COMPENSATING THE POOR OUT OF TRADITIONAL HEALING IN CAMEROON: A NESTED LOGIT ANALYSIS

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Abstract

The objectives of the current paper sought to (i) identify the determinants of the choice of health care providers in Cameroon, and (ii) determine the compensation to the poor to get them away from traditional/self healing. The core is a nested Logit model, accounting for the poor's decision in terms of a Spline function of consumption. Overall, the majority of the determinants had the expected sign with a significant effect. The compensation to the poor is at least 46.20% of the lower poverty line, while the intermediate group receives a compensation of at least 14.47% of the upper poverty line.

JEL Classification: I1; I3; C4

Keywords: Health care providers, indirect demand, compensation, poverty, Spline function, nested Logit model.

1. Introduction

Despite the key role of health care in defining an equitable labor-using growth, the government of Cameroon, like many other African countries, had to put in place a health cost recovery system as of the early 1990s. Of course, Gertler and Hammer (1997) point out that the combination of general government budget financing of health-care and user fees affects how public subsidies are allocated across programs and who gets the subsidies. But, as poverty incidence increased over the 1990s, means rather than quality of services should explain the demand for health-care services.

We therefore sought to know: i) if the poor would turn away from traditional/self healing if they get compensated for the poverty line; and ii) what the amount of the compensation could be. Using a nested Logit model defined on a spline function of consumption to account for poverty, first we identified the determinants of the choice of health care providers, and second we simulated the increases in the poverty lines that are necessary to compensate the poor out of traditional/self healing.

2. The Logit Model

Following Dor, Gertler and van der Gaag (1987), we depart from U_{ij}, the level of the utility a patient *i* associates with a visit to provider *j (j = 0 for traditional medication, j= 1, 2 for Private religious health centers and Private non religious health institutions, and j= 3, 4, 5 for Public Dispensaries, Provincial Hospitals, and Referral Hospitals, in the current paper)*. Of course, U_{ij} comprises a deterministic part V_{ij} and a random effect ε_{ij}. V_{ij} is a function of the characteristics of both the patient *i,* and of the provider *j*, x_i *and* z_j

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respectively, and is supposed to be observable by the researcher. The random component ε_{ij} a conception of the researcher is rather known to the patient. Our contention is that a sick person will decide for the health care provider that maximizes his utility, such that the response probability is,

$$P\{h_i = j|x,z\} = P\{U_{ij} = \max\{U_{i1},...,U_{iJ}\}|x,z\} = \mathrm{P}\left\{\mathrm{V_{ij}} + \varepsilon_{ij} > \max_{k=1,...,J,k\neq j}\{\mathrm{V_{ik}} + \varepsilon_{ik}\}|x,z\right\}$$

Furthermore, assuming that the error terms are drawn following a generalized extreme value cumulative density function, then in the current case of a two-level nested Logit model, letting the index *l* define the first level alternative (Health care sector) and *q* the bottom-level alternative (Health care service), we would be determining the following probabilities:

$$P_{lq} = P_{q|l} \cdot P_l = \frac{e^{\beta' x_{2q/l} + \gamma' x_{1l}}}{\sum_{l}^{J_1}\sum_{q}^{J_2} e^{\beta' x_{2q/l} + \gamma' x_{1l}}}; \quad P_{q|l} = \frac{e^{\beta' x_{2q/l}}}{\sum_{q=1}^{J_2} e^{\beta' x_{2q/l}}}; \quad P_l = \frac{e^{\gamma' x_{1l} + \tau_l I_l}}{\sum_{l}^{J_1} e^{\gamma' x_{1l} + \tau_l I_l}};$$

which are respectively the probability that a health provider is selected within a given health sector, the probability that a health provider is selected conditional a health sector was chosen, and the probability of choosing a health sector. The term $I_l = \ln \sum_{q}^{J_2} e^{\beta' x_{2q|l}}$ specifies the inclusive values[1] for alternative *l* (Greene, 2003; Maddala, 1994). x_1 specifies the vector of explanatory variables which determine the choice of the sector of health services, and x_2 the vector of variables which explain the choice of the service providers.

3. The poverty effect

Following Morey et al. (2002) a piece-wise linear Spline function of ($y_i - p_{ij}$), is specified considering two cases:

Net income ≡ $(y_i - p_{ij})$ if $(y_i - p_{ij}) < z$;
Net income ≡ $(y_i - p_{ij} - z)$ if $(y_i - p_{ij}) > z$.

More specifically, the lower and upper poverty lines *z* are used as thresholds whose variations allow modifying the behavior of the individual vis a vis the health care provider. Indeed, given that z-y_i defines the amount to be transferred to the poor to bring him above the poverty line, the greater the value of *z* is, the higher the compensation would be.

[1] The inverse of those inclusive values defines the sigma values ($0 \leq \sigma \leq 1$), quantities which are necessary to appreciate the degree of dependence. If $\sigma = 0$, one falls under the case of independence and $F(\varepsilon_1,\ldots,\varepsilon_5)$ reduces to the product of five type I extreme-value distributions, hence specifies the case of independent Logit (Amemiya, 1981).

4. Analysis of the differences among households in the choice of health care providers

The main data base is the ECAMII[2]. In each one of the versions of the models, the variables considered in explaining the choice of the health service providers (final decision) are mainly consultation cost (Ln cost) and the nearness of the service. The Log of age of the household head (LnAge) and its square, gender (equals 1 if male), milieu of residence (Milieu Resid equals 1 if urban), sector of activity as specified by Activity FS (Formal Sector equals 1 if activity in the formal sector) and Activity IFS (Informal Sector equals 1 if activity in the informal sector)[3], motives for choosing the service (Curative disease, Wound/accident, Antenatal)[4], and the level of instruction (Illiteracy equals 1 if illiterate) are defined in explaining the choice of the health sector.

Overall, the Independence of irrelevant (IIA) assumption between public services (taken as the reference health sector) and the alternatives of other services remained weak, thus supporting the evaluation of a nested (heteroscedastic) Logit model. Consultation cost significantly and negatively affects the predictions of the choice of service providers, while nearness of the service has a positive and significant effect. It appears that males prefer the public sector to private modern services, but will choose traditional/self healing over public services (Tables A1, A2, and A3). Living in the urban areas, however, is an incentive to choose the public sector over both the private services and traditional healing (Tables A1 to A4).

The effect of income per se remains marginal as expected. But when income increases, households would choose the private sector over the public services, but prefer the public to traditional/self healing. Households systematically prefer public services over the traditional ones, in cases of curative diseases, wounds/accidents, and antenatal. Even illiterate household heads significantly use the public sector instead of the private sector; but would choose traditional healing over the public sector.

5. Compensating the poor out of traditional healing

In the Spline specification, the considered knots are the lower poverty line of 232,547 cfa francs and the upper line of 345,535 cfa francs; thus defining three income variables in the Logit model: LnRevenue1 (values<232,547), LnRevenue2 (232,547≤values<345,535) and Ln Revenue3 (values ≥345,535).

Up to a 46% increase in the lower poverty line along with a 14.47% increase in the upper poverty line (Table A1, A2, and A3), the poor would choose the confessional private health services, as well as traditional healing/self medication over the public health care services. But an increase in the lower poverty line by 46.20% while

[2] which stands for Deuxième Enquête Camerounaise auprès des Ménages, a survey conducted on 12000 households, but 56 927 individuals in the second semester of the year 2001.
[3] The reference modality is unemployed.
[4] Other diseases stands as the reference group for the 3 reason dummies.

maintaining the upper line at a 14.47% (Table A4), moves the poor away from the traditional healers to the public sector.

6. Conclusion

Based on a nested Logit model adjusted for a spline function of consumption, this paper first identifies the determinants of health care providers, and then determines that the poor households could turn away from traditional/self healing to the public health care facilities if they get compensated for at least 46.20% of the lower poverty line, while the intermediate group receives a compensation of at least 14% of the upper poverty line.

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Annex

Table A1: Estimation of Nested Logit Model for health service provider free of poverty consideration

Levels=2 ; Number of obs=65628 ; Dependent variable=choice
LR chi2(27)=6066.631 ; Log likelihood=-16564.95 ; Prob>chi2=0.0000

	Coef.	SE	z	P>|z|	[95% Conf.	Interval]
Service Providers						
Ln cost	-0.1233	0.0112	-10.98	0.000	-0.1454	-0.1013
Nearness	1.1999	0.0234	51.25	0.000	1.1540	1.2458
Health Sector						
Private						
Gender	-0.1310	0.0555	-2.36	0.018	-0.2399	-0.0222
Ln age	-1.6834	0.5326	-3.16	0.002	-2.7274	-0.6393
Ln age_sq	0.2760	0.0750	3.68	0.000	0.1288	0.4231
Illiteracy	-0.3977	0.0639	-6.22	0.000	-0.5230	-0.2724
Milieuresid	-0.3439	0.0509	-6.75	0.000	-0.4438	-0.2441
Ln Revenue	0.0975	0.0329	2.96	0.003	0.0330	0.1620
Activity FS	0.0209	0.0766	0.27	0.784	-0.1291	0.1711
Activit IFS	0.0064	0.0707	0.09	0.928	-0.1322	0.1450
Curative dis	-0.1594	0.1280	-1.24	0.213	-0.4104	0.0916
Wound/accidt	-0.6301	0.1740	-3.62	0.000	-0.9712	-0.2890
Antenatal	0.0780	0.2696	0.29	0.772	-0.4503	0.6065
Traditional						
Gender	0.0890	0.0677	1.31	0.189	-0.0438	0.2218
Ln age	5.5244	0.6007	9.20	0.000	4.3469	6.7019
Ln age_sq	-0.7725	0.0844	-9.15	0.000	-0.9380	-0.6070
Illiteracy	0.4367	0.0662	6.59	0.000	0.3068	0.5665
Milieu resid	-0.1086	0.0637	-1.70	0.088	-0.2334	0.0162
Ln Revenue	-0.1955	0.0417	-4.69	0.000	-0.2772	-0.1137
Activity FS|	-0.2412	0.1119	-2.15	0.031	-0.4607	-0.0217
ActivityIFS|	0.4448	0.0956	4.65	0.000	0.2574	0.6323
Curativedis|	-.38058	0.1494	-2.55	0.011	-0.6734	-0.0877
Woundaccidt|	-1.3125	0.2259	-5.81	0.000	-1.7553	-0.8698
Antenatal |	-3.0483	1.0244	-2.98	0.003	-5.0562	-1.0404
Reference Sector: Public						
Inclusive values Parameters						
/Public	7.6461	0.6886	11.10	0.000	6.2963	8.9959
/Private	13.0857	1.0748	12.17	0.000	10.9790	15.1923
/Traditional	2.8051	0.1860	15.07	0.000	2.4404	3.1699

Sigma
/Public: 0.13 /Private: 0.08 /Traditional: 0.36
LR test of homoskedasticity (iv=1): chi2(3)=914.49 Prob>chi2=0.0000

Notes: Ln (Logarithm); sq (square); FS (Formal Sector); IFS (Iformal Sector); resid (residence); accidt (Accident). Source: author's construction.

Table A2: Estimation of Nested Logit Model for health service provider accounting for poverty in a Spline function

mkspline rev1 232547 rev2 345535 rev3=revenu
Levels=2 Number of obs=65628 Dependent variable=choice
LR chi2(31)=6068.403 Log likelihood=-16564.063 Prob>chi2=0.0000

	Coef.	SE	z	P>|z|	[95% Conf.	Interval]
Service Providers						
Ln cost	-0.1129	0.0117	-9.61	0.000	-0.1360	-0.0899
Nearness	1.2042	0.0235	51.05	0.000	1.1580	1.2505
Health Sector						
Private						
Gender	-0.1415	0.0554	-2.55	0.011	-0.2501	-0.0329
Ln age	-0.2530	0.7932	-0.32	0.750	-1.8077	1.3017
Ln age sq	0.0787	0.1095	0.72	0.472	-0.1359	0.2933
Illiteracy	-0.3868	0.0638	-6.06	0.000	-0.5119	-0.2617
Milieu resid	-0.3463	0.0508	-6.81	0.000	-0.4461	-0.2466
Ln Revenue1	0.0397	0.1129	0.35	0.725	-0.1816	0.2611
Ln Revenue2	-0.0156	0.0079	-1.98	0.048	-0.0312	-0.0001
Ln Revenue3	0.0144	0.0053	2.71	0.007	0.0039	0.0248
Activity FS	0.0119	0.0778	0.15	0.878	-0.1407	0.1645
Activity IFS	-0.0159	0.0711	-0.22	0.822	-0.1554	0.1235
Curative dis	-0.1529	0.1282	-1.19	0.233	-0.4042	0.0984
Wound/accidt	-0.6249	0.1740	-3.59	0.000	-0.9659	-0.2838
Antenatal	0.0581	0.2696	0.22	0.829	-0.4703	0.5866
Traditional						
Gender	0.0839	0.0679	1.24	0.217	-0.0492	0.2170
Ln age	2.8070	1.0127	2.77	0.006	0.8220	4.7920
Ln age sq	-0.4066	0.1388	-2.93	0.003	-0.6789	-0.1344
Illiteracy	0.4325	0.0669	6.46	0.000	0.3014	0.5637
Milieu resid	-0.1131	0.0636	-1.78	0.076	-0.2379	0.0117
Ln Revenue1	0.4033	0.1323	3.05	0.002	0.1439	0.6627
Ln Revenue2	-0.0227	0.0087	-2.61	0.009	-0.0397	-0.0056
Ln Revenue3	-0.0217	0.0063	-3.42	0.001	-0.0342	-0.0092
Activity FS	-0.1866	0.1136	-1.64	0.101	-0.4093	0.0361
Activity IFS	0.4849	0.0961	5.04	0.000	0.2964	0.6734
Curative dis	-0.3940	0.1490	-2.64	0.008	-0.6862	-0.1018
Wound/accidt	-1.3260	0.2261	-5.86	0.000	-1.7692	-0.8828
Antenatal	-3.0691	1.0278	-2.99	0.003	-5.0836	-1.0547
Reference Sector: Public						
Inclusive Values Parameters						
/Public	9.4964	1.02962	9.22	0.000	7.4784	11.5145
/Private	12.3839	1.03036	12.02	0.000	10.3644	14.4034
/Traditional	2.8895	0.19468	14.84	0.000	2.5079	3.2711
Sigma						
/Public: 0.11	/Private: 0.08	/Traditional: 0.35				

LR test of homoskedasticity (iv=1): chi2(3)=913.38 Prob>chi2=0.0000

Table A3: Estimation of Nested Logit Model for health service provider accounting for poverty in a Spline function, having increased the levels of revenue

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mkspline rev1 340000 rev2 395535 rev3=revenue
Levels=2    Number of obs=65628   Dependent variable=choix
LR chi2(31)=5888.441  Log likelihood=-16654.045   Prob>chi2=0.0000
```

	Coef.	SE	z	P>|z|	[95% Conf.	Interval]
Service Providers						
Ln cost	-0.3028	0.0211	-14.32	0.000	-0.3442	-0.2613
Nearness	1.0955	0.0262	41.67	0.000	1.0440	1.1470
Health Sector						
Private						
Gender	-0.1252	0.0553	-2.26	0.024	-0.2338	-0.0166
Ln age	2.1518	0.6349	3.39	0.001	0.9074	3.3962
Ln age sq	-0.2481	0.0880	-2.82	0.005	-0.4206	-0.0755
Illiteracy	-0.3937	0.0632	-6.22	0.000	-0.5177	-0.2696
Milieu resid	-0.3352	0.0503	-6.66	0.000	-0.4339	-0.2366
Ln Revenue1	0.0044	0.0817	0.05	0.957	-0.1558	0.1647
Ln Revenue2	-0.0050	0.0096	-0.53	0.595	-0.0239	0.0137
Ln Revenue3	0.0126	0.0074	1.69	0.091	-0.0020	0.0272
Activity FS	-0.0321	0.0766	-0.42	0.675	-0.1823	0.1181
Activity IFS	-0.0769	0.0708	-1.09	0.277	-0.2157	0.0618
Curative dis	-0.1940	0.1273	-1.52	0.128	-0.4437	0.0556
Wound/accidt	-0.6499	0.1720	-3.78	0.000	-0.9870	-0.3127
Antenatal	0.0809	0.2675	0.30	0.762	-0.4435	0.6053
Traditional						
Gender	0.0888	0.0668	1.33	0.184	-0.0421	0.2199
Ln age	0.9837	0.6154	1.60	0.110	-0.2226	2.1900
Ln age sq	-0.1598	0.0859	-1.86	0.063	-0.3282	0.0085
Illiteracy	0.4129	0.0652	6.32	0.000	0.2849	0.5408
Milieu resid	-0.1288	0.0629	-2.05	0.041	-0.2522	-0.0055
Ln Revenue1	-0.0018	0.0855	-0.02	0.983	-0.1693	0.1657
Ln Revenue2	-0.0104	0.0109	-0.96	0.339	-0.0319	0.0109
Ln Revenue3	-0.0191	0.0090	-2.12	0.034	-0.0368	-0.0014
Activity FS	-0.1446	0.1109	-1.30	0.192	-0.3620	0.0727
Activity IFS	0.5094	0.0943	5.40	0.000	0.3244	0.6944
Curative dis	-0.4190	0.1470	-2.85	0.004	-0.7073	-0.1308
Wound/accidt	-1.3180	0.2202	-5.98	0.000	-1.7482	-0.8863
Antenatal	-3.2392	1.0859	-2.98	0.003	-5.3675	-1.1101
Reference: Public						
Inclusive Values parameters						
/Public	2.4712	0.2373	10.41	0.000	2.0060	2.9365
/Private	7.3341	0.3428	21.39	0.000	6.6620	8.0061
/Traditional	2.0157	0.1912	10.54	0.000	1.6408	2.3907
Sigma						
/Public:0.40	/Private:0.14	/Traditional:0.50				
LR test of homoskedasticity (iv=1): chi2(3)=740.34	Prob>chi2=0.0000					

Table A4: Estimation of Nested Logit Model for health service provider accounting for poverty in a Spline function, having increased the levels of revenue

mkspline rev1 340000 rev2 395535 rev3=revenue
Levels=2 Number of obs = 65628 Dependent variable=choix
LR chi2(31)=5888.441 Log likelihood=-16654.045 Prob>chi2=0.0000

	Coef.	SE	z	P>|z|	[95% Conf.	Interval]
Service Providers						
Ln cost	-0.3028	0.0211	-14.32	0.000	-0.3442	-0.2613
Nearness	1.0955	0.0262	41.67	0.000	1.0440	1.1470
Health Sector						
Private						
Gender	-0.1252	0.0553	-2.26	0.024	-0.2338	-0.0166
Ln age	2.1518	0.6349	3.39	0.001	0.9074	3.3962
Ln age sq	-0.2481	0.0880	-2.82	0.005	-0.4206	-0.0755
Illiteracy	-0.3937	0.0632	-6.22	0.000	-0.51771	-0.2696
Milieu resid	-0.3352	0.0503	-6.66	0.000	-0.4339	-0.2366
Ln Revenue1	0.0044	0.0817	0.05	0.957	-0.1558	0.1647
Ln Revenue2	-0.0050	0.0096	-0.53	0.595	-0.0239	0.0137
Ln Revenue3	0.0126	0.0074	1.69	0.091	-0.0020	0.0272
Activity FS	-0.0321	0.0766	-0.42	0.675	-0.1823	0.1181
Activity IFS	-0.0769	0.0708	-1.09	0.277	-0.2157	0.0618
Curative dis	-0.1940	0.1273	-1.52	0.128	-0.4437	0.0556
Wound/accidt	-0.6499	0.1720	-3.78	0.000	-0.9870	-0.3127
Antenatal	0.0809	0.2675	0.30	0.762	-0.4435	0.6053
Traditional						
Gender	0.0888	0.0668	1.33	0.184	-0.0421	0.2199
Ln age	0.9837	0.6154	1.60	0.110	-0.2226	2.1900
Ln age sq	-0.1598	0.0859	-1.86	0.063	-0.3282	0.0085
Illiteracy	0.4129	0.0652	6.32	0.000	0.2849	0.5408
Milieu resid	-0.1288	0.0629	-2.05	0.041	-0.2522	-0.0055
Ln Revenue1	-0.0018	0.0855	-0.02	0.983	-0.1693	0.1657
Ln Revenue2	-0.0104	0.0109	-0.96	0.339	-0.0319	0.0109
Ln Revenue3	-0.0191	0.0090	-2.12	0.034	-0.0368	-0.0014
Activity FS	-0.1446	0.1109	-1.30	0.192	-0.3620	0.0727
Activity IFS	0.5094	0.0943	5.40	0.000	0.3244	0.6944
Curative dis	-0.4190	0.1470	-2.85	0.004	-0.7073	-0.1308
Wound/accidt	-1.3180	0.2202	-5.98	0.000	-1.7498	-0.8863
Antenatal	-3.2392	1.0859	-2.98	0.003	-5.3675	-1.1109
Reference: Public						
Inclusive Values parameters						
/Public	2.4712	0.2373	10.41	0.000	2.0060	2.9365
/Private	7.3341	0.3428	21.39	0.000	6.6620	8.0061
/Traditional	2.0157	0.1912	10.54	0.000	1.6408	2.3907
Sigma						
/Public:0.40	/Private:0.14	/Traditional:0.50				

LR test of homoskedasticity (iv=1): chi2(3)=740.34 Prob>chi2=0.0000