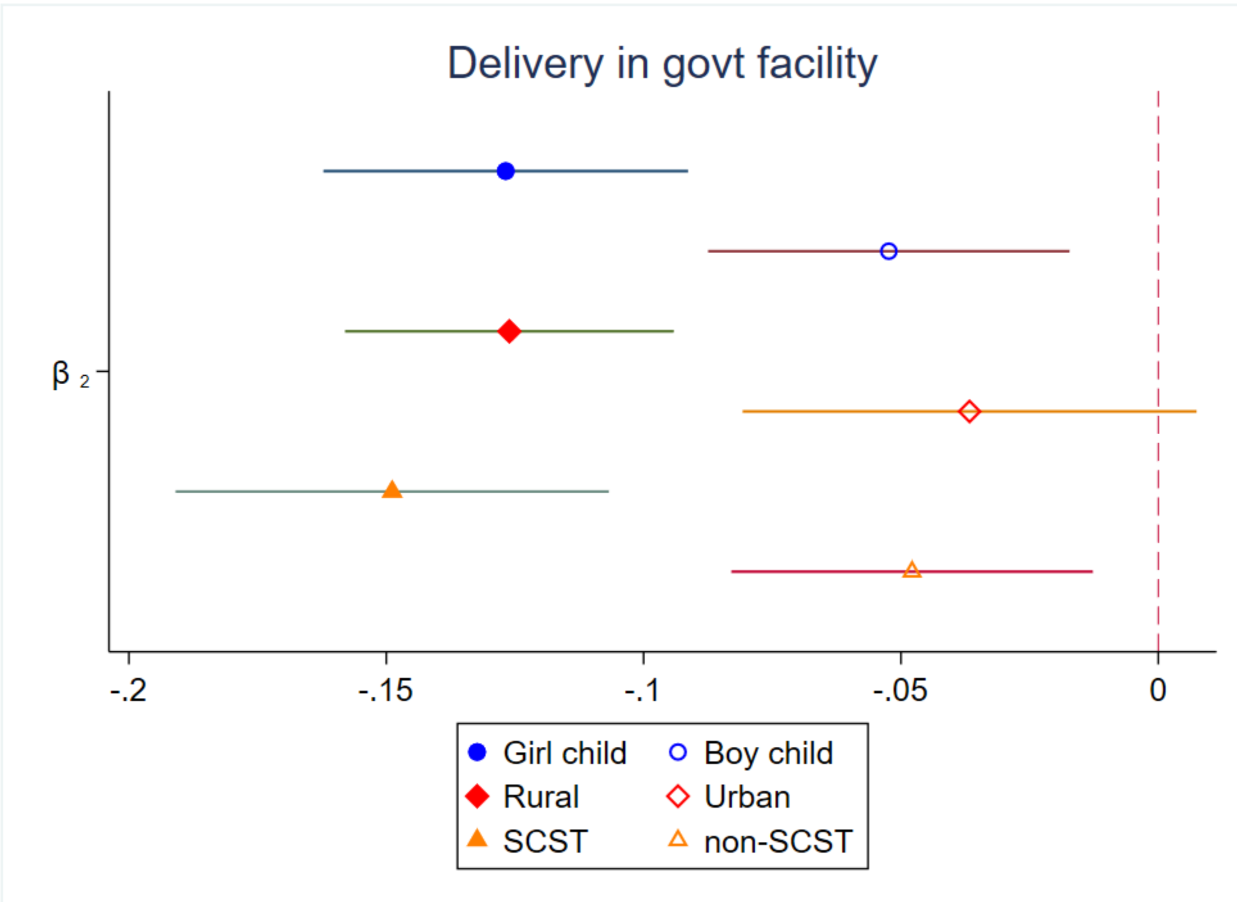

Figure 6: Heterogeneity of delivery in government facilities

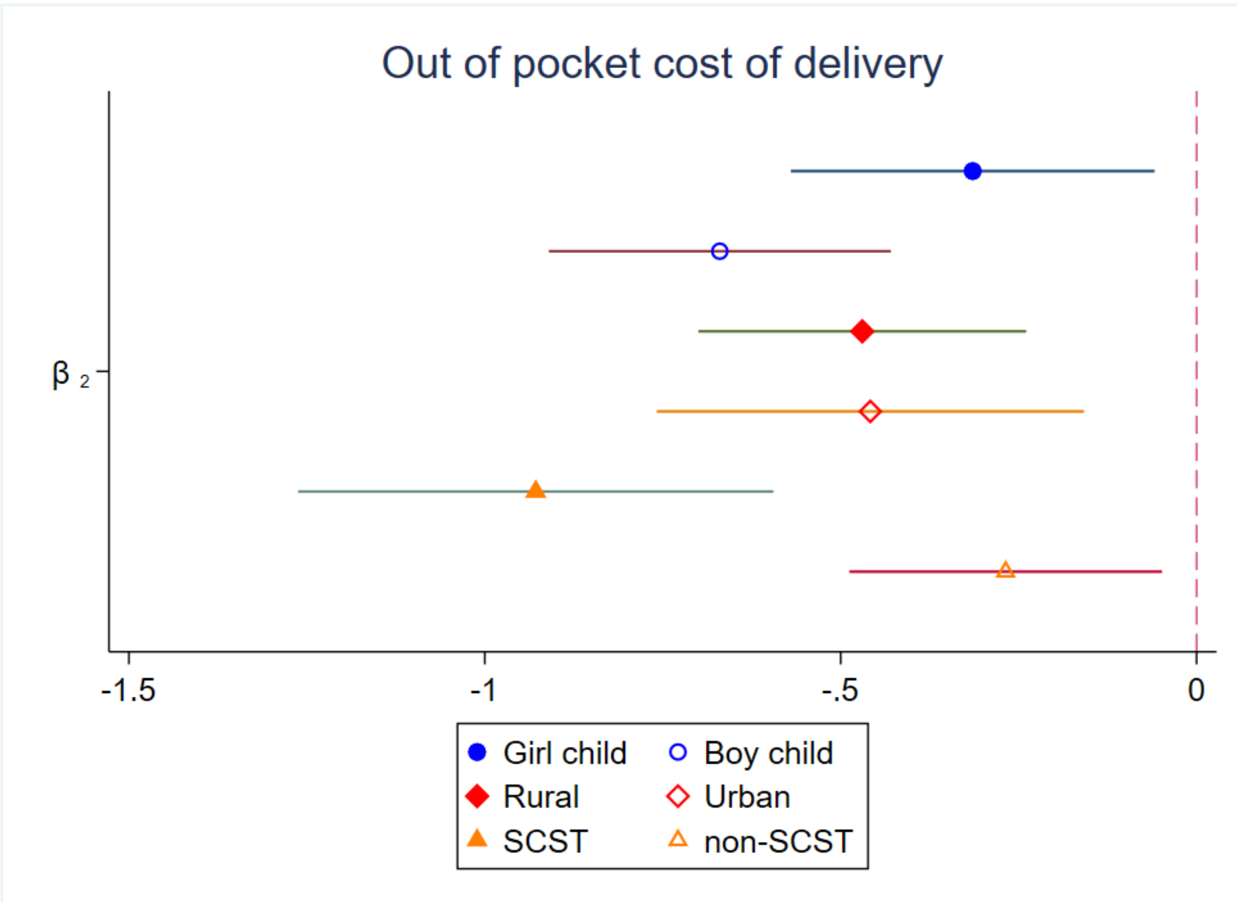

Figure 7: Heterogeneity of OOP costs of delivery

Table 7: Impact of Aarogyasri on delivery care: supply side factors

	(1) Delivery: pvt facility	(2) Delivery: govt facility	(3) Log of OOP delivery cost
Panel A: Neighbouring states			
Policy state X Born after	0.077***	-0.132***	-0.510***
	(0.011)	(0.011)	(0.074)
JSY in PSU	0.013**	0.046***	0.117**
	(0.004)	(0.006)	(0.043)
Anganwadi in PSU	-0.021**	0.021*	-0.171**
	(0.007)	(0.008)	(0.055)
Depvar Mean	0.249	0.421	7.509
R-squared	0.144	0.141	0.088
N	75044	75044	40522
State FE	Yes	Yes	Yes
Year of birth FE	Yes	Yes	Yes
Control variables	Yes	Yes	Yes
Panel B: Border districts of neighbouring states			
Border district X Born after	0.080***	-0.136***	-0.124
	(0.015)	(0.017)	(0.115)
JSY in PSU	-0.004	0.009	0.120
	(0.014)	(0.015)	(0.117)
Anganwadi in PSU	0.044**	-0.014	-0.233
	(0.015)	(0.021)	(0.139)
Depvar Mean	0.243	0.429	7.412
R-squared	0.168	0.149	0.125
N	14911	14911	8304
District FE	Yes	Yes	Yes
Year of birth FE	Yes	Yes	Yes
Control variables	Yes	Yes	Yes
Panel C: Contiguous district pairs			
Border district X Born after	0.077***	-0.170***	-0.134
	(0.016)	(0.017)	(0.125)
JSY in PSU	0.007	0.010	0.333**
	(0.013)	(0.015)	(0.115)
Anganwadi in PSU	0.033*	0.086***	-0.676***
	(0.015)	(0.020)	(0.133)
Depvar Mean	0.243	0.429	7.412
R-squared	0.161	0.133	0.093
N	14911	14911	8304
Contiguous district pair FE	Yes	Yes	Yes
Year of birth FE	Yes	Yes	Yes
Control variables	Yes	Yes	Yes

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Table 8: Impact of Aarogyasri on delivery care: alternative data

	(1) Delivery: pvt facility	(2) Delivery: govt facility
Panel A: Neighbouring states		
Policy state X Born after	0.096***	-0.116***
	(0.010)	(0.011)
Depvar Mean	0.265	0.547
R-squared	0.187	0.146
N	132492	132492
State FE	Yes	Yes
Year of birth FE	Yes	Yes
Control variables	Yes	Yes
Panel B: Border districts of neighbouring states		
Border district X Born after	0.101***	-0.091***
	(0.016)	(0.017)
Depvar Mean	0.236	0.568
R-squared	0.192	0.177
N	24596	24596
District FE	Yes	Yes
Year of birth FE	Yes	Yes
Control variables	Yes	Yes
Panel C: Contiguous district pairs		
Border district X Born after	0.121***	-0.117***
	(0.016)	(0.016)
Depvar Mean	0.236	0.568
R-squared	0.177	0.164
N	24596	24596
Contiguous district pair FE	Yes	Yes
Year of birth FE	Yes	Yes
Control variables	Yes	Yes

Standard errors in parentheses

* $p<0.10$, ** $p<0.05$, *** $p<0.01$

Table 9: Role of physical infrastructure: delivery in private facility

	(1) Only private facility	(2) Only government facility	(3) Both private and government facilities
Border district X Born after	-0.090	0.276*	0.330*
	(0.064)	(0.137)	(0.150)
Depvar Mean	0.340	0.165	0.061
R-squared	0.185	0.196	0.525
N	1007	395	478
District FE	Yes	Yes	Yes
Year of birth FE	Yes	Yes	Yes
Control variables	Yes	Yes	Yes

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 10: Role of physical infrastructure: delivery in government facility

	(1) Only private facility	(2) Only government facility	(3) Both private and government facilities
Border district X Born after	-0.090	0.276*	0.330*
	(0.064)	(0.137)	(0.150)
Depvar Mean	0.340	0.165	0.061
R-squared	0.185	0.196	0.525
N	1007	395	478
District pair FE	Yes	Yes	Yes
Year of birth FE	Yes	Yes	Yes
Control variables	Yes	Yes	Yes

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 11: Role of physical infrastructure: OOP cost of delivery

	(1) Only private facility	(2) Only government facility	(3) Both private and government facilities
Border district X Born after	-0.090	0.276*	0.330*
	(0.064)	(0.137)	(0.150)
Depvar Mean	0.340	0.165	0.061
R-squared	0.185	0.196	0.525
N	1007	395	478
District FE	Yes	Yes	Yes
Year of birth FE	Yes	Yes	Yes
Control variables	Yes	Yes	Yes

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01

Table 12: Impact of Aarogyasri on child health outcomes

	(1) Infant mortality	(2) 3-year mortality
Panel A: Neighbouring states		
Policy state X Born after	-0.008******	-0.009******
	(0.002)	(0.002)
Depvar Mean	0.023	0.025
R-squared	0.019	0.020
N	141945	141945
State FE	Yes	Yes
Year of birth FE	Yes	Yes
Control variables	Yes	Yes
Panel B: Border districts of neighbouring states		
Border district X Born after	-0.006	-0.008**
	(0.004)	(0.004)
Depvar Mean	0.026	0.028
R-squared	0.029	0.031
N	25573	25573
District FE	Yes	Yes
Year of birth FE	Yes	Yes
Control variables	Yes	Yes

Standard errors in parentheses

* $p<0.10$, ** $p<0.05$, *** $p<0.01$