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Abstract

In this study, we analyze the impact of the PNAFN, a Tunisian social protection program combining a cash transfer and access to a free healthcare insurance program. The outcomes of interest are healthcare out-of-pocket spending, financial risk associated to illness, and healthcare utilization. Using the nationally representative household survey, we implement various regression techniques taking into account the endogeneity of selection into the program. We find that the access to PNAFN reduces the risks of incurring high and catastrophic out-of-pocket expenses. It also encourages the PNAFN families to spend more on medications than any of three control groups. However, PNAFN beneficiaries have a higher probability to be unable to visit the doctor when having an illness due to a higher demand for health facilities coupled with financial deficiencies.

JEL classification: I13, I18, I32, O55.

Keywords: Cash transfers, Health insurance, Impact evaluation, Developing Economies

ملخص

في هذه الدراسة، نحلل تأثير البرنامج القومي لمساعدة العائلات الفقيرة فى تونس (PNAFN)، وهو برنامج تونسي ـ للحماية الاجتماعية يجمع بين التحويلات النقدية والنفاذ إلى برنامج تأمين صحي مجاني. جاءت نتائج الاهتمام كالتالى: الإنفاق على الرعاية الصحية من الجيب، والمخاطر المالية المرتبطة بالمرض، واستخدام الرعاية الصحية. باستخدام المسح الأسري الممثل وطنيا، نقوم بتطبيق تحليلات الانحدار المختلفة مع مراعاة التجانس الداخلي للاختيار في البرنامج. ونجد أن النفاذ إلى البرنامج يقلل من مخاطر تكبد نفقات عالية وكارثية من الجيب الخاص للمواطن التونسى ـ. كما يشجع عائلات البرنامج على إنفاق المزيد على الأدوية أكثر من أي من مجموعات التحكم الثلاث. ومع ذلك، فإن المستفيدين من البرنامج لديهم احتمال أكبر لعدم القدرة على زيارتهم للطبيب عند الإصابة بمرض بسبب ارتفاع الطلب على المرافق الصحية مقترناً بحالات القصور المالي.

1 Introduction

Social protection for the poor has always been a critical element for the cohesion of societies. The COVID-19 pandemic has put back the focus on social protection programs in developing countries. The rapid deterioration of the socioeconomic situation due to lockdowns and social distancing led governments to implement mitigation measures based often on regular social protection programs. In countries where the prevalence of informal jobs is very high, these regular programs have the advantage of identifying entire sectors of the society that are potentially vulnerable. The pandemic has also put back the focus on health issues.

Given the costs of these programs and the limited fiscal space in many countries, it is legitimate to investigate the effectiveness of these social protection programs in improving health utilization and outcomes. Although high at the macro level, the budgets of these programs could be also insufficient to reduce out-of-pocket spending by poor households (Wagstaff et al., 2009). In this paper we report the results of an impact evaluation of the two Tunisian main social protection schemes. The first, the PNAFN[1], launched in 1986 to reduce the burden of the social adjustment program on the poorest families, offers unconditional cash transfers and free access to public health services. The second, the AMGII[2] launched in the sixties, offers discounted health care for low income households.

The aim of this study is to analyze the impact of the PNAFN and compare it to the impact of the AMGII on the two first outcomes among the three defined by Acharya et al. (2012), namely healthcare utilization, out-of-pocket spending and health outcomes. In the literature, healthcare utilization is notably measured by the number of visits (outpatient or inpatient), the level of prenatal care, birth in hospitals and preventive checkups (Acharya et al., 2012). When dealing with health expenses authors distinguish high expenses from catastrophic[3] ones (Wagstaff and Lindelow, 2008; Bernal et al., 2017).

We are also interested in the channels through which the two social protection programs affect the outcomes identified. Strupat (2021) discusses how cash transfers can improve health outcomes by stabilizing and increasing income. They reduce the risks of facing large expenditures drops and enhance the capacities to buy more and better quality food, live in a cleaner environment and endure less stress. Free or subsidized healthcare services can also increase their utilization by poor households. However, this is pending on the availability and quality of these services. This raises the issue of the cost-effectiveness of cash transfers in comparison to supply side policies improving health infrastructure (Lagarde et al., 2007). Wagstaff and Lindelow (2008) discuss another potential consequence of lower costs of access to healthcare, consisting in the increase of out-of-pocket spending due to a shift to the right of the demand curve. Moreover, according to Bernal et al. (2017) poor households are made more aware of healthcare

[1] *Programme national des familles nécesiteuses*
[2] *Assurance maladie gratuite*
[3] Which exceed a pre-defined level of per capita expenditures

thanks to the greater access to the system. However, given the supply-side limitations, they may for example pay for medicines prescribed by public physicians and which are not available in public hospitals. While basic interventions are free or set by the government at low prices, sophisticated interventions in the private sector can be very costly (Wagstaff and Lindelow, 2008).

Our impact analysis of the Tunisian social protection programs is based on the Tunisian household survey of 2015. The methodology of the study relies on the estimation of the actual out-of-pocket expenses and the probability of incurring large or catastrophic expenses. The endogeneity of selection into PNAFN is taken into account through an instrumental variable strategy.

Our main results are that the access to PNAFN (and AMG I) does reduce the risks of incurring high and catastrophic out-of-pocket expenses, compared to the CNAM[4] and the no-coverage groups. It also encourages the PNAFN families to spend more on medications than any of the three control groups. Regarding the effects of AMG II relative to PNAFN, we find little significant distinction between the two programs. The PNAFN beneficiaries spend less on inpatient services and incur lower risk of catastrophic health spending at the 25% threshold of total spending. However, they have a lower capacity to visit the doctor when having an illness due to a higher demand for health facilities coupled with financial deficiencies.

The rest of the paper is organized as follows. Section 2 presents similar impact evaluations conducted in other countries. Section 3 discusses the two social protection programs with a focus on healthcare. In section 4 we present the data and methodology. The results are presented in section 5 and section 6 concludes and proposes some policy implications.

2 Impact evaluations of subsidized health insurance programs

Our paper is related to the literature on the impact of free or state subsidized health insurance on health and financial outcomes.

2.1 Lessons from comprehensive litterature reviews

Acharya et al. (2012) conduct a comprehensive review of the literature on the impact of subsidized health insurance programs until 2010. This review is completed by Erlangga et al. (2019) for the studies published between 2010 and 2016.

Acharya et al. (2012) report on 19 studies and distinguish them according to the methodology used, notably randomized studies, matching techniques, differences-in-differences, regression discontinuity designs and instrumental variables settings. They find a weak evidence of impact of the programs on the variables of interest in the surveyed studies. Moreover, when there is an impact on the protection from financial risk,

[4]Caisse nationale d'assurance maladie, the Public Health Insurance Fund

they highlight an increase of out-of-pocket spending for the poorest households. The main reason is that unaffiliated households seem to have given up healthcare because they do not afford it.

In contrast to the previous literature review, Erlangga et al. (2019) highlight a positive impact of state-funded health insurance on healthcare use and mixed effects on protection from financial risk (mostly positive or insignificant). In what follows we briefly summarize the country studies that seemed to us the most relevant given our paper's scope.

2.2 Previous studies on Tunisia

Abu-Zaineh et al. (2013) analyzed the impact of the formal and publicly subsidized health insurance schemes on catastrophic health expenses in Tunisia. They rely on a nationally representative survey on healthcare expenditure, utilization and morbidity and implement logistic regressions. They find that the odds of facing catastrophic health expenditures is twice lower for households benefiting from free or reduced tariffs of care (they are 8 times lower for households covered by private insurance regimes). The second study on Tunisia conducted by Makhloufi et al. (2015) uses propensity score matching to compare the outcomes of those enrolled in the mandatory health insurance (MHI) for formal workers, beneficiaries of the medical assistance schemes (MAS) and those excluded. They find that the third group uses healthcare services significantly less. Moreover, both insurance schemes have similar effects on the access to healthcare services.

2.3 Matching and difference-in-differences papers

Wagstaff et al. (2009) investigate the impact of subsidized health insurance on access to healthcare and out-of-pocket spending in rural China. They combine propensity score matching (PSM) and difference-in-differences (DID) techniques. The counterfactual population is not chosen among non participants in same counties but on non exposed individuals from different counties. The rationale is to avoid adverse selection on non observables that vary over time. The results show an improvement in healthcare utilization (inpatient and outpatient) but no effect on overall out-of-pocket spending.

Wagstaff (2010) evaluates the impact of the Vietnam's health care fund for the poor, using triple differences. The results indicate a substantial decrease in out-of-pocket spending, but no impact on any type of healthcare services.

Sparrow et al. (2013) study the Indonesian health insurance scheme using a PSM-DID framework. They find an increase in outpatient utilization but also in out-of-pocket spending. The authors also highlight a slightly higher incidence of catastrophic spending (at a 15 percent threshold of total household spending)[5].

[5]The PSM estimates are non significant

Neelsen and O'Donnell (2017) analyse the impact of granting access to state subsidized health insurance to the poor in Peru (SIS). They opted for difference-in-differences by comparing the beneficiaries to a group of poor adults enrolled in formal workers' health insurance. They found evidence of a substantial rise in the use of ambulatory care and medication, but no effect on dental or ophthalmic and inpatient care (covered partially by the program). Similarly the study does not find any effect on average out-of-pocket spending.

2.4 Regression discontinuity designs

Miller et al. (2013) evaluate the effects of the Colombian health insurance plan targeting the poor population, the Subsidized regime (SR). They apply a fuzzy regression discontinuity design to a proxy means test reconstructed by them. The authors compute county-specific thresholds and use them to check for each individual if they are below the threshold. The "below" variable is used as an instrument for enrollment in SR. The authors find a positive impact of health insurance on health services utilization, notably physician visits and preventive care. They also highlight lower out-of-pocket spending associated to SR, but limited to inpatient care. There is also evidence of a positive impact on children's health (measured by self-reports and days of absence due to health problems).

Bernal et al. (2017) evaluate the Peruvian SIS through a sharp regression discontinuity design. The results show a positive effect for curative care use, such as physician visits and medical analysis. Receiving medicines, hospitalization and surgery have also been positively impacted by the program, but it turns out that individuals pay for these services themselves. Out-of-pocket expenditures may have increased due to health care supply limitations. Finally, the authors do not find any effect of the program on the risk of high expenditures.

2.5 Instrumental variables settings

Wagstaff and Lindelow (2008) investigate the impact of health insurance on catastrophic health expenses in China. The authors rely on a generalized linear model for out-of-pocket expenditures and on probit estimations for the probability of catastrophic expenditures. The endogeneity of selection into the insurance scheme is addressed through an instrumental variable strategy. The instrument differ for the three databases used. The various instruments used are being a government official, head of household, working member of the household, the perceived quality of care in local health centres and the employment status. The main finding is that insurance is likely to increase out-of-pocket expenditures and catastrophic expenditures. Their explanation is that insurance raises health awareness and the demand by households for more sophisticated and costly health products.

Sosa-Rubi et al. (2009) analyze the impact of a social protection program on access to obstetrical services of poor pregnant women in Mexico. The authors rely on a

multinomial probit model and take into account the endogeneity of the decision to participate in the program through an instrumental variable strategy. Given that the program was not implemented everywhere at the same time, the authors use a dummy variable for the incorporation of the program at the county level. They find a positive and significant effect of the social protection program on the use of obstetrical care by poor women. Moreover, the SP program produces a crowding-out effect: the increasing use of health facilities provided by the SP program reduces the use of non-SP public health facilities and, to a lesser extent, the services delivered in private clinics.

3 Health coverage through social assistance programs in Tunisia

3.1 The beneficiaries

In Tunisia non-contributory social assistance programs currently revolve around the Amen Social scheme, structured around two flagship programs: (1) the National Program for Assistance to Needy Families (PNAFN), providing the targeted populations with unconditional monthly cash transfers and free access to health care in public health facilities[6] labeled AMG I and (2) the reduced-fee health care access program, labeled AMG II. Social assistance also implements programs dedicated to the disabled, support for school-aged children coming from poor and vulnerable families, improvement of housing for needy families, and specific initiatives to protect children at risk.

The beneficiaries of the PNAFN currently receive a monthly cash transfer of about 180 Tunisian Dinars (TND) equivalent to 62 US $. Similarly, the monetary transfer could be increased by 10 TND per month for each dependent child under the age of 18, and up to the age of 25 for dependent conditional on the pursuit of studies, apprenticeship or training. The amount of this additional transfer is doubled for each child with a disability[7]. As our paper addresses data collected in 2015, it is noteworthy that the amount of the transfer that prevailed during this period was about 140 DT (US$ 70) and the additional transfer of 10 TND was limited to only three children.

The number of recipients of the PNAFN skyrocketed just after the revolution in 2011 and kept on climbing all along the period 2011-2020 to reach around 256 000 recipients in 2020 versus 118 309 in 2010 and 176 000 in 2011. Furthermore, the beneficiaries of the cash transfer are broken down into 51.3 % and 48.7% between men and women. Table 1 shows that 55.1 % of the beneficiaries are over 60 years. The populations that joined the PNAFN after 2010, which represent 58.6 % of the total number of beneficiaries in 2018, are made up particularly of the two salient groups (see Table 1). The two age groups that include those aged between 40 and 59 and between 60 and 79, representing

[6]The first line of care is provided by the Basic Health Care Centers (CSB) and the District Hospitals (HC). The secondary level of health care (2nd line) is provided in the regional hospitals, which also provide first line care for the local population. The tertiary level (3rd line) of health care is composed of a network of 23 hospitals and University Hospitals (CHU), which may be general or specialized, with the status of public health establishments (EPS). They provide referral and highly specialized care, in addition to first and second level care for the local population.

[7]Organic law no. 2019-10 of January 30, 2010, creating the "AMEN SOCIAL" program.

Table 1: Distribution of beneficiaries by region and year

Year of benefit	District of Tunis	North East	North West	Center East	Center West	South East	South West	Total
87-89	0.9	1.1	2.3	1.5	2.0	1.1	1.4	10.3
90-94	0.3	0.3	0.9	0.4	0.4	0.3	0.2	2.9
95-99	0.9	0.7	1.7	0.8	1.6	0.6	0.7	7.0
00-04	1.0	0.7	1.3	1.2	1.2	0.7	0.7	6.8
05-10	2.2	1.6	2.7	1.9	2.8	1.6	1.5	14.4
11-18	7.4	6.4	13.3	7.2	13.4	5.3	5.7	58.6
Total	12.7	10.8	22.2	12.9	21.4	9.7	10.4	100.0

Source: authors' compilation using administrative data from PNAFN (2018)

successively 24.6 % and 20.6% of the total population. In other words, one out of four post-revolutionary PNAFN beneficiaries belongs to an age group that is still active in the labour market, i.e. 40-59 years. The geographical distribution of the beneficiaries of the PNAFN program (Table 1) indicates that 50.9 % of the beneficiaries live in the regions of the west of Tunisia, the north-west, the center-west and the south, i.e. successively 21.2 %, 19.4 % and 10.4 %. It is worth pointing out that the western regions account for 30 % of the total population in Tunisia and contribute 40 % to poverty at the national level.

3.2 Eligibility criteria for the PNAFN/AMGI and AMGII

The provision of the cash transfer, free or reduced health care is a complex process based on eligibility criteria that include annual income and other variables that inform the living standards of families applying for the two programs. The process of identifying eligible households is entirely centred on the role of social workers who are distributed in all governorates of the country. A social survey is undertaken by these social workers to assess the household's socio-economic and health situation against the eligibility criteria as published in the official documents and circulars of the Ministry of Social Affairs.

In order to benefit from free care (AMG I)[8], the beneficiary applying for the program must justify an adjusted annual per capita income of no more than 585 TD or 290 USD, the incapacity of all family members to work, the absence of family support, the disability and/or chronic illness of a family member, and deteriorated living conditions (particularly the condition and facilities of the home). Not all of these criteria need to be met for the family to be eligible, thus providing a wide margin of discretion to the social worker.

The eligibility criteria for AMGII are mainly based on annual income, which should not exceed the guaranteed minimum wage (SMIG) for families of less than two people, one and a half times the SMIG if the family consists of three to five people and twice

[8]Joint Circular of the Ministry of Social Affairs and the Ministry of Interior, dated 27 May 2011, defining the eligibility criteria of families for the AMG 1 program.

the SMIG if the family consists of more than five people[9]. Following the grouping of the two programs PNAFN and AMGII under the umbrella of the Amen Social, a decree was issued in 2020[10], which adopts unified eligibility criteria underlying a classification drawn up at the level of each governorate to identify the families eligible for each of the two programs.

The two programs, PNAFN and AMGII, do not perfectly target the poorest segments of the population (Bibi and Ben Cheikh, 2017). The authors showed that the inclusion errors (type I) for the PNAFN would be around 53 % and 49.7 % for the AMGII.

Furthermore, the PNAFN/AMGII covers 30 % of the poorest individuals of the Tunisian population compared to higher levels for Croatia (55 %) and Belarus (37.5 %). For conditional cash transfer programs, coverage levels are even higher: 73.2 % for Uruguay (Asignaciones Familiares Program), 59.2 % for Brazil (Bolsa Familia Program), 52.3 % for Argentina (Asignación Universal por Hijo para la Protección Social Programme) and 44.9 % for Mexico (Prospera Program)[11].

3.3 Use of public health facilities by AMGI and AMGII beneficiaries

A World Bank study showed that AMGI and AMGII beneficiaries unevenly access public health care services. Households receiving AMGI, representing 9 % of Tunisian households, benefited from 14 % of the care provided in public facilities, compared to only 13 % for households with AMGII cards, whose weight in the population is approximately 22 % (World Bank, 2016). This overuse of care in public health facilities by AMG I beneficiaries compared to AMG II could be attributed to the more frequent needs of this category of the population due the age of PNAFN beneficiaries and the prevalence of chronic diseases among them. Co-payments could also act as a disincentive for a subset of AMGII households from the poorest segment of the population.

4 Methodology and Data

4.1 Data

To measure the impact of the PNAFN and AMG I on household's annual out-of-pocket expenses and the probability of household incurring large out-of-pocket payments, we use data from the 2015 National Survey on Household Budget, Consumption and Living Standards (EBCNV). The 2015 EBCNV was conducted on a sample of 25,235 households, and is representative at the governorate level. The survey was divided into three modules. The first module collected information on housing conditions and characteristics of all household's members, such as gender, age, marital status, education attainment and employment. More importantly, it contains questions on

[9]Decree No. 2012-2522 of 16 October 2012, which sets out the conditions for the attribution of the AMGII cards.

[10]Decree No. 2020-317 of 19 May 2020, setting the conditions and procedures for eligibility, withdrawal and objection to the "AMEN SOCIAL" program.

[11]Data collected from : https://www.worldbank.org/en/data/datatopics/aspire

individual health status, coverage by the main health insurance funds (AMG I, AMG II and CNAM) and basic healthcare service utilization. The second and the third modules provide detailed information on household's expenditure and food consumption. The expenditure module asked the respondents to provide their household annual spending at a fine product/ service level. Therefore, we are able to examine not only total out-of-pocket health spending but also spending on various healthcare products and services, such as doctor visits, medications, medical analysis, etc. The survey, however, does not contain household income, thus, we proxy the income level of a household by its total consumption.

Following Wagstaff and Lindelow (2008), Wagstaff et al. (2009) and Bernal et al. (2017), we define out-of-pocket health spending as high if its exceeds an x percentage threshold of the sampling unit's mean; or exceeds the 50th or 75th percentile of the sampling unit. Similarly, a household has catastrophic out-of-pocket spending if its share of healthcare spending in total annual spending exceeds an x percentage threshold. Five thresholds are taken into account: 5%, 10%, 15%, 20% and 25%. Table 2 reports the descriptive statistics of our variables.

4.2 Empirical methods

Our challenges in evaluating the impacts of the PNAFN are twofold: (i) the endogeneity of the policy variable and (ii) the non-negative nature and right-skewed distribution of outcomes.

As mentioned above, PNAFN targets the most vulnerable households of which one or many members are not able to work due to old age, chronic condition and/or disability. These families may have a predisposition to higher or lower healthcare expenditures. On one hand, the PNAFN beneficiaries are likely to have higher spending on curative health services and products, because they are mostly composed of elderly people and people with an impairment or chronic condition. On the other hand, they might be constrained by their meagre earnings, thus, tend to spend less on healthcare. The latter is also true among AMG II beneficiaries, whose income is supposed to be below the 20th percentile. Failure to control for pre-treatment outcomes will lead to biased estimates.

In this analysis, we use an instrumental variable approach to deal with the potential selection bias associated with the PNAFN program. Our instrument deploys a critical PNAFN eligibility criterion – "the loss of the father of the family due to death, imprisonment or abandonment with the deterioration of the material capacity of the family [12]". Indeed, households headed by widowed and elderly women have clearly a higher probability to be granted the aid (Nasri, 2020). We define the instrumental variable by a dummy equal to 1 if the head of the household is female. As showed in Table 2, the PNAFN group has a higher share of female headed household than all other groups.

[12] *Circulaire conjointe entre le Ministre de l'Intérieur et le Ministre des Affaires Sociales sur le programme national d'aide aux familles nécessiteuses* (2011).

Table 2: Mean of outcomes and covariates across sub-samples

	All households (N=23,675)	PNAFN (N=1,919)	AMG II (N=3,473)	CNAM (N=15,956)	No coverage (N=2,327)
Instrumental variable for PNAFN					
Female household header	0.16	0.42	0.13	0.12	0.31
Household characteristics					
Number of working people	1.14	0.68	1.11	1.22	0.88
Number of rooms per person	0.97	0.98	0.76	0.99	1.08
1st quintile of per capita spending *	0.12	0.22	0.24	0.09	0.17
2nd quintile of per capita spending	0.15	0.19	0.20	0.14	0.17
3rd quintile of per capita spending	0.18	0.21	0.19	0.18	0.18
4th quintile of per capita spending	0.23	0.21	0.20	0.23	0.19
5th quintile of per capita spending	0.32	0.18	0.17	0.35	0.29
Number of people with disabilities	0.13	0.30	0.13	0.11	0.13
Number of people with chronic disease	0.62	0.83	0.52	0.64	0.48
Distance to local hospital (km)	5.99	9.01	10.16	4.89	7.45
Education of household header	2.27	1.46	1.80	2.46	1.99
Number of >=65 year old people	0.35	0.61	0.31	0.34	0.32
Household size	3.96	3.29	4.25	4.03	3.55
Outcomes					
Per capita annual healthcare spending (dinar)	250.91	201.18	165.74	269.35	243.87
(a) Outpatient spending	221.00	185.94	146.47	236.28	215.97
- Spending on doctor visits	45.67	33.34	28.09	49.29	46.77
- Spending on medicines	109.91	106.40	75.44	115.11	113.54
- Spending on medical analysis	27.49	22.83	17.08	30.09	23.28
(b) Inpatient spending	27.10	15.09	18.33	29.97	23.43
Per capita annual healthcare spending					
- exceeds the median	0.51	0.43	0.48	0.53	0.47
- exceeds the 75th percentile	0.29	0.26	0.25	0.31	0.28
- exceeds 5% of the mean	0.34	0.30	0.28	0.35	0.32
- exceeds 10% of the mean	0.33	0.29	0.27	0.34	0.31
- exceeds 15% of the mean	0.32	0.28	0.26	0.33	0.30
- exceeds 20% of the mean	0.31	0.27	0.25	0.32	0.29
- exceeds 25% of the mean	0.30	0.27	0.24	0.31	0.29
Share of annual healthcare spending					
- exceeds 5% of total spending	0.37	0.38	0.39	0.37	0.36
- exceeds 10% of total spending	0.19	0.23	0.21	0.18	0.20
- exceeds 15% of total spending	0.10	0.14	0.12	0.10	0.11
- exceeds 20% of total spending	0.06	0.09	0.07	0.05	0.07
- exceeds 25% of total spending	0.03	0.05	0.04	0.03	0.04
Visited the doctor when having an illness	0.93	0.89	0.90	0.94	0.90
Did not visit the doctor due to lack of resources	0.13	0.33	0.25	0.07	0.24

Note: (*) Quintiles are calculated using per capita expenditures for each household's sampling unit.

The second issue is the nature of the data. Since our actual health expenditure takes on non-negative values and has a right-skewed distribution, it is common practice to use the natural log transformation for strictly positive variables. However, unlike income or the spending on subsistence needs, the out-of-pocket expenses take on the value zero for a nontrivial fraction of the data set. As a result, using log transformation will cause an important upward bias. To include the zero outcome, we can add 1 to every observation before the log transformation, but then it is not obvious to interpret the coefficients even when they are obtained from a linear regression. Given the upper-unbounded data, we use the generalized linear model (GLM), i.e., instead of estimating $E(ln(y)|x) = x\beta$, we estimate the exponential model $E(y|x) = exp(x\beta)$. This approach has been widely used in the literature of health expenditures (see Hardin et al., 2003; Wagstaff and Lindelow, 2008). To handle the endogeneity of the policy variable in such a non-linear model, we apply the two-stage residual inclusion estimation (2SRI) proposed by Terza et al. (2008).

This method, also called the control function approach (Terza et al., 2008; Wooldridge, 2014), includes the residual from the first-stage model into the second-stage model to control for unobserved components. Although the control function approach is well-known for yielding good estimates in the case of limited response variables, the use of this method when the endogenous regressor is discrete is still controversial, because the discrete variable will violate the assumption of additive, independent errors of the 2SRI's reduced form (Baum et al., 2013; Wooldridge, 2014). For our binary outcomes, we run a bivariate probit model which deals with the fact that both the response variable and the endogenous variable are binary.

Instead of pooling together all other health insurances in the control group, we divide the control observations into three separate groups according to their health insurance regime. There are two reasons for this separation. First, one of our main purposes is to compare the impact of PNAFN and AMG II, and this allows us to disentangle the effect of each health-insurance regime. Second, since PNAFN (AMG I), AMG II and CNAM address different income segments, the characteristics and behaviours of their beneficiaries can be very different, even divergent. Therefore, it is more relevant to separate the control observations into three groups.

5 Results

The results for three sub-samples are reported in Table 3 - 5. The tables present only coefficient estimates/ average marginal effects, robust standard errors and p-value for the PNAFN variable. For the continuous outcomes, we apply the OLS, Poisson-GLM, IV-2SLS and 2SRI estimators. For the binary outcomes, the estimates obtained from probit and bivariate probit models are reported. The Wald test of endogeneity is conducted for IV-2SLS and biprobit models. The null hypothesis is that the PNAFN can be treated as exogenous; a rejection implies that the PNAFN is endogenous.

We first interpret the result of our comparison between PNAFN beneficiaries and the households that have no insurance coverage (Table 3). OLS estimates show that the PNAFN significantly reduces actual health spending. However, the GLM estimations do not confirm this result. The Wald test obtained from the 2SLS procedure could not reject the null hypothesis, which suggests that there might be no need for a 2-step procedure to handle the endogeneity. When we control for the selection bias with 2SRI, the effect of the PNAFN is also non significant. Our results are thus similar to those of Wagstaff et al. (2009) and Neelsen and O'Donnell (2017).

If we look at the various components of healthcare spending, both OLS and GLM estimations show a significant decrease of spending on doctor visits, but these results are not confirmed by the IV estimations. However, if we look at spending on medicines, the OLS regression shows a negative effect while the SRI estimation shows a positive effect of the PNAFN on medication expenses. This can be explained by the cash transfer granted to the PNAFN household in addition to the free health insurance. Moreover,

similarly to Wagstaff (2010) we find no effects of the PNAFN on health utilization, proxied by doctor visit when having an illness, compared to those having no health insurance.

The results are quite different in the case of discrete response variables. The Wald test significantly rejects the null hypothesis for all financial outcomes. Regardless of the estimators, the PNAFN significantly reduces the risk of catastrophic and large out-of pocket spending. This result is in line with Miller et al. (2013) and in contrast to Bernal et al. (2017) who find no effect and Wagstaff and Lindelow (2008) who highlight an increase of financial risk. Biprobit models provide much higher estimates of the effect of the PNAFN: it reduces around 10 to 17 percentage points the risks of catastrophic and high expenses.

Moving to Table 4, we find a less significant distinction between the PNAFN and AMG II beneficiaries. The Wald test rules out the exogeneity hypothesis for actual health spending, its outpatient component and the spending on medicines sub-component. Again, the PNAFN households spend more on medications than the AMG II households when we control for the selection bias with the 2SLS and 2SRI models. This confirms our hypothesis that the cash transfer allows these families to spend more on health products that are not covered by the insurance. We also find that the full insurance coverage for the PNAFN beneficiaries help them to retain about 58 - 69% of inpatient expenses compared to the AMG II beneficiaries who have only a partially-covered insurance. This result is robust in 3 out of 4 models. For high and catastrophic health expenses thresholds, the treatment variable is only endogenous for high out-of-pocket expenditures at the 25% of the mean threshold. According to the biprobit estimate, PNAFN significantly decreases the risks of high out-of-pocket expenditures at the 25% of the mean threshold. The Wald test also points to the endogeneity for one of our health service utilisation variables. We find that PNAFN beneficiaries have a higher probability to be unable to visit the doctor due to a lack of resources. One possible reason is that the PNAFN families have a higher demand for health facilities (World Bank, 2016). Therefore, they are more likely to be constrained, especially when there is an insufficient provision of free or reimbursable health services and the prices of alternative services in the private sector exceed the payment capacity of these families.

Finally, Table 5 presents the results of the pooled regressions for the PNAFN and CNAM families. The instrument works quite well for the binary endogenous variables. The PNAFN decreases the risk of incurring high and catastrophic health out-of-pocket expenditures, compared to the CNAM families. The effects for high healthcare spending are small, about 1-2 percentage points of difference between the two groups. This can be explained by the fact that high-income families tend to spend more on healthcare and purchase more private services. Moreover, the PNAFN families visit significantly less the doctor when having an illness than families covered by the CNAM, due to lack of resources.

Table 3: PNAFN vs. No coverage

	OLS/Probit			Poisson-GLM			IV-2SLS/Biprobit				2SRI		
	Coef./ AME	SE	p-value	Coef.	SE	p-value	Coef./ AME	SE	p-value	Wald test (prob)	Coef.	SE	p-value
Actual health spending	-44.524	21.737	0.041	-0.142	0.098	0.148	-3.17	309.6	0.992	0.387	-0.137	0.108	0.205
(a) Outpatient spending	-30.892	17.818	0.083	-0.098	0.087	0.26	-97.364	269.167	0.718	0.531	0.018	0.098	0.857
- Spending on doctor visits	-9.946	4.274	0.02	-0.208	0.105	0.047	-117.239	80.189	0.144	0.195	0.058	0.082	0.476
- Spending on medicines	-14.455	8.556	0.091	-0.068	0.073	0.357	-56.179	150.367	0.709	0.307	0.095	0.049	0.051
- Spending on medical analysis	-0.232	11.662	0.984	0.058	0.503	0.908	80.513	147.486	0.585	0.718	NA	NA	NA
(b) Inpatient spending	-12.278	7.202	0.088	-0.537	0.38	0.157	106.172	98.996	0.284	0.367	NA	NA	NA
Healthcare spending													
- exceeds the median	-0.047	0.018	0.011				-0.122	0.026	0.000	0.009			
- exceeds the 75th percentile	-0.029	0.016	0.072				-0.121	0.031	0.000	0.003			
- exceeds 5% of the mean	-0.034	0.017	0.043				-0.134	0.025	0.000	0.001			
- exceeds 10% of the mean	-0.031	0.017	0.058				-0.132	0.028	0.000	0.003			
- exceeds 15% of the mean	-0.029	0.017	0.075				-0.122	0.033	0.000	0.008			
- exceeds 20% of the mean	-0.027	0.016	0.093				-0.125	0.031	0.000	0.003			
- exceeds 25% of the mean	-0.027	0.016	0.093				-0.118	0.03	0.000	0.003			
Share of healthcare spending													
- exceeds 5% of total spending	-0.036	0.018	0.048				-0.158	0.006	0.000	0.001			
- exceeds 10% of total spending	-0.019	0.015	0.216				-0.169	0.02	0.000	0.001			
- exceeds 15% of total spending	-0.008	0.012	0.521				-0.09	0.044	0.041	0.023			
- exceeds 20% of total spending	-0.005	0.01	0.572				-0.056	0.037	0.136	0.063			
- exceeds 25% of total spending	0.002	0.007	0.798				-0.078	0.045	0.085	0.006			
Visited the doctor when having an illness	-0.002	0.013	0.85				0.011	0.035	0.758	0.717			
Did not visit the doctor due to lack of resources	0.032	0.028	0.255				0.068	0.038	0.074	0.28			

Note: The table presents coefficient estimates/average marginal effects, robust standard errors and p-value for PNAFN variable. The models compare between PNAFN beneficiaries and no-coverage households. The first column shows the variable on the LHS of the equations. All models include the covariates listed in Table 2. OLS, Poisson-GLM, IV-2SLS and 2SRI estimator are applied to the continuous outcomes. Bootstrapped standard errors are reported for the 2SRI estimator. NA indicates no available estimate provided due to the lack of variation (>= 90% observations have a zero outcome). Probit and Biprobit estimator are applied to the binary outcomes. The instrumental variable for PNAFN in the 2-step models is a dummy variable which takes the value 1 if the household header is female. The null hypothesis of the Wald test of endogeneity is that the PNAFN can be treated as exogenous; a rejection implies that the PNAFN is endogenous.

Table 4: PNAFN vs. AMG II

	OLS/Probit			Poisson-GLM			IV-2SLS/Biprobit				2SRI		
	Coef./ AME	SE	p-value	Coef.	SE	p-value	Coef./ AME	SE	p-value	Wald test (prob)	Coef.	SE	p-value
Actual health spending	-5.265	16.464	0.749	-0.008	0.087	0.926	80.777	84.817	0.341	0.045	-0.128	0.089	0.149
(a) Outpatient spending	6.47	12.897	0.616	0.056	0.075	0.457	71.984	67.69	0.288	0.056	-0.09	0.101	0.376
- Spending on doctor visits	0.071	2.875	0.98	0.022	0.092	0.814	-14.619	15.481	0.345	0.344	0.028	0.167	0.866
- Spending on medicines	6.364	6.427	0.322	0.093	0.068	0.174	51.063	29.713	0.086	0.048	0.235	0.087	0.007
- Spending on medical analysis	3.847	8.765	0.661	0.199	0.401	0.62	37.263	47.171	0.43	0.244	NA	NA	NA
(b) Inpatient spending	-11.191	5.822	0.055	-0.582	0.349	0.096	10.742	27.326	0.694	0.276	-0.691	0.291	0.018
Healthcare spending													
- exceeds the median	-0.069	0.017	0.000				-0.043	0.024	0.066	0.395			
- exceeds the 75th percentile	-0.029	0.014	0.038				-0.039	0.024	0.105	0.22			
- exceeds 5% of the mean	-0.024	0.015	0.104				-0.034	0.024	0.159	0.273			
- exceeds 10% of the mean	-0.023	0.015	0.125				-0.036	0.024	0.141	0.234			
- exceeds 15% of the mean	-0.018	0.015	0.224				-0.03	0.024	0.214	0.305			
- exceeds 20% of the mean	-0.017	0.014	0.241				-0.039	0.024	0.113	0.16			
- exceeds 25% of the mean	-0.016	0.014	0.268				-0.047	0.024	0.048	0.067			
Share of healthcare spending													
- exceeds 5% of total spending	-0.037	0.017	0.03				-0.051	0.025	0.039	0.119			
- exceeds 10% of total spending	-0.023	0.014	0.097				-0.032	0.026	0.208	0.32			
- exceeds 15% of total spending	-0.013	0.011	0.251				-0.026	0.026	0.316	0.358			
- exceeds 20% of total spending	-0.003	0.008	0.686				0.006	0.015	0.71	0.669			
- exceeds 25% of total spending	-0.002	0.006	0.755				0.009	0.009	0.322	0.366			
Visited the doctor when having an illness	0.003	0.012	0.792				0.006	0.015	0.663	0.703			
Did not visit the doctor due to lack of resources	0.057	0.025	0.021				0.064	0.012	0.000	0.014			

Note: The table presents coefficient estimates/average marginal effects, robust standard errors and p-value for PNAFN variable. The models compare between PNAFN and AMG II beneficiaries. The first column shows the variable on the LHS of the equations. All models include the covariates listed in Table 2. OLS, Poisson-GLM, IV-2SLS and 2SRI estimator are applied to the continuous outcomes. Bootstrapped standard errors are reported for the 2SRI estimator. NA indicates no available estimate provided due to the lack of variation (>= 90% observations have a zero outcome). Probit and Biprobit estimator are applied to the binary outcomes. The instrumental variable for PNAFN in the 2-step models is a dummy variable which takes the value 1 if the household header is female. The null hypothesis of the Wald test of endogeneity is that the PNAFN can be treated as exogenous; a rejection implies that the PNAFN is endogenous.

Table 5: PNAFN vs. CNAM

	OLS/Probit			Poisson-GLM			IV-2SLS/Biprobit				2SRI		
	Coef./ AME	SE	p-value	Coef.	SE	p-value	Coef./ AME	SE	p-value	Wald test (prob)	Coef.	SE	p-value
Actual health spending	-60.353	17.087	0.000	-0.182	0.08	0.023	-9.557	159.305	0.952	0.068	-0.051	0.058	0.373
(a) Outpatient spending	-46.788	13.986	0.001	-0.154	0.071	0.031	15.051	137.376	0.913	0.048	-0.044	0.053	0.408
- Spending on doctor visits	-14.895	3.928	0.000	-0.319	0.098	0.001	-38.881	32.933	0.238	0.435	-0.105	0.067	0.118
- Spending on medicines	-22.179	8.034	0.006	-0.109	0.074	0.138	157.159	106.764	0.141	0.001	0.061	0.048	0.204
- Spending on medical analysis	-5.693	8.354	0.496	-0.134	0.359	0.709	-24.238	41.29	0.557	0.899	-1.134	0.806	0.16
(b) Inpatient spending	-13.783	5.298	0.009	-0.443	0.293	0.131	-25.825	72.945	0.723	0.846	-0.16	0.238	0.502
Healthcare spending													
- exceeds the median	-0.084	0.015	0.000				-0.017	0.002	0.000	0.000			
- exceeds the 75th percentile	-0.029	0.013	0.03				-0.012	0.004	0.001	0.003			
- exceeds 5% of the mean	-0.032	0.014	0.021				-0.013	0.003	0.000	0.001			
- exceeds 10% of the mean	-0.029	0.014	0.035				-0.012	0.003	0.000	0.002			
- exceeds 15% of the mean	-0.025	0.014	0.066				-0.011	0.003	0.001	0.003			
- exceeds 20% of the mean	-0.022	0.014	0.108				-0.011	0.004	0.002	0.004			
- exceeds 25% of the mean	-0.021	0.013	0.119				-0.011	0.004	0.001	0.003			
Share of healthcare spending													
- exceeds 5% of total spending	-0.043	0.014	0.003				-0.021	0.003	0.000	0.000			
- exceeds 10% of total spending	-0.004	0.011	0.707				-0.014	0.004	0.002	0.001			
- exceeds 15% of total spending	0.005	0.008	0.547				-0.012	0.005	0.011	0.001			
- exceeds 20% of total spending	0.008	0.006	0.166				-0.004	0.004	0.271	0.082			
- exceeds 25% of total spending	0.009	0.004	0.02				0.000	0.002	0.822	0.374			
Visited the doctor when having an illness	-0.026	0.007	0.000				-0.004	0.001	0.000	0.288			
Did not visit the doctor due to lack of resources	0.091	0.01	0.000				0.015	0.002	0.000	0.421			

Note: The table presents coefficient estimates/average marginal effects, robust standard errors and p-value for PNAFN variable. The models compare between PNAFN and CNAM beneficiaries. The first column shows the variable on the LHS of the equations. All models include the covariates listed in Table 2. OLS, Poisson-GLM, IV-2SLS and 2SRI estimator are applied to the continuous outcomes. Bootstrapped standard errors are reported for the 2SRI estimator. Probit and Biprobit estimator are applied to the binary outcomes. The instrumental variable for PNAFN in the 2-step models is a dummy variable which takes the value 1 if the household header is female. The null hypothesis of the Wald test of endogeneity is that the PNAFN can be treated as exogenous; a rejection implies that the PNAFN is endogenous.

6 Conclusion

In this study we assessed the impact of the PNAFN and AMG I free health insurance program and compared it to the effects of having no insurance, having access to the AMG II subsidized health insurance and to the CNAM contributory program. Using the 2015 household survey we apply different econometric techniques taking into account the endogenous selection into the program.

We find that the access to PNAFN (and AMG I) has no effects on actual total health expenses. However, it reduces the risks of incurring high and catastrophic out-of-pocket expenses, compared to the CNAM and no-coverage groups. It also encourages the PNAFN families to spend more on medications than any of three control groups, conditional on their characteristics.

The comparison between the PNAFN and AMG II beneficiaries shows that the former have higher expenses on medicines, thanks to the cash transfer and spend less on inpatient services. They also incur a lower risk of catastrophic health spending. However, they have a higher probability to be unable to visit the doctor when having an illness due to a higher demand for health facilities, coupled to financial deficiencies.

One of the main limits of the study is that we were not able to disentangle the effects of the cash transfer from the impact of the free access to public healthcare. Moreover, our database did not allow us to investigate the impact of social protection on health outcomes.

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