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Research Institute in Management Sciences

Solvay Brussels School
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Do economic conditions and in-kind benefits make needy patients bond together? insights from cross-section data on clusters of co-located patients in Vietnam

Quan-Hoang Vuong and Ha Nguyen

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Methods: The study uses a cross-section data set containing 336 observations from four patients' colocation clusters, collected from 2015Q4 to 2016Q1. The analysis employs the baseline category logits model for dichotomous variable, and reports logistic regression results. The main hypothesis is both economic conditions and in-kind benefits received from the community have influence on patients' bonding to their community.

Results: Both personal economic conditions and benefits are found statistically significant, but the in-kind benefits decrease the bonding strength of the community, while the impact of economic instability is as expected. The strongest factor that serves to bond the patients together is the free will and predetermination of patients themselves to join the community.

Discussion: Patients in unstable conditions will more likely to stick to the co-location community. But those in better economic conditions show a more complex need and their perceptions change depending on the specific conditions. In-kind benefits are not what poorer patients expect and when they see these benefits from the community as “substitutes” for financial means, their expectation of sticking to the community declines.

Keywords: patients' quality of life, medical expenses, personal economic conditions, in-kind benefits, bonding strength

JEL Classifications: I12, I19

CEB Working Paper N° 16/030
June 2016

Université Libre de Bruxelles - Solvay Brussels School of Economics and Management
Centre Emile Bernheim
ULB CP114/03 50, avenue F.D. Roosevelt 1050 Brussels BELGIUM
e-mail: ceb@admin.ulb.ac.be Tel.: +32 (0)2/650.48.64 Fax: +32 (0)2/650.41.88

Do economic conditions and in-kind benefits make needy patients bond together? insights from cross-section data on clusters of co-located patients in Vietnam

Quan Hoang Vuong(*)
FPT University School of Business (FSB), Vietnam
Université Libre de Bruxelles, Belgium;
Email: qvuong@ulb.ac.be

Ha Nguyen
FPT University School of Business (FSB), Vietnam;
Email: nguyenh@fsb.edu.vn

<u>Abstract</u>

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(*) Corresponding author.

Introduction

Needy patients in Vietnam have been facing risks of destitution[1] and decreasing quality of life [2,3]. The problem appears to have been persistent due largely to undeveloped healthcare and health financing systems, especially for patients from rural areas or those suffering from chronic diseases [1, 4]. To cope with harsh realities of life during their medical treatments, an increasing number of Vietnamese patients have chosen to live together in voluntary co-location clusters [5] where they seek to support one another in reducing burdens and sharing resources, apart from information needs [6]. By living together, need patients hope for some improvement in quality of life [7], which is a crucial part constituting quality of healthcare during their long-term treatment [8].

Patients with lower socio-economic status face more hurdles during their treatments as costs emerge to be major barrier to basic treatment facilities, quality medicine and adequate care giving [4, 9, 10]. Therefore, co-location clusters that help share basic amenities, reduce costs of accommodation for some become the only choice [11, 12, 13]. An important part of patients' needs can be met with in-kind benefits [14] that those voluntary communities may be able to deliver [5].

Nonetheless, little research has been done with respect to the emerging phenomenon of patients' co-location clusters in urban areas in Vietnam. This short article communicate new insights acquired from our investigation into a set of cross-section data surveying co-located patients in such clusters in Hanoi, Vietnam.

The main hypothesis that is tested for acquiring the insights reported in this article follows.

Research Hypothesis:

> Personal economic conditions and in-kind benefits provided by the community have impacts on the bonding of patients in a co-location cluster during their treatment period.

Materials and Methods

Data Set

The data set employed in this research has been collected by the research team at Hanoi-based Vuong & Associates from December 2015 through March 2016, containing 336 observations from four different clusters of co-located patients in Hanoi.

The data are used to assess the degree of significance of patients' economic conditions and in-kind benefits they receive and evaluate how these factors affect the bonding of patients.

In the structured data table 1, these factors are coded as "PEC" (personal economic conditions) and "Ben.ikd" (in-kind benefits provided to a patient).

PEC has two states (i.e., values): "stable" and "unstable". A patient with a stable economic condition is one that can somehow overcome financial hardship and cover basic medical costs. In contrary, unstable PEC refers to a patient's opposite state of economic security.

Likewise, "Ben.ikd" has two states (values): "met.ikd" and "unmet.ikd". A patient who reports the state "met.ikd" is basically satisfied with in-kind benefits that his/her community has provided during the treatment period. The opposite state "unmet.ikd" reports unsatisfactory in-kind benefits from the community.

These two factors "PEC" and "Ben.ikd" serve to be predictor variables in our analytical model--which is presented in the statistical analysis subsection--whose numerical values enable us to compute useful empirical probabilities.

Following our hypothesis, these predictors are expected to influence the response variable “Bonding”, which reports whether a patient sees his/her bonding to the co-location cluster as indispensable (value/state: “indisp.dur”) or not (“disp.dur”).

Table 1. Distributions of “Bonding” responses against “PEC” and “Ben.ikd” values

“PEC”	“Ben.ikd”	“indisp.dur”	“disp.dur”
“stable”	“met.ikd”	19	25
	“unmet.ikd”	23	14
“unstable”	“met.ikd”	27	27
	“unmet.ikd”	165	36

From Table 1 we learn that the majority of surveyed co-located patients are in “unstable” state of PEC: 255 (out of 336). A large portion of patients, nearly 70%, considers living in the community “indispensable” during their medical treatment times, although most of them do not report satisfactory in-kind benefits from the community.

Statistical Analysis

This study employs the baseline category logits (BCL) framework for analysis of categorical data. The BCL framework that is used to examine the empirical data sets estimates a multivariate generalized linear model (GLM) in the following form:

$$\mathbf{g}(\boldsymbol{\mu}_i) = \mathbf{X}_i\boldsymbol{\beta},$$

where, $\boldsymbol{\mu}_i = \mathrm{E}(\mathbf{Y}_i)$, corresponding to $\mathbf{y}_i = (y_{i1}, y_{i2}, \dots)'$; row h of the model matrix $\mathbf{X}_i$ for observation i contains values of independent (also, predictor) variables for y_{ih}.

Due to this set-up of the problem, and as $\pi_j(\mathbf{x}) = P(Y = j|\mathbf{x})$ represent a fixed setting for independent variables, with $\sum_j \pi_j(\mathbf{x}) = 1$, categorical data are distributed over J categories of Y as either binomial or multinomial with corresponding probabilities $\{\pi_1(\mathbf{x}), \dots, \pi_j(\mathbf{x})\}$. Thus, the BCL model aligns each dependent (response) variable with a baseline category: $\ln[\boldsymbol{\pi}_j(\mathbf{x})/\boldsymbol{\pi}_J(\mathbf{x})]$, with $j = 1, \dots, J-1$.

As $\ln[\boldsymbol{\pi}_a(\mathbf{x})/\boldsymbol{\pi}_b(\mathbf{x})] = \ln[\boldsymbol{\pi}_a(\mathbf{x})/\boldsymbol{\pi}_J(\mathbf{x})] - \ln[\boldsymbol{\pi}_b(\mathbf{x})/\boldsymbol{\pi}_J(\mathbf{x})]$, the set of empirical probabilities from binomial and/or multinomial logits $\{\boldsymbol{\pi}_j(\mathbf{x})\}$ can be computed using the formula:

$$\boldsymbol{\pi}_j(\mathbf{x}) = \frac{\exp\,(\alpha_j + \beta_j^{\mathrm{T}}\mathbf{x})}{1 + \sum_h^{J-1} \exp\,(\alpha_h + \beta_h^{\mathrm{T}}\mathbf{x})}.$$

The categorical variables used in our models are dichotomous (e.g., the variate “Ben.ikd” has value of “met.ikd” or “unmet.ikd”), thus practically making the analysis logistic regressions. The coded names and values for those dichotomous variables are described in the corresponding data set in the data section. Technical details and practical estimations are given in [15] and [1], respectively. (A possible alternative for modeling the data is log-linear analysis, with example provided in [16].)

Results

The results reported in Table 4 below are estimated using the statistical package R 3.2.3. (See Appendix for the actual estimation that leads to subsequent analysis and computing of numerical values.)

All estimated coefficients are statistically significant at any conventional levels ($p < 0.01$). And both $\beta_1, \beta_2 < 0$. Generally speaking, such factors as PEC and Ben.ikd are all influential to patient's bonding strength.

Table 4. Estimation results on influence of predictor variables PEC and Ben.ikd on response variable "Bonding" during patients' medical treatment period

	Intercept	"PEC"	"Ben.ikd"
		"stable"	"met.ikd"
	β_0	β_1	β_2
logit(indisp.dur | disp.dur)	1.445^{***} [8.476]	-0.669^{*} [-2.336]	-1.272^{***} [-4.734]
Significance codes: 0 '***' 0.001 '**' 0.01 '*'; z-value in square brackets; baseline category for "PEC": "unstable"; and for "Ben.ikd": "unmet.ikd". Residual deviance: 1.77 on 1 degree of freedom.			

With, $\beta_1 = -0.669$ ($p < 0.01$) corresponding to PEC=stable, and $\beta_2 = -1.272$ ($p < 0.0001$) for Ben.ikd=met.ikd, the empirical data show that stable economic conditions and satisfactory in-kind benefits from the community both reduce the bonding strength of patients in the community. However the larger absolute numerical value with positive sign of the intercept $\beta_0 = +1.445$ ($p < 0.0001$) tells us that the propensity of staying with the community is somewhat natural and less dependent on economic conditions and/or benefits received from the community.

From Table 4, the we arrive at the empirical relationship given in Eq. (RQ1):

$$\ln\left(\frac{\pi_{\text{indisp.dur}}}{\pi_{\text{disp.dur}}}\right) = 1.445 - 0.669 \times \text{Stable} - 1.272 \times \text{MetIkd} \qquad \text{Eq. (RQ1)}$$

An example of the computation of an empirical probability from Eq. (RQ1) for a patient in unstable economic condition and in receipt of in-kind benefits provided by the community is as follows:

$$\pi_{\text{indisp.dur}} = \frac{e^{(1.445-1.272)}}{1 + e^{(1.445-1.272)}} = 0.543$$

Thus, there is a probability of 54.3% that such a patient will be likely to be loyal and stick to the community. Table 5 provides distributions of probabilities conditional on different states for "PEC" and "Ben.ikd".

Table 5. Computed probabilities for a patient to stick to the community against different PEC and in-kind benefits conditions

"Bonding"	"indisp.dur" (a)		"dis.dur" (b)	
"PEC" | "Ben.ikd"	"met.ikd"	"unmet.ikd"	"met.ikd"	"unmet.ikd"
"stable"	0.378	0.685	0.622	0.315
"unstable"	0.543	0.809	0.457	0.191

Discussion

From the above results, we arrive at some insights as discussed in what follows.

First, patients who face less stable economic conditions tend to be sticking to the community regardless of the level of in-kind benefits they receive from the community. The trend can be seen more clearly in Fig. 1.

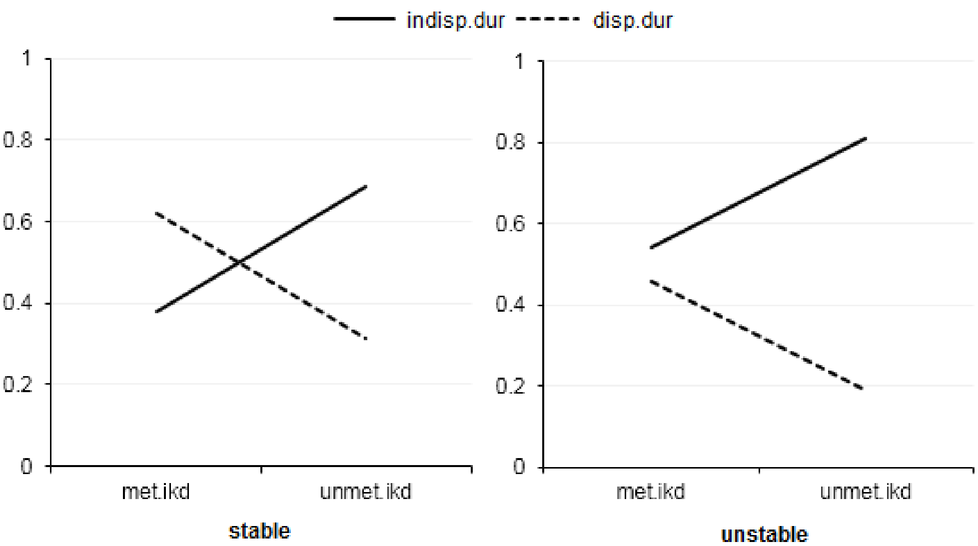

Figure 1. Propensity of patients to stick to their community in stable and unstable economic conditions

The Fig.1.unstable (right-hand-side) graph shows a clear difference with propensity to stick to the community is much stronger than the opposite. More interestingly, the difference is much larger when a patient does not think the in-kind benefits are adequate.

Second, for the Fig.1.stable (left-hand-side), the trends for patients in stable conditions change when switching from significant to insignificant in-kind benefits. The situation is a little more complicated than for those in unstable economic conditions.

Third, it is noteworthy that in-kind benefits do not appear to be a driver for patients to bond together. Perhaps a proper explanation for this phenomenon is that most patients who decide to co-live in these clusters have a primary concern of seeking financial means. In-kind benefits are not what they expect, and thus, when they see these benefits as "substitute" for financial means (such as low-cost borrowings, income-generating supports or giving in cash...) the benefits end up decreasing the perceived bonding strength.

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Appendix

A. Estimating the relationship in R (3.2.3) using the data set:

```
> RQ1=read.csv("D:/.../Data/Data336/tab12.34.41.csv",header=T)
> attach(RQ1)
> contrasts(RQ1$Ben.ikd)=contr.treatment(levels(RQ1$Ben.ikd),base=2)
> contrasts(RQ1$PEC)=contr.treatment(levels(RQ1$PEC),base=2)
> fit.RQ1=glm(cbind(indisp,disp)~PEC+Ben.ikd,data=RQ1,family=binomial)
> summary(fit.RQ1)
```