DOCUMENTOS DE TRABAJO

Use of Medical Services in Chile: How Sensitive are The Results to Different Econometric Specifications?

Alejandra Chovar
Felipe Vásquez
Guillermo Paraje

N.º 776 Febrero 2016

BANCO CENTRAL DE CHILE





BANCO CENTRAL DE CHILE

CENTRAL BANK OF CHILE

La serie Documentos de Trabajo es una publicación del Banco Central de Chile que divulga los trabajos de investigación económica realizados por profesionales de esta institución o encargados por ella a terceros. El objetivo de la serie es aportar al debate temas relevantes y presentar nuevos enfoques en el análisis de los mismos. La difusión de los Documentos de Trabajo sólo intenta facilitar el intercambio de ideas y dar a conocer investigaciones, con carácter preliminar, para su discusión y comentarios.

La publicación de los Documentos de Trabajo no está sujeta a la aprobación previa de los miembros del Consejo del Banco Central de Chile. Tanto el contenido de los Documentos de Trabajo como también los análisis y conclusiones que de ellos se deriven, son de exclusiva responsabilidad de su o sus autores y no reflejan necesariamente la opinión del Banco Central de Chile o de sus Consejeros.

The Working Papers series of the Central Bank of Chile disseminates economic research conducted by Central Bank staff or third parties under the sponsorship of the Bank. The purpose of the series is to contribute to the discussion of relevant issues and develop new analytical or empirical approaches in their analyses. The only aim of the Working Papers is to disseminate preliminary research for its discussion and comments.

Publication of Working Papers is not subject to previous approval by the members of the Board of the Central Bank. The views and conclusions presented in the papers are exclusively those of the author(s) and do not necessarily reflect the position of the Central Bank of Chile or of the Board members.

Documentos de Trabajo del Banco Central de Chile
Working Papers of the Central Bank of Chile
Agustinas 1180, Santiago, Chile
Teléfono: (56-2) 3882475; Fax: (56-2) 3882231

Documento de Trabajo
N° 776

Working Paper
N° 776

USE OF MEDICAL SERVICES IN CHILE: HOW SENSITIVE ARE THE RESULTS TO DIFFERENT ECONOMETRIC SPECIFICATIONS?*

Alejandra Chovar
Banco Central de Chile

Felipe Vásquez
Universidad del Desarrollo

Guillermo Paraje
Universidad Adolfo Ibáñez

Abstract

We compared different econometric specifications to model the use of medical services in Chile focusing on visits to both a general practitioner and a specialist physician. We found the best-fitting model and discussed the determinant factors for the use of medical services. Our results indicate that the model with the best goodness of fit is the Latent Class Model. Furthermore, the econometric estimations consistently show that living outside the capital of the country, especially in rural areas, having some sort of physical or age-related limitation, are the main determinants of the use of medical services; additionally in average the model gives higher predictions of utilization of medical services for women. This research provides evidence, with policy implications, on how people's characteristics, such as place of residence or age, influence the use of medical services in different way depending on the type of medical service to be used.

Resumen

En este paper comparamos diferentes especificaciones econométricas para modelar el uso de servicios médicos en Chile, enfocados en la utilización de visitas a médico general y visitas a médico especialista. Encontramos el modelo con mejor ajuste y luego discutimos los factores determinantes del uso de servicios médicos. Nuestros resultados indican que el modelo con mejor ajuste es el Modelo de Clase Latente. Adicionalmente, las estimaciones econométricas muestran permanentemente que vivir fuera de la capital del país, especialmente en zonas rurales, tener algún tipo de limitación física, o la edad de las personas son los principales factores que determinan la utilización de servicios médicos. Además, el modelo entrega, en promedio, mayores predicciones de utilización para las mujeres. Esta investigación entrega evidencia, con implicancias de políticas, sobre como las características de las personas, tales como el lugar de residencia o la edad influencia el uso de servicios médicos en diferente manera dependiendo del tipo de servicio utilizado.

* Central Bank of Chile, Agustinas 1180, Santiago, Chile. Comments are welcome at achovar@bcentral.cl. All errors are our own. Emails: achovar@bcentral.cl, fvasquez@udd.cl y guillermo.paraje@uai.cl.

1. INTRODUCTION

People use medical services to preserve or to improve their health conditions considering that health condition are a highly valued assets and a prerequisite for the development of other activities. At the same time, the increased use of health services generates significant costs for families as well as for the public and private health systems. Chile is not an exemption, for instance when considering the period between 2000 and 2009, it is possible to see that visits to specialists and general practitioners have increased by 15% and 18%, respectively (CASEN, 2000-2009). Over this same period, health spending in both the public and private sectors has undergone a considerable increase (Castillo et al., 2011).

In order to assure the supply of medical services to be capable of fully covering the current and future demand on a national level, both public and private health systems are required to appropriately estimate future demand. One challenging feature of the measurement of medical service visits is that the structure of the data corresponds to count data, i.e., the dependent variable is a non-negative integer with a discrete distribution and a high concentration of zeros. The traditional approaches for modeling this type of data have been the Poisson or Negative Binomial (NB) models (Greene, 2003; Cameron, 2013), which jointly include participation decisions (whether to visit a physician or not) and intensity of use (total number of visits).

However, some evidence suggested that it is better to model the participation decision and the intensity of use separately (Pohlmeier and Ulrich, 1995) due to the large number of zeros in samples. The aforementioned suggests the use of the Zero Inflated Poisson and NB models, Latent Class models or the two stage Hurdle model (Pohlmeier and Ulrich, 1995; Grootendorst, 1995; Deb and Holmes, 2000; Deb and Trivedi, 2002; Jiménez-Martín et al., 2004; Jiménes-Martín et al., 2002). In general, they concluded that a misspecification of the model, that is, a model that does not reflect the underlying behavior that leads individuals to use medical services may have undesired consequences in any policy based on the results of these models. Nevertheless, it seems that previous results cannot be generalized and the evaluation must be done case to case (Jiménez-Martín et al., 2004; Jiménes-Martín et al., 2002).

There is a significant amount of literature applying some of the aforementioned models to estimate health demand. For instance, Atella et al. (2004) analyzed data for Italy, Andersen and Newman (2005) for the United States, Cumming et al. (2010) for New Zealand, and Skordis-Worrall et al. (2010) for South Africa. Most of the time these papers focused on identifying the social determinant of health and inequity, but they do not compare among different econometric specifications.

Perhaps the most widely studied issue in Chile is the inequality in healthcare access or use and the different dimensions of the problem, such as sex differences (Sapelli and Vial, 1998; Vega, 2001; Vega et al., 2003; Vega et al., 2001); the econometric specification (Paraje and Vásquez, 2012); evolution of inequality levels for a variety of medical services (Vásquez et al., 2013); and inequalities in the use of medical services for different age groups (Chovar et al., 2014). There is no evaluation of the best econometric model to fit health demand data in Chile.

The first objective of this research is to compare different econometric specifications to model the use of medical services in Chile. This is one of the few applications of these models in a less developed country and the first in Chile. Our comparison includes all possible econometric approaches used in the literature. These models are as follows: (1) Poisson, (2) Negative Binomial (NB), (3) Poisson Zero Inflated, (4) NB Zero Inflated (5) Hurdle and (6) Latent Class. We used the Akaike and Bayesian information criteria, AIC and BIC, respectively, to determine the model with a best goodness of fit. Finally, we discuss the determinant factors for the use of general and specialist medical services in Chile focusing in the partial effects of individuals' characteristics. We focus on just two medical usage variables: general practitioner and specialist visits.

According to the results of the AIC-BIC criteria, we find that the model with the best fit is the Latent Class model, which separates the population according to high frequency users and low frequency users, allowing the unobserved heterogeneousness among each class. The model estimation indicates that the use of medical services is mainly determined by the geographic area where individuals live, the age, and the existence of some sort of physical. We separate the data by gender to consider the natural differences

between women and men; in average the model gives higher predictions of utilization of medical services for women.

The remainder of the paper is structured as follows. In section 2, we describe the econometrics specification to be compared and the data. Section 3 discusses our results and section 4 concludes.

2. METHODS AND DATA

2.1 Methods

The models used in this paper are extensively described in different papers in the literature (Greene, 2003; Cameron and Trivedi, 2013; Deb and Trivedi, 2002; Jansakul and Hinde, 2002; Jones et al., 2013); thusly, we present only a brief summary of each model. These empirical models respond to the theoretical model developed by Zweifel et al. (1997), Grossman (1972a), Grossman (1972b) for health economics.

A. Poisson Model

The dependent y_i variable (visits to a physician) follows a Poisson distribution with a λ_i mean defined as a function of the explanatory variables (regressors) x_i given by:

$$\Pr(Y_i = y_i) = e^{-\lambda_i}\frac{{\lambda_i}^{y_i}}{\lambda_i!} \text{ with } y_i = 0,1,2, \dots \dots \quad (1)$$

Where $\lambda_i = E(y_i|x_i) = Var(y_i|x_i) = \exp(x_i\beta)$, therefore the likelihood function is given by $lnL = \sum_{i=1}^{n} -\lambda_i + y_i * (x_i\beta) - lny_i!$.

B. Negative Binomial Model (NB)

The Poisson model did not consider the existence of unobserved heterogeneity that causes over-dispersion (conditional variance is greater than the conditional mean).This can be solved by introducing an unobservable individual effect into the conditional mean of the Poisson model, that is:

$$ln\lambda_i = x_i'\beta + \varepsilon \quad (2)$$

Where $\exp(\varepsilon)$ follows a gamma distribution with a mean of one and a α variance The NB density is:

$$f(y_i) = \Pr(Y_i = y_i) = \frac{\Gamma(\theta + y_i)}{\Gamma(\theta)y_i!} v_i^{\theta}(1+v)^{y_i} \quad (3)$$

Where $v = \theta/(\theta + \lambda_i)$ and $\theta = 1/\alpha$ and $\Gamma(.)$ is the gamma function.

Thus, the variance of the random $y_i$variable is $var[y_i] = E[y_i](1 + \alpha E[y_i])$. The additional α parameter allows the mean to differ from the variance.

C. Zero Inflated Models (ZIP-ZINB)

If we think that there are two groups of individuals, the non-users of medical services and the potential users, then the estimation of the Zero-Inflated Poisson or the Zero-Inflated Negative Binomial models is appropriate. These models estimate the conditional probability that a person belongs to one of two groups denoted by q_i, conditioned on a vector of regressors, z_i. That is:

$$q_i = prob(y_i = 0) = F(z_i'\delta) \quad (4)$$

where $F(z_i'\delta)$ is the cumulated distribution function. Thusly, the Poisson or Negative Binomial model is used to estimate the demand for the potential users. The mean of the distribution will be conditioned by another series of explanatory variables x_i, $\lambda_i = \exp(x_i'\beta)$. Defining $f(.)$as the density function of the Poisson or NB, the following distribution is obtained for individuals who use medical services:

$$prob = (y_i = 0) = q_i + (1 - q_i)f(y_i = 0) \quad (5)$$
$$prob = (y_i = j) = (1 - q_i)f(y_i = j)$$

D. Hurdle Model

Unlike the zero inflated model, the Hurdle model indicates that decisions about the use of medical services are the result of two separate processes. The first part specifies the decision of visiting physician or not

(yes or no) and the second decision models the positive values of the dependent variable for people who receive some sort of medical attention. Theoretically, modeling the use of medical services in this way responds to a supply and demand relationship between these services, considering the existence of supplier-induced demand (Zweifel, 1997; Zweifel, 1999).

The use of medical services is broken down into two random components:"$y_i > 0$"and " $y_i|y_i > 0$"and a specific probability for each component. The prediction of these two models, the probability of some sort of a medical visit $\Pr(y_i > 0|x_i)$ and the expected number of visits, conditioned on any visits $E(y_i|y_i > 0, x_i)$, are used to predict the mean number of visits $E(y_i|x_i)$:

$$E(y_i|x_i) = \Pr(y_i > 0|x_i)\, E(y_i|y_i > 0, x_i) \quad (6)$$

For a sample of n individuals, N observations have some sort of medical visit while (n-N) individuals have not consulted with a doctor. The probability for each of the N participants is:

$$L = \Pr(y_i > 0|x_i) * density(y_i|y_i > 0, x_i) \text{ with } i = 1, \dots, N \quad (7)$$

The probability of (n-N) is $L = \Pr(y_i = 0|x_i)$

The likelihood function is given by:

$$L = \prod_{i=1}^{N} \Pr(y_i > 0|x_i) * density(y_i|y_i > 0, x_i) * \prod_{i=1}^{n-N} \Pr(y_i = 0|x_i) \quad (8)$$

A Logit model will be used for the first decision and a Truncated Poisson model for the second decision.

E. Latent Class Model

The Latent Class or the so-called finite mixture model assumes that the population is divided into C classes in the proportions$\pi_1, \dots, \pi_c$, where$\sum_{j=1}^{c} \pi_j = 1$, $0 \leq \pi_j \leq 1$, j=1,…, C. The density of the finite mixture at points C for the observation I, with i=1…n, is determined as follows (Deb and Holmes, 2000; Deb and Trivedi, 2002):

$$f(y_i|.) = \sum_{j=1}^{c} \pi_j f_j((y_i|.) \quad (9)$$

where the term on the right corresponds to the sum of the product of each $\pi_j$probability and the density of the component (subpopulation) $f_i(y_i|.)$. The distribution of the component at point C is defined as a NB:

$$f_i(y_i|.) = \frac{\Gamma(y_i + \psi_{ji})}{\Gamma(\psi_{ji})\Gamma(y_i + 1)} \left(\frac{\psi_{ji}}{\lambda_{ji} + \psi_{ji}}\right)^{\psi_{ji}} \left(\frac{\lambda_{ji}}{\lambda_{ji} + \psi_{ji}}\right)^{y_i} \quad (10)$$

where j=1,…,C is the latent classes, $\lambda_{ji} = \exp(x_i\beta_j)$ and $\psi_{ji} = \left(\frac{1}{\alpha_j}\right)\lambda_{ji}^{k}$.

We used two classes or subpopulations in frequent users and frequent users, subsequently. The use of medical services in each component is characterized by the mean and low variance and by the mean and high variance.

F. Selection Criteria

We use the Akaike information criteria (AIC=-LogL+2K) and the Bayesian information criteria (BIC=-2LogL+Klog(N)), where LogL is the logarithmic value of the likelihood function, k corresponds to the number of parameters in the model and N is the sample size. The choice criteria dictate that we chose the model with the lowest AIC or BIC.

We also use the Vuong statistical test to choose between the Negative Binomial and the Zero-Inflated Negative Binomial models (Vuong, 1989). This test considers choosing between two non-nested models, or models that are such that they cannot be expressed in terms of the other. In order to estimate this statistic, which is asymptotically normal, two models are considered: F_θ and G_γ, with densities $f(y|x_i\theta)$ and $g(y|x_i\gamma)$, where the hypothesis to be tested is $H_0: E\left[log\frac{f(y_i|x_i;\widehat{\theta}_n)}{g(y_i|x_i;\widehat{\gamma}_n)}\right] = 0$. Accepting this hypothesis means that the first model is the preferred one.

2.2 Data

We use data from the 2009 National Socio-Economic Characterization Survey (CASEN) from Chile. We used adult population between 18 and 75 year old, the groups under 18 and adults over 75 are advised to be treated separately due to their marked differences in use of medical services (Newacheck amd Halfon, 1986; Riley et al., 1993; Artazcoz and Rueda, 2007). We engaged in a differentiated analysis according to gender, since men and women have different types of usage needs. The dependent variables are the number of specialist physician visits (VS) and the number of general practitioner visits (GPV) over a given period of time (last three months).

The data indicates that on average both sexes visit more often a general practitioner than specialist doctors, but on average women make more use of both services (Table 1). We observe a high concentration of zeros in both variables: 88.66% of men have not had any general practitioner visits, compared to 82.48% of women, while 92.47% of men have not had specialist physician visits, compared to 86.67% of women.

Table 1: Frequency of medical services use by gender, 2009.

	GPV		SV	
Consults	Men %	Women %	Men %	Women %
0	88.66	82.48	92.47	86.67
1	7.33	10.62	4.54	7.52
2	1.62	2.56	1.15	2.07
3	1.47	2.57	0.94	1.9
4	0.34	0.64	0.19	0.53
above 5	0.6	1.13	0.71	1.31
Mean	0.209	0.348	0.308	0.857
s.d.	0.857	1.127	1.294	1.026

Source: 2009 CASEN Survey.

Table A.1 of the appendix contains a descriptive statistic for each variable use in our regressions.

3. RESULTS

A. Model selection

We started by assessing the Poisson model, which requires proving the equal dispersion property. One way to do this test is using the NB model, which considers that the variance is a quadratic function of the mean, to identify the existence of over-dispersion. The statistical significance of α parameter in the NB is used to test the hypothesis. The test suggests that the response variable is more disperse and not sufficiently described by the Poisson model (see Table 2, panel A).

The specification of the Zero-Inflated model can be obtained by mixing a distribution concentrated on zero and a Poisson (ZIP) or Negative Binomial model (ZINB). The estimation for GPV and SV was made with both ZIP and ZINB. Once again, it is possible to conclude that the ZINB specification is preferable by using the α coefficient (Table 2 second row, panel A). Finally, the Vuong test is not significant in any of the cases, which allows us to conclude that the NB estimation is preferable over the ZINB one (Table 2 third row, panel A).

The logit model was used for the first stage of the Hurdle model, the contact stage, while the second stage was estimated with a truncated Poisson model. A truncated Negative Binomial could also have been used for the estimation, but we had problems with convergence in the estimation, a situation that can be explained by the excessive number of zeros in the sample. Regarding the Latent Class model, it was implemented with the negative binomial specification.

The results using the two-stage Hurdle model are consistent if the assumption that the period under analysis contains only one sickness episode, but the data does not allow us to check this. This is more likely to be true when analyzing specialist physician visits. Regarding the latent class model, this is in all cases the model with the best goodness of fit (Table 2, panel B).

Table 2: Test likelihood for over-dispersion and Voung, and AIC - BIC Information criteria

PANEL A: Test Likelihood over-dispersion and Vuong				
	Women		Men	
	GPV	SV	GPV	SV
Test Likelihood ratio. Choice between Poisson and NB. H0: α = 0 (over-dispersion)	chibar2 (01) = 1.9e+06 Prob ≥ chibar2 = 0.000	chibar2 (01) = 2.7e+06 Prob ≥ chibar2 = 0.000	chibar2 (01) = 1.0e+06 Prob ≥chibar2 = 0.000	chibar2 (01) = 1.6e+06 Prob≥chibar2 = 0.000
Test Likelihood ratio. Choice between ZIP and ZINB. H0: α = 0 (over-dispersion)	chibar2(01) =5.8e+05 Pr ≥ chibar2 = 0.0000	chibar2(01) = 8.2e+05 Pr ≥ chibar2 = 0.0000	chibar2(01) =2.9e+05 Pr ≥ chibar2 = 0.0000	chibar2(01) =5.3e+05 Pr≥chibar2 = 0.000
Test Vuong choice between ZINB vs NB. $H_0: E\left[log\frac{f(y_i\|x_i;\hat{\theta}_n)}{g(y_i\|x_i;\hat{\gamma}_n)}\right] = 0$	z = 0.00 Pr ≥ z = 0.5017	z = -14.15 Pr>z =1.000	z = -0.00 Pr>z = 0.5007	z = -0.00 Pr>z = 0.5011

PANEL B: AIC-BIC information criteria								
	Women				Men			
	SV		GPV		SV		GPV	
Model	AIC	BIC	AIC	BIC	AIC	BIC	AIC	BIC
Poisson	9274535	9274853	9483767	9484084	5082141	5082455	5517304	5517619
NB	6541810	6542137	7530726	7531053	3507648	3507971	4492843	4493167
ZIP	7366229	7366555	8111195	8111522	4034725	4035049	4786352	4786676
ZINB	6541812	6542148	7530728	7531065	3507650	3507983	4492845	4493178
Hurdle	7129143	7129787	7906783	7907428	3822675	3823314	4670277	4670916
Latent Class	6425841	6426504	7426066	7426729	3397848	3398506	4442290	4442947

Source: Estimation results

B. Determinant factors in the use of medical services

According to the results of the AIC-BIC criteria, the model with the best fit is the Latent Class model, which separates the population according to high frequency users and low frequency users, allowing the

unobserved heterogeneousness among each class. We believe that this unobserved heterogeneousness that divides the population, in this case into two classes, is based on individuals' long term conditions, meaning that the proxy variables used to declare individuals' health condition – their self-reported conditions and the existence of physical limitations – do not fully explain the population's heterogeneousness (Deb and Trivedi, 2002. Within the estimation, the first class or component will determine the class of low-frequency users, or the healthy group, which has the trait of a lower mean and lower variance. The second class or component corresponds to high frequency users, or the group of sick people, and it represents that part of the population with a higher mean and greater variance in the number of medical visits. Table 3 shows the descriptive statistics of the prediction for each component, according to GPV and SV and for men and women. In all cases, it is possible to observe that the characteristic of the model is preserved. Tables 4 and 5 show the estimation results of each usage variable for men and women.

Table 3: Latent Class model predictions by component.

	GPV		SV	
	Mean	St. Dev	Mean	St. Dev.
Component 1 Men	0.131	0.174	0.065	0.212
Component 2 Men	1.608	1.254	0.239	0.277
Component 1 Women	0.246	0.235	0.146	0.219
Component 2 Women	2.033	1.099	1.968	1.111

Source: Estimation results.

In general the majority of variables have the same sign in both classes, GPV and SV (men and women), though the magnitude in absolute terms and the marginal effects are greater for individuals belonging to the second class, high frequency users. Additionally, the percentage of the population belonging to the first component is repeated in the majority of cases at around 95%, even though the exception is the SV variable for men, where the percentage belonging to the first class is around 66%.

Age, the self-reported health condition and the existence of a physical limitation of some kind are some of the variables that influence the perception of individuals' health condition and which are determinant

factors in the use of medical services. In detail, the GPV of low frequency users are positively determined by the different groups of age (35-44, 45-54, 55-64, 65-74 years of age; control 18-34 years group), both in men and women. Meanwhile, in the case of men, high-frequency usage is positively determined by the first three groups of age, with the greatest usage increase in the 55-64 year age group. We are talking about an increase of 0.86 times (marginal effect). In the case of women, it is only significant in the 64-75 age group with an average reduction in visits of 0.74 times.

In the case of SV, all age categories are significant and positive determinant factors for low frequency users, both men and women, except for the 35-44 age group, which is not significant among women. In the second class of high frequency male users, only the 64-75 age group is determinant with a positive sign and in the case of women, only the 55-64 and 65-75 age categories are determinant with a negative sign.

The variable that indicates individuals' self-reported health condition is negative and significant among the class of high frequency users as well as among the class of low frequency users, in both men and women. There is a higher marginal effect in the group of high-frequency users in both variables (GPV and SV). That is, on average high frequency male users who report a good health condition reduced GPVs by 1.16 times, while high frequency female users reduced GPVs by 0.99 times. In the case of SV, men were down by 0.3 times and women 1.42 times.

The variable indicating whether people have some sort of physical limitation is positively determinant in all cases, but the marginal effects are greater in the case of GPV in the class of high frequency users, with visits increasing by an average of 1.1 times among both men and women, and in the case of SV, visits increase, but to a lesser degree.

Occupation, which reflects the opportunity cost of time, has little relevance to both specialist as well as general practitioner visits, as the marginal effects are very small. In addition, these variables are not

significant the majority of times. The most significant effect is in the retired category for SV in the case of women who are high frequency users, with a reduction of about 0.7 times in average visits.

For its part, education, which measures individuals' level of human capital, is not statistically significant for high frequency users of GPV or SV. On the contrary, it is statistically significant for the case of low frequency users, among which it has a negative influence.

As part of the group of variables that indicate individuals' ease of access to the use of medical services, living in a rural area and in provinces (Metropolitan Region as control variable) are important factors. Living in a rural area is a negative determinant for the use of medical services in all cases and high frequency users are the ones with the greatest marginal effect, around 0.4 for both GPV and SV.

Lastly, the region where people live is relevant and determines the use of medical services. GPV are positively or negatively depending on individuals' gender and whether they are frequent or non-frequent users. Women who are low frequency users of GPV are positively influenced by the Sixth Region, Ninth Region and Eleventh Region and negatively by the Second Region, Fourth Region and Seventh Region. Men who are low frequency users receive the positive influence of the Fourth Region and Eleventh Region and the negative influence of the Fourth Region. For high frequency users, significant changes in the signs and the variables can be observed. When it comes to SV, the majority of regions are significant and the majority of them show a negative sign for the case of both men and women. Thusly, high frequency users, mainly women, are the group with the highest marginal effect.

Table 4: Estimation Latent Class model for GPV.

	Women						Men					
	Component 1			Component 2			Component 1			Component 2		
	Coefficient	Value z	Margin Eff.	Coefficient	Value z	Margin Eff.	Coefficient	Value z	Margin Eff.	Coefficient	Value z	Margin Eff.
log-income	−0.003	−0.490	−0.001	−0.009	−0.560	−0.016	0.011	0.750	0.001	0.012	0.680	0.015
age35-44	0.293∗	2.390	0.052	−0.103	−0.660	−0.181	0.259 ∗∗	1.800	0.020	0.443∗	2.330	0.660
age45-54	0.518∗	3.680	0.098	−0.241	−1.330	−0.407	0.547∗	4.220	0.047	0.349 ∗∗	1.930	0.505
age55-64	0.803∗	6.030	0.176	−0.157	−0.880	−0.269	0.986∗	6.840	0.105	0.543∗	2.280	0.865
age65-74	0.909∗	5.750	0.215	−0.492∗	−2.080	−0.743	1.499∗	6.420	0.214	0.419	1.500	0.645
healthmb-b	−1.362∗	−18.440	−0.267	−0.516∗	−3.800	−0.990	−1.508∗	−24.770	−0.155	−0.763∗	−5.810	−1.157
phys-lim	0.413∗	5.790	0.079	0.473∗	3.120	1.048	0.525∗	6.870	0.047	0.601∗	4.240	1.010
educ-elementary	−0.323∗	−5.200	−0.048	0.328 ∗∗	1.750	0.644	−0.466∗	−5.000	−0.030	−0.189	−1.010	−0.234
educ-secondary	−0.256∗	−4.330	−0.041	0.122	0.840	0.221	−0.432∗	−4.560	−0.031	−0.035	−0.250	−0.045
Independent	−0.003	−0.030	−0.001	−0.090	−0.500	−0.157	−0.130	−1.440	−0.009	−0.085	−0.600	−0.107
Unemployed	0.170	0.950	0.030	−0.314	−0.890	−0.496	−0.070	−0.550	−0.005	0.031	0.150	0.041
Retired	−0.032	−0.320	−0.005	−0.199	−0.640	−0.331	−0.129	−1.040	−0.009	−0.467	−1.620	−0.500
Student	−0.559∗	−2.420	−0.071	0.084	0.230	0.157	−0.241	−0.960	−0.016	−0.093	−0.400	−0.115
Household activities	−0.157∗	−1.980	−0.025	−0.263 ∗∗	−1.770	−0.455	0.482	1.190	0.044	−0.949	−0.520	−0.798
Other activ.	0.101	1.360	0.017	0.235	1.100	0.463	0.060	0.690	0.004	0.374 ∗∗∗	1.660	0.567
ethnic group	0.081	0.860	0.014	−0.337 ∗∗	−1.700	−0.535	0.151	0.970	0.012	−0.349	−1.520	−0.394
rural	−0.189∗	−2.670	−0.030	−0.262∗	−2.680	−0.457	−0.298∗	−3.450	−0.021	−0.288∗	−2.210	−0.362
reg-1	0.055	0.690	0.009	0.016	0.040	0.030	−0.230	−0.950	−0.015	−0.346	−0.700	−0.381
reg-2	−0.201∗	−2.650	−0.029	0.308∗	2.770	0.646	−0.161	−0.600	−0.011	0.133	0.830	0.184
reg-3	0.0003	0.000	0.00005	−0.167	−1.100	−0.280	−0.248	−0.890	−0.016	−0.155	−0.280	−0.187
reg-4	−0.390∗	−2.000	−0.053	−0.206 ∗∗	−1.860	−0.340	−0.389∗	−3.220	−0.024	−0.567∗	−2.510	−0.575
reg-5	0.177	1.270	0.030	0.031	0.200	0.057	0.271 ∗∗	1.750	0.022	−0.027	−0.190	−0.035
reg-6	0.326∗	2.150	0.060	−0.135	−1.060	−0.231	0.484	1.790	0.043	0.337	1.560	0.503

reg-7	−0.268 **	−1.710	−0.039	−0.006	−0.050	−0.011	−0.320	−1.310	−0.020	−0.336 **	−1.810	−0.381
reg-8	0.142	1.470	0.024	0.126	0.570	0.239	0.055	0.470	0.004	0.350*	2.030	0.511
reg-9	0.275*	2.180	0.050	−0.394	−1.320	−0.609	0.017	0.140	0.001	0.115	0.700	0.157
reg-10	0.102	0.660	0.017	−0.393 **	−1.960	−0.604	0.122	0.910	0.009	0.011	0.030	0.014
reg-11	0.374*	3.790	0.072	0.729*	5.110	1.925	0.395*	1.780	0.035	0.401	1.550	0.634
reg-12	0.184	1.610	0.032	−0.240 **	−1.770	−0.387	−0.043	−0.280	−0.003	0.115	0.400	0.158
reg-14	−0.358	−1.600	−0.049	0.026	0.100	0.047	−0.081	−0.370	−0.006	0.252	1.400	0.368
reg-15	0.179	1.850	0.031	−0.135	−1.140	−0.230	−0.121	−1.240	−0.008	0.382*	2.160	0.600
married-cohab	0.131*	2.810	0.021	0.206	1.640	0.367	0.085	1.060	0.006	0.143	0.960	0.183
Public	−0.108	−0.860	−0.018	0.008	0.050	0.014	−0.259*	−2.810	−0.020	−0.037	−0.220	−0.049
Constant	−1.105*	−3.550		1.069*	3.650		−1.625*	−6.720		0.429	0.990	
/imlogitpi1				2.977*	6.010					3.213*	6.840	
/lnalpha1				1.042*	18.620					1.128*	12.230	
/lnalpha2				0.256	0.580					0.084	0.200	
alpha1				2.836						3.091		
alpha2				1.292						1.088		
pi1				0.952						0.961		
pi2				0.048						0.039		
No. Observations	84195			84195			78010			78010		
	Wald Chi2 (66) = 7389.52						Wald Chi2 (66) = 5445.45					
	P rob > chi2 = 0.0000						P rob > chi2 = 0.0000					

* significant <0.001, ** significant <0.05

Source: Estimation result

Table 5: Estimation Latent Class model for SV use.

	Women						Men					
	Component 1			Component 2			Component 1			Component 2		
	Coefficient	Value z	Margin Eff.	Coefficient	Value z	Margin Eff.	Coefficient	Value z	Margin Eff.	Coefficient	Value z	Margin Eff.
log-income	−2.E−05	0.000	−2.E−06	−0.015	−1.060	−0.025	0.629∗	3.400	0.006	0.003	0.140	4. 32E−04
age35-44	0.010	0.060	0.001	0.072	0.640	0.126	0.931∗	3.350	0.013	0.031	0.200	0.005
age45-54	0.282∗	2.120	0.021	−0.002	−0.010	−0.004	0.856∗	3.370	0.011	−0.023	−0.140	−0.004
age55-64	0.399∗	2.280	0.032	−0.258 ∗∗	−1.920	−0.403	1.346∗	5.570	0.023	−0.015	−0.070	−0.002
age65-74	0.268∗	1.950	0.021	−0.349∗	−2.440	−0.523	1.566∗	5.170	0.032	0.444 ∗∗	1.920	0.085
healthmb-b	−1.790∗	−23.580	−0.166	−0.758 ∗∗	−6.290	−1.418	−1.951∗	−11.540	−0.032	−1.279∗	−8.440	−0.271
phys-lim	0.808∗	6.890	0.080	0.381∗	2.630	0.762	1.235∗	4.650	0.022	0.750∗	5.260	0.165
educ-elementary	−0.999∗	−9.280	−0.057	−0.276∗	−1.920	−0.444	−1.139∗	−4.710	−0.009	−0.257	−1.110	−0.038
educ-secondary	−0.740∗	−8.470	−0.052	−0.083	−0.660	−0.141	−0.806∗	−5.240	−0.008	−0.183	−0.990	−0.029
Independent	−0.024	−0.150	−0.002	0.052	0.390	0.090	−0.534∗	−3.960	−0.004	−0.119	−0.820	−0.018
Unemployed	0.232	1.210	0.018	−0.222	−1.390	−0.344	0.003	0.000	0.000	−0.062	−0.220	−0.010
Retired	0.029	0.250	0.002	−0.475∗	−2.490	−0.671	−0.057	−0.280	−0.001	−0.016	−0.070	−0.002
Student	−0.555∗	−2.130	−0.030	−0.043	−0.180	−0.072	0.563∗	1.830	0.007	0.356	0.760	0.067
Household activities	−0.404∗	−4.900	−0.026	−0.353∗	−2.560	−0.566	−1.779∗	−3.550	−0.011	0.800	0.930	0.193
Other activ.	0.310∗	3.600	0.024	0.114	0.960	0.203	0.775∗	3.250	0.011	0.469∗	2.160	0.091
ethnic group	−0.193	−1.430	−0.012	−0.164	−1.370	−0.262	0.403	1.190	0.005	0.191	0.690	0.033
rural	−0.585∗	−4.160	−0.037	−0.237∗	−2.080	−0.390	−1.024∗	−4.880	−0.009	−0.318∗	−2.420	−0.049
reg-1	−1.231∗	−10.810	−0.050	−0.108	−1.110	−0.175	−4.608∗	−0.820	−0.011	−0.842∗	−4.000	−0.091
reg-2	−0.905∗	−4.700	−0.042	−0.093	−0.740	−0.151	−0.638∗	−2.610	−0.005	−1.204∗	−4.980	−0.115
reg-3	−0.711∗	−2.510	−0.036	−0.484	−2.780	−0.662	−0.828∗	−2.470	−0.006	−0.095	−0.270	−0.014
reg-4	−0.808∗	−5.460	−0.040	−0.182	−0.840	−0.287	−0.875∗	−3.160	−0.006	−0.160	−1.020	−0.024

reg-5	−0.087	−0.630	−0.006	0.049	0.410	0.085	0.362∗	1.880	0.004	−0.774∗	−3.190	−0.093
reg-6	−0.123	−0.570	−0.008	0.094	0.390	0.167	0.176	0.520	0.002	−0.444∗	−2.230	−0.059
reg-7	−1.228∗	−4.870	−0.055	−0.282∗	−2.190	−0.431	−0.929∗	−3.810	−0.007	−0.857∗	−5.420	−0.099
reg-8	−0.130	−0.840	−0.009	0.096	0.570	0.169	−0.272	−1.340	−0.002	−0.447∗	−3.280	−0.062
reg-9	−0.679∗	−5.080	−0.036	−0.487∗	−2.670	−0.685	−0.631∗	−3.290	−0.005	−0.851∗	−4.350	−0.098
reg-10	−0.243∗	−1.950	−0.015	−0.367∗	−2.460	−0.537	0.034	0.110	0.000	−0.499∗	−1.940	−0.064
reg-11	−1.198∗	−7.240	−0.049	0.026	0.190	0.044	0.027	0.080	0.000	−0.423∗	−2.190	−0.055
reg-12	0.117	1.060	0.009	0.035	0.290	0.060	0.937 ∗∗	1.920	0.015	−0.016	−0.030	−0.003
reg-14	−0.128	−0.850	−0.008	−0.235	−0.710	−0.360	−0.630∗	−3.490	−0.005	−0.269	−0.750	−0.038
reg-15	−0.978∗	−7.790	−0.044	−0.349∗	−3.430	−0.504	−1.047∗	−7.300	−0.006	0.283∗	1.650	0.052
married-cohab	0.206∗	2.220	0.014	0.104	1.140	0.175	−0.295	−1.620	−0.003	0.297∗	2.440	0.046
Public	−0.632∗	−6.460	−0.057	−0.224	−1.390	−0.419	−0.296	−1.110	−0.003	−0.425∗	−3.100	−0.079
Constant	−0.078	−0.420		1.758∗	6.660		−9.233∗	−3.510		−0.258	−0.730	
/imlogitpi1				2.812∗	10.350					0.677	1.250	
/lnalpha1				1.370∗	15.040					0.715	0.960	
/lnalpha2				0.432 ∗∗	1.760					2.643∗	14.340	
alpha1				3.935						2.044		
alpha2				1.541						14.053		
pi1				0.943						0.663		
pi2				0.057						0.337		
No. Observations	84146			84146			78002			78002		
	Wald Chi2 (66) = 7242						Wald Chi2 (66) = 25508.53					
	P rob > chi2 = 0.0000						P rob > chi2 = 0.0000					

* significant <0.001, ** significant <0.05

Source: Estimation result.

4. CONCLUSION

In this study we have sought statistical evidence for the best econometric specification to estimate the use of medical services in Chile, particularly in the case of general practitioner and specialist physician services, and separating the data by gender. We made the choice of using AIC and BIC information criteria, the calculation of which showed that in all cases the Latent Class model was the one with the best fit when compared to the Poisson, Negative Binomial, Zero Inflated Poisson, Zero Inflated Negative Binomial and the Hurdle models.

The Latent Class model's advantage over the other models shows that it is a more flexible model for the specification of density mixtures. The model is based on the discrete representation of the unobserved heterogeneousness of health, which is not captured by the variables on individuals' health condition, which are their self-reported health condition and the existence of a physical limitation. Our analysis considers two subpopulations: infrequent users of visits and high frequency users of visits, with the former group being considered as healthy users and the latter being considered as sick users, and with each group validated according to the average individual.

Our results are in line with the existent evidence in the literature, which reports that the best way of modeling the use of medical services is to consider, in a first place, the participation decision and then the intensity of use. The Hurdle model has been a good option, when not compared to the Latent Class model (Pohlmeier amd Ulrich, 1995; Grootendorst, 1995). However, considering the comparison with this model, the results are not conclusive (Jiménez−Martín, 2002). In our cases, this conclusion makes sense due to the structure of the Chilean Health System, in which the general practitioner acts as a *gatekeeper* to specialist attention in the public sector, and in the private sector the person usually has direct access to the specialist.

Additionally, the results produced by the Latent Class model estimation provide us with evidence that the use of medical services is mainly determined by the geographic area where individuals live. Living in

provinces is a negative determinant for specialist physician visits when compared to living in the Metropolitan Region, especially in the case of women. Meanwhile, general practitioner visits are positively and negatively determined, depending on the region. Living in a rural area is also a negative determinant of use in both classes, men and women, and for GPV as well as SV.

Furthermore, individuals' age influences usage, something that was measured across the different age groups from 18 to 75 years of age. Each group's response basically depends on whether individuals are high frequency users or low frequency users, in addition to their gender. The existence of some sort of physical limitation is also a positive determinant in the use of medical services for all cases, increasing the number of visits by high frequency users further. Meanwhile, the level of education among men or women is a significant characteristic only among low frequency users.

This research provides evidence on how people's characteristics, such as place of residence, influence the use of medical services. Along these lines, policy efforts for healthcare services should essentially be associated with the people's need to use medical services, and not with their characteristics. This is mainly because the use of medical services is something that people need to improve or maintain a good health condition, in addition to considering that health is a preliminary requirement for the development of other activities, such as working.

In conclusion, the evidence found in this research allows us to indicate that individuals' behavior changes depending on the medical service to be used, meaning that it would be relevant to undertake the analysis for other measures of usage, such as, the use of emergency services, hospitalization, use of dental medical services, among others. This would provide detailed information on individuals' characteristics and have implications on the application of public policies. It would also be relevant to see the results in case a Latent Class model is applied, which would allow differentiation by classes, according to the Chilean population.

REFERENCES

Andersen R, Newman JF. 2005. Societal and individual determinants of medical care utilization in the United States. Milbank Quarterly. DOI:10.1111/j.1468-0009.2005.00428.x/epdf.

Atella V, Brindisi F, DebP, Rosati FC. 2004. Determinants of access to physician services in Italy: a latent class seemingly unrelated probit approach. Health economics;13: 657-668. DOI: 10.1002/hec.860

Artazcoz L, Rueda S. 2007. Social inequalities in health among the elderly: a challenge for public health research. Journal of epidemiology and community health;61: 466-467. DOI: 10.1136/jech.2006.058081

Cameron AC, Trivedi P K. 2013. *Regression analysis of count data*. Cambridge university press.

Castillo C, Miranda S, Palacios A. 2011. Gasto de salud en Chile: análisis comparativo. Economía and Salud; 5: 13-23.

Chovar VA, Vasquez LF, Paraje G. 2014. Desigualdad e inequidad en la utilización de servicios médicos según grupos etarios en Chile, 2000–2011.Rev Panam Salud Publica;36, 171.

Cumming J, Stillman S, Liang Y, et al. 2010. The determinants of GP visits in New Zealand. Australian and New Zealand journal of public health;34: 451-457. DOI: 10.1111/j.1753-6405.2010.00589.x.

Deb P, Holmes AM. 2000. Estimates of use and costs of behavioural health care: a comparison of standard and finite mixture models. Health Economics;**9**: 475-489.

Deb P, Trivedi PK. 2002. The structure of demand for health care: latent class versus two-part models. Journal of health economics; **21**: 601-625.

Encuesta de Caracterización Socioeconómica Nacional, CASEN, 2000 and 2009.

Greene WH. 2003. *Econometric analysis*. Pearson Education India.

Grootendorst PV. 1995. A comparison of alternative models of prescription drug utilization. Health Economics:**4**: 183-198.

Grossman M. 1972a . The demand for health: a theoretical and empirical investigation. New York: National Bureau of Economic Research, Columbia University Press.

Grossman M. 1972b. On the concept of health capital and the demand for health. Journal of Political Economics; 80(2): 223-255. Retrieved from http://www.jstor.org/stable/1830580

Jiménez-Martín S, Labeaga JM, Martínez-Granado M. 2004. An empirical analysis of the demand for physician services across the European Union. The European Journal of Health Economics, formerly: HEPAC;5:150-165.

Jiménez−Martín S, Labeaga JM, Martínez−Granado M, Jones AM, O'Donnell O. 2002. Latent class versus twopart models in the demand for physician services across the European Union. Health economics:11, 301-321. DOI: 10.1002/0470846313.ch7

Jansakul N, Hinde J. 2002. Score tests for zero-inflated Poisson models. Computational statistics & data analysis;40: 75-96.

Jones AM, Rice N, d'Uva TB, Balia S. 2013. Applied health economics. Routledge.

Newacheck P, Halfon N. 1986. The association between mother's and children's use of physician services. Medical care;24: 30-38.

Paraje G, Vásquez F. 2012. Health equity in an unequal country: the use of medical services in Chile. Int J Equity in Health;11: 81. DOI: 10.1186/1475-9276-11-81.

Pohlmeier W, Ulrich V. 1995. An econometric model of the two-part decisionmaking process in the demand for health care. Journal of Human Resources; 339-361. DOI: 10.2307/146123

Riley AW, Finney JW, Mellits ED, et al. 1993. Determinants of children's health care use: an investigation of psychosocial factors. Medical care; 767-783.

Sapelli GC, Vial LB. 1998. Utilización de prestaciones de salud en Chile:¿ Es diferente entre grupos de ingreso?. Cuadernos de Economía; 343-382.

Skordis-Worrall J, Hanson K, Mills A. 2011. Estimating the demand for health services in four poor districts of Cape Town, South Africa.International health;3: 44-49. DOI: 10.1016/j.inhe.2011.01.004

Vega J. 2001. Enfermo de pobre.Revista Universitaria; 73: 43-56.

Vega J, Bedregal P, Jadue L, Delgado I. 2003. Equidad de género en el acceso a la atención de salud en Chile. Revista médica de Chile; 131: 669-678.

Vega J, Hollstein R, Delgado I, et al. 2001. Chile: socioeconomic differentials and mortality in a middle-income nation, Challenging Inequalities in Health: From Ethics to Action. Oxford: OUP.

Vásquez F, Paraje G, Estay M. 2013. Income-related inequality in health and health care utilization in Chile, 2000-2009.Revista Panamericana de Salud Pública; 33: 98-106.

Vuong Q H. 1989. Likelihood ratio tests for model selection and non-nested hypotheses. Econometrica: Journal of the Econometric Society;307-333.

Zweifel P, Breyer F, Kiefmann M. 1997. Health Economics. Oxford University Press.

Zweifel P, Felder S, Meiers M. 1999. Ageing of population and health care expenditure: a red herring?. Health economics; 8:485-496.

Appendix

Table A.1: Descriptive Statistics variables considered in the analysis.

		WOMEN		MEN	
		Mean	St. Dev	Mean	St. Dev
GPV	Number of general practitioner visits, last 3 months.	0.348	1.127	0.209	0.857
SV	Number of specialist physician visits, last 3 months.	0.308	1.294	0.167	1.026
age 18-34	1 if between 18 and 34 years of age, 0 otherwise.	0.341	0.474	0.371	0.483
age 35-44	1 if between 35 and 44 years of age, 0 otherwise.	0.186	0.389	0.188	0.391
age 45-54	1 if between 45 and 54 years of age, 0 otherwise.	0.186	0.389	0.183	0.387
age 55-64	1 if between 55 and 64 years of age, 0 otherwise.	0.128	0.334	0.123	0.328
age 65-74	1 if between 65 and 74 years of age, 0 otherwise.	0.088	0.284	0.080	0.272
Educ -elementary	1 if up to elementary level, 0 otherwise.	0.313	0.464	0.288	0.453
Educ –secondary	1 if up to secondary level, 0 otherwise.	0.457	0.498	0.465	0.499
Educ –higher	1 if up to higher level, 0 otherwise.	0.230	0.421	0.246	0.431
Pub. System	1 if part of the public health system, 0 otherwise	0.817	0.387	0.766	0.424
No system	1 if without health system, 0 otherwise.	0.031	0.172	0.052	0.222
Other system	1 if part of the Armed Forces, ISAPRE, or other system, 0 otherwise.	0.153	0.360	0.182	0.386
Physical limit.	1 if physical limitation exists, 0 otherwise.	0.899	0.301	0.910	0.286
no_limit	1 if no physical limitation, 0 otherwise.	0.101	0.301	0.090	0.286
Married-cohab.	1 if married or cohabitating, 0 otherwise.	0.529	0.499	0.596	0.491
ms_other	1 if widowed, separated, single, divorced or annulled, 0 otherwise.	0.471	0.499	0.404	0.491
Rural	1 if lives in rural area, 0 otherwise.	0.121	0.326	0.138	0.345
Urban	1 if lives in urban area, 0 otherwise.	0.879	0.326	0.862	0.345
Ethnic group	1 if part of an ethnic group, 0 otherwise.	0.061	0.240	0.065	0.247
log-income	Family income logarithm per adult equivalent	11.370	2.853	11.573	2.629
healthmb-b	1 if self-reported health is good or very good, 0 otherwise.	0.604	0.489	0.689	0.463
Sah others	1 if self-reported health is very poor, very poor, or regular, 0	0.396	0.489	0.311	0.463

	otherwise.				
Independent	1 if independent worker, 0 otherwise.	0.076	0.265	0.143	0.350
Unemployed	1 if unemployed (a), 0 otherwise.	0.054	0.225	0.065	0.247
Retired	1 if retired (a), 0 otherwise.	0.115	0.319	0.092	0.290
Student	1 if studying, 0 otherwise.	0.057	0.232	0.058	0.234
Household tasks	1 if dedicated to housework, 0 otherwise.	0.236	0.425	0.005	0.067
Employed	If working, 0 otherwise.	0.318	0.466	0.547	0.498
Other activity	1 if engaged in other activity, 0 otherwise.	0.144	0.351	0.089	0.284
reg-1	1 if belongs to the First Region of the country.	0.017	0.129	0.017	0.129
reg-2	1 if belongs to the Second Region of the country.	0.032	0.175	0.032	0.175
reg-3	1 if belongs to the Third Region of the country.	0.015	0.120	0.015	0.123
reg-4	1 if belongs to the Fourth Region of the country.	0.042	0.200	0.042	0.201
reg-5	1 if belongs to the Fifth Region of the country.	0.104	0.306	0.101	0.302
reg-6	1 if belongs to the Sixth Region of the country.	0.051	0.220	0.054	0.226
reg-7	1 if belongs to the Seventh Region of the country.	0.059	0.236	0.060	0.237
reg-8	1 if belongs to the Eighth Region of the country.	0.119	0.324	0.119	0.324
reg-9	1 if belongs to the Ninth Region of the country.	0.055	0.227	0.056	0.230
reg-10	1 if belongs to the 10th Region of the country.	0.047	0.212	0.049	0.215
reg-11	1 if belongs to the 11th Region of the country.	0.006	0.075	0.006	0.078
reg-12	1 if belongs to the 12th Region of the country.	0.009	0.095	0.009	0.097
reg-13	1 if belongs to the Metropolitan Region of the country.	0.412	0.492	0.408	0.492
reg-14	1 if belongs to the 14th Region of the country.	0.022	0.147	0.020	0.141
reg-15	1 if belongs to the 15th Region of the country.	0.011	0.102	0.010	0.101

Documentos de Trabajo Banco Central de Chile	Working Papers Central Bank of Chile
NÚMEROS ANTERIORES	PAST ISSUES
La serie de Documentos de Trabajo en versión PDF puede obtenerse gratis en la dirección electrónica: www.bcentral.cl/esp/estpub/estudios/dtbc. Existe la posibilidad de solicitar una copia impresa con un costo de Ch$500 si es dentro de Chile y US$12 si es fuera de Chile. Las solicitudes se pueden hacer por fax: +56 2 26702231 o a través del correo electrónico: bcch@bcentral.cl.	Working Papers in PDF format can be downloaded free of charge from: www.bcentral.cl/eng/stdpub/studies/workingpaper. Printed versions can be ordered individually for US$12 per copy (for order inside Chile the charge is Ch$500.) Orders can be placed by fax: +56 2 26702231 or by email: bcch@bcentral.cl.

DTBC – 775
Traspaso de Tipo de Cambio a Precios en Chile: El Rol de los Insumos Importados y del Margen de Distribución
Andrés Sansone

DTBC – 774
Calibrating the Dynamic Nelson-Siegel Model: A Practitioner Approach
Francisco Ibáñez

DTBC – 773
Terms of Trade Shocks and Investment in Commodity-Exporting Economies
Jorge Fornero, Markus Kirchner y Andrés Yany

DTBC – 772
Explaining the Cyclical Volatility of Consumer Debt Risk
Carlos Madeira

DTBC – 771
Channels of US Monetary Policy Spillovers into International Bond Markets
Elías Albagli, Luis Ceballos, Sebastián Claro y Damián Romero

DTBC – 770
Fuelling Future Prices: Oil Price and Global Inflation
Carlos Medel

DTBC – 769
Inflation Dynamics and the Hybrid Neo Keynesian Phillips Curve: The Case of Chile
Carlos Medel

DTBC – 768
The Out-of-sample Performance of an Exact Median-unbiased Estimator for the Near-unity AR(1) Model
Carlos Medel y Pablo Pincheira

DTBC – 767
Decomposing Long-term Interest Rates: An International Comparison
Luis Ceballos y Damián Romero

DTBC – 766
Análisis de Riesgo de los Deudores Hipotecarios en Chile
Andrés Alegría y Jorge Bravo

DTBC – 765
Economic Performance, Wealth Distribution and Credit Restrictions Under Variable Investment: The Open Economy
Ronald Fischer y Diego Huerta

DTBC – 764
Country Shocks, Monetary Policy Expectations and ECB Decisions. A Dynamic Non-Linear Approach
Máximo Camacho, Danilo Leiva-León y Gabriel Péres-Quiros

DTBC – 763
Dynamics of Global Business Cycles Interdependence
Lorenzo Ductor y Danilo Leiva-León

DTBC – 762
Bank's Price Setting and Lending Maturity: Evidence from an Inflation Targeting Economy
Emiliano Luttini y Michael Perdersen

DTBC – 761
The Resource Curse: Does Fiscal Policy Make a Difference?
Álvaro Aguirre y Mario Giarda



BANCO CENTRAL
DE CHILE

DOCUMENTOS DE TRABAJO • Febrero 2016