

Sanwald, Alice; Theurl, Engelbert

Working Paper

Out-of-pocket expenditures of private households for dental services: Empirical evidence from Austria

Working Papers in Economics and Statistics, No. 2014-30

Provided in Cooperation with:

Institute of Public Finance, University of Innsbruck

Suggested Citation: Sanwald, Alice; Theurl, Engelbert (2014) : Out-of-pocket expenditures of private households for dental services: Empirical evidence from Austria, Working Papers in Economics and Statistics, No. 2014-30, University of Innsbruck, Research Platform Empirical and Experimental Economics (eecon), Innsbruck

This Version is available at:

<https://hdl.handle.net/10419/122208>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



Out-of-pocket expenditures of private households for dental services - Empirical evidence from Austria

Alice Sanwald, Engelbert Theurl

Working Papers in Economics and Statistics

2014-30

University of Innsbruck
Working Papers in Economics and Statistics

The series is jointly edited and published by

- Department of Economics
- Department of Public Finance
- Department of Statistics

Contact Address:
University of Innsbruck
Department of Public Finance
Universitaetsstrasse 15
A-6020 Innsbruck
Austria
Tel: + 43 512 507 7171
Fax: + 43 512 507 2970
E-mail: eeecon@uibk.ac.at

The most recent version of all working papers can be downloaded at
<http://eeecon.uibk.ac.at/wopec/>

For a list of recent papers see the backpages of this paper.

Out-of-pocket expenditures of private households for dental services - Empirical evidence from Austria

Alice Sanwald*

Engelbert Theurl**

Abstract

Objectives: Dental services differ from other health services in several dimensions. One important difference is that a substantial share of costs of dental services – especially those beyond routine dental treatment - are paid directly by the patient out-of-pocket. We analyze the socio-economic determinants of out-of-pocket expenditures for dentals services (OOPE) in Austria on the household level. *Methods:* We use cross-sectional information on OOPE and on household characteristics provided by the Austrian household budget survey 2009/10. We apply a two-part model (Logit/GLM) and a one-part GLM. *Results:* The probability of OOPE is strongly affected by the life cycle (structure) of the household. It increases with adults' age, with income and partially with the level of education. The type of public insurance has an influence on the expenditure probability while the existence of private health insurance has no significant effect. In contrast to the highly statistically significant coefficients in the first stage the covariates of the second stage remain predominantly insignificant. According to our results, the level of expenditures is mainly driven by the level of education and income. The results of the one-part GLM confirm the results of the two-part model. *Conclusions:* Our results allow new insights into the determinants of OOPE for dental care. The household level turns out to be an adequate basis to study the determinants of OOPE, although we should be cautious to jump to conclusions for the individual level.

Keywords: out-of-pocket expenditures, dental services, two-part model, generalized linear model

* University of Innsbruck, Department of Economics and Statistics, Universitätsstrasse 15, A-6020 Innsbruck, Austria: E-Mail: Alice.Sanwald@uibk.ac.at, Tel: +43 (0) 512 507 7164, Fax: +43 (0) 512 507 2788

** University of Innsbruck, Department of Economics and Statistics, Universitätsstrasse 15, A-6020 Innsbruck, Austria: Email: Engelbert.Theurl@uibk.ac.at, Tel: +43 (0) 512 507 7159, Fax +43 (0) 512 2788

Introduction

Dental care services are to some extent different from other medical services and these differences might influence the mechanisms of service provision and financing. Dental diseases are normally not life threatening, their expenditures are not existence spoiling and the need for dental services is to some extent predictable and/or susceptible by preventive actions. Patients' ability to learn from experience on provider quality is at least partially possible. However, expenditure smoothing by public and/or private insurance arrangements offer lower space for welfare improvement and higher rates of copayment seem to be optimal. In fact, empirically out-of-pocket expenditures for dental services (OOPE) are higher compared to other medical services. In an unweighted OECD-average in 2011 OOPE account for 53 % of total dental service expenditures which is roughly threefold the level of overall out-of-pocket financing of health care services (1). In Austria the situation is similar. OOPE account for 50 % of dentists' service expenditures leaving 2 % to general government, 46 % to social health insurance and 2 % to private health insurance financing in 2011 (2). This high level of OOPE raises several equity and efficiency related questions. But before drawing any policy conclusions on these issues it seems to be necessary to identify the determinants influencing the level of OOPE. In this paper we exactly focus on this question on the private household level. Thereby we use cross-sectional information of OOPE and on several household characteristics provided by the latest Austrian household budget survey.

The paper benefits from several strands of previous research activities. It builds on research work on out-of-pocket health care expenditure based on micro data in general (3-9) and on the bounded literature on the demand for dental services in particular on OOPE (10-16). Finally, the paper benefits from research work which focuses on the link between the institutional background of health care service consumption and preferred empirical strategies (17-24). The paper contributes to the scarce empirical research on OOPE. It adds evidence from the perspective of the household and completes/adjusts findings available from the individual level. We study OOPE in a highly particularized

health care system which is based on Bismarckian principles and a specific two-tiered institutional architecture.

The remainder of this paper is organized in the following way. In the next section, we briefly describe the institutional setting of consuming dental services in Austria. We subsequently provide a brief description of the data, elaborate the econometric framework, present and discuss the empirical findings. We close the paper by summarizing our findings.

Institutional setting of dental care in Austria

With minor modifications, the general institutional design of demand and supply of outpatient health care services in Austria is also relevant for dental services. The social health insurance system represents the first tier of coverage against the risks of illness. Membership in this system is obligatory for wage earners both in the public and the private sector, for self-employed persons and farmers. Individuals with family ties to obligatorily insured persons and without own coverage obtain free health coverage. Overall, the social health insurance system covers around 99.3% of the population, excluding only marginal groups. Social health insurance is financed mainly by income-related contributions. Private health insurance and out-of-pocket payments constitute the second tier of the Austrian health care system.

Dental services in Austria are offered by (i) private dentists, (ii) public dentists, (iii) dental services offered by the social health insurance system directly (so called dental laboratories) and (iv) by the dental ambulances of public and private hospitals. In our definition, public dentists are dentists that have a contract with the social health insurance system. Private and public dentists are self-employed and mainly work in single practices. Patients with social health insurance coverage are free to consult providers of categories (i), (ii), (iii), and with minor restrictions also providers of type (iv). However, the associated costs of utilization are considerably different.

The consumption of public dentist services is based on a benefit-in-kind scheme. Basic dental services (e.g. filling and extraction of teeth) are offered with negligible cost-sharing elements. This is especially true for workers in the private sector (76 % of the population, insurance label: GKK). Public workers (8.6 % of the population, insurance label: BVA) and employers (8.4 % of the population, insurance label: SVA) face a proportional cost sharing scheme of 20 % for these services, farmers (4 % of the population, insurance label SVB) have to pay a lump sum fee quarterly when using dental services. Patients are confronted with substantial amounts of cost sharing (approximately 50 % of the costs) when they undergo specialized treatments such as endodontic services, crowns and bridges, and prosthodontic and orthodontic services. A closer inspection of the arrangements reveals a quite heterogeneous mix of copayment methods (proportional and absolute cost sharing, public subsidies) for these dental services. Cost sharing designs differ between the different public sickness funds (GKK, BVA, SVA, SVB). In all sickness funds fixed prosthodontics are only co-financed by the social health insurance system in exceptional cases.

A similar regulation of service prices and copayment exists for dental services offered by the public health insurance system directly. Dental costs of private dentists' services are paid out of pocket, and/or by the social health insurance system. The latter only reimburses a portion of a private dentist's invoice. For basic services, the maximum refundable amount is fixed at 80% of the amount a public dentist is allowed to charge for the same service. For specialized private treatments, the remuneration schedules of contracted dentists are applied. Since the prices of private dentists for basic and specialized treatments are above the ones for contracted dentists, the financial burden for the utilization of private dentists is substantial. Private health insurance, which in general completes social health insurance coverage in Austria, plays only a very limited role in the coverage of dental expenditure risks. In 2011, 2 % of the total costs for dental services were paid by the private health insurance system (2).

Material and Methods

To analyze the determinants of OOPE empirically we use data from the latest household budget survey 2009/10 conducted by Statistics Austria. This periodically repeated survey (in the moment with a five year interval) is used to study the level and structure of private consumption of households within the System of National Accounts. The observation unit is the private household without institutionalized households. The total sample offered by Statistics Austria consists of 6,534 households with 15,540 members. We exclude 747 households with unclear household and/or social health insurance status and use a final sample size of 5,787 households. Households participating in the survey are asked to fill in a diary over 14 days in which they record every single expense. These expenditures are converted into monthly expenditures presented in Euros. The data set results in 52 overlapping weeks of bookkeeping. Selected socio-economic characteristics of the household are gathered by face-to-face interviews.

For econometric and economic reasons hurdle models, specifically two-part models serve as methodological cornerstones to explain health care utilization/expenditures (21). The first part is a binary model that focuses on the separation between users and nonusers. The second part explains the level/frequency of medical care use conditional on some use. Statistically the split in the estimation procedure is motivated by the specific characteristics of health care expenditures: (i) skewness, (ii) excess zeros, (iii) heavy right tails. From an economic perspective the split in the estimation procedure is motivated by the fact that the two decision stages are characterized by differences in the involved actors and decision covariates. The empirical strategy in the first step is normally based on explicit or reduced versions of the Grossman-model of demand for health services(25, 26). The patient seeking care decides autonomously whether to seek professional diagnostic and curative medical help at all. The modelling of the second step is influenced by principle-agent considerations leading to joint decisions of patients and their service suppliers. In a nutshell the ideal starting point of two-part models is the entire episode of medical services defined as a set of medical services received

by a patient in response to particular requests caused by a specific illness (for an extended discussion see Stoddart and Barer (24)). The data should picture individual behavior and should allow the separation between the initial spell and additional visits.

The description of the data collection for OOPE in Austria makes clear that our data set does not perfectly fulfill these preconditions for using a two-part model. We react to these fact and use different econometric approaches. First, we apply a two-part model. The first stage of the model predicts the likelihood of any OOPE and was specified as Logit. The second part predicts the level of spending, conditional on having non-zero OOPE. For the latter part we use a generalized linear model (GLM). As an alternative modelling strategy we use a one-part GLM and estimate both decision stages jointly. In both GLM specifications we determine the link function and the relationship between the mean and the variance as suggested by e.g. Manning and Mullahy (27) and Matsaganis, Mitrakos (8). In a modified Park test the squared residuals of a provisional log-transformed OLS model or a provisional GLM model are regressed on the predictions from the same model. The estimated coefficient λ indicates which variance function is appropriate, suggesting either a constant variance model ($\lambda = 0$), a proportional to the mean model ($\lambda = 1$) or a standard deviation proportional to the mean model ($\lambda = 2$). The latter two models are sometimes also called “Poisson-like” model or respectively “Gamma-like” model (17). As suggested, the goodness of fit of competing model specifications will be evaluated by comparing the mean absolute error, the mean squared error and the R2 scores (8). Tests concerning model fit encompass Pregibon’s Link test, Ramsey’s Reset test, a modified Hosmer-Lemeshow test, Cook’s distance and a goodness of fit test for the combined model.

We use monthly OOPE per household as dependent variable. We test for several socio-economic characteristics of the household: the household structure or the household life cycle, adults’ age structure, adults’ education level, public and private insurance characteristics, sex of the householder, income level and the degree of urbanization. In Table 3 (Annex) we give detailed information on the specification of these variables and the percentages of observations with a specific characteristic.

Table 1 presents the summary statistics of the dependent variable for the explanatory variables. We separate between the expenditure means and standard deviation (SD) for the total sample and those households with expenditures > 0 (1,384 households). The average OOPE for the total household size is 35.57 Euros (SD = 133.28). The mean for households with non-zero OOPE is 148.74 (SD = 239.72). The data show substantial differences in the OOPE level between households with different characteristics.

[Table 1 about here]

Results and Discussion

The econometric results of the two-part-model and the one-part GLM are summarized in Table 2. The probability to have OOPE is strongly influenced by the life cycle of the households. Especially larger observation units like full nest I¹, married couples without children and full nest II have a higher or respectively the highest probability of spending OOPE. These three household types further represent the largest observation units with on average 3.3 - 4 household members. As only one household member with non-zero OOPE is sufficient to classify the total observation unit as a household which consumes OOPE the higher probability of the mentioned household types might be - at least partially - explained. Furthermore, there is strong evidence of the relationship between adults' age and the probability of consuming OOPE. As increasing age is an important factor of seeking health care in general this is also true for dental health care. In our case, the age class of 65 - 85 years shows the highest probability of OOPE. The type of public insurance influences the probability of OOPE (reference group: GKK). Households being insured at BVA, SVB and SVA show a higher probability of OOPE, but the results for members of the SVA remain insignificant. This might reflect the higher proportion of cost-sharing in these sickness funds. The existence of private health insur-

¹ For the specification of the household structure see table 3 in the appendix.

ance is without any statistically significant effect. A higher level of education and income increases the probability of having OOPE significantly.

[Table 2 about here]

In the second stage we tested for the kurtosis which verified a log link function and the estimated λ clearly suggests a standard deviation proportional to the mean model.² In contrast to the highly statistically significant coefficients in the first stage the covariates of the second stage remain predominantly insignificant. According to our results, the level of expenditures is mainly driven by the level of education and income. One explanation for this fact is the well-known attitude of these both groups to contact private dentists with higher service fees. Columns 5/6 show the results of the one-stage GLM. We tested for the kurtosis which takes the score 3.3 and therefore justifies a log link function. The applied Park test shows an estimated λ of 1.84 for the provisional OLS model with log-transformed dependent variable and an estimated λ of 1.60 for the provisional GLM model. In the evaluation process the standard deviation proportional to the mean model clearly outperformed the proportional to the mean model which will be used in the following analysis. The considered household types, income, adults' age and education level show a strong impact on the expenditure level. A negative effect of a lower degree of urbanization is revealed which might reflect a limited access to dental care facilities. To sum up, the findings of the one-stage GLM widely confirm the results the two-part-model.

For robustness checks we separated OOPE into the two components (i) routine dental services and (ii) specialized treatments (e.g. endodontic services, crowns, bridges). It turns out that (ii) is much more important. We observe 1291 households with positive OOPE (mean OOPE for the total sample: 27.41; mean OOPE for sample OOPE > 0: 122.88) in this expenditure category while only 157 households have positive OOPE for routine dental services (mean OOPE for the total sample:

² The estimated λ of the provisional OLS model with log-transformed dependent variable takes a score of 2.04 and respectively a score of 2.004 in the provisional GLM model.

8.15; mean OOPE for sample OOPE > 0: 300.70). The econometric results (two-part model, one-part GLM) for category (ii) are very similar to the results for total OOPE while the results for category (i) are widely insignificant.

A comparison of our results with the results of previous research (10-16) is only partially useful. We focus on OOPE. The vast majority of the previous literature analyses utilization (measured by visits or by total dental expenditures). Additionally, we focus on the household while previous research is based on individual data. Finally, we extensively stress socio-economic household characteristics as explanatory variables and are not able to control for the dental health status and supply-related characteristics in detail. We only use “degree of urbanization” as a proxy for the access to dental service. Therefore we also abstain from drawing any supply side related conclusions from our results (see Nguyen and Häkkinen (14)). Previous evidence sometimes points to a u-shaped relationship between age and dental utilization/expenditures. We find an effect of age on OOPE which increases with age. Our finding is not contradictory to a u-shaped relationship. Our reference group consists of adults which are on average below 25. Children are only included in the household structure. Compared to Choi (10) the study presents new and dissenting findings on the role of public and private insurance characteristics on OOPE. The type of public insurance influences OOPE. Copayment mechanisms for routine dental services and especially for special treatment differ between the public sickness funds. This is an essential feature of the Austrian health care system in general although movements to harmonize the remunerations system of public dentists and the copayment schemes for specialized treatment are in process. Of course the differences in the OOPE levels of the members of the different public sickness funds might also be caused by unobserved heterogeneity between the members of the different insurance groups. Additional private health insurance is without any effect on OOPE. This could be interpreted as an indication for a sufficient public level of coverage against dental expenditure risks.

Conclusions

This paper analyzes the socio-economic determinants of OOPE of private households in Austria using data from the household budget survey 2009/10. Empirically the data show substantial differences in the expenditure levels between households with different characteristics. The characteristics of the data (household level data, period based data, short observation period) pose several challenges to the choice of the empirical estimation procedure. Therefore we supplement the two-part estimation strategy widely used in the explanation of health expenditure with a one-part GLM. The two-part model estimation reveals highly significant results for several household characteristics (household life cycle, adults' age, adults' education, income) when explaining the probability of OOPE while in the second stage (expenditure level) only income and education have significant coefficients. The one-part GLM estimation confirms the results of the two-part model. The existence of private insurance has no influence on the expenditure probability/level. Public insurance characteristics influence the expenditure probability. Public workers and farmers have a higher expenditure probability, which might be caused by higher net prices or higher quantities consumed. The household turns out to be an adequate basis to study the determinants of dental expenditures, although we should be cautious in deriving conclusions for the individual level.

Acknowledgements

The authors declare that there are no conflicts of interest. Financial support from the Austrian Science Fund (FWF, grant no. S 10306-G16 "National Research Network and the Welfare State") is gratefully acknowledged.

Literature

1. OECD. Health at Glance, Paris. 2013.
2. Statistik Austria. Gesundheitsausgaben in Österreich, https://www.statistik.aat/web_de/statistiken/gesundheit/gesundheitsausgaben. 2014.
3. Bilger M, Chaze J-P. What Drives Individual Health Expenditure in Switzerland? *Swiss J Econ Stat* 2008;144:337-58.
4. Chaze J-P. Assessing household health expenditure with Box-Cox censoring models. *Health Econ.* 2005;14:893-907.
5. Norton EC, Wang H, Stearns SC. Out-of-Pocket Health Care Expenditures. *Swiss J Econ Stat.* 2006;142:3-11.
6. Jones G, Savage E, Van Gool K. The Distribution of Household Health Expenditures in Australia. *Econ Rec.* 2008;84:S99-S114.
7. Jowett M, Contoyannis P, Vinh ND. The impact of public voluntary health insurance on private health expenditures in Vietnam. *Soc Sci Med.* 2003;56:333-42.
8. Matsaganis M, Mitrakos T, Tsakoglou P. Modelling health expenditure at the household level in Greece. *Eur J Health Econ.* 2009;10:329-36.
9. Leibowitz A, Manning WG, Newhouse JP. The demand for prescription drugs as a function of cost-sharing. *Soc Sci Med.* 1985;21:1063-9.
10. Choi MK. The impact of Medicaid insurance coverage on dental service use. *J Health Econ.* 2011;30:1020-31.
11. Groenewegen P, Postma J. The supply and utilization of dental services. *Soc Sci Med.* 1984;19:451-9.
12. Holtmann AG, Olsen Jr EO. The demand for dental care: a study of consumption and household production. *J Hum Resour.* 1976:546-60.
13. Manning Jr WG, Phelps CE. The demand for dental care. *Bell J of Econ.* 1979:503-25.
14. Nguyen L, Häkkinen U. Choices and utilization in dental care. *Eur J of Health Econ.* 2006;7:99-106.
15. Vargas CM, Manski RJ. Dental expenditures and source of payment by race/ethnicity and other sociodemographic characteristics. *J Public Health Dent.* 1999;59:33-8.
16. White BA. Factors influencing demand for dental services: population, demographics, disease, insurance. *J Dent Educ.* 2012;76:996-1007.
17. Buntin MB, Zaslavsky AM. Too much ado about two-part models and transformation?: Comparing methods of modeling Medicare expenditures. *J Health Econ.* 2004;23:525-42.
18. Deb P, Holmes AM. Estimates of use and costs of behavioural health care: a comparison of standard and finite mixture models. *Health Econ.* 2000;9:475-89.
19. Deb P, Trivedi PK. The structure of demand for health care: latent class versus two-part models. *J Health Econ.* 2002;21:601-25.
20. Gerdtham UG. Equity in health care utilization: further tests based on hurdle models and Swedish micro data. *Health Econ.* 1997;6:303-19.
21. Jones AM. Health econometrics. In: Culyer AJ, Newhouse JP, editors. *Handbook of Health Economics.* 1: Elsevier: Amsterdam et al.; 2000;265-344.
22. Pohlmeier W, Ulrich V. An econometric model of the two-part decisionmaking process in the demand for health care. *J Human Resour.* 1995:339-61.
23. Santos Silva J, Windmeijer F. Two-part multiple spell models for health care demand. *J Econometrics.* 2001;104:67-89.
24. Stoddart GL, Barer ML. Analysis of Demand and Utilization through Episodes of Medical Service. In: van der Gaag J, Perlman M, editors. *Health Economics.* Amsterdam; 1981; 149-170.
25. Grossman M. On the concept of health capital and the demand for health. *J Polit Econ.* 1972:223-55.
26. Wagstaff A. The demand for health: an empirical reformulation of the Grossman model. *Health Econ.* 1993;2:189-98.
27. Manning WG, Mullahy J. Estimating log models: to transform or not to transform? *J Health Econ.* 2001;20:461-94.

Table 1: Descriptive statistics according to households' characteristics and structures

Total households	Dental Care Expenditures				
	Average expenditures		Expenditures > 0		
	Mean	S.D.	Mean	S.D.	N
<i>Household structure</i>					
Single person I	23.75	116.86	141.57	255.19	126
Single person II	24.15	101.76	136.49	208.26	172
Unmarried couple	48.19	236.65	181.64	433.94	91
Married couple	36.12	121.22	165.35	214.82	128
Empty nest	42.77	135.90	149.14	220.51	232
Full nest I	29.74	124.98	129.84	235.45	164
Full nest II	58.80	151.77	167.71	218.01	271
Married couple w/o childs	38.16	116.47	129.61	185.51	106
Single parents	24.52	104.07	122.86	206.25	92
<i>Degree of urbanization</i>					
High urbanization	41.21	158.53	169.37	285.82	502
Average urbanization	36.60	138.14	148.69	246.92	369
Low urbanization	29.65	99.95	128.59	175.06	513
<i>Age structure</i>					
Age < 25	7.07	35.41	86.46	94.51	17
Age 25-45	31.13	131.35	134.12	246.17	506
Age 45-65	43.96	144.97	170.07	244.81	588
Age 65-85	32.49	122.11	133.78	219.01	273
<i>Education level</i>					
Primary education	13.15	47.19	74.56	89.96	130
Other education	38.40	140.15	154.93	247.46	1125
Tertiary education	42.79	150.56	169.61	262.05	129
<i>Insurance characteristics (public)</i>					
GKK	30.09	126.79	137.51	242.35	892
BVA	49.75	153.49	174.31	246.88	302
SVA	47.03	127.38	161.43	193.33	141
SVB	46.11	156.38	159.03	259.34	49
Private health insurance (1)	45.56	122.36	179.77	250.98	290
Private health insurance (2)	43.59	145.52	147.91	183.19	207
Total households	35.57	133.28	148.74	239.72	1,384
N (households)	5,787		1,384		

Notes: (1) corresponds to one adult of the household which has an additional private health insurance. (2) corresponds to both adults of the households which have an additional private health insurance. This also includes households consisting of one individual (single person I and single person II). Dummy variables for female householders and income are not reported in the table.

Table 2: Econometric results of the Two-Part Model and the one-part GLM

	Dental Care Expenditures					
	Probability (Logit)		Conditional (GLM)^a		GLM^a	
	Coeff.	Rob. S.D.	Coeff.	Rob. S.D.	Coeff.	Rob. S.D.
<i>Household structure</i>						
Single person II	-0.287*	0.169	-0.005	0.048	-0.154	0.226
Unmarried couple	0.478**	0.194	-0.005	0.052	0.775***	0.266
Married couple	0.125	0.178	-0.068	0.053	-0.137	0.255
Empty nest	0.267	0.186	-0.005	0.049	0.107	0.259
Full nest I	0.390**	0.165	-0.075*	0.043	0.162	0.237
Full nest II	0.690***	0.162	0.008	0.040	0.496**	0.231
Married couple w/o childs	0.464**	0.205	-0.081	0.057	-0.040	0.297
Single parents	0.011	0.189	-0.033	0.050	0.012	0.246
<i>Degree of urbanization</i>						
Average urbanization	-0.041	0.095	-0.022	0.024	-0.019	0.136
Low urbanization	-0.135	0.089	-0.022	0.023	-0.287**	0.126
<i>Age structure</i>						
Age 25-45	0.997***	0.315	0.062	0.116	1.343***	0.306
Age 45-65	1.301***	0.322	0.105	0.117	1.873***	0.321
Age 65-85	1.420***	0.341	0.035	0.121	1.861***	0.345
<i>Education level</i>						
Other education	0.272**	0.132	0.089**	0.042	0.694***	0.174
Tertiary education	0.282	0.185	0.090*	0.051	0.832***	0.253
<i>Insurance characteristics (public)</i>						
BVA	0.288***	0.095	0.028	0.025	0.323**	0.139
SVA	0.170	0.129	0.024	0.029	0.304	0.192
SVB	0.531***	0.205	0.066	0.045	0.668**	0.311
Private health insurance (1)	0.179	0.113	0.013	0.026	0.150	0.170
Private health insurance (2)	0.016	0.096	0.007	0.023	0.121	0.134
<i>Other characteristics</i>						
Female householder	0.214**	0.095	0.028	0.025	0.121	0.137
Income (log)	0.235**	0.095	0.129***	0.026	0.466***	0.124
Constant	-4.795***	0.759	0.268	0.218	-2.684***	0.955
Observations (households)	5,787		1,384		5,787	

Notes: a) GLM with log-link and gamma distribution. (1) corresponds to one adult of the household which has an additional private health insurance. (2) corresponds to both adults of the households which have an additional private health insurance. This also includes households consisting of one individual (single person I and single person II). Reference groups: single person I, high urbanization, age class 18- 25, primary education, GKK, no additional private health insurance and male householder. Significance level *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix

Table 3: Overview of variable specification and the corresponding share of observations

Variables	Percentage of observations	S.D.	Definition
<i>Household structure</i>			
Single person I	12.98	0.44	<i>Household consists of 1 adult, single.</i>
Single person II	16.80	0.49	<i>Household consists of 1 adult, either married, divorced or widowed.</i>
Unmarried couple	5.93	0.31	<i>Household consists of 2 adults, unmarried.</i>
Married couple	10.13	0.40	<i>Household consists of 2 adults, married, members are below 60 years.</i>
Empty nest	13.98	0.46	<i>Household consists of 2 adults, married, members are above 60 years.</i>
Full nest I	12.37	0.43	<i>Household consists of 2 adults, members are below 40 years, at least one child.</i>
Full nest II	13.36	0.45	<i>Household consists of 2 adults, members are above 40 years, at least one child.</i>
Married couple w/o childs	6.22	0.32	<i>Household consists of more than 3 adults, married, no children.</i>
Single parents	7.97	0.36	<i>Household consists of one adult, at least one child.</i>
<i>Degree of urbanization</i>			
High urbanization	35.65	0.63	<i>Areas with a population of at least 50,000 and more than 500 inhabitants per square kilometer.</i>
Average urbanization	25.90	0.58	<i>Areas with a population of at least 50,000 and 100 - 500 inhabitants per square kilometer.</i>
Low urbanization	38.45	0.64	<i>All other areas.</i>
<i>Age structure</i>			
Age < 25	3.59	0.24	<i>Average age of both adults. Refers to householder, if household consists of one adult.</i>
Age 25-45	37.67	0.64	<i>Average age of both adults. Refers to householder, if household consists of one adult.</i>
Age 45-65	39.31	0.64	<i>Average age of both adults. Refers to householder, if household consists of one adult.</i>
Age 65-85	19.42	0.52	<i>Average age of both adults. Refers to householder, if household consists of one adult.</i>
<i>Education level</i>			
Primary education	12.74	0.44	<i>Both adults have a primary education level. This also includes households consisting of one adult.</i>
Other education	78.43	0.54	<i>Both adults have a mixed or secondary education level. This also includes households consisting of one adult.</i>
Tertiary education	8.83	0.37	<i>Both adults have a secondary education level. This also includes households consisting of one adult.</i>
<i>Insurance characteristics (public)</i>			
GKK	70.43	0.60	<i>Workers in the private sector. Refers to householder's insurance type.</i>
BVA	18.28	0.51	<i>Public servants. Refers to householder's insurance type.</i>
SVA	8.36	0.36	<i>Employers. Refers to householder's insurance type.</i>
SVB	2.92	0.22	<i>Farmers. Refers to householder's insurance type.</i>
Additional private health insurance (1)	11.61	0.42	<i>One adult of the household has an additional health insurance.</i>
Additional private health insurance (2)	20.67	0.53	<i>All adults have an additional health insurance. This includes households consisting of one adult.</i>
<i>Other characteristics</i>			
Female householder	32.73	0.62	<i>Householder is female.</i>
Income	2986.40	2025.56	<i>Monthly household income in Euros.</i>

University of Innsbruck - Working Papers in Economics and Statistics
Recent Papers can be accessed on the following webpage:

<http://eeecon.uibk.ac.at/wopec/>

- 2014-30 **Alice Sanwald, Engelbert Theurl:** Out-of-pocket expenditures of private households for dental services - Empirical evidence from Austria
- 2014-29 **Stefan Borsky, Esther Blanco:** Setting one voluntary standard in a heterogeneous Europe - EMAS, corruption and stringency of environmental regulations
- 2014-28 **Eberhard Feess, Christian Grund, Markus Walzl, Ansgar Wohlschlegel:** Competing trade mechanisms and monotone mechanism choice
- 2014-27 **Esther Blanco, E. Glenn Dutcher, Tobias Haller:** To mitigate or to adapt? Collective action under asymmetries in vulnerability to losses
- 2014-26 **Alice Sanwald, Thomas Schober:** Follow your heart: Survival chances and costs after heart attacks - An instrumental variable approach
- 2014-25 **Eric Mayer, Sebastian R uth, Johann Scharler:** Total factor productivity and the propagation of shocks; Empirical evidence and implications for the business cycle
- 2014-24 **Susanne Berger, Herbert Stocker, Achim Zeileis:** Innovation and institutional ownership revisited: An empirical investigation with count data models
- 2014-23 **James C. Cox, Rudolf Kerschbamer, Daniel Neururer:** What is trustworthiness and what drives it?
- 2014-22 **Michael Kirchler, Caroline Bonn, J rgen Huber, Michael Razen:** The “Inflow-Effect” - Trader inflow and bubble formation in asset markets
- 2014-21 **Silvia Angerer, Daniela Gl tze-R tzler, Philipp Lergetporer, Matthias Sutter:** Donations, risk attitudes and time preferences: A study on altruism in primary school children *forthcoming in Journal of Economic Behavior and Organization*
- 2014-20 **Christian Kleiber, Achim Zeileis:** Visualizing count data regressions using rootograms
- 2014-19 **Matthias Siller, Christoph Hauser, Janette Walde, Gottfried Tappeiner:** The multiple facets of regional innovation

- 2014-18 **Carmen Arguedas, Esther Blanco:** On fraud and certification of corporate social responsibility
- 2014-17 **Achim Zeileis, Christoph Leitner, Kurt Hornik:** Home victory for Brazil in the 2014 FIFA World Cup
- 2014-16 **Andreas Exenberger, Andreas Pondorfer, Maik H. Wolters:** Estimating the impact of climate change on agricultural production: accounting for technology heterogeneity across countries
- 2014-15 **Alice Sanwald, Engelbert Theurl:** Atypical employment and health: A meta-analysis
- 2014-14 **Gary Charness, Francesco Feri, Miguel A. Meléndez-Jiménez, Matthias Sutter:** Experimental games on networks: Underpinnings of behavior and equilibrium selection *slightly revised version forthcoming in Econometrica*
- 2014-13 **Uwe Dulleck, Rudolf Kerschbamer, Alexander Konovalov:** Too much or too little? Price-discrimination in a market for credence goods
- 2014-12 **Alexander Razen, Wolfgang Brunauer, Nadja Klein, Thomas Kneib, Stefan Lang, Nikolaus Umlauf:** Statistical risk analysis for real estate collateral valuation using Bayesian distributional and quantile regression
- 2014-11 **Dennis Dlugosch, Kristian Horn, Mei Wang:** Behavioral determinants of home bias - theory and experiment
- 2014-10 **Torsten Hothorn, Achim Zeileis:** partykit: A modular toolkit for recursive partytioning in R
- 2014-09 **Rudi Stracke, Wolfgang Höchtel, Rudolf Kerschbamer, Uwe Sunde:** Incentives and selection in promotion contests: Is it possible to kill two birds with one stone? *forthcoming in Managerial and Decision Economics*
- 2014-08 **Rudi Stracke, Wolfgang Höchtel, Rudolf Kerschbamer, Uwe Sunde:** Optimal prizes in dynamic elimination contests: Theory and experimental evidence *forthcoming in Journal of Economic Behavior and Organization*
- 2014-07 **Nikolaos Antonakakis, Max Breitenlechner, Johann Scharler:** How strongly are business cycles and financial cycles linked in the G7 countries?
- 2014-06 **Burkhard Raunig, Johann Scharler, Friedrich Sindermann:** Do banks lend less in uncertain times?
- 2014-05 **Julia Auckenthaler, Alexander Kupfer, Rupert Sendlhofer:** The impact of liquidity on inflation-linked bonds: A hypothetical indexed bonds approach

- 2014-04 **Alice Sanwald, Engelbert Theurl:** What drives out-of pocket health expenditures of private households? - Empirical evidence from the Austrian household budget survey
- 2014-03 **Tanja Hörtnagl, Rudolf Kerschbamer:** How the value of information shapes the value of commitment or: Why the value of commitment does not vanish
- 2014-02 **Adrian Beck, Rudolf Kerschbamer, Jianying Qiu, Matthias Sutter:** Car mechanics in the lab - Investigating the behavior of real experts on experimental markets for credence goods *forthcoming in Journal of Economic Behavior and Organization*
- 2014-01 **Loukas Balafoutas, Adrian Beck, Rudolf Kerschbamer, Matthias Sutter:** The hidden costs of tax evasion - Collaborative tax evasion in markets for expert services
- 2013-37 **Reto Stauffer, Georg J. Mayr, Markus Dabernig, Achim Zeileis:** Somewhere over the rainbow: How to make effective use of colors in meteorological visualizations
- 2013-36 **Hannah Frick, Carolin Strobl, Achim Zeileis:** Rasch mixture models for DIF detection: A comparison of old and new score specifications
- 2013-35 **Nadja Klein, Thomas Kneib, Stephan Klasen, Stefan Lang:** Bayesian structured additive distributional regression for multivariate responses
- 2013-34 **Sylvia Kaufmann, Johann Scharler:** Bank-lending standards, loan growth and the business cycle in the Euro area
- 2013-33 **Ting Wang, Edgar C. Merkle, Achim Zeileis:** Score-based tests of measurement invariance: Use in practice
- 2013-32 **Jakob W. Messner, Georg J. Mayr, Daniel S. Wilks, Achim Zeileis:** Extending extended logistic regression for ensemble post-processing: Extended vs. separate vs. ordered vs. censored *published in Monthly Weather Review*
- 2013-31 **Anita Gantner, Kristian Horn, Rudolf Kerschbamer:** Fair division in unanimity bargaining with subjective claims
- 2013-30 **Anita Gantner, Rudolf Kerschbamer:** Fairness and efficiency in a subjective claims problem
- 2013-29 **Tanja Hörtnagl, Rudolf Kerschbamer, Rudi Stracke, Uwe Sunde:** Heterogeneity in rent-seeking contests with multiple stages: Theory and experimental evidence
- 2013-28 **Dominik Erharder:** Promoting coordination in summary-statistic games
- 2013-27 **Dominik Erharder:** Screening experts' distributional preferences

- 2013-26 **Loukas Balafoutas, Rudolf Kerschbamer, Matthias Sutter:** Second-degree moral hazard in a real-world credence goods market
- 2013-25 **Rudolf Kerschbamer:** The geometry of distributional preferences and a non-parametric identification approach
- 2013-24 **Nadja Klein, Michel Denuit, Stefan Lang, Thomas Kneib:** Nonlife ratemaking and risk management with bayesian additive models for location, scale and shape
- 2013-23 **Nadja Klein, Thomas Kneib, Stefan Lang:** Bayesian structured additive distributional regression
- 2013-22 **David Plavcan, Georg J. Mayr, Achim Zeileis:** Automatic and probabilistic foehn diagnosis with a statistical mixture model *published in Journal of Applied Meteorology and Climatology*
- 2013-21 **Jakob W. Messner, Georg J. Mayr, Achim Zeileis, Daniel S. Wilks:** Extending extended logistic regression to effectively utilize the ensemble spread
- 2013-20 **Michael Greinecker, Konrad Podczeck:** Liapounoff's vector measure theorem in Banach spaces *forthcoming in Economic Theory Bulletin*
- 2013-19 **Florian Lindner:** Decision time and steps of reasoning in a competitive market entry game *forthcoming in Economics Letters*
- 2013-18 **Michael Greinecker, Konrad Podczeck:** Purification and independence *forthcoming in Economic Theory*
- 2013-17 **Loukas Balafoutas, Rudolf Kerschbamer, Martin Kocher, Matthias Sutter:** Revealed distributional preferences: Individuals vs. teams *forthcoming in Journal of Economic Behavior and Organization*
- 2013-16 **Simone Gobien, Björn Vollan:** Playing with the social network: Social cohesion in resettled and non-resettled communities in Cambodia
- 2013-15 **Björn Vollan, Sebastian Prediger, Markus Frölich:** Co-managing common pool resources: Do formal rules have to be adapted to traditional ecological norms? *published in Ecological Economics*
- 2013-14 **Björn Vollan, Yexin Zhou, Andreas Landmann, Biliang Hu, Carsten Herrmann-Pillath:** Cooperation under democracy and authoritarian norms
- 2013-13 **Florian Lindner, Matthias Sutter:** Level-k reasoning and time pressure in the 11-20 money request game *published in Economics Letters*
- 2013-12 **Nadja Klein, Thomas Kneib, Stefan Lang:** Bayesian generalized additive models for location, scale and shape for zero-inflated and overdispersed count data

- 2013-11 **Thomas Stöckl:** Price efficiency and trading behavior in limit order markets with competing insiders *forthcoming in Experimental Economics*
- 2013-10 **Sebastian Prediger, Björn Vollan, Benedikt Herrmann:** Resource scarcity, spite and cooperation
- 2013-09 **Andreas Exenberger, Simon Hartmann:** How does institutional change coincide with changes in the quality of life? An exemplary case study
- 2013-08 **E. Glenn Dutcher, Loukas Balafoutas, Florian Lindner, Dmitry Ryvkin, Matthias Sutter:** Strive to be first or avoid being last: An experiment on relative performance incentives.
- 2013-07 **Daniela Glätzle-Rützler, Matthias Sutter, Achim Zeileis:** No myopic loss aversion in adolescents? An experimental note
- 2013-06 **Conrad Kobel, Engelbert Theurl:** Hospital specialisation within a DRG-Framework: The Austrian case
- 2013-05 **Martin Halla, Mario Lackner, Johann Scharler:** Does the welfare state destroy the family? Evidence from OECD member countries *forthcoming in Scandinavian Journal of Economics*
- 2013-04 **Thomas Stöckl, Jürgen Huber, Michael Kirchler, Florian Lindner:** Hot hand belief and gambler's fallacy in teams: Evidence from investment experiments
- 2013-03 **Wolfgang Luhan, Johann Scharler:** Monetary policy, inflation illusion and the Taylor principle: An experimental study
- 2013-02 **Esther Blanco, Maria Claudia Lopez, James M. Walker:** Tensions between the resource damage and the private benefits of appropriation in the commons
- 2013-01 **Jakob W. Messner, Achim Zeileis, Jochen Broecker, Georg J. Mayr:** Improved probabilistic wind power forecasts with an inverse power curve transformation and censored regression *forthcoming in Wind Energy*

University of Innsbruck

Working Papers in Economics and Statistics

2014-30

Alice Sanwald, Engelbert Theurl

Out-of-pocket expenditures of private households for dental services - Empirical evidence from Austria

Abstract

Background: Dental services differ from other health services in several dimensions. One important difference is that a substantial share of costs of dental services - especially those beyond routine dental treatment - are paid directly by the patient out-of-pocket. Objectives: We analyze the socio-economic determinants of out-of-pocket expenditures for dentals services (OOPE) in Austria on the household level. Methods: We use cross-sectional information on OOPE and on household characteristics provided by the Austrian household budget survey 2009/10. We apply a two-part model (Logit/GLM) and a one-part GLM. Results: The probability of OOPE is strongly affected by the life cycle (structure) of the household. It increases with adults' age, with income and partially with the level of education. The type of public insurance has an influence on the expenditure probability while the existence of private health insurance has no significant effect. In contrast to the highly statistically significant coefficients in the first stage the covariates of the second stage remain predominantly insignificant. According to our results, the level of expenditures is mainly driven by the level of education and income. The results of the one-part GLM confirm the results of the two-part model. Conclusions: Our results allow new insights into the determinants of OOPE for dental care. The household level turns out to be an adequate basis to study the determinants of OOPE, although we should be cautious to jump to conclusions for the individual level.

ISSN 1993-4378 (Print)

ISSN 1993-6885 (Online)