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Devolution of Health Services, Fiscal Decentralization, and Antenatal Care in the Philippines

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Abstract

Despite the long tradition of decentralization in health care worldwide, there remains limited evidences on its impact on health outcomes. In this paper, we investigate how the expansion of local government incomes in the Philippines influences household demand for healthcare under a decentralized setting. Using a natural experiment, we find that greater transfers from the national government to local governments do not necessarily lead to greater demand for antenatal care services among pregnant women. This may be a consequence of local public spending on health services not responding to greater national transfers. Local government income from locally generated sources, on the other hand, are consistently positively associated with greater antenatal care demand. We also document some evidence of inter-jurisdictional spillovers in healthcare, which may potentially limit the effectiveness of decentralized healthcare service delivery.

Keywords: Decentralization, Health care, Philippines

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Devolution of health services, fiscal decentralization, and antenatal care in the Philippines

Michael R.M. Abrigo and Danica Aisa P. Ortiz[1]

1. Introduction

Decentralization has been an important feature of many a healthcare reforms over the past nearly half century. Indeed, by the turn of the millennium, around four in every five countries have experimented with some form of decentralization (Manor, 1999). This is not unsurprising given the theoretical gains from decentralization. For instance, Oate's (1972) seminal work highlights the efficiency gains in allocating resources by more knowledgeable governments that are more responsive to local needs and preferences. Further, decentralization may promote competition (Shleiffer, 1985; Starett, 1980) and innovation (Rose-Ackerman, 1980) among competing government units that could, theoretically, increase welfare.

Despite the compelling arguments favoring decentralization, rigorous empirical evidences to support the theoretical justifications for decentralization, particularly in healthcare, remain limited (Channa and Faguet, 2016; Munoz, et. al., 2017; Abrigo, et. al., 2017). To some extent, this feature may be an artifact inherent in many countries' transition towards decentralization, which generally involves the simultaneous adoption of decentralization across the whole of government. This effectively limits the range of empirical techniques that allows causal inference on the effects of decentralization. In addition, decentralization often involves many different features that are often different across different settings, which needs to be individually unpacked in order to effectively assess its impacts. These, together, pose a potentially insurmountable challenge to evaluators of decentralization.

This paper aims to contribute to the literature by providing new evidences on the impact of decentralization on the demand for health care in the Philippines. While the delivery of healthcare in the country has been devolved to local governments for more than 25 years, the body of empirical literature on the effects of decentralization on health outcomes in the Philippines remain thin and of varying methodological rigor (Abrigo, et. al., 2017).

This study bridges some of these gaps in the literature by combining household- and local government-level data to assess how an exogenous expansion of incomes by local governments affect household antenatal care decisions. More specifically, we leveraged on the administrative rules that govern the creation of new cities, and the substantial rise in national transfers that comes with city ratification in order to provide credible estimates of the impact of decentralization on health outcomes. This natural experiment allows us to convincingly assess how an expansion in local government incomes, under a decentralized setting, influences household healthcare decisions by looking at how marginal local government incomes are allocated across different government functions, and how city ratification relates to different measures of local development. As such, this study takes on all short-term (local government income and expenditure), medium-term (local development), and long-term (health outcomes) views on the impact of decentralization on local outcomes.

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Overall, we find that the expansion of local government incomes is associated with greater healthcare demand among households. However, the increase in healthcare demand comes from having greater locally generated incomes by local governments. While greater transfers from the national government to local governments substantially increase local government incomes and thereby allows the latter to provide more services in general, we find that expenditures for population, health and nutrition services do not necessarily rise with greater national transfers. Moreover, we document inter-jurisdictional spillovers in government healthcare services that may limit the effectiveness of the current devolved government healthcare setup.

Our results are particularly relevant in the on-going discussions of the Philippines' transition to Universal Health Care. Although our results do not discredit the potential gains from a decentralized delivery of government health care services, our documented evidence of inter-jurisdictional spillovers in healthcare casts doubt on the effectiveness of the current degree of decentralization. In the presence of spatial spillovers, local government investments on healthcare may potentially be sub-optimal. Decentralizing the administration of local healthcare delivery at higher levels of government, say provincial or regional, may be more desired than the current setup since this will allow the internalization of spillovers. Further, our results suggest that unconditional transfers to local governments may not necessarily lead to greater investments in health care. While this is not contrary to potentials gains in allocative efficiency under decentralization, earmarking of local government incomes, for instance from social health insurance receipts, may be more feasible to ensure funding of necessary health care services. Finally, our results highlight the role of the local economy in access to health care. To the extent that locally generated incomes correlate positively with local economic development, our results suggest that initiatives to promote growth of local economies may be an important step to improve local health outcomes.

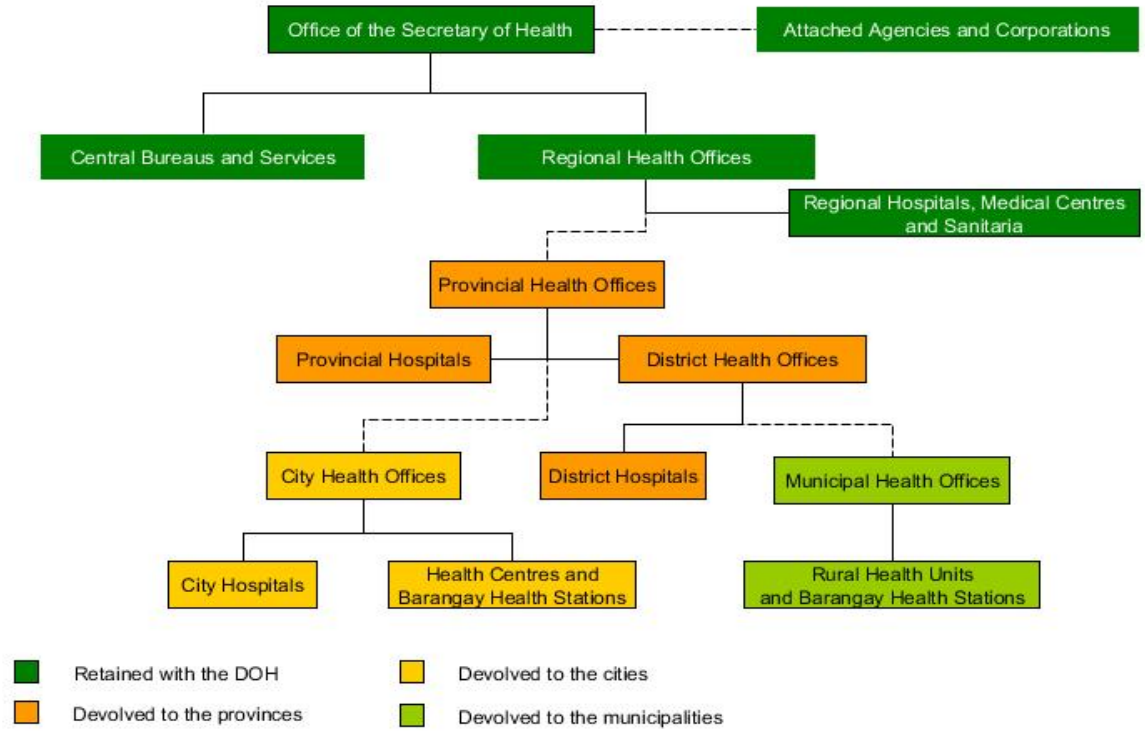
The rest of the paper is organized as follows. In the next section, we provide an overview of the decentralization of health care in the Philippines. This is then followed by a discussion of trends in antenatal care coverage in the country. In Section 4, we discuss the data and empirical strategy that we employed. The results are presented in Section 5. Finally, we conclude the paper in Section 6 by linking our discussions with the broader literature on decentralization and health.

2. Decentralization and health in the Philippines

Republic Act (RA) 7160, or more commonly known as the 1991 Local Government Code (LGC), introduced a major reform to the country's health sector landscape by shifting the primary role of delivering local health services from the national, i.e., central, government to local governments. Under the 1991 LGC, provincial governments are tasked to provide tertiary level health services, including the operation of provincial and some district hospitals. Municipal governments, on the other hand, are tasked to provide primary and preventive care, including maternal and child health services, through its network of rural health units and barangay health stations (BHS). City governments, especially of highly urbanized and independent cities, perform all the above tasks by managing city hospitals, health centers and BHS. In all local government units (LGU), a local health board, headed by the local chief executive, is mandated to serve as an advisory body for the LGU. Meanwhile, the national government, through the Department of Health (DOH), kept its role of setting and enforcing the country's national policy agenda, technical standards, and guidelines on health, as well as

its mandates over specialized and tertiary-level health care. Figure 1 summarizes the organizational structure of the government health sector under the 1991 LGC.

Figure 1. Organizational structure of government health services post-devolution



Source: World Health Organization, 2016

The devolution of basic public services, including of health care, to local governments coincided with the granting of additional taxing powers to local governments under the 1991 LGC. In addition, RA 7160 provided for the greater share of local governments in the country's internal revenues. Prior to the 1991 LGC, only 20 percent of the country's internal revenues are allotted to local governments. This has since been raised to 40 percent. As shown by Manasan (2009), however, such concessions to local governments may not be sufficient to cover the costs of the additional mandates that have been devolved, especially for local governments that had received an inordinate number of health facilities to manage.

By and large, the empirical literature on the Philippines show that the devolution of government health care delivery, together with fiscal decentralization, resulted in better health outcomes. In a systematic review conducted by Abrigo, et. al. (2017), they found some indication of the positive impacts of decentralization on nutrition, infant mortality, and demand for family planning services, similar to findings in other countries (e.g., Channa and Faguet, 2016; Munoz, et. al., 2017), although they also noted that the body of local empirical evidences remain relatively small and of varying methodological rigor. Despite these documented benefits on health outcomes, a number of descriptive studies on decentralization in the Philippines have

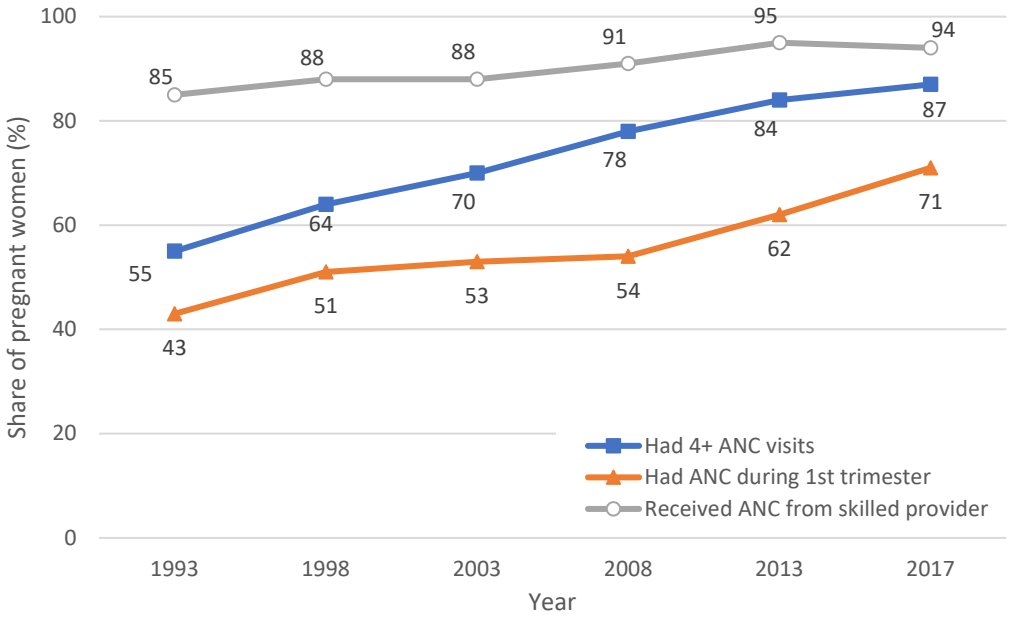
highlighted some implementation issues, including the fragmentation of the health system (e.g., Kwon and Dodd, 2011; Melgar, 2010; Solon, et. al., 1999), and the mismatch between the costs of the devolved functions to local governments and the marginal allocations from the national government (e.g., Capuno and Solon, 1996; Manasan, 2009).

3. Trends in Antenatal Care in the Philippines

Consistent and timely antenatal care (ANC) among pregnant women have important implications on both maternal and child health. It offers an opportunity to implement important healthcare functions during pregnancy, including health promotion and education, screening and diagnosis, and disease prevention (World Health Organization [WHO], 2016). This, in turn, results in better health outcomes. For instance, several studies suggest that children of mothers who received antenatal care have lower risks of being born preterm and of having low birth weight (Balcazar and Hartner, 1993; Barros and Tavares, 1996). ANC also protects mothers as it facilitates the early diagnosis and treatment of potential complications from pregnancy (e.g., Chhabra & Kakani, 2007). While some obstetric emergencies cannot be foreseen through ANC tests, having more frequent ANC visits increases the propensity of detecting symptoms of potentially serious health conditions (Bhattia & Cleland, 1995). Further, having ANC appears to result in greater utilization of postnatal healthcare services (Chakraborty et.al., 2002).

In the Philippines, ANC is covered under the government's Maternal, Newborn, and Child Health and Nutrition (MNCHN) Core Package of Services (Department of Health [DOH], 2011). The MNCHN core package of services include interventions that are delivered at specific life stages, i.e., pre-pregnancy, pregnancy, delivery, and post-partum and newborn periods, that are found to be cost-effective in preventing deaths, and improving maternal and child health.

Figure 2. Trends in antenatal care coverage: Philippines, 1993-2017



Source: NDHS, various years

Antenatal care coverage in the Philippines has improved over the last three decades (Figure 2). From about 85 percent in 1993, the proportion of pregnant mothers who had received ANC from a skilled provider increased to 94 percent in 2017 based on estimates from various rounds of the Philippine National Demographic and Health Survey (NDHS). Among women aged 15-49 that were covered in the 1993 NDHS, 55 percent had at least four ANC visits.[2] This has improved to 70 percent in 2003, and further increased to 87 percent in 2017.

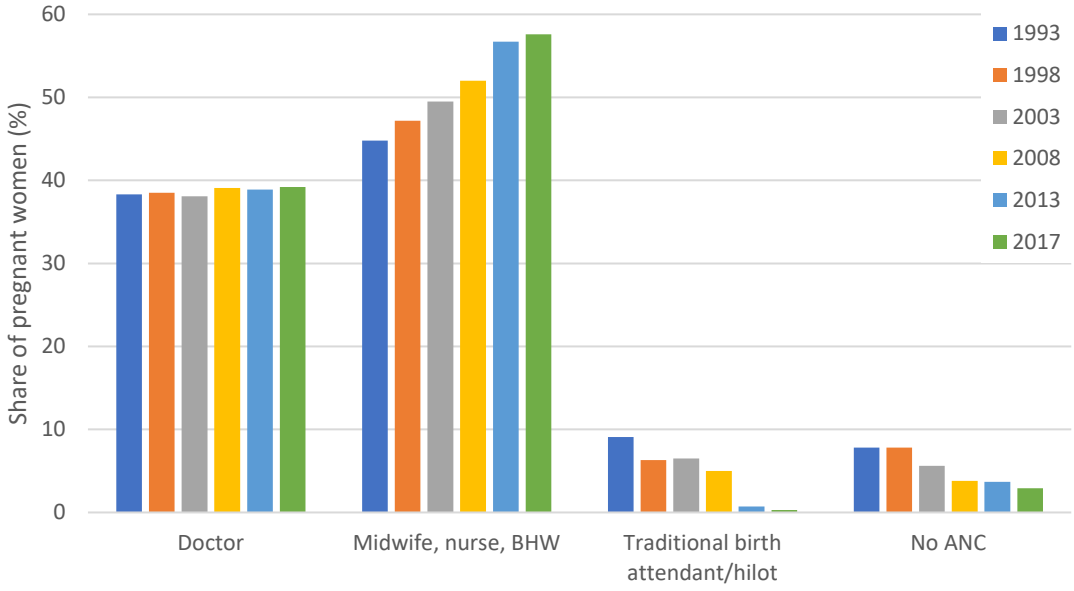
Aside from frequency of visits, the timing of ANC visits is crucial for ANC contacts to be effective. Earlier ANC visits allows greater time for essential diagnosis and treatment routines. Figure 2 shows the rising trend in the Philippines of the proportion of pregnant women receiving ANC earlier in the course of pregnancy. In 1993, less than 50 percent of pregnant women were able to receive ANC during their first trimester of pregnancy. Between 1993 and 2008, however, improvements had been slow with the proportion of pregnant women receiving ANC during their first trimester reaching only 54 percent by 2008. But the trend has picked up in more recent years with more pregnant women being able receive ANC earlier, increasing from 62 percent in 2013 to 71 percent in 2017.

Figure 3 presents the distribution of health care provider from whom pregnant mothers sought antenatal care services. Over the last three decades, the figure shows that the proportion of mothers receiving ANC from traditional birth attendants have been steadily decreasing. From a high of almost one in ten mothers seeking pregnancy advice from traditional birth attendants in 1993, this proportion has gone done to less than one percent by 2017. This trend coincides with the rising significance of health professionals in providing ANC. In 1993, for instance, only 45 percent of pregnant women were attended by a midwife, nurse or barangay health worker. This has increased to about 50 percent in 2003, steadily rising to 57 percent in 2013; and finally reaching 58 percent in 2017. Over the same period, the share of pregnant mothers who had ANC from a medical doctor hovers just below 40 percent.

Despite the general upward trend in ANC coverage over the last three decades, the services that pregnant women receive during ANC visits appear to vary widely (Figure 4). In 2017, for instance, although nearly all pregnant women had their blood pressure and weight measured, only 87 percent had their height taken, only 78 percent had their urine sample taken, and only 72 percent had their blood sample taken. While there have been great improvements in the ANC services covered over the last two decades, there are still room to expand the coverage in some critical services, especially on basic diagnostic and screening tests. For example, urinalysis is necessary for checking conditions such as sugar level, or even detecting urinary tract infection. Meanwhile, blood tests can determine potential risks such as anemia and other infections that may affect pregnancy.

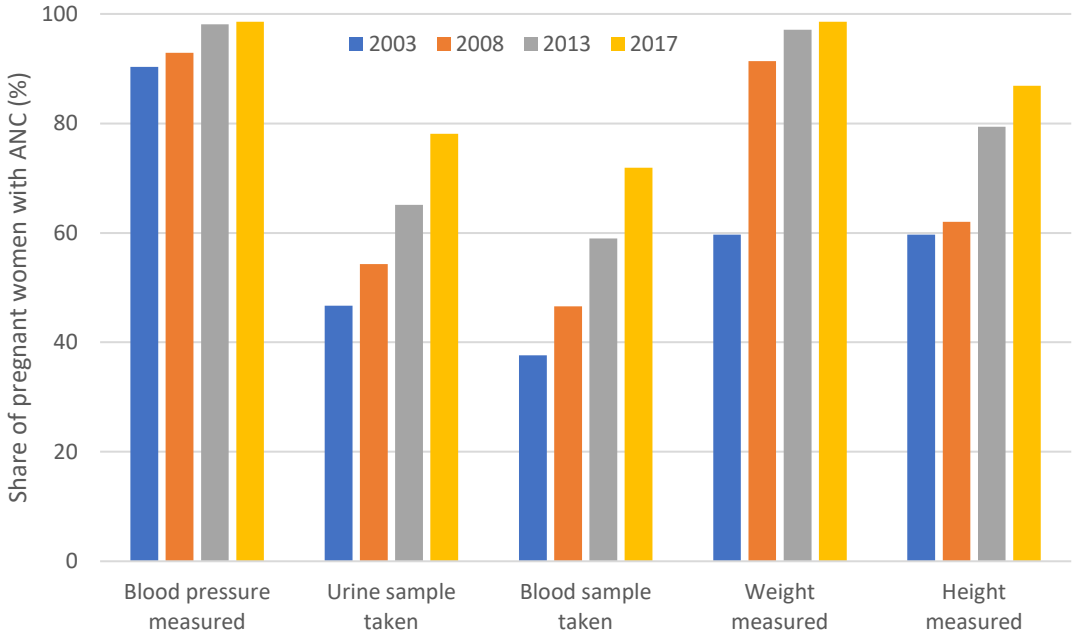
[2] The Philippine DOH (2011) recommends at least four (4) ANC visits over the course of pregnancy. The WHO (2016), on the other hand, recommends more frequent ANC visits with a minimum of eight (8) visits.

Figure 3. Antenatal care provider: Philippines, 1993-2017



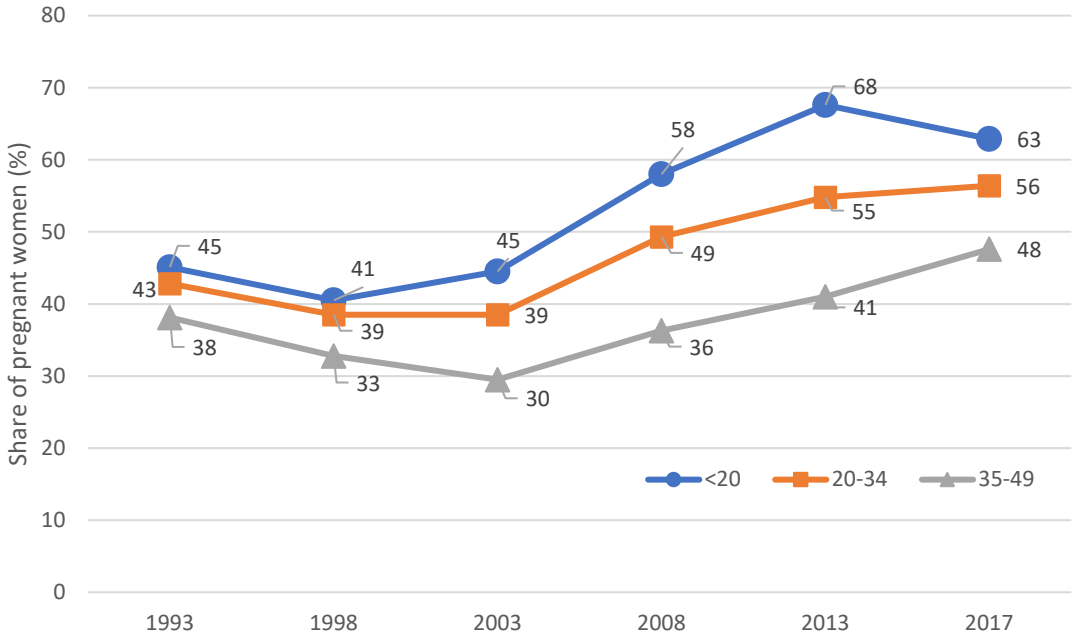
Source: NDHS, various years

Figure 4. Services provided during antenatal care visit: Philippines, 2003-2017



Source: NDHS, various years

Figure 5. Tetanus toxoid injection by age of pregnant women: Philippines, 1993-2017



Source: NDHS, various years

Aside from the above services, the DOH (2011) also recommends that pregnant women be given at least two tetanus toxoid injections (TTI) to prevent neonatal tetanus. This complication is primarily due to sanitary issues during delivery, including poor umbilical cord care packages, but may be prevented with proper TTI. In the Philippines, tetanus toxoid immunization remains relatively low with only 56 percent of women receiving at least two TTI for their most recent birth in 2017. Interestingly, among pregnant women aged 35-49, while the prevalence of having at least two TTIs has been increasing since 2003, the proportion has dropped from its peak of 68 percent in 2013 to 63 percent in 2017 (Figure 5).

Receiving ANC appear to be correlated with households' socioeconomic status. As shown in Table 1, pregnant women from richer households are more likely to have had ANC from a skilled professional, especially from medical doctors. In 2017, for instance, less than one percent of pregnant women from the highest wealth deciles of households have had no ANC, compared to 7.9 percent of pregnant women in the poorest quintile of households. The same pattern holds true with pregnant women's educational attainment. Among those pregnant women with no formal schooling, about 24 percent did not receive ANC, while the proportion is less than one percent among college-educated pregnant women. In terms of birth order, pregnant mothers are more likely to receive ANC for earlier than later pregnancies, although this may be confounded by other socioeconomic variables since households with more children are more likely to be poorer (Orbeta, 2006). Overall, these trends on the determinants of the demand for ANC follows the general patterns that have been observed elsewhere (e.g., Simkhada et.al., 2008; Nielsen et. al. 2001; Erci, 2003; Miles-Doan and Brewster, 1998; Matthews, et. al. 2001).

Table 1. Distribution of antenatal care by ANC attendant and pregnant woman's background characteristics (%)

Background Characteristic	Doctors			Nurses, Midwives and BHWs			Traditional skilled birth attendant/hilot			No ANC		
	1993	2003	2017	1993	2003	2017	1993	2003	2017	1993	2003	2017
Wealth Quintile												
Lowest	…	8.6	9.6	…	63.8	81.7	…	16.2	0.7	…	11.2	7.9
Second	…	22.8	23.9	…	65.3	73.8	…	6.0	0.1	…	5.4	2.2
Middle	…	38.9	39.6	…	51.8	58.9	…	4.2	0.3	…	4.7	1.3
Fourth	…	58.5	61.1	…	37.7	38.5	…	1.5	0.0	…	2.1	0.3
Highest	…	79.9	84.5	…	16.7	13.9	…	1.0	0.0	…	2.1	0.9
Education												
No education	10.7	6.7	8.3	22.8	26.5	65.0	41.3	38.6	2.4	25.1	27.5	24.3
Grades 1-6	19.5	13.0	12.3	54.6	62.6	77.8	14.5	12.9	0.8	11.4	11.3	9.2
Secondary	42.7	34.2	32.1	46.5	58.0	65.9	5.1	4.1	0.1	5.7	3.4	1.8
College	72.0	71.1	68.0	25.4	25.0	31.2	1.8	1.9	0.1	1.8	1.8	0.7
Residence												
Urban	53.9	53.0	48.1	34.4	38.2	49.1	5.7	3.7	0.2	6.1	4.7	2.5
Rural	23.5	22.5	31.8	54.7	61.3	64.6	12.4	9.4	0.3	9.5	6.5	3.2
Birth Order												
1	53.4	52.0	48.5	35.7	40.9	49.9	5.8	4.0	0.2	5.1	2.9	1.3
2-3	42.0	42.8	41.4	44.2	48.6	55.8	7.9	4.3	0.3	6.0	4.2	2.5
4-5	31.7	27.9	28.8	50.1	57.8	66.8	9.9	7.6	0.2	8.3	6.3	4.1
6+	21.2	17.3	14.7	50.8	55.3	66.8	14.3	14.4	0.4	13.7	12.3	8.0

Source: NDHS, various years.

Note: Data on secondary education for 2017 refers to women who finished Grade 7-10; ... – published data for 1993 not available

While there has been an overall progress in ANC coverage in the Philippines, maternal and infant mortality remains high. In 2017, for instance, the country's infant mortality ratio (IMR) is estimated at 21 infant deaths per thousand live birth. Although this is a significant drop from the 1993 IMR of 34, it is not enough to reach the IMR goal of only 19 by 2015 under the country's commitment for the Millennium Development Goals (Philippine Statistics Authority [PSA], 2015). In 2015, the Philippines maternal mortality ratio (MMR), defined as the number of maternal deaths per 100,000 live births, was at 117, which is higher than those in our regional peers: Thailand (20), Malaysia (40) and Viet Nam (54). Further, although the country's MMR dropped from 152 in 1990, the improvement had been sluggish, especially when compared to the experiences of other countries in Southeast Asia. Indonesia, for instance, was able to drive their MMR from 446 in 1990 down to 126 in 2015. Viet Nam was able to reduce their MMR from 139 in 1990 to only 54 in 2015. Table 2 presents the trends in MMR in Southeast Asian countries.

Table 2. Maternal mortality per 100,000 live births: Southeast Asian countries, 1990-2015

Country	1990	1995	2000	2005	2010	2015
Brunei Darussalam	35	33	31	30	27	23
Cambodia	1,020	730	484	315	202	161
Indonesia	446	326	265	212	165	126
Lao PDR	905	695	546	418	294	197
Malaysia	79	68	58	52	48	40
Myanmar	453	376	308	248	205	178
Philippines	152	122	124	127	129	114
Singapore	12	13	18	16	11	10
Thailand	40	23	25	26	23	20
Viet Nam	139	107	81	61	58	54

Source: World Health Organization, 2015.

4. Data and Empirical Strategy

4.1. Data

We combine local government finance statistics from the Bureau of Local Government Finance of the Department of the Interior and Local Government (DILG-BLGF) with the Philippines' National Demographic and Health Surveys (NDHS) in 2003, 2008, and 2013 to study the impact of decentralization on the demand for healthcare, specifically of antenatal care. The various rounds of the NDHS are nationally representative surveys of reproductive aged women (defined as 15-49), and contain detailed information on pregnancies and child health histories. We pooled the three waves of NDHS to create a sample of mothers who had given birth within the last five years of each survey round. Overall, our sample consists of 20,495 pregnancy records, of which 14,612 correspond to the most-recent pregnancy. From this sample, we are able to identify maternal use of prenatal care for the most recent birth, and birthing assistance for all births in the previous five years of the survey, in addition to household characteristics, such as parental education and household asset holdings. Table 3 shows descriptive statistics of the key variables we used in our analysis for each of the survey round by households' residence location.

The table shows that over a span of a decade there is improvement in antenatal care coverage, timing and frequency, matching the overall trend presented in the previous section, although pregnant women living in cities are more likely to avail of ANC services. In the 2013 NDHS, for instance, 97.1 percent of pregnant women living in cities have had antenatal care from a skilled attendant, compared to only

92.3 percent of pregnant women living in municipalities. In the same NDHS wave, city-mothers are more likely than municipality-mothers to have their first antenatal care visit in the first trimester of pregnancy (66.4 percent versus 61.9 percent), to have at least eight antenatal care visits (40.5 percent versus 28.0 percent), and to have their births attended by a skilled provider (82.4 percent versus 61.7 percent).

In some respect, this marked disparity in ANC may be attributed to differences in the availability of resources in cities and in municipalities. An average city government in 2013, for instance, expects to have about PhP2,200 in income per capita that it can use for its different services. In contrast, an average municipality government only expects a little over PhP1,000 in per capita income, i.e., less than half of an average city government's per capita income, to finance its services. This observation, however, may be confounded by the fact that those living in cities are also more likely to be better educated and of higher economic status. In our sample of pregnant women, those living in cities are about twenty percentage points more likely to have reached secondary education compared to pregnant women in municipalities. Further, those living in cities enjoy more household amenities as evidenced by the difference in city- and municipality-households' asset indices.

In order to assess how decentralization may influence local government outcomes, we also combine municipal- and city-level information on local government incomes and expenditures from DILG-BLGF with data on health human resource, local government health facilities, poverty headcount ratio, and night lights. The information on health human resource and local government health facilities provide us measures of the availability of infrastructures and resources in the local health system. The poverty headcount ratio and night lights intensity, on the other hand, proxy for local economic development, which may influence the ability of households to procure health services. Local government finance statistics are available starting in 1992, thereby allowing us to create a panel of local government units that span almost as long as the 1991 LGC, although some of the measures mentioned above are available in fewer periods. Annex A describes these data and their sources in more detail.

Table 3. Descriptive Statistics: NDHS

	2003		2008		2013	
	Non-city	City	Non-city	City	Non-city	City
Had antenatal care with skilled attendant (=1)	0.843	0.922	0.882	0.939	0.923	0.971
	(0.363)	(0.269)	(0.322)	(0.239)	(0.267)	(0.169)
Had antenatal care visit in first trimester of pregnancy (=1)	0.510	0.628	0.508	0.601	0.619	0.664
	(0.500)	(0.483)	(0.500)	(0.490)	(0.486)	(0.473)
Had at least eight (8) antental care visits (=1)	0.197	0.296	0.252	0.388	0.280	0.405
	(0.398)	(0.457)	(0.434)	(0.488)	(0.449)	(0.491)
Birth attended by skilled provider (=1)	0.488	0.758	0.517	0.729	0.617	0.824
	(0.500)	(0.429)	(0.500)	(0.445)	(0.486)	(0.381)
Household asset index, studentized	-0.359	0.273	-0.373	0.299	-0.436	0.228
	(0.950)	(0.929)	(0.967)	(0.942)	(0.998)	(0.926)
Mother is at least high school level (=1)	0.587	0.768	0.614	0.794	0.630	0.802
	(0.492)	(0.422)	(0.487)	(0.405)	(0.483)	(0.399)
Father is at least high school level (=1)	0.525	0.751	0.550	0.763	0.542	0.772
	(0.499)	(0.433)	(0.498)	(0.426)	(0.498)	(0.420)
Per capita LGU income from national transfers (in constant 2000 PhP)	675.8	1,110.6	769.7	1,100.7	886.6	1,155.5
	(365.2)	(711.9)	(435.0)	(657.6)	(557.5)	(676.9)
Per capita LGU income from local sources (in constant 2000 PhP)	192.3	1,051.5	182.3	1,028.2	188.3	1,086.4
	(282.1)	(784.8)	(238.6)	(1,117.3)	(260.4)	(1,138.7)

Note: Authors' calculations using various rounds of NDHS.

Table 4 presents descriptive statistics of the above measures for the starting and end years available in our panel of local governments. As may be expected, city governments are more endowed than municipality governments. On average, about eight in ten barangays in cities have its own health station in 2010, compared to only seven in ten in municipalities, although the ratio has increased quite substantially for municipalities since 2000. In terms of health human resources, there are about seven health professionals per thousand population in cities, while municipalities only have about four per thousand population. Poverty rates are also lower in cities, although both cities and municipalities have seen substantial decline in poverty incidence over the years. Finally, night lights, which are commonly used to proxy for economic activity, are substantially brighter in cities than in municipalities.

Table 4. Descriptive Statistics: Panel local governments

	2000		2010	
	Non-city	City	Non-city	City
A. Proportion of barangays with health stations	0.644	0.800	0.706	0.838
	(0.260)	(0.190)	(0.270)	(0.204)
B. Health human resource per thousand population	3.883	7.132	3.975	7.626
	(2.816)	(3.118)	(2.482)	(3.308)
	1992		2013	
	Non-city	City	Non-city	City
C. Night lights (Digital number)	2.068	11.743	2.616	14.653
	(7.854)	(17.247)	(5.395)	(15.739)
	2000		2012	
	Non-city	City	Non-city	City
D. Poverty headcount ratio	46.413	24.320	30.870	15.400
	(15.820)	(14.832)	(17.132)	(11.198)

Note: Authors' calculations.

4.2. Empirical Strategy

We want to assess the impact of decentralization on the demand for healthcare. In an ideal set-up applied to our data, pregnant women are randomly assigned to treatment (i.e., decentralized healthcare) and control (i.e., centralized healthcare) groups, and the outcomes are observed. In such case, the differences in outcomes may be solely and directly attributed to decentralization since the subjects, in this case pregnant women, have no control over the healthcare system that they receive, and only the treatment assignments are different between the control and treatment groups because of the randomization.

This, however, is far from reality. In the case of the 1991 Local Government Code, decentralization was simultaneously adopted across the whole country, therefore comparing states of centralized and decentralized healthcare may not be directly possible. Further, those local government that have thrived more effectively under decentralization may likely be systematically different in a number of dimensions from other local governments. Thus, differences in outcomes across local governments may actually reflect these differences in characteristics rather than the impact of decentralization. Rather than tackling the problem head-on, we assess the impact of decentralization on the demand for healthcare by leveraging on two key features of the 1991 LGC, that is, first, the allocation of internal

revenue across government units, and, second, the creation of local government units, specifically of cities.

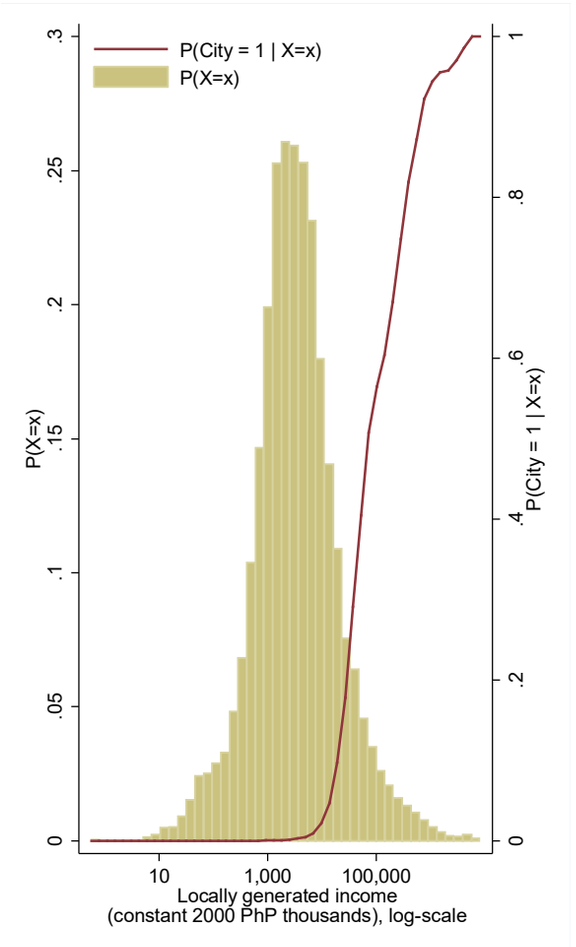
Internal revenue allotments (IRA) are distributed across the different levels of local government: provinces (23%), cities (23%), municipalities (34%), and barangays (20%). Within each level of government, these allotments are further subdivided among individual local governments based on population (50%), land area (25%), and an equal-sharing provision (25%). We focus on cities and municipalities, which are more similar administratively than the other local governments. In 1990, a year before the 1991 LGC was promulgated, there were 60 cities that expected to share among themselves 23 percent of the total IRA, compared to 1,537 municipalities that expected to share 34 percent of the same amount. If all cities and all municipalities have the same population and land area, a city is expected to receive about 0.38 percent of all IRA, while a municipality's share is only roughly at 0.02 percent. That is, there is substantial potential gain in income if a local government transitions from being a municipality to a city. And this ultimately affects the services that a local government may provide to its constituent.

But the creation of local governments, specifically of cities, are not automatic. A municipality or a group of contiguous barangays may only be converted into a city if they meet the minimum requirement for (i) locally generated income, and for either (ii) population or (iii) land area. Between 1990 and 2010, the number of cities had more than doubled with 78 new cities created, while the number of municipalities only declined by 41. Despite this development, cities may still expect a 0.17 percent share in the total IRA, while municipalities still have to contend with their 0.02 percent share if the allotments are divided equally among the same type of local government units.

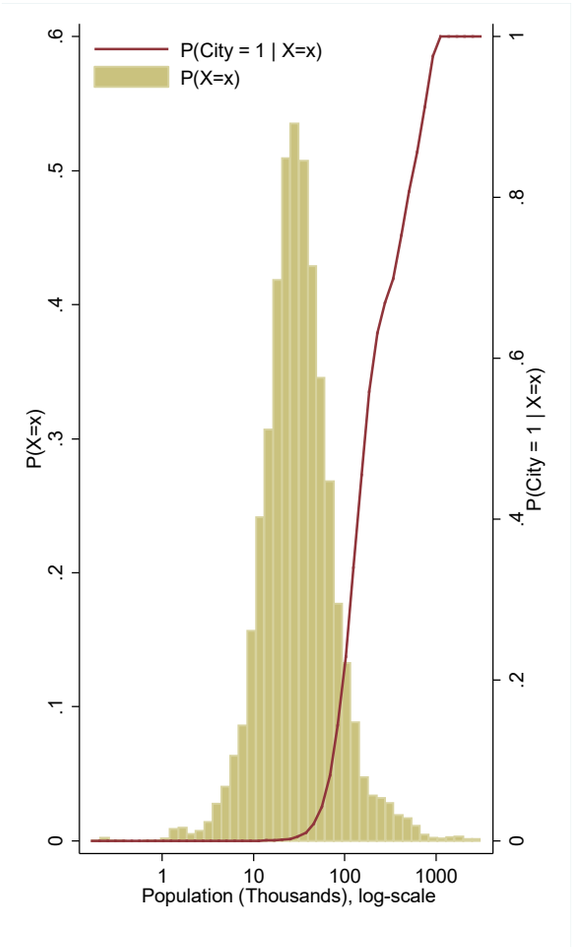
Figure 6 presents the distribution of locally generated government income, population, and land area between 1992 and 2015. In each panel, we superimpose the propensity of a local government to have city-status. In general, cities have higher locally generated income and greater population count as mandated by the 1991 Local Government Code, but land area vary widely from very small (e.g., San Juan City with less than 10 sq. km.) to very large (e.g., Davao City with more than 2,400 sq. km.).

Figure 6. Cityhood and RA 9009 parameters

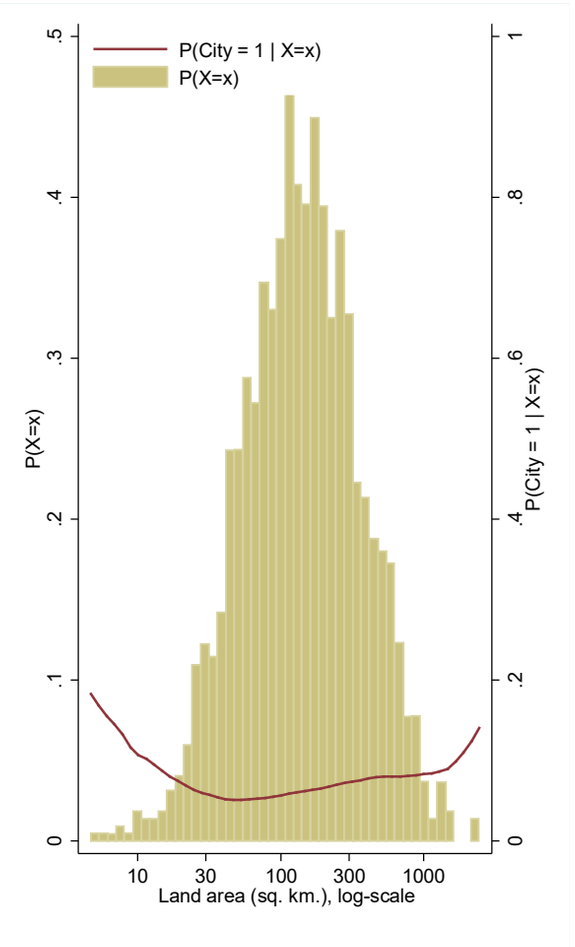
A. Locally generated income



B. Population



C. Land area



Note: Authors' calculations.

In order to assess the impact of decentralization on the demand for antenatal care among women, we instrument national government transfers to local governments, which include IRA, by the city-status of local government units. In our specifications, we control for year, population, land area, and locally generated government income in the main regression models. Since the internal revenue allotment and city-status are based on these variables, the unexplained variation in these two variables after controlling for land area and population (and locally generated income for city-status) in the regression models may be considered as purely random, and therefore should not directly affect the decision of pregnant women regarding antenatal care, but only indirectly through its effect on local government incomes.

Under the Philippines' decentralization law, local governments have the autonomy to decide over the provision of basic services and facilities, including for health, under its jurisdiction, as well as some limited taxation and other income generation powers to finance its operations. Household budget constraints may therefore be relaxed to the extent that increased local government incomes under decentralization leads to greater and more responsive provision of local goods and services, or to increased household incomes from more economic activity.

We first evaluate how city-status affects local government incomes and expenditures using difference-in-differences (DID) by estimating the following regression model:

$$Y_{it} = \tau C_{it} + \alpha N_{it} + \beta L_{it} + \gamma_i + \gamma_t + \epsilon_{it}, \quad (1)$$

where Y_{it} is either log-transformed per capita income or per capita expenditure of local government unit i at period t. The variable C_{it} is a dummy variable for city status that takes on a value of unity if the LGU is a city, and zero if otherwise. The variables N_{it} and L_{it} correspond to (log-transformed) population and (log-transformed) past three-year average locally sourced income, with their corresponding parameters α and β, respectively. The LGU- and period-fixed effects γ_i and γ_t, respectively, capture invariant characteristics within-LGU, such as land features, and within-period, such as equal-share provisions in IRA. We are interested in the DID coefficient τ, which describes how much local government incomes or expenditures have changed as a result of the local government being conferred a city status.

After establishing the impact of cityhood on local government incomes and expenditures, we then proceed to estimate how much national transfers to local governments affect the demand for antenatal care among pregnant women. More specifically, we estimated the following Wald coefficient representation using linear IV/2SLS

$$\phi = \frac{E[A_{mit}|C_{it} = 1, X_{mit}] - E[A_{mit}|C_{it} = 0, X_{mit}]}{E[T_{it}|C_{it} = 1, X_{mit}] - E[T_{it}|C_{it} = 0, X_{mit}]}, \quad (2)$$

where A_{mit} is antenatal care outcome for mother m, T_{it} is logged per capita national transfers to local governments, and X_{mit} is a vector of maternal-, household-, and local government-characteristics, including population, land area, and locally generated government income. The above coefficient captures the weighted average of responses of pregnant women as a result of per capita government transfers increasing from the change in city-status of their local government unit. We look at four indicator outcomes, namely, (i) having antenatal care by a skilled professional, (ii) having antenatal care in the first trimester of pregnancy, (iii) having at least eight antenatal care visits, and (iv) having birth delivered by a skilled birth attendant.

Finally, we take a step back to identify potential mechanisms of how national government transfers may influence antenatal care demand of pregnant women by estimating variations of equation (1), but replacing the outcome measure with (i) proxies for health resources available, and (ii) of economic development, and with (iii) local government spending by sector. Such analyses allow us to assess how local governments respond to a substantial increase in their incomes in light of the devolved set-up and fiscal autonomy under decentralization.

5. Fiscal decentralization and access to healthcare

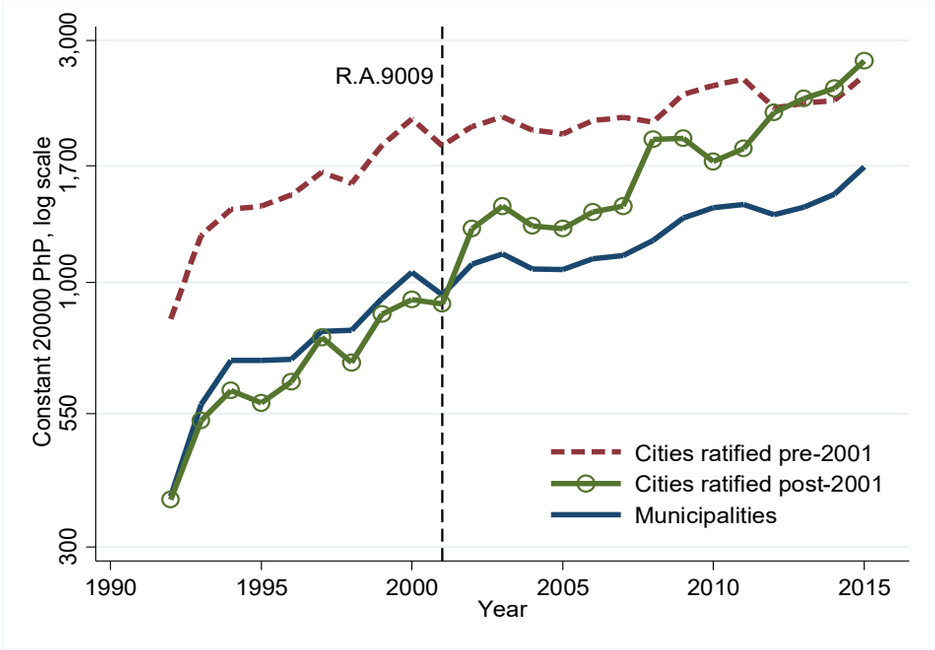
5.1. Cityhood and local government finance

Before formally estimating the association between cityhood, and income and expenditures of local governments, we first explore the relationship graphically. Figure 7 shows the trend in per capita income from local sources and expenditures by LGUs in 1992 to 2015. We group the LGUs into three classes: (i) those municipalities that have never been given city-status; (ii) cities that were ratified before 2001, when the parameters required for granting cityhood was modified by RA 9009; and (iii) those cities ratified under the rules provided in RA 9009. Trends in the averages of both per capita locally generated income and per capita expenditure among LGU classes appear to be moving along the same direction, but at different levels until before 2001. At the turn of the millennium however, as more cities were ratified, the per capita locally generated income and per capita expenditure of the new cities started to break away from the municipality average as it inched towards – then eventually overlapping – that of older cities. The growth in per capita income and expenditures among older cities and never cities, on the other hand, appear to have slowed over the same period, but much more pronounced for older cities.

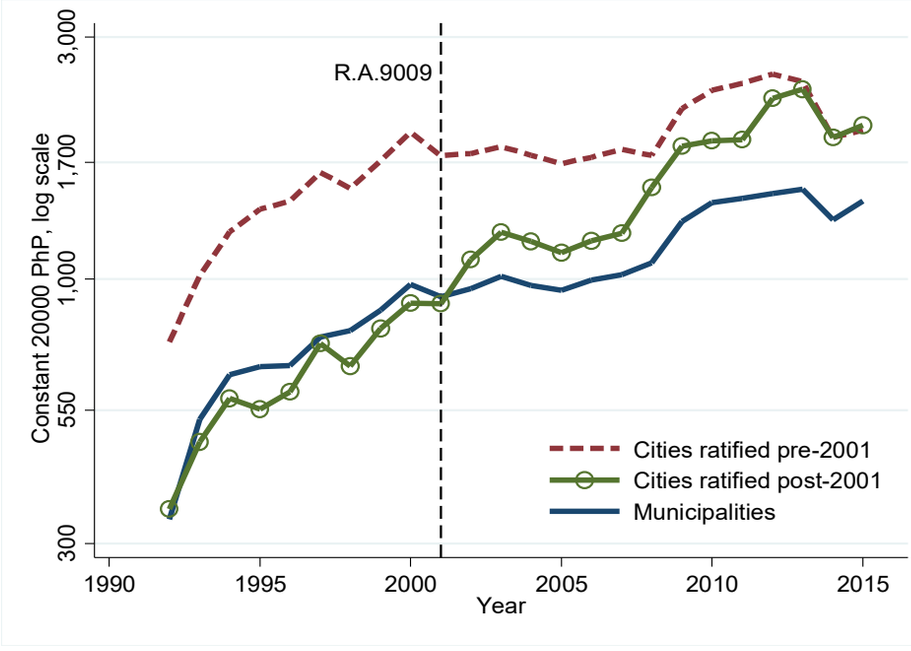
Table 5 then shows our DID estimate of the impact of cityhood on per capita income and expenditure of LGUs following equation (1). We report simple DIDs In Columns (1) and (4). The other columns control for lagged total population and total locally generated income. In Columns (3) and (6), we expand the indicator for city-status to bins of years since cityhood ratification in order to capture potential lagged effects of cityhood. In all specifications, we include year- and local government fixed-effects. The outcomes are in natural logs, thereby allowing us to interpret the DID coefficients as log-points growth in the outcome variable.

Figure 7. Trends in local government income and expenditure

A. Per capita income from local sources



B. Per capita expenditures



Note: Authors' calculations based on DOF-BLGF local government finance statistics.

Table 5. City ratification, and LGU income and expenditure

	Per Capita Income			Per Capita Expenditure		
	(1)	(2)	(3)	(4)	(5)	(6)
City (= 1)	0.562 ***	0.604 ***		0.504 ***	0.546 ***	
	(0.055)	(0.048)		(0.056)	(0.049)	
City (0 < t ≤ 3)			0.609 ***			0.535 ***
			(0.058)			(0.053)
City (3 < t ≤ 6)			0.624 ***			0.574 ***
			(0.047)			(0.047)
City (6 < t ≤ 9)			0.642 ***			0.561 ***
			(0.051)			(0.058)
City (9 < t)			0.543 ***			0.518 ***
			(0.051)			(0.064)
Local Income (t-1), ln		0.067 ***	0.067 ***		0.071 ***	0.071 ***
		(0.009)	(0.009)		(0.010)	(0.010)
Population (t-1), ln		-0.71 ***	-0.708 ***		-0.746 ***	-0.746 ***
		(0.075)	(0.075)		(0.068)	(0.069)
Observations	38,041	32,438	32,438	38,041	32,438	32,438
Adjusted R-sq.	0.739	0.664	0.665	0.667	0.564	0.564
F-test			11.605 ***			1.523

Note: Authors' calculations. Year- and local government fixed-effects are included in all specifications. The F statistic tests the hypothesis that the coefficients for the interaction between the city and the years since ratification dummy variables are all equal to zero.

Overall, Table 5 confirms our conjecture that cityhood increases local government income, and, therefore, their capacity to provide services, which are proxied by their expenditures. On average, a new city may expect to benefit from about 60 log-points (ca. 80 percent) increase in its income per capita, which allows them to spend 55 log-points (ca. 70 percent) more per capita relative to their baseline expenditure. Together, these estimates translate to about 0.9 income elasticity of local government expenditures, i.e. local governments increase their expenditure by roughly 0.9 percent for every percent increase in their income. Our elasticity estimate closely matches earlier estimates for the Philippines (e.g. Canare, 2016), but relatively higher than estimates in cross-country studies (e.g. Wahab, 2004; Bruckner, et. al., 2012).

We ran standard placebo tests, including randomizing city-status among government units, moving the year of city ratification, and using rainfall as outcome, in order to assess the validity of our DID estimates. In all of the tests we conducted, the placebo DID coefficients are not statistically significant at conventional alpha-levels. These results lend support to the credibility of our estimated associations that the results we presented are not driven by unobserved factors that may be correlated with cityhood. We provide details of the placebo tests in the Annex.

5.2. Decentralization and antenatal care

Given the expected increase in income when local governments transition to cityhood, we now explore the differentiated association, if any, of local government income by source, i.e., whether national transfers or locally generated, on antenatal care. While it may be argued that local government income is largely fungible (e.g., Bossert and Beauvais, 2002), evidences from the literature (e.g., Hines and Thaler, 1995; Thaler, 1990; Inman, 2016) suggest that the sources of income matter. Indeed, local governments may be more willing to spend external grants than the same amount raised from local sources.

Table 6 presents our IV/2SLS estimates of the association between local government income by source and antenatal care. We also provide estimates using ordinary least squares as reference. We successively add control variables in each column to assess the robustness of our estimates. In Columns (1) and (4), we only control for locally generated income and population, which allows us to use cityhood status of local governments as instrument. In Columns (2) and (5), we add household asset index, and the parents' educational attainments and ages at time of pregnancy as proxies for household's socioeconomic status. In Columns (3) and (6), we controlled additionally for child's birth order to account for potential learning among mothers; and years since pregnancy at the time of the survey to capture potential recall bias. We also include indicator variables for whether the mother is a smoker to capture risk-taking behavior; whether the child was wanted at the time of pregnancy as proxy for unmet family need; and whether any household member is covered by health insurance, and whether the household is a beneficiary of the governments' conditional cash transfer program as controls for additional resources available to households. In all of the models, we include year- and local government-fixed effects.

Table 6. LGU income source and antenatal care

	OLS			IV/2SLS		
	(1)	(2)	(3)	(4)	(5)	(6)
A. Had antenatal care by skilled professional						
National transfers, ln	-0.026 **	-0.009	-0.011	-0.036 ***	-0.029 ***	-0.030 ***
	(0.011)	(0.011)	(0.011)	(0.008)	(0.008)	(0.008)
Local Income (t-1), ln	0.073 ***	0.053 ***	0.051 ***	0.074 ***	0.055 ***	0.053 ***
	(0.006)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
Population (t-1), ln	-0.08 ***	-0.076 ***	-0.071 ***	-0.073 ***	-0.061 ***	-0.056 ***
	(0.016)	(0.015)	(0.014)	(0.008)	(0.008)	(0.008)
Observations	14,644	13,646	13,598	14,644	13,646	13,598
Weak identification F				10,984	10,409	10,392
Underidentification F				3,170	3,027	3,011
Adjusted R-sq.	0.074	0.153	0.166	0.071	0.149	0.163
B. Had antenatal visit in first trimester of pregnancy						
National transfers, ln	-0.04 ***	-0.012	-0.011	-0.068 ***	-0.057 ***	-0.053 ***
	(0.012)	(0.012)	(0.012)	(0.015)	(0.015)	(0.015)
Local Income (t-1), ln	0.062 ***	0.038 ***	0.034 ***	0.063 ***	0.041 ***	0.037 ***
	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)
Population (t-1), ln	-0.023	-0.034 **	-0.029 **	-0.002	0	0.003
	(0.014)	(0.013)	(0.013)	(0.014)	(0.015)	(0.014)
Observations	13,943	13,007	12,959	13,943	13,007	12,959
Weak identification F				10,446	9,919	9,904
Underidentification F				3,030	2,898	2,882
Adjusted R-sq.	0.038	0.082	0.100	0.034	0.077	0.096

Note: Authors' calculations. Year- and local government fixed-effects are included in all specifications. Columns (2) and (5) include controls for household asset index, parents' educational attainments and mother's age at time of pregnancy. Columns (3) and (6) additionally controls for child birth order, years of recall from survey year, and indicator variable if whether the mother is a tobacco user, if the child is wanted at the time of pregnancy, and if the any member of the household is covered by health insurance or by the government's conditional cash transfer program. National transfers are instrumented by city status of local government. The weak- and under-identification F statistics test, respectively, the hypothesis that the IV/2SLS system of equation is weakly or under-identified. The F statistics are all highly statistically significant.

Table 6. LGU income source and antenatal care (continued)

	OLS			IV/2SLS		
	(1)	(2)	(3)	(4)	(5)	(6)
C. Had at least eight (8) antenatal care visits						
National transfers, ln	-0.067 ***	-0.042 ***	-0.042 ***	-0.047 ***	-0.042 ***	-0.041 ***
	(0.011)	(0.012)	(0.012)	(0.014)	(0.014)	(0.014)
Local Income (t-1), ln	0.055 ***	0.026 ***	0.024 ***	0.054 ***	0.026 ***	0.024 ***
	(0.005)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)
Population (t-1), ln	0.025 **	0.018 *	0.022 **	0.009	0.018	0.021 *
	(0.012)	(0.010)	(0.010)	(0.013)	(0.013)	(0.013)
Observations	14,612	13,617	13,564	14,612	13,617	13,564
Weak identification F				10,977	10,397	10,362
Underidentification F				3,167	3,023	3,004
Adjusted R-sq.	0.048	0.137	0.149	0.044	0.134	0.145
D. Delivery by skilled birth attendant						
National transfers, ln	-0.116 ***	-0.064 ***	-0.064 ***	-0.044 ***	-0.032 ***	-0.032 ***
	(0.018)	(0.016)	(0.016)	(0.011)	(0.011)	(0.011)
Local Income (t-1), ln	0.122 ***	0.065 ***	0.06 ***	0.118 ***	0.063 ***	0.058 ***
	(0.007)	(0.006)	(0.006)	(0.003)	(0.003)	(0.003)
Population (t-1), ln	-0.016	-0.02	-0.012	-0.072 ***	-0.045 ***	-0.037 ***
	(0.022)	(0.018)	(0.018)	(0.011)	(0.010)	(0.010)
Observations	20,495	19,304	19,233	20,495	19,304	19,233
Weak identification F				15,053	14,529	14,465
Underidentification F				4,433	4,289	4,271
Adjusted R-sq.	0.129	0.301	0.312	0.124	0.299	0.309

Note: Authors' calculations. Year- and local government fixed-effects are included in all specifications. Columns (2) and (5) include controls for household asset index, parents' educational attainments and mother's age at time of pregnancy. Columns (3) and (6) additionally controls for child birth order, years of recall from survey year, and indicator variable if whether the mother is a tobacco user, if the child is wanted at the time of pregnancy, and if the any member of the household is covered by health insurance or by the government's conditional cash transfer program. National transfers are instrumented by city status of local government. The weak- and under-identification F statistics test, respectively, the hypothesis that the IV/2SLS system of equation is weakly or under-identified. The F statistics are all highly statistically significant.

The results presented in Table 6 suggest that the income source of local governments is relevant in capturing variations in antenatal care by pregnant women. More specifically, higher locally generated income by local governments appear to be consistently associated with higher use of antenatal care, even after for controlling for a battery of household-, parents-, child-, and community-specific characteristics. However, the table also shows that higher transfers from the central to local governments are negatively correlated with antenatal care demand. These generalizations appear to be consistent regardless of the antenatal care outcome that we examined. Our results on the effect of transfers contradict earlier estimates for the Philippines (e.g., Maccini, 2006), which generally show that national government grants are beneficial to improving health outcomes, and instead support casual claims that the Philippine decentralization experiment has negatively impacted the country's health system.

We tried to unpack this conundrum by looking at the relationship between national transfers, and proxies for local health service delivery, and local development. We also assess how marginal transfers are used by local government units in order to identify potential mechanisms to explain our results.

5.3. Decentralization and local development

We first look at the impact of city ratification on night light intensity and poverty incidence. As we have shown earlier, the grant of city-status to a local government is associated with greater local government income, which allows them to expand their services. This, in turn, is expected to positively affect household welfare. Night light intensity have been often used to proxy for economic activity (e.g. Henderson, et. al., 2012). Poverty incidence, on the other hand, provides a more direct measure of household welfare at the local level.

Table 7 shows our estimation results. Overall, it appears that cityhood does not correlate with greater economic activity, as measured by night lights intensity, and poverty incidence, especially at the immediate term. In the longer term, city ratification is associated with higher poverty incidence, which may be a consequence of a confluence of agglomeration factors. Interestingly, higher locally generated income is associated with greater local economic activity, but not poverty incidence.

Table 7. City ratification and local development

	Night lights			Poverty incidence (%)		
	(1)	(2)	(3)	(4)	(5)	(6)
City (= 1)	-0.013	-0.027		1.824 *	1.766	
	(0.035)	(0.026)		(1.073)	(1.065)	
City (0 < t ≤ 3)			-0.017			0.911
			(0.017)			(1.198)
City (3 < t ≤ 6)			-0.023			1.386
			(0.026)			(1.071)
City (6 < t ≤ 9)			-0.020			3.791 **
			(0.037)			(1.508)
City (9 < t)			-0.056			4.531 **
			(0.047)			(2.012)
Local Income (t-1), ln		0.018 ***	0.018 ***		0.048	0.034
		(0.006)	(0.006)		(0.307)	(0.307)
Population (t-1), ln		-0.072	-0.071		3.493	3.296
		(0.063)	(0.063)		(3.970)	(3.980)
Observations	34,628	29,008	29,008	7,917	7,770	7,770
Adjusted R-sq.	0.278	0.178	0.178	0.384	0.393	0.394
F-test			0.896			2.956 **

Note: Authors' calculations. Year- and local government fixed-effects are included in all specifications. The F statistic tests the hypothesis that the coefficients for the interaction between the city and the years since ratification dummy variables are all equal to zero.

5.4. Decentralization and government health service delivery

We then turn to the delivery of health services within local government units. We looked at two proxies, namely, the share of barangays with health stations, and the supply of human resources for health. Again, the expectation is that with greater incomes from city ratification, local governments will be able to expand its capacity to provide health services. However, results presented in Table 8 show that city ratification on average does not lead to the establishment of more barangay health centers or to greater supply of health workers. Further, the estimates suggest that greater locally generated income is also not associated with greater availability of health services in cities and municipalities.

Arguably, the measures that we used may be poor proxies for health service delivery. For instance, they are only able to capture the effect of city ratification on the extent of health services that can be provided by government units. A more relevant measure for health service delivery could be the intensity of spending on health per person at the local level. That is, local government units may not be building more facilities or hiring more health workers, but are spending more per person given their supply constraints.

Table 8. City ratification and local government health service delivery

	Share of barangays with BHS			HRH per thousand population, log		
	(1)	(2)	(3)	(4)	(5)	(6)
City (= 1)	-0.005	-0.002		0.017	0.009	
	(0.026)	(0.026)		(0.043)	(0.043)	
City (0 < t ≤ 3)			-0.006			-0.039
			(0.040)			(0.046)
City (3 < t ≤ 6)			-0.019			-0.06
			(0.029)			(0.050)
City (6 < t ≤ 9)			0.015			0.118
			(0.033)			(0.083)
City (9 < t)			-0.014			-0.051
			(0.034)			(0.051)
Local Income (t-1), ln		-0.003	-0.003		0.01	0.009
		(0.008)	(0.009)		(0.046)	(0.046)
Population (t-1), ln		-0.047	-0.046		0.182	0.185
		(0.055)	(0.055)		(0.158)	(0.159)
Observations	3,126	3,102	3,102	3,127	3,103	3,103
Adjusted R-sq.	0.096	0.094	0.093	0.035	0.035	0.034
F-test			0.238			1.202

Note: Authors' calculations. Year- and local government fixed-effects are included in all specifications. The F statistic tests the hypothesis that the coefficients for the interaction between the city and the years since ratification dummy variables are all equal to zero.

Table 9. City ratification and local government expenditure by type, 2000-2008

			Per Capita Expenditure by Type					
	Per Capita Income	Per Capita Expenditure	General Public Services	Education	Health, Nutrition and Population	Labor and Employment	Social Services and Welfare	Economic Services
A. Constant τ								
City (= 1)	0.694 ***	0.587 ***	0.49 ***	0.22 ***	-0.040	0.265	0.371 ***	0.198 **
	(0.063)	(0.058)	(0.068)	(0.078)	(0.079)	(0.162)	(0.096)	(0.095)
Local Income (t-1), ln	0.010 **	0.026 ***	0.008	0.106 ***	0.033	0.015	0.069 *	0.112 ***
	(0.005)	(0.009)	(0.007)	(0.038)	(0.026)	(0.012)	(0.037)	(0.036)
Population (t-1), ln	-0.364 ***	-0.36 **	-0.258 *	0.042	-0.55	0.234	-0.269	-0.248
	(0.101)	(0.137)	(0.147)	(0.283)	(0.368)	(0.151)	(0.261)	(0.196)
Observations	14,104	14,104	12,588	12,588	12,588	12,588	12,588	12,588
Adjusted R-sq.	0.308	0.095	0.07	0.007	0.009	0.108	0.011	0.008
B. Time-varying τ								
City ($0 < t \leq 3$)	0.694 ***	0.568 ***	0.452 ***	0.221 ***	-0.031	0.259	0.314 ***	0.202 **
	(0.069)	(0.061)	(0.070)	(0.073)	(0.079)	(0.163)	(0.094)	(0.097)
City ($3 < t \leq 6$)	0.705 ***	0.639 ***	0.622 ***	0.215 *	-0.056	0.309 *	0.574 ***	0.189
	(0.058)	(0.057)	(0.067)	(0.118)	(0.098)	(0.185)	(0.141)	(0.128)
City ($6 < t \leq 9$)	0.654 ***	0.56 ***	0.563 ***	0.205 *	-0.152	0.199	0.436 **	0.182
	(0.055)	(0.062)	(0.072)	(0.119)	(0.125)	(0.186)	(0.179)	(0.121)
City ($9 < t$)	0.608 ***	0.502 ***	0.578 ***	0.168	-0.141	0.389	0.483 **	0.193
	(0.053)	(0.054)	(0.075)	(0.182)	(0.113)	(0.270)	(0.187)	(0.171)
Local Income (t-1), ln	0.01 **	0.026 ***	0.007	0.106 ***	0.034	0.014	0.067 *	0.112 ***
	(0.005)	(0.009)	(0.007)	(0.038)	(0.026)	(0.012)	(0.037)	(0.036)
Population (t-1), ln	-0.362 ***	-0.36 **	-0.266 *	0.044	-0.542	0.234	-0.278	-0.247
	(0.101)	(0.137)	(0.146)	(0.284)	(0.368)	(0.152)	(0.262)	(0.196)
Observations	14,104	14,104	12,588	12,588	12,588	12,588	12,588	12,588
Adjusted R-sq.	0.309	0.096	0.073	0.007	0.009	0.108	0.012	0.008

Note: Authors' calculations. Year- and local government fixed-effects are included in all specifications.

Table 10. City ratification and local government expenditure by type, 2009-2015

			Per Capita Expenditure by Type					
	Per Capita Income	Per Capita Expenditure	General Public Services	Education	Health, Nutrition and Population	Labor and Employment	Social Services and Welfare	Economic Services
A. Constant τ								
City (= 1)	0.407 ***	0.369 **	0.346 ***	0.265 *	0.085	0.074	0.146	0.406 ***
	(0.119)	(0.146)	(0.095)	(0.134)	(0.158)	(0.187)	(0.344)	(0.150)
Local Income (t-1), ln	-0.003	0.027 ***	-0.001	0.087 ***	0.005	-0.002	0.02	0.015
	(0.008)	(0.010)	(0.006)	(0.032)	(0.022)	(0.011)	(0.049)	(0.020)
Population (t-1), ln	-1.099 ***	-1.148 ***	-1.182 ***	-0.660 *	-1.034 **	-0.036	-1.419 **	-1.041 **
	(0.269)	(0.259)	(0.217)	(0.354)	(0.439)	(0.135)	(0.610)	(0.437)
Observations	11,124	11,124	11,124	11,123	11,124	11,125	11,124	11,124
Adjusted R-sq.	0.215	0.114	0.074	0.016	0.025	0.019	0.071	0.019
B. Time-varying τ								
City (0 < t ≤ 3)	0.391 ***	0.363 **	0.334 ***	0.245 *	0.073	0.082	0.13	0.397 **
	(0.122)	(0.148)	(0.096)	(0.136)	(0.159)	(0.188)	(0.344)	(0.154)
City (3 < t ≤ 6)	0.647 ***	0.453 ***	0.502 ***	0.481 **	0.258	0.007	0.393	0.543 ***
	(0.135)	(0.146)	(0.116)	(0.216)	(0.211)	(0.190)	(0.345)	(0.156)
City (6 < t ≤ 9)	0.872 ***	0.546 ***	0.576 ***	0.355	0.297	0.222	0.566	0.574 ***
	(0.142)	(0.165)	(0.146)	(0.297)	(0.220)	(0.221)	(0.392)	(0.160)
City (9 < t)	0.838 ***	0.521 ***	0.561 ***	0.219	0.36	0.202	0.593	0.615 ***
	(0.138)	(0.162)	(0.142)	(0.295)	(0.237)	(0.217)	(0.405)	(0.189)
Local Income (t-1), ln	-0.003	0.027 ***	-0.001	0.087 ***	0.005	-0.003	0.02	0.015
	(0.007)	(0.010)	(0.006)	(0.032)	(0.022)	(0.011)	(0.049)	(0.020)
Population (t-1), ln	-1.114 ***	-1.153 ***	-1.189 ***	-0.654 *	-1.046 **	-0.04	-1.436 **	-1.049 **
	(0.267)	(0.260)	(0.216)	(0.353)	(0.438)	(0.136)	(0.611)	(0.436)
Observations	11,124	11,124	11,124	11,123	11,124	11,125	11,124	11,124
Adjusted R-sq.	0.230	0.115	0.078	0.016	0.026	0.020	0.072	0.019

Note: Authors' calculations. Year- and local government fixed-effects are included in all specifications.

5.5. Decentralization and local government spending pattern

Table 9 and 10 present estimates of the impact of city ratification on local government incomes and expenditures. The outcomes are all log-transformed to facilitate interpretation of the estimated coefficients. We provide separate estimates for 2000 to 2008, and for 2009 to 2015 because of a break in how the DILG-BLGF defines expenditure classes in these two periods. In any case, the qualitative interpretation of the estimates appears to be consistent over these two horizons.

The results on per capita income and per capita expenditure are consistent with our full-sample estimates (Table 5). However, the estimates in Tables 9 and 10 suggest that the marginal growth in local government incomes and expenditures are greater for those cities that were created earlier. More specifically, the results suggest that the cities created between 2000 and 2008 (Table 9) resulted in about 70 log-points (ca. 100 percent) increase in their per capita income, and a 60 log-points (ca. 80 percent) growth in their per capita expenditures. On the other hand, cities that were created in 2009 to 2015 (Table 10) saw only an increase of about 40 log-points (ca. 50 percent) increase in both their per capita income and per capita expenditures. Despite this wide margin, the more recently created cities were more effective in translating their marginal incomes into greater services, with their implied income elasticity being 0.9 compared to those by earlier created cities of 0.8.

By and large, the results we presented so far show that the link between greater national transfers to local governments, and local antenatal care outcomes is weak. While we have shown that city ratification leads to greater local government incomes and spending, we found no evidence that this actually leads to greater health service delivery by local governments. Indeed, when we disaggregate local government spending by its components, we see that per capita expenditures on health services is not affected by the overall budgetary expansion. This correlates squarely with our earlier results that local health service delivery is not affected by the granting of city-status to local government units. Further, our results suggest that city ratification does not lead to greater economic activity or to lower poverty rates, at least in the immediate term.

While the results suggest that we should expect a weak link between national-to-local transfers and health outcomes, these results do not necessarily explain why greater transfers depresses health care demand. What other factors could potentially be driving our results?

6. Inter-jurisdictional interaction in healthcare

The estimates we have presented so far assume that local government units do not interact with each other. This may be an unrealistic assumption especially among local government units that are in close proximity with each other. For instance, several studies (e.g., Capuno and Solon, 1996) have documented inter-jurisdictional spillovers in the demand for healthcare, where some populations living in a local government unit receive public healthcare provided by other local government units. Indeed, local government spending on health services has been shown to be affected by the decisions made by neighboring local governments units (Kelekar, 2012; Kelekar and Llanto, 2014). This real-world artifact may potentially bias our estimates to the extent that city-ratification directly impacts the decisions made by other government units.

In order to account for this potential confounder, we modify our earlier empirical models by introducing within-province neighbor averages of national-to-local government transfers, locally sourced income, and population as additional control variables. Following the general strategy proposed by Kelejian and Prucha (1999), we instrumented average provincial transfers with the proportion of cities among neighboring government units within provinces. Similar to our earlier

argument on using city-status as instrument for national government transfers, the unexplained variations in the proportion of cities within province may be seen as purely by chance once within-province neighbor averages of locally sourced income and population are taken into account.

6.1. Spatial interaction in antenatal care

Table 11 presents our estimation results where inter-jurisdictional spillovers are taken into account. Several observations are apparent. First, our results suggest that increasing national transfers is not associated with improved antenatal care demand among pregnant women living within the boundaries of the government unit once inter-jurisdictional spillovers have been factored in. This is in contrast to our earlier estimates which appear to suggest that increasing national transfers to local governments lead to poorer healthcare demand outcomes (Table 6), and more in line with our other results that greater local government incomes from cityhood do not correlate with greater health service delivery (Tables 7 to 10).

Second, increasing the average national transfers to neighboring local government units leads to lower antenatal care demand among pregnant women. This result highlights the role of inter-jurisdictional spillovers on health outcomes. That is, household healthcare decisions are affected not just by conditions within their immediate community, but in neighboring communities as well. Based on our estimates, a one-percent increase in average national transfers to neighboring local government units is associated with about 0.1 percentage point drop in the propensity of a pregnant mother having antenatal care by a skilled professional. It is also associated with lower propensity of having antenatal care within the first trimester of pregnancy by about 0.1 percentage point.

Table 11. Inter-jurisdictional interactions in antenatal care

	OLS			IV/2SLS		
	(1)	(2)	(3)	(4)	(5)	(6)
A. Had antenatal care by skilled professional						
Own-LGU						
National transfers, ln	-0.018	-0.007	-0.008	-0.004	-0.005	-0.008
	(0.011)	(0.013)	(0.012)	(0.010)	(0.010)	(0.010)
Local Income (t-1), ln	0.048 ***	0.034 ***	0.033 ***	0.046 ***	0.034 ***	0.033 ***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Population (t-1), ln	-0.048 ***	-0.046 ***	-0.042 ***	-0.061 ***	-0.051 ***	-0.045 ***
	(0.014)	(0.013)	(0.012)	(0.009)	(0.009)	(0.009)
Neighbor-LGU average						
National transfers, ln	-0.034	-0.010	-0.012	-0.124 ***	-0.102 ***	-0.097 ***
	(0.022)	(0.023)	(0.023)	(0.022)	(0.022)	(0.022)
Local Income (t-1), ln	0.076 ***	0.061 ***	0.059 ***	0.085 ***	0.069 ***	0.067 ***
	(0.011)	(0.010)	(0.010)	(0.006)	(0.006)	(0.006)
Population (t-1), ln	-0.116 ***	-0.105 ***	-0.101 ***	-0.057 ***	-0.047 ***	-0.047 ***
	(0.028)	(0.025)	(0.024)	(0.016)	(0.016)	(0.016)
Observations	14,343	13,389	13,341	14,343	13,389	13,341
Weak identification F				1,597	1,416	1,412
Underidentification F				2,285	2,091	2,095
Adjusted R-sq.	0.097	0.167	0.179	0.09	0.159	0.172

Note: Authors' calculations. Year- and local government fixed-effects are included in all specifications. Columns (2) and (5) include controls for household asset index, parents' educational attainments and mother's age at time of pregnancy. Columns (3) and (6) additionally controls for child birth order, years of recall from survey year, and indicator variable if whether the mother is a tobacco user, if the child is wanted at the time of pregnancy, and if the any member of the household is covered by health insurance or by the government's conditional cash transfer program. Neighbor-LGU refer to local governments within provinces. National transfers are instrumented by city status of local government. Neighbor-LGU averages are instrumented by the proportion of cities in provinces. The weak- and under-identification F statistics test, respectively, the hypothesis that the IV/2SLS system of equation is weakly or under-identified. The F statistics are all highly statistically significant.

Table 11. Inter-jurisdictional interactions in antenatal care (continued)

	OLS			IV/2SLS		
	(1)	(2)	(3)	(4)	(5)	(6)
B. Had antenatal visit in first trimester of pregnancy						
Own-LGU						
National transfers, ln	-0.016	0.004	0.003	-0.022	-0.023	-0.022
	(0.015)	(0.016)	(0.016)	(0.018)	(0.018)	(0.018)
Local Income (t-1), ln	0.042 ***	0.022 ***	0.02 ***	0.042 ***	0.025 ***	0.023 ***
	(0.006)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
Population (t-1), ln	-0.028	-0.037 ***	-0.031 **	-0.026	-0.02	-0.014
	(0.017)	(0.014)	(0.013)	(0.017)	(0.017)	(0.017)
Neighbor-LGU average						
National transfers, ln	-0.02	0.018	0.018	-0.155 ***	-0.114 ***	-0.096 **
	(0.022)	(0.026)	(0.026)	(0.042)	(0.043)	(0.043)
Local Income (t-1), ln	0.045 ***	0.032 ***	0.029 ***	0.055 ***	0.042 ***	0.038 ***
	(0.010)	(0.010)	(0.009)	(0.008)	(0.009)	(0.009)
Population (t-1), ln	-0.033 *	-0.038 **	-0.037 **	0.052 *	0.042	0.032
	(0.019)	(0.019)	(0.018)	(0.031)	(0.032)	(0.032)
Observations	13,653	12,761	12,713	13,653	12,761	12,713
Weak identification F				1,480	1,317	1,315
Underidentification F				2,139	1,970	1,974
Adjusted R-sq.	0.042	0.085	0.104	0.035	0.077	0.096

Note: Authors' calculations. Year- and local government fixed-effects are included in all specifications. Columns (2) and (5) include controls for household asset index, parents' educational attainments and mother's age at time of pregnancy. Columns (3) and (6) additionally controls for child birth order, years of recall from survey year, and indicator variable if whether the mother is a tobacco user, if the child is wanted at the time of pregnancy, and if the any member of the household is covered by health insurance or by the government's conditional cash transfer program. Neighbor-LGU refer to local governments within provinces. National transfers are instrumented by city status of local government. Neighbor-LGU averages are instrumented by the proportion of cities in provinces. The weak- and under-identification F statistics test, respectively, the hypothesis that the IV/2SLS system of equation is weakly or under-identified. The F statistics are all highly statistically significant.

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Table 11. Inter-jurisdictional interactions in antenatal care (continued)

	OLS			IV/2SLS		
	(1)	(2)	(3)	(4)	(5)	(6)
C. Had at least eight (8) antenatal care visits						
Own-LGU						
National transfers, ln	-0.030 **	-0.016	-0.016	-0.016	-0.023	-0.023
	(0.015)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Local Income (t-1), ln	0.035 ***	0.011 *	0.009	0.033 ***	0.011 ***	0.010 **
	(0.007)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)
Population (t-1), ln	0.004	0.001	0.005	-0.006	0.007	0.012
	(0.016)	(0.012)	(0.013)	(0.016)	(0.016)	(0.015)
Neighbor-LGU average						
National transfers, ln	-0.085 **	-0.041	-0.045	-0.067 *	-0.02	-0.013
	(0.033)	(0.033)	(0.034)	(0.040)	(0.041)	(0.040)
Local Income (t-1), ln	0.044 ***	0.03 ***	0.029 ***	0.043 ***	0.027 ***	0.025 ***
	(0.011)	(0.009)	(0.009)	(0.007)	(0.007)	(0.007)
Population (t-1), ln	0.03	0.022	0.025	0.02	0.008	0.004
	(0.029)	(0.025)	(0.025)	(0.029)	(0.029)	(0.029)
Observations	14,315	13,364	13,312	14,315	13,364	13,312
Weak identification F				1,594	1,413	1,408
Underidentification F				2,287	2,093	2,094
Adjusted R-sq.	0.054	0.142	0.153	0.051	0.139	0.15

Note: Authors' calculations. Year- and local government fixed-effects are included in all specifications. Columns (2) and (5) include controls for household asset index, parents' educational attainments and mother's age at time of pregnancy. Columns (3) and (6) additionally controls for child birth order, years of recall from survey year, and indicator variable if whether the mother is a tobacco user, if the child is wanted at the time of pregnancy, and if the any member of the household is covered by health insurance or by the government's conditional cash transfer program. Neighbor-LGU refer to local governments within provinces. National transfers are instrumented by city status of local government. Neighbor-LGU averages are instrumented by the proportion of cities in provinces. The weak- and under-identification F statistics test, respectively, the hypothesis that the IV/2SLS system of equation is weakly or under-identified. The F statistics are all highly statistically significant.

Table 11. Inter-jurisdictional interactions in antenatal care (continued)

	OLS			IV/2SLS		
	(1)	(2)	(3)	(4)	(5)	(6)
D. Delivery by skilled birth attendant						
Own-LGU						
National transfers, ln	-0.060 ***	-0.029	-0.029	0.007	-0.005	-0.007
	(0.021)	(0.018)	(0.018)	(0.013)	(0.012)	(0.012)
Local Income (t-1), ln	0.087 ***	0.042 ***	0.039 ***	0.081 ***	0.04 ***	0.037 ***
	(0.009)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)
Population (t-1), ln	-0.027	-0.028	-0.022	-0.079 ***	-0.045 ***	-0.038 ***
	(0.032)	(0.023)	(0.023)	(0.012)	(0.012)	(0.012)
Neighbor-LGU average						
National transfers, ln	-0.196 ***	-0.113 ***	-0.117 ***	-0.144 ***	-0.054 *	-0.044
	(0.048)	(0.033)	(0.034)	(0.029)	(0.028)	(0.028)
Local Income (t-1), ln	0.093 ***	0.061 ***	0.058 ***	0.091 ***	0.057 ***	0.052 ***
	(0.017)	(0.015)	(0.015)	(0.006)	(0.006)	(0.006)
Population (t-1), ln	0.01	0.001	0.01	-0.014	-0.032	-0.032
	(0.048)	(0.034)	(0.034)	(0.022)	(0.021)	(0.021)
Observations	20,076	18,938	18,867	20,076	18,938	18,867
Weak identification F				2,150	1,944	1,942
Underidentification F				3,210	2,974	2,976
Adjusted R-sq.	0.145	0.310	0.320	0.138	0.307	0.316

Note: Authors' calculations. Year- and local government fixed-effects are included in all specifications. Columns (2) and (5) include controls for household asset index, parents' educational attainments and mother's age at time of pregnancy. Columns (3) and (6) additionally controls for child birth order, years of recall from survey year, and indicator variable if whether the mother is a tobacco user, if the child is wanted at the time of pregnancy, and if the any member of the household is covered by health insurance or by the government's conditional cash transfer program. Neighbor-LGU refer to local governments within provinces. National transfers are instrumented by city status of local government. Neighbor-LGU averages are instrumented by the proportion of cities in provinces. The weak- and under-identification F statistics test, respectively, the hypothesis that the IV/2SLS system of equation is weakly or under-identified. The F statistics are all highly statistically significant.

Table 12. Inter-jurisdictional interaction and local government finance

	Per Capita Income			Per Capita Expenditure		
	(1)	(2)	(3)	(4)	(5)	(6)
Own-LGU						
City (= 1)	0.585 ***	0.611 ***		0.529 ***	0.555 ***	
	(0.051)	(0.046)		(0.050)	(0.046)	
City (0 < t ≤ 3)			0.604 ***			0.530 ***
			(0.059)			(0.053)
City (3 < t ≤ 6)			0.629 ***			0.580 ***
			(0.046)			(0.046)
City (6 < t ≤ 9)			0.651 ***			0.572 ***
			(0.048)			(0.054)
City (9 < t)			0.565 ***			0.547 ***
			(0.041)			(0.053)
Local Income (t-1), ln		0.068 ***	0.068 ***		0.072 ***	0.072 ***
		(0.009)	(0.009)		(0.010)	(0.010)
Population (t-1), ln		-0.713 ***	-0.712 ***		-0.749 ***	-0.748 ***
		(0.079)	(0.079)		(0.073)	(0.073)
Neighbor-LGU average						
City (= 1)	-0.487 ***	-0.449 ***	-0.433 ***	-0.512 ***	-0.511 ***	-0.512 ***
	(0.101)	(0.092)	(0.086)	(0.101)	(0.109)	-0.105
Local Income (t-1), ln		-0.009	-0.009		-0.007	-0.007
		(0.016)	(0.016)		(0.018)	(0.018)
Population (t-1), ln		0.054	0.054		0.048	0.048
		(0.048)	(0.048)		(0.047)	(0.047)
Observations	37,968	32,370	32,370	37,968	32,370	32,370
Adjusted R-sq.	0.742	0.667	0.667	0.669	0.567	0.567
F-test			10.008 ***			1.494

Note: Authors' calculations. Year- and local government fixed-effects are included in all specifications. Neighbor-LGU refer to local governments within provinces. The F statistic tests the hypothesis that the coefficients for the interaction between the city and the years since ratification dummy variables are all equal to zero.

Table 13. Inter-jurisdictional interaction and local development outcomes

	Share of barangays with BHS		HRH per thousand population, log		Night lights		Poverty incidence (%)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Own-LGU								
City (= 1)	-0.005	0.000	0.016	0.006	0.003	-0.018	1.717	1.630
	(0.026)	(0.025)	(0.043)	(0.043)	(0.027)	(0.022)	(1.091)	(1.097)
Local Income (t-1), ln		-0.005		0.015		0.018 ***		0.037
		(0.008)		(0.043)		(0.005)		(0.308)
Population (t-1), ln		-0.043		0.172		-0.03		2.765
		(0.055)		(0.193)		(0.043)		(3.019)
Neighbor-LGU average								
City (= 1)	-0.292 **	-0.303 **	0.322	0.379	-0.254 *	-0.235	-11.804	-12.820
	(0.129)	(0.130)	(0.364)	(0.345)	(0.148)	(0.147)	(13.971)	(14.088)
Local Income (t-1), ln		0.090 ***		-0.144		0.017		1.600
		(0.030)		(0.104)		(0.023)		(2.293)
Population (t-1), ln		-0.101		0.044		-0.215 **		1.072
		(0.080)		(0.274)		(0.105)		(8.478)
Observations	3,120	3,096	3,121	3,097	34,561	28,946	7,907	7,760
Adjusted R-sq.	0.100	0.110	0.035	0.037	0.28	0.184	0.384	0.395

Note: Authors' calculations. Year- and local government fixed-effects are included in all specifications. Neighbor-LGU refer to local governments within province.

Finally, similar to our earlier results, the estimates in Table 11 suggest that antenatal care demand increases with locally generated incomes of local governments. This relationship holds regardless whether the generated income is by the government unit where the pregnant mother resides, or in neighboring local government units. However, the relative magnitudes differ, with the implied procyclical changes in antenatal care demand being greater with the same percentage increase in the average locally generated income in neighboring local government units.

Although we are able to now rationalize our earlier results by incorporating inter-jurisdictional spillovers in our analysis, we are now left with another question: Why does greater national transfers to neighboring units lead to lower antenatal care demand? We investigate this new conundrum by looking at how city ratification affects outcomes in neighboring local government units.

6.2. Inter-jurisdictional interaction and local outcomes

Table 12 recreates Table 5 but includes in addition the proportion of cities among other local government units within the province, and the average of within-province neighboring government units' locally generated income and population as controls. Similar to our earlier results, city ratification leads to greater per capita income in the local government unit, which may be directly linked to the expansion of their per capita expenditures. However, our estimates also suggest that this depresses the income, and therefore expenditures, in other government units. More specifically, a one-percentage point increase in the proportion of cities among neighboring government units is associated with about 0.4 log-point (0.5 percent) drop in per capita income, and a 0.5 log-point (0.6 percent) drop in per capita expenditures of an average local government.

Table 13 show estimates using the same specification as above, but looking at proxies for the supply of health care, and for economic development at the local level. Again, similar to our earlier results, particularly in Tables 7 and 8, city ratification appears to be not associated with the expansion of government health centers and of the supply of health workers, as well as of greater economic activity, as proxied by night lights intensity, and of lower poverty incidence. However, there is some limited indication that city status of neighboring government units results in the contraction in the number of barangays with health centers.

Taken together, these patterns on local fiscal and development outcomes suggest that inter-government interaction play an important role in shaping local health outcomes.

7. Conclusion

This paper attempts to assess the impact of fiscal decentralization on the demand for health care in the Philippines. Despite the many claimed potentials from decentralization, the evidence we presented suggests that greater local government incomes do not necessarily lead to greater healthcare demand, particularly in the case of antenatal care by pregnant women. More specifically, we were not able to detect greater health care demand in response to an increase in transfers from the national to local governments. This is not surprising given that the expansion in national transfers do not necessarily lead to higher local government expenditures on health, or to greater economic activity, at least in the immediate term. This should not be misconstrued, however, as a failure of decentralization. Indeed, the outcomes that we observed may actually be the result of local governments matching the preferences of its local constituents. To what extent this is true is left for future research.

We also document a procyclical relationship between locally generated government income and health care demand. To the extent that greater government income from local sources are driven by the expansion of the local economy, our results are consistent with the documented evidences on the positive interaction between wealth and health (Pritchett and Summers, 1996; Preston, 1975; Cutler, et. al., 2007). This suggests that promoting the economic development of local communities remains an important driver in improving local health outcomes.

Our results highlight the role of inter-jurisdictional interactions play on local development outcomes, especially on health (Capuno and Solon, 1996; Uchimura and Jutting, 2009; Kelekar and Llanto, 2014). More particularly, our documented negative spillovers on health care demand as a result of higher transfers to neighboring governments casts doubt on the appropriateness of decentralized delivery of government health service. While there may be much to be gained from decentralization, these benefits are based on certain pre-conditions. The presence of inter-jurisdictional spillovers violates one of these key pre-conditions (Oates, 1972; Rondinelli, 1981; Besley and Coate, 2003; Bardhan and Mookerjee, 1998). We must qualify, however, that our results do not entirely dismiss the potentials from having a decentralized delivery of government health services. The challenge is rather on finding the optimal balance between degrees of centralization and decentralization such that the benefits from decentralization are realized while taking into account geographic externalities that are inherent in the delivery of health care services.

We concede that this study is limited in a number of ways. First, we were only able to document the impact of decentralization on local health service delivery at the extensive margin. While we provide some indications that per capita expenditures on health were not affected by greater local government incomes, we are unable to comment on the details of this particular spending. As shown by Schwartz, et. al. (2002), for example, local governments shifted towards providing more private goods and services, and away from public health under the 1991 Local Government Code. Second, we only looked at the demand for antenatal care.

Previous empirical studies in the Philippines using other health outcomes, such as infant mortality (Maccini, 2005), body mass index (Maccini, 2006), and immunization (Schwartz, et. al., 2002), generally found a positive association between decentralization and health. Whether our results hold if based on these outcomes are left for future research. Finally, our analysis barely scratched the surface of how interjurisdictional interaction among local governments influence household behavior. Understanding such interface may be an important key in the optimal design of government health service delivery systems.

8. References

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9. Annex

Annex A. Data

A.1. National Demographic and Health Survey

The National Demographic and Health Survey (NDHS) is a nationally representative survey of reproductive aged women (operationally defined as between 15 and 49 years) that is designed to provide indicators on fertility and fertility preferences, family planning practices, and maternal and child health, among others. The NDHS is conducted by the Philippine Statistics Authority (previously the National Statistics Office) around every five years.

A.2. Bureau of Local Government Finance Fiscal Data

The Bureau of Local Government Finance (BLGF) under the Department of Finance (DOF) collects local government fiscal data, including detailed income sources and expenditure types. Municipal-, city-, and province-level statistics for 1992 and later years are available from their online repository. Standard classifications of entries in the database have changed through the years, with consistent series available for 1992 to 2000, 2001 to 2008, and 2009 to present.

A.3. Poverty headcount ratio small area estimates

Small area, i.e., city- and municipality-level, estimates (SAE) of poverty headcount ratio are estimated by the Philippine Statistics Authority (formerly the National Statistical Coordination Board), and are available every three years starting 2000 until 2012. The various rounds of poverty SAE combine household- and community-level characteristics to model per capita household income that are then applied to impute incomes in population census data.

A.4. Night lights luminosity

Annual average night lights luminosity within local government unit boundaries are downloaded from AidData (www.aiddata.org). The estimates are based on stable lights composites of the Defense Meteorological Satellite Program/Operational Linescan System (DMSP/OLS) by the United States Department of Commerce's National Oceanic and Atmospheric Administration (NOAA). In the original DMSP/OLS night lights composites, pixel values range between 0 to 63, with higher numbers representing greater luminosity. AidData provides annual and regional summaries, which we used in this paper.

Annex B. Falsification Tests

We provide some placebo tests to assess the robustness of our difference in differences estimates to potential unobserved confounding. In each specification below, we include year- and local government-fixed effects. For Columns 2, 4, and 6, we additionally control for population and locally generated income.
In Panel B, we perform DID on (log-transformed) per capita income and per capita expenditure, but shifting the year of city ratification by three years earlier relative to the actual years of cityhood. In Panel C, we did a similar strategy, but this time randomly assigning city status to all local government units. We reproduce our baseline estimates from Table 5 as Panel A for reference. If the timing of city ratification coincided with some unobserved conditions that we were not able to control in our estimation, this will be captured by our placebo DID estimates. Results presented in the table below shows that the DID coefficients are not statistically significant at conventional alpha-levels thereby signifying that our results are robust to this particular falsification test.

Finally, in Columns 5 and 6, we performed similar DID estimations using precipitation as outcome. In this placebo test, we want to rule out the possibility that city ratification coincided with other variables that may affect our outcomes of interest. Once we have conditioned on population and locally generated income (Column 6), our results suggest that city ratification is not correlated with precipitation, which further strengthens our confidence on the validity of our baseline DID estimates.

	Per Capita Income		**Per Capita Expenditure**		**Precipitation**	
	(1)	(2)	(3)	(4)	(5)	(6)
A. Baseline estimate						
City (= 1)	0.562 ***	0.604 ***	0.504 ***	0.546 ***	-3.989 **	-2.688
	(0.055)	(0.048)	(0.056)	(0.049)	(2.004)	(1.810)
Observations	38,041	32,438	38,041	32,438	38,938	36,814
Adjusted R-sq.	0.739	0.664	0.667	0.564	0.614	0.621
B. Early city ratification by 3 years						
City (= 1)	-0.017	0.040	-0.033	0.036	-2.688	-1.823
	(0.022)	(0.027)	(0.023)	(0.028)	-1.866	-1.736
Observations	35,522	33,554	35,522	33,554	36,289	34,231
Adjusted R-sq.	0.747	0.722	0.673	0.640	0.613	0.622
C. Random assignment of city status						
City (= 1)	0.001	0.036	-0.013	0.022	-2.838	-1.799
	(0.054)	(0.051)	(0.052)	(0.046)	-2.292	-2.323
Observations	38,041	36,007	38,041	36,007	38,938	36,814
Adjusted R-sq.	0.718	0.687	0.652	0.615	0.614	0.621
Local Income (t-1), ln		Yes		Yes		Yes
Population (t-1), ln		Yes		Yes		Yes