Substitution of Private for Public
Expenditure on Health Care Services: the
Case of Countries in Transition

by

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A thesis submitted in partial fulfillment of
the requirements for the degree of

Master of Arts in Economics

National University "Kyiv-Mohyla Academy"
Economics Education and Research Consortium
Master's Program in Economics

2007

Approved by _____
Ms. Serhiy Korablin (Head of the State Examination Committee)

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Program Authorized
to Offer Degree Master's Program in Economics, NaUKMA

Date _____

National University "Kyiv-Mohyla Academy"

Abstract

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In this study we investigate the empirical evidence of the existence of the degree of substitution between the public and the private expenditures on health care services and products. A special attention is paid to the countries in transition. We construct two panel datasets and for each of them estimate the model of the private expenditures on health. The main finding is that the degree of substitution between the two types of expenditures does exist, it is considerably less than perfect and does not differ much for the poor countries comparing to the richer ones. The next major finding is that the degree of substitution is not significantly different for the transition countries. The main results provide support to the previous findings. So any claims to reduce the government expenditures on health should take into account less than perfect substitution between the public and the private expenditures on health.

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ACKNOWLEDGMENTS

I would like to express my sincere gratitude to my thesis advisor, Dr. Polina Vlasenko, for her guidance and support on this research. Due to her patience and thorough reviewing of drafts, this paper comes into life.

I would like to thank Dr. Tom Coupè for generation of invaluable ideas, crucial comments and forcing me to work hard. I would also like to thank Olesia Verchenko, Olena Nizalova, Serguei Maliar and other Research Workshop professors for invaluable comments and suggestions.

I want to thank my EERC friends, Olena Stetsenko, Vladimir Botchorishvili, Maia Gejadze and Lily Samkharadze for their help and creative ideas. I give my special thanks to my family for enormous support and encouragement.

GLOSSARY

TCE	Total Consumer Expenditure
PPP	Purchasing Power Parities
ROW	Rest of the World
GPSE	Government Expenditures on General Public Services
IV	Instrumental Variable

Chapter 1

INTRODUCTION

For over decade and a half countries of the former soviet camp are in transition. Some of them, such as Czechs Republic, Hungary, Estonia and Slovakia have done much better in terms of transformation than CIS countries have[1]. During this period a number of reforms was undertaken or proposed: as a result one can observe various structural changes in these economies, both in economic and social aspects of life. In this paper we want to address questions of individuals' welfare, which is strongly affected by health care systems and health care services.

Health is one of the most important assets for the individual and a key factor in determining human capital. As a result, scientific world investigates questions concerning health to derive policy relevant conclusions. Health is important prerequisite to go to university, of the ability to grow intellectually and physically, and to be productive (Konoreva, 2006).

Different countries established different types of health systems to support and improve health status of a nation as a whole. All health systems can be divided into two main groups: publicly financed and privately financed. The latter implies that people spend out-of-pocket to consume health care services, while the former means that health care institutions are financed by the government. There are considerable drawbacks and advantages for each system and the type of health care system established depends upon history and traditions.

As mentioned above, there exist two types of health care systems – publicly financed and privately financed –and it is debated whether one is preferable to

[1] Commonwealth of Independent States is meant by CIS here

another and in which circumstances. Countries do not usually have purely public or purely private system, often the system is a mix of the two types in varying proportions. In most transition economies health care systems are publicly financed, that is, they are a part of government expenditures. A number of arguments can be made in favor of cutting public expenditure on health care, for example in name of economic efficiency (Guissan et al, 2001). By economic efficiency authors mean the efficiency gains from shifting to private health care system from the public one. Other arguments in favor of cutting public expenditures include government bureaucracy, inefficiency, inability to buy costly but technologically advanced equipment and others.

In transition countries, particularly, there are tendencies and arguments to cut the government expenditures on health care services: due to inefficient usage of money provided to the public health care system and reasons mentioned above.

To add, bureaucracy sometimes leads to the situations when even the publicly financed health care institutions force people to pay for various drugs and treatments out of pocket. These are the so called in-kind payments[2], due to which there is no clear-cut distinction between the private and the public health care system. The inefficiency of the public health care systems in transition economies comes from poor quality of equipment, poor professional level of physicians, resulting in the long queues of patients waiting to be seen by a doctor. At the same time, one can observe a growth in the number of private hospitals which are thought to be more efficient in provision of health care services, but they are more expensive as well.

Considering Guissan et al (2001) we are going to investigate whether a possible reduction in the public expenditures on health care services can be proportionally matched by an increase in the private expenditures on health. For

[2] In-kind payments are treated as bribes from patients to doctors payed to make them provide treatment or consultation in time and of fair quality

the countries in transition, the question becomes: given the problems of the current health care system, can a cut in the public health care expenditures improve individuals' well-being, in terms of quality and quantity of private health care services? In other words, will a reduction in the amount of money transferred to the public health care system (and a corresponding reduction in taxes) be compensated for by an increase in the private expenditures on health?

The novelty of this research is that we are going to consider countries in transition as a special case, in order to find how the relationship between public and private expenditures on health differ for these countries from that of the rest of the world. Also, we are going to try to deal with causality problem between private expenditures on health and public ones (both of them has a cause effect on each other), which was not done in previous study.

So, well-being is the main motivation of this thesis and a second reason is that there was no such an investigation conducted for transition countries. The population's well-being can be adversely affected by the reduction in public expenditure on health if the private expenditures do not raise enough to compensate.

The structure of this paper is as follows:

Next chapter is literature review, where we are going to mention previous related studies, problems encountered and major findings.

Third chapter is data description and methodology. It covers data, model and methods, which we are going to use for estimation of the model.

In fourth chapter we will try to cover empirical estimation procedure, problems encountered and possible solutions on them. In particular, we are going to test whether relationship between private and public health expenditures is significantly different for transition countries from the rest of the world.

In fifth chapter we are going to conclude on results received.

Chapter 2

LITERATURE REVIEW

Health is regarded as one of the most important factors that determine a country's human capital. Moreover several studies have shown that there exists a positive effect of a nation's "health status" on the country's GDP level. Therefore, it is important to consider health as a determinant of the nation's wealth. In recent decades the world expenditure on health services has had a structural tendency to grow due to an increase in the share of elderly population in Europe and the introduction of new health care products. World population is ageing, which will have a number of economic consequences worldwide: in particular there exists a concern that ageing population can have an effect on health expenditure – both public and private (Mahal and Berman, 2001).

Countries around the globe have adopted different approaches of financing the health care aimed at sustaining and supporting the national health level. For example, in USA 54.11% of health expenditure was private in 2004, while in France and Japan – more than 80% was public (Guisan and Arranz, 2001). There is no clear evidence that some particular way of financing is cheaper or yields better results, such as health care of higher quality. The main question we want to raise in my thesis comes from the fact that often "attempts" are made to cut public expenditure on health, not bearing in mind that this can result in

significant losses to nation's welfare. We are going to estimate the degree of substitution between private and public expenditure on health, paying particular attention to how this degree is different for the countries in transition. If this degree is far enough from one, then there is a possibility that private expenditure on health cannot completely offset the contraction in public expenditure on health, resulting in significant losses to individuals' well-being.

Researchers began to explore substitutability or complementarity of the public and the private health care expenditures only recently, therefore this question is a rather new one. Studies in this area can be divided into two broad categories: those that investigate health expenditure based on micro and macro data. Micro studies concentrate on investigating which factors in particular are being determinants of private health care expenditures and public health care expenditures, while macro studies investigate relationship and the degree of substitution between both. We are going to concentrate on macro approach, due to the availability of data and interest in possible implications.

Findings of macro studies

Guisan and Arranz (2001) analyze private consumption of health care expenditures for 13 OECD countries for the period 1970 – 1994, and for 24 OECD countries for the period 1990 – 1996. The authors estimate an econometric model using a mix of OECD National Accounts Statistics and OECD Purchasing Power Parities and Real Expenditure Statistics as data source.

In the paper, authors underline the importance of studying the private expenditure on health, due to the fact that in OECD countries (1970 – 1994 period) private expenditure on health was growing at rates higher than total private expenditure. Their results confirm that there exists some degree of substitution between private and public expenditure on health. Moreover, the authors claim that consumption of public and private health care services are not perfect substitutes, therefore they should complement each other. Any proposition to cut public expenditure on health should have the quality of services and social welfare, not solely economic efficiency as the primary concern. In this research we are going to use methodology proposed by the authors to estimate degree of substitution between private and public expenditure on health. The novelty will be in dealing with causality problem between two types of expenditures, focusing on question of poor versus rich countries, and in investigating the relationship for transition countries in order to estimate how the degree of substitution differs for these countries.

Atella and Marini (2002) use data on health expenditure from OECD Health data for 20 countries from 1960 to 1999 to shed new light on the question of how income affects health care expenditures. They incorporate in their analysis the following features: the presence of different health systems, the role of the technical progress, and the substitutability relationship between private and public health expenditure. The authors say that it is difficult to determine whether health care expenditures are normal or luxury good. An important conclusion of the

paper is that substitution relationship is sensitive to the functional form and the variable specification used. Taking this into consideration, they found that there exists a substitution effect between the public and the private expenditure, and this effect is asymmetric – public expenditure is a good substitute for private one in Australia, Canada, Denmark, UK and Italy (NHS[3] countries), while private expenditures on health care services are not good substitutes for public expenditures on health. In fact, in these countries one dollar spent on public health expenditure reduce private expenditures on health care services by $1,43; at the same time, one dollar spent on private health expenditure reduces public expenditures by a smaller amount – $0,13. So the empirical evidence from NHS countries shows that, while public health expenditure can offset the contraction in the private expenditures, the private expenditures has a much lower substitutability power to increase correspondingly when the public share is reduced. This result underscores the importance of investigating the degree of substitution between private and public health care expenditures.

Among studies that are related to transition countries, a working paper by Konoreva (2006) investigates the relationship between health status and GDP growth rate for 24 transition countries. Author uses data from the database "Health for All" of World Health Organization and "World Development Indicators (WDI) database 2005". Transition countries are concerned with

[3] NHS is National Health Service, public organization operating in various countries, which provides health care services and controlled by health departments of a specific country

promoting GDP growth and the author finds a positive effect of health status on GDP growth rate and argues that the expenditures on health care services are an important determinant of economic growth.

Lehan et al (2005) were first to provide a comparative analysis of health care expenditures for several CIS countries. Interesting finding is that low level of government support for the health care industry forces population to use private services. Taking into account the unofficial out-of-pocket payments by patients, the authors claim that the share of the private expenditure on health care services is expected to be about 50%. These figures imply that the substitution of private health expenditure for public one already occurs, unofficially, in transition countries.

Findings of micro studies

Fabbri and Monfardini (2002) base their microeconomic research on utilization of physician services in Italy. They perform analysis of the demand for physician services in Italy, evaluating the determinants of individual utilization for both classes of providers – private and public. In the paper, authors emphasize the remarkable feature of the Italian market for medical professional consultation – the presence of two broad and distinguishable classes of providers: public and private. The paper investigates several models of health care utilization and uses the new Italian Survey on Health, Ageing and Wealth (SHAW) conducted in 2001 for the empirical analysis. The econometric evidence presented in the paper

confirms that the private and the public demands for health care services are explained by different processes, which are driven by the same factors.

Considering the substitutability between the private and the public expenditure on health care, one should keep in mind that they are driven by same factors but in different directions: being richer increases propensity to contact private clinic, while decreases number of contacts with public specialists. Publicly financed health care is not free of cost to particular person; usually in the public health care system the waiting time for being seen by a physician is much longer than the waiting time in a private clinic (Fabbri and Monfardini, 2002). The time that people spend waiting is a cost, and this cost is usually lower for the private clinic's services. Econometric evidence found by the authors underlines that personal health insurance is not a determinant of the health expenditure type, while positively influences a frequency of private specialist visits. Another very interesting finding is that age is not a significant factor in choosing which type of service to consume – public or private, but rather income is found to be a crucial determinant of health care service's type consumed, in particular, public health care services appear to be pro-poor, while private ones – pro-rich. In thesis paper we are going to take into consideration age of the population, due to the fact that in transition countries the poorest population is elder one.

Grossman (1972) was first to develop a human capital perspective model, that treats health as a given initial capital good, which can depreciate with age and grow when investment in it is made. This model treats an individual as a decision-

maker choosing the level of consumption of health care services subject to the fact that a better state of health allows more efficient performance and higher productivity.

In thesis paper we are going to incorporate in this framework the fact that individual chooses either public or private health care services. We will assume that individual makes his or her choice subject to several factors: the level of income, education and government financing of public health services.

Another study by Cree and Farell (2001) explore the determinants of usage of six different types of health care services, using the Medical Expenditure Panel Survey data (years 1996 – 2000). They determine what model of univariate count data fits the data the best and find that this depends on how the data is pooled over sexes and over time. Despite the fact that the goal of this paper is to investigate different models that fit microeconomic data, it sheds some useful insight on how the demand for health care services is measured: office based doctor visits, outpatient doctor visits, emergency room visits etc.

Mahal and Berman (2001) review the link between ageing and health spending. They find that several studies confirm that elderly tend to spend more on health care comparing to youngsters – this happens due to poorer health status and invention of new drugs. The cost of health care for elderly depends directly on the type of service consumed – formal institution financed by government (nursing homes or hospices) or informal home-based care. The

choice between the two also depends on whether the expenditure on health care is private or public.

As can be seen from literature mentioned above, there is a room to investigate the relationship between private expenditures on health care services and public ones for countries in transitions. In particular, we are going to see how the degree of substitution is different for countries in transition from the rest of the world.

Next chapter proceeds with description of the data and methodology we are going to use in this research.

Chapter 3

DATA DESCRIPTION AND METHODOLOGY

For the purpose of estimation of the degree of substitution between the private and the public expenditures on health care services we construct two panels: first consisting of 39 countries and second consisting of 55 countries. Explanation behind doing different panels is as follows: the first panel will be used to estimate degree of substitution for 39 world countries using yearly observations from 1995 to 2005 and focusing on question how the degree of substitution differs for poor countries versus rich ones. The institution behind addressing such a question is that population in poor countries should be of less ability to substitute for public expenditures on health with out-of-pocket spending. Doing this we are following Guissan et al (2001), but we add more countries into a sample: 39 countries comparing to 13. The second panel will be constructed of 55 countries using yearly observations from 1997 to 2005, 16 of them being countries in transition (Azerbaijan, Kazakhstan, Belarus, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia, Slovenia and Ukraine). Using such a panel we are going to estimate degree of substitution and to evaluate how this relationship differs for the particular interest group – countries in transition. There would be sense to include more transition countries into the sample, but data for these countries suffers from gaps and small number of observations.

Estimation will be based on procedure proposed by Guissan et al (2001), therefore we will need data on public and private expenditures on health care services, measured in per capita terms. These data can be obtained from General Market Information Database (GMID) website. According to GMID definition,

private expenditures on health goods and medical services include consumer expenditures on pharmaceutical products, medical appliances and equipment, outpatient and hospital services (here are also included health services purchased from school and university health centers). At the same time, government expenditures on health covers all non-repayable payments – whether capital or current, requited or not – by government (including medical products, appliances and equipment, outpatient services, hospital services and public health services, R & D on health). Both, the private and the public expenditures on health, are measured in local currencies and then in US dollars using year-on-year exchange rates. To modify data into per capita terms we use straightforward formula:

$$X_{per\_capita\_country\_i} = \frac{X_{total\_country\_i}}{P_{country\_i}}, \qquad (1)$$

where

X – is a variable of interest and

P – is population of certain country.

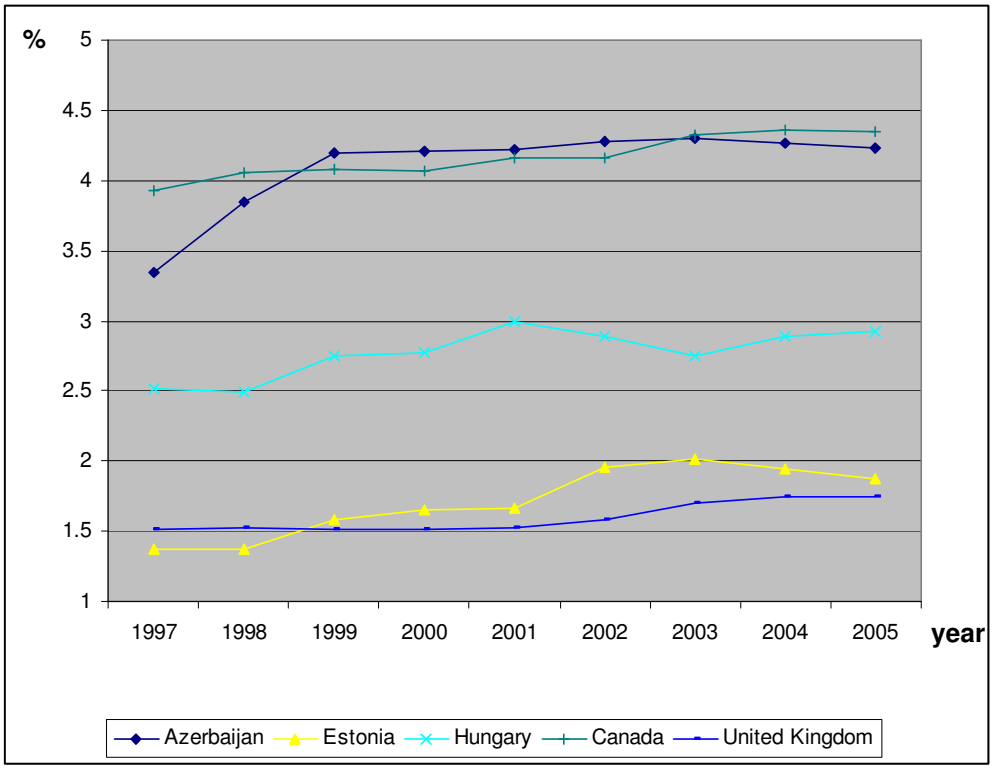
Data on population is taken from GMID website, based on national estimates at January 1st of each year calculating population using de facto definition of this variable, in particular counting all residents regardless of legal status or citizenship – except for refugees not permanently settled in the country of asylum.

Share of the private expenditures on health care services in total consumer expenditure is growing, reflecting raise in its importance as one of the contributors to the individuals total expenditure. Figure 1 represents trend in the share of the private expenditures on health care services in total individual's expenditure for some transition and ROW countries. As we can see the share increased slightly during last 10 years, making individual's health expenditures

more important part of its expenditures. Data on consumer expenditures is taken from GMID website and comprises personal expenditure on goods – durable, semi-durable and non-durable – and on services, including the imputed rent of owner-occupied dwellings, the administrative costs of general insurance and of life assurance and superannuation schemes.

Figure 1

Share of the private expenditures on health in total consumer expenditures



Other variable that we will need is Gross Domestic Product (GDP) in per capita terms. GMID provides data on GDP, measured at PPP in US dollars, and GDP per capita we are going to get dividing it by countries' total population estimates. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the

value of the products. Intuition behind inclusion of this variable into my regression is as follows: GDP is treated as an income and in its own turn income is considered as a determinant of any kind of expenditures, in particular on health care services: the greater the person's income the greater the possibility to stop using some public health services and spend some part of income on private health care services (for example, to minimize time costs).

Also we will need data on such variables as literacy rate and aged population percentage. According to Guissan et al (2001) literacy rate is included to capture educational aspect: the more educated is the person the higher probability that it will take care about its own health, therefore spending more on health care services. To proxy the educational aspect we are going to use number of university students per one thousand units of population.

Also, elderly people tend to consume health care services more than youngsters in order to sustain health at certain level; therefore, it is useful to incorporate share of country's aged population into the model, due to its explanatory power. Mean age of population is going to be used as a proxy for share of aged people in a certain country. This data and university student per thousand of population can be taken form GMID website, both for world and transition countries. GMID data includes both foreign and national students, and full-time/part-time students (the statistics in general refer to both public and private education). Mean age of population is just the arithmetic average of the country's age distribution.

We are going to use described data to estimate degree of substitution of the private for the public expenditures on health; in particular, we are going to concentrate on this relationship in transition countries, as there is no study that did it yet.

Table 1 represents statistics of variables we are going to use to estimate the degree of substitutability of the private for public expenditures on health.

Table 1

Descriptive statistics

STATA Name	Variable	Mean	Std. Dev.	Min - Max	
year	Year	2001	2.58	1997	2005
id	Country	28	15.890	1	55
prhe	The private expenditure on health care services per capita	365.83	746.529	2.73	5821.69
ghe	The private expenditure on health care services per capita	495.744	698.379	0.13	3870
age	Mean age of population	32.98	6.347	19.1	41.8
gdp	Gross Domestic Product per capita	15519.80	10435.360	1924.90	42839.2
unst	Number of university students per 1000 of population	13.94	10.629	2.46	56.84
gpse	The government expenditures on general public services	929.14	1114.219	26.08	5315.43
d_tr	Dummy for transition countries	0.29	0.454	0	1

As we can see from Table 1 we are going to use yearly observations on 55 countries. 16 of these 55 are countries in transition, with dummy variable equal to 1. The private expenditures on health per capita considerable vary from the lowest 2.73 US dollars up to 5821.69 US dollars per capita. The variables "public expenditures on health" and "gross domestic product per capita" have considerable variation too, indicating sample includes both poor and rich countries. As mentioned above age is expected to be an important factor too, this

variable ranges from 19.1 to 41.8 and is going to incorporate age as one of the determinants of the private expenditures on health care services. We are going to use government expenditure on general public services as an instrument to deal with causality problem between the private and public expenditures on health. This variable will be explained and justified later in this section.

In the second part of this section we are going to explain which methods we are using to estimate the degree of substitution between private and public expenditures on health. Based on methodology proposed by Guissan et al (2001) we investigate the relationship between two types of the expenditures on health for 39 world countries and 55 countries including transition ones, using following model, where private expenditure on health is a function of several variables:

$$PRHE = f(GDP, E, AGE, PHE), \qquad (2)$$

where

PRHE is private expenditures on health care services per capita,

GDP is Gross Domestic Product per capita,

AGE is aged population percentage,

E is education,

PHE is public expenditures on health care services per capita.

As mentioned above, aged population percentage and educational aspect will be proxied by mean age of population and number of university students per one thousand of population. Also, since various expenditures (both private and public) are rising over time for reasons unrelated solely to the substitution between private and public expenditures on health, using logarithmic form of the

model definitely makes more sense. Therefore, for the first panel of 39 countries model is:

$$\log(\mathrm{Pr}_{it}) = \alpha + \beta \cdot \log(\mathrm{P}_{it}) + \theta \cdot \log(\mathrm{Y}_{it}) + \eta \cdot \log(U_{it}) + \lambda \cdot \log(\mathrm{A}_{it}) + \varepsilon_{it} \quad (3)$$

, where

Pr is private expenditure on health care services per capita,

P is public expenditure on health care services per capita,

Y is Gross Domestic Product per capita,

U is number of university students per thousand of population,

A is mean age of population,

i reprsents individual (in our case it is country),

t stands for time.

Particular interest lies in coefficient of the public expenditures on health, as it is going to show the degree of substitution between the public and the private expenditures on health care services. Guissan et al (2001) do similar estimation for 13 OECD countries and find the coefficient to be -0.43; which shows the evidence of the existence of the degree of substitution between private and public expenditure on health. Moreover, result confirms the expected relationship between two types of health expenditures – coefficient is considerable less than one, implying that private expenditures on health cannot equally catch up reduction in public expenditures on health. So we are going to estimate the degree of substitution for 39 world countries using regression on equation (3). The novelty of this paper will be that we are going to concentrate on how the degree of substitution is different for the poor countries versus richer ones. This can be done by adding interacted dummy variable for the poor countries into the

equation (3). Dummy for the poor countries takes the value of one if GDP per capita is less than 5000 US dollars per capita (poor country) and zero otherwise.

Also, one of the novelties of this paper is going to be concentration on the case of countries in transition. We will use model specified by equation (2) as well. To capture how the degree of substitution is different for countries in transition comparing to the rest of the world we are going to use dummy for transition countries and include an interacted dummy into equation (3), so that the regression will be based on the following equation:

$$\log(\mathrm{Pr}_{it}) = \alpha + \beta \cdot \log(\mathrm{P}_{it}) + \gamma \cdot D_{it} + \omega \cdot [D \cdot \log(\mathrm{P}_{it})] + \theta \cdot \log(\mathrm{Y}_{it}) + \eta \cdot \log(U_{it}) + \lambda \cdot \log(\mathrm{A}_{it}) + \varepsilon_{it} \quad (4)$$

where

D is dummy for countries in transition,

$D \log(\mathrm{P}_{ti})$ represent interacted dummy.

Regression on equation (4) will be run using 55 countries, 16 of which being transition countries; and ω will show how the degree of substitution differs for transition countries from the rest of the world.

Next approach will be based on intuition that correspondent change in share of the private expenditures on health care services in total expenditures on health (to reduction or raise in public expenditures on health) does not fully occur within short period of time. Moreover, in case of second regression which includes transition countries only 9 years of observations are available – far not enough for capturing long run relationship. Considering expenditures on health, one year can be treated to be a short period of time; one can argue that we should expect private expenditures to change during few years, when there are changes in amount of public provision of health care services in some first year *t*.

We are going to incorporate this argument into research by getting differences, pooling them and then using equations (3) and (4), but rather in differences. In particular:

- for the case of 39 world countries we are going to use differences of years 2000 – 1996 and 2005 – 2001.
- for the case of 55 countries we are going to use following differences: 2001 – 1998, 2005 – 2002.

Using differences in all variables is going to capture time.

Equation (3) is specified in a way that regression on it will clearly suffer from the problem of the reverse causality – between the private and the public expenditures on health. Despite the fact that the public expenditures on health is explanatory variable and private expenditures is dependent, it is not clear what causes what. They are linked and influence each other in interaction: for example, if private expenditures on health care services drop significantly, government may raise public expenditures in order to sustain certain level of health care services' consumption (because people still need treatment, preventive measures etc.); at the same time, if public expenditures on health care services are reduced considerably, one can expect raise in private expenditures to compensate for this reduction.

We expect to get negative relationship between the private and the public expenditures on health, but due to reverse causality problem we can get opposite relationship: for example, consider some positive shock $\varepsilon_{it} > 0$, which would influence both the private and the public expenditures on health – this would lead to positive relationship between both. In order to "refine" the regression from the causality problem we are going to apply IV technique. Good instrumental variable is very critical for the panel data approach, because we have 11 and 9 years panel datasets for ROW and transition countries respectively; problems of endogeneity and omitted variables can be solved only if good instrument is found. Good instrument should be:

i. correlated with independent variable (in particular, the public health expenditures)

ii. uncorrelated with an error term ε_{it}

So to deal with the reverse causality problem we are going to use government expenditures on general public services as instrument for the public expenditures on health. Following the GMID definition the government expenditures on general public services cover all non-repayable payments – whether capital or current, requited or not – by government, and include: executive and legislative organs, financial and fiscal affairs, external affairs, foreign economic aid, general services (general personnel services, overall planning and statistical services, other general services), basic research, R & D on general public services, public debt transactions, transfers of a general character between different levels of government. Intuition is as follows:

a) government expenditures on general public services (GPSE) and public expenditures on health care services are correlated due to the fact that they both constitute government expenditures, decisions on their volumes are made in interactions and there can exists certain kind of trade-off between them (though, not necessarily), so we expect the GPSE to satisfy condition i. for variable to be a good instrument.

b) intuitively, any type of shock in GPSE should not trace its violations to changes in private expenditures on health care services, so we expect GPSE to satisfy condition ii. as well.

From Figure 2 and Figure 3 we can see that for the case of ROW countries starting from 2002 both the public expenditure on health care services and government expenditure on general public services slightly increase.

Figure 2

Public Expenditure on Health (ROW)

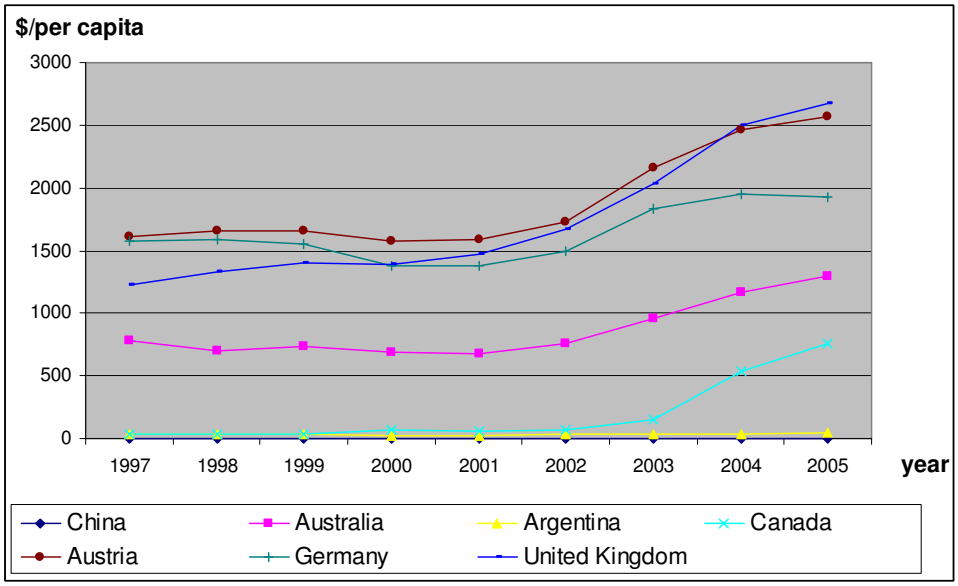
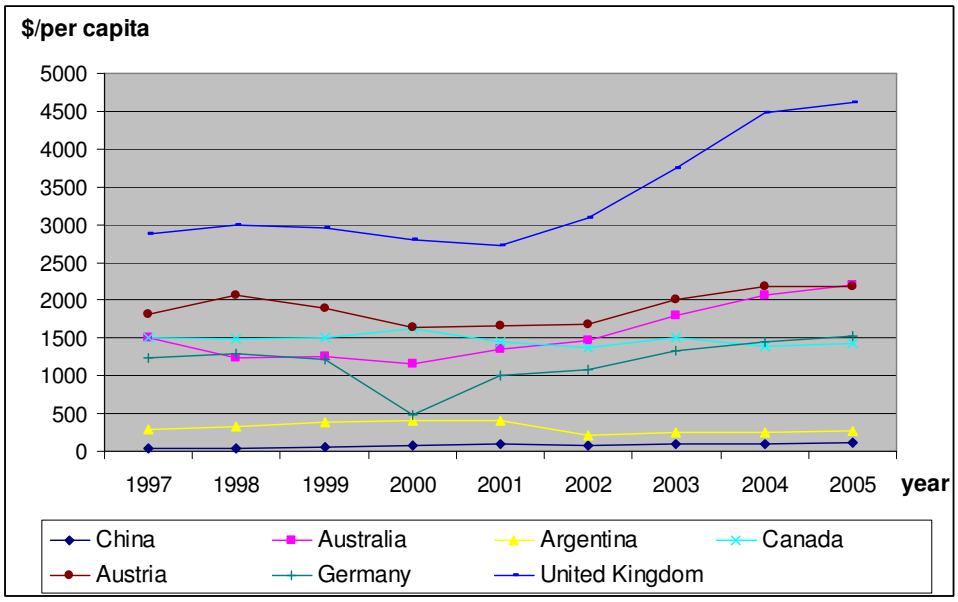


Figure 3

Government expenditure on general public services (ROW)



Considering countries in transition, we can refer to appendices and see from Figure 4 and Figure 5 that starting from year 2002 both the public expenditures on health and government expenditures on general public services rise, though in different proportions.

Due to the reasons described above we expect government expenditures on general public services to be a good instrument for the public expenditures on health care services.

In the next section we are going to state empirical estimation results of the model described.

Chapter 4

EMPIRICAL ESTIMATION AND RESULTS

We are going to follow the methodology described in section 3 and we will try to estimate the degree of substitutability between the private and public expenditures on health care services. Estimation will be done for several different regressions: firstly, based on the panel of 39 ROW countries using yearly observations from 1995 to 2005; secondly, based on the panel of the 55 countries, 16 of which are transition countries, using yearly observations from 1997 to 2005; thirdly, for 39 ROW countries based on pooled differences for each country variable (particularly, 2000-1996 and 2005-2001 differences); and for 55 countries (among which 16 are transition countries) based on pooled differences for each country variable (particularly, 2001-1998 and 2005-2002 differences). Last two regressions are used to capture relationship between the public and private heath expenditure incorporating changes over time.

Firstly, in statistical package Intercooled Stata 9.2 we generate logarithms of variables that we use for our regressions, because we need logarithmic form for reasons explained in section 3. Also we generate interacted dummy variable by multiplying dummy for transition countries by the public expenditures on health (for each country and for every year):

$$\text{inter\_D}_{it} = D_{it} \cdot P_{it}, \tag{5}$$

where

Inter_D – is interacted dummy for transition countries,

D – is dummy for transition countries,

P – is the public expenditures on health care services.

Interacted dummy variable is constructed on the public expenditures on health; therefore, it will be a cause of the reverse causality problem. So there is a need to instrument this variable and one of the possible ways to do it is to construct instrument, based on the dummy for transition countries and the government expenditures on general public services:

$$\text{inter\_D}_{it}\_\text{instr} = \text{D}_{it} \cdot \text{GPSE}_{it}, \qquad (6)$$

where

inter_D_instr – is an instrument for interacted dummy,

GPSE – is the government expenditures on general public services.

The same procedure is applied to construct the interacted dummy for the poor countries.

Before we will present the results we are going to mention some tests and checks for right estimation procedure.

First step is to test whether the right estimation method is fixed effect or random effect estimation. Difference between the two comes from the fact that group differences are examined in intercepts by the fixed effect model; slopes are the same and variances across all groups are assumed to be constant. Meanwhile, random effect model estimates variance components for the error term and particular groups, with the assumption of same slopes and intercepts; therefore, unknown parameters are treated as the part of the error term.

Fixed effect is usually tested by the F test, LM test examines random effect model. In Stata 9.2 test between this two models can be performed using the Hausman specification test, and if p-value is greater than 0.05 then random effect estimation can be safely used. We are going to test fixed versus random effects model for every specification that uses panel data approach.

Second step is to check for heteroskedasticity problem, because if the problem exists then OLS estimates are no longer of minimum variance, though estimates are still unbiased. We expect the possibility of such a problem to arise, as error terms associated with large countries might have larger variances that

those associated with smaller countries might have. The Breusch-Pagan test can be used in Stata 9.2, it tests the hypothesis that the error variances are all equal versus the alternative one that error variances are multiplicative function of some variables. Sometimes heteroskedasticity problem may arise from the model misspecification, for example, some important variable is omitted. Usually, it is advised to try to re-specify the model or transform some variables when the problem of heteroskedasticity is detected, if that is difficult or impossible robust standard errors can be used. The Breusch-Pagan made for all regressions do not reject the null hypothesis of constant variance.

Thirdly, in cases of unbalanced panel check for autocorrelation is crucial to detect problems with the specific regression, so that standard errors are not trusted. Operator xtregar can accommodate unbalanced panels whose observations are unequally spaced over time, though panels of data used for regression in this paper are balanced, therefore we are not performing autocorrelation test here.

Finally, we are going to present the results in four tables: firstly, for the regression based on the panel of 39 ROW countries using yearly observations from 1995 to 2005; secondly for the regression based on the panel for 55 countries using yearly observations from 1997 to 2005; thirdly, for 39 ROW countries using pooled differences for years 2000-1996 and 2005-2001; and finally, for 55 countries using pooled differences for years 2001- 1998 and 2005-2002.

Table 2

39 ROW countries' estimation results

Explanatory variables	log_prhe (1.1)	log_prhe (1.2)	log_prhe (1.3)	log_prhe (1.4)	log_prhe (1.5)	log_prhe (1.6)	log_prhe (1.7)	log_prhe (1.8)
log_age	0.424	0.246	-1.674*	-1.667*	-0.889*	-0.899*	-1.674*	-1.667*
	(0.28)	(0.29)	(0.9)	(0.9)	(0.5)	(0.51)	(0.9)	(0.9)
log_unst	0.141**	0.171***	0.660***	0.656***	-0.089	-0.089	0.660***	0.656***
	(0.058)	(0.058)	(0.21)	(0.22)	(0.062)	(0.066)	(0.21)	(0.22)
log_gdp	1.154***	1.079***	3.204***	3.156***	1.243***	1.243***	3.204***	3.156***
	(0.098)	(0.1)	(0.74)	(0.88)	(0.13)	(0.13)	(0.74)	(0.88)
log_ghe	0.09***	0.104***	-0.665**	-0.650**	0.075***	0.075***	-0.665**	-0.650**
	(0.023)	(0.024)	(0.27)	(0.31)	(0.017)	(0.017)	(0.27)	(0.31)
Inter_poor		-0.118***		-0.0193		-0.0003		-0.019
		(0.042)		(0.13)		(0.062)		(0.13)
Constant	-7.942***	-6.728***	-18.04***	-17.67***	-3.516***	-3.490***	-18.04***	-17.67***
	(0.56)	(0.71)	(3.67)	(4.98)	(0.97)	(1.02)	(3.67)	(4.98)
Observations	429	429	429	429	429	429	429	429
R-squared	0.81	0.82	0.35	0.37	0.79	0.79	0.49	0.50

Note: Dependent variable is log_prhe.

Specification presented in column (1.1) of Table 2 includes age, university students, GDP and the public expenditure on health as explanatory variables. It is standard OLS regression and estimated coefficients are 1.154 for logarithm of GDP and 0.0903 for logarithm of the public expenditures on health care services. The latter coefficient is inconsistent with theory but that could be explained by the fact that this specific regression is standard OLS and no instrument for the public expenditures on health is used, therefore allowing for causality problem to produce biased estimates. The value for R-squared is 0.81 which implies that model fits data quite well, though this particular example clearly shows that value of this statistics is not self-fulfilling to state that results are reliable – even with high R-squared estimates are expected to be biased and non-reliable.

Specification 1.2 includes one more explanatory variable – interacted dummy for poor countries. Values for this variable are calculated using the following formula:

$$\text{Inter\_poor}_{it} = \text{D\_poor}_{it} \cdot \text{P}_{it} \qquad (7)$$

where

Inter_poor – is interacted dummy for poor countries,

D_pooor – is a dummy for poor countries, taking value of 1 if country is poor and zero otherwise,

P – is the public expenditure on health care services.

Decision on whether the country is poor or not is taken based upon GDP per capita values: if it is less than 5000 US dollars then the country is treated as being poor.

As this variable is calculated using values of the public expenditures on health, it can create the problem of reverse causality, so it is needed to be instrumented. Values for the instrument are calculated using similar formula as (7), but multiplying dummy for poor countries by the government expenditures on general public services.

Column 1.2 in Table 2 reports estimates for the specification 1.2. It is standard OLS regression with no instruments used for the public expenditures on health and interacted dummy for poor countries. Coefficients are close to the previous specification and in addition negative and significant at 1% significance level coefficient for interacted dummy for poor countries is received. In next specifications we are going to use instruments to deal with the causality problem and examine how coefficients will change and in what direction.

Specification 1.3 does not include interacted dummy for the poor countries, and model was estimated by the two stage least-squares (2SLS) regression with the public expenditures on health being instrumented by the government expenditures on general public services. Coefficients received for university students and GDP per capita are slightly higher than for the specifications 1.1

and 1.2, they are both significant at 1 per cent significance level and equal to 0.660 and 3.204 respectively, which supports the theory. Coefficient for the public expenditures on health is significant at 5 per cent level and equals -0.665, which is consistent with theory and previous findings, particularly with Guissan et al (2001), which come with almost the same value for this coefficient. Before instrumenting the public expenditures on health we were getting positive coefficients for this variable in specifications 1.1 and 1.2, so bias was changing the sign of the coefficient and implied that two types of expenditures on health are complements rather than substitutes.

And in specification 1.4 we include interacted dummy for the poor countries, instrumenting it as well as the public expenditures on health in 2SLS regression. Results of this model estimation are not very different from the results in column 1.3. What is interesting is that we get insignificant coefficient for interacted dummy for the transition countries, implying no significant difference between the degree of substitution for the private and public expenditures on health for poor countries comparing to the richer ones. It is important to note that for the regressions 1.3 and 1.4 R-squared values are 0.35 and 0.37 respectively.

Now we are going to report on specifications estimated by the panel data approach. Specification 1.5 includes just the same explanatory variables as the specification 1.1 (number of university students per thousand of population, mean age of population, GDP per capita and the public expenditures on health). Estimates are received by the random effect generalized least-squares (GLS) regression. Hausman test of random versus fixed effect model did not reject the null hypothesis, therefore we use random effects model. Breusch-Pagan test checking for heteroskedasticity did not reject null-hypothesis of constant variance. Coefficients received are significant at 1 per cent level for GDP per capita and the public expenditures on health and equal to 1.243 and 0.0752 respectively. We again get positive coefficient for the public expenditures on

health for regressions where we do not use instrument to control for the causality problem, therefore bias is of positive magnitude. Also we get significant at 10 per cent level coefficient for mean age of population, which is equal to -0.889, and insignificant coefficient for the number of university students, which is inconsistent with estimates for previous four specifications. In general coefficients on explanatory variables are of expected sign.

We are using the Breusch and Pagan Lagrange-multiplier test for random effects which has the null hypothesis of var(u)=0. If we cannot reject the null hypothesis then there are no random effects. To do this in Stata 9.2 we use command xttest0. We get significant result that rejects the null, implying that random effects model should be used.

In specification 1.6 we include interacted dummy for the poor countries and Hausman test does not reject the null hypothesis, so we are using random effect GLS regression to get the following results: coefficients equal to 1.243 and 0.0751 for GDP per capita and the public expenditures on health respectively (both significant at 1 per cent significance level), insignificant coefficient for university students and -0.899 for mean age of population. So results are quite the same as for the previous specification and also we get insignificant coefficient for the interacted dummy for the poor countries. Test for heteroskedasticity do not reject the null hypothesis of constant variance and R-squared values for specifications 1.5 and 1.6 are both equal to 0.79.

Specification 1.7 is the same as the specification 1.5, but the regressions are quite different. Now we are instrumenting the public expenditures on health with the government expenditures on general public services, using two stage generalized least-squares (G2SLS) random effect regression. Using instruments we get coefficient of interest with the expected sign and equal to -0.665 and significant at 5 per cent significance level. Therefore, we received result consistent with Guissan et al (2001), so that the degree of substitution between the private and the public expenditures on health is less than one. R-squared statistics is 0.49

and coefficients for the university students and GDP per capita are both significant at 1 per cent level and equal to 0.660 and 3.204 respectively. So 1 per cent increase income per capita results in 3.24 per cent increase in per capita private expenditures on health; and 1 per cent increase in number of university student per thousand of population will result in 0.66 per cent increase in per capita private expenditures on health care products and services.

In specification 1.8 we also include interacted dummy for the poor countries, instrument this variable, and get results very similar to the results in regression 1.7 and we also receive insignificant coefficient for the interacted dummy. So the main conclusion based on Table 2 report that we can make is that we get quite similar results to previous findings regarding less than perfect degree of substitution between the private and the public expenditures on health care services and products.

In Table 2 we report results on eight regressions. We do standard OLS regressions, also we use panel data approach, and some specifications are estimated using instruments. Due to the fact that Breusch and Pagan Lagrange-multiplier test rejects the null hypothesis of var(u)=0 and that IV approach allows to control for the reverse causality problem we treat specifications 1.7 and 1.8 as the most trustworthy. So we conclude that 1 per cent decrease in the public expenditures on health will result in 0.65 per cent increase in private expenditures on health. Also 1 per cent increase in per capita income increases the private expenditures on health by 3.16 per cents. Important result is that the relationship between the public and the private expenditures on health is not significantly different for the poor countries comparing to the rich ones.

Particular interest of this paper lies in investigating how the degree of substitution is different for the countries in transition. Results received for the panel of 55 countries including 16 transition ones are reported in Table 2.

Table 3

55 countries' estimation results

Explanatory variables	log_prhe (2.1)	log_prhe (2.2)	log_prhe (2.3)	log_prhe (2.4)	log_prhe (2.5)	log_prhe (2.6)	log_prhe (2.7)	log_prhe (2.8)
log_age	-1.714***	-1.331***	-1.337	-1.756***	-1.712***	-1.803***	-1.337	-1.756***
	(0.21)	(0.22)	(1.05)	(0.47)	(0.44)	(0.58)	(1.05)	(0.47)
log_unst	0.0818	0.0799	-0.162	0.23	-0.0634	-0.057	-0.162	0.23
	(0.063)	(0.062)	(0.66)	(0.15)	(0.065)	(0.073)	(0.66)	(0.15)
log_gdp	1.799***	1.653***	0.85	2.305***	1.537***	1.368***	0.85	2.305***
	(0.08)	(0.083)	(2.55)	(0.61)	(0.1)	(0.12)	(2.55)	(0.61)
log_ghe	0.0353	0.0734***	0.439	-0.192	0.0884***	0.0659***	0.439	-0.192
	(0.025)	(0.025)	(1.09)	(0.25)	(0.017)	(0.017)	(1.09)	(0.25)
Inter_tr		-0.001***		-0.001		0.001***		-0.001
		(0.00023)		(0.00069)		(0.00018)		(0.00069)
Constant	-6.418***	-6.484***	0.0322	-10.38***	-3.768***	-1.855	0.0322	-10.38***
	(0.65)	(0.64)	(17.3)	(3.67)	(1.09)	(1.47)	(17.3)	(3.67)
Observations	495	495	495	495	495	495	495	495
R-squared	0.77	0.79	0.65	0.74	0.7694	0.61	0.6727	0.6649

Note: Dependent variable is log_prhe.

Specification 2.1 is estimated by the standard OLS regression and not distinguishing among 55 countries transition ones and not. Results are not consistent with theory in sense that coefficient for the public expenditure on health is positive, though not significant. We also get positive and significant coefficient for the GDP per capita of value 1.799 and significant coefficient for mean age of population that equals to -1.714. R-squared statistics is 0.77.

In specification 2.2 we add interacted dummy for the transition countries and estimated the model with the standard OLS regression. We received significant coefficient for the public expenditures on health but of the sign, which is not supported with the theory. Significant coefficient for the interacted dummy

shows that the relationship between two expenditures on health is significantly different for countries in transition, and is equal to -0.00124.

Specification 2.3 is the same as specification 2.1, though now we estimate it using instrumental variable for the public expenditures on health, so it is a 2SLS regression. R-squared for this regression is somewhat lower and equals to 0.65 and results are quite surprising: all coefficients are insignificant, implying that there is now significant explanatory power in variables presented in Table 2.

Then in specification 2.4 we add interacted dummy to distinguish between countries in transition and ROW countries and R-squared statistics is 0.74 for this regression, implying that this model fits the data better than previous one. We receive significant coefficients for the mean age of population and GDP per capita, but insignificant coefficients for the public expenditures on health and interacted dummy for the transition countries, which is quite unexpected.

Now we are going to report results based on panel data approach in our estimations. As can be seen from the Table 3 specification 2.5 is similar to the specification 2.1 but now we are going to estimate running random effects GLS regression, with Hausman test reported as "random effects" and Breusch-Pagan test reported: null hypothesis of constant variance cannot be rejected. Results are close to the results of the regression 2.1 but now we also get significant at 1 per cent significance level coefficient of the public expenditures on health. Though, the sign of this coefficient is positive which is not supported by the theory, while the coefficient of GDP per capita is significant and of expected sign.

Adding to the specification 2.6 interacted dummy for the transition countries does not change results much. It is fixed effect regression, no heteroskedasticity based on Breusch-Pagan test and R-squared value is 0.61. What is interesting coefficient for the interacted dummy is significant and equals to 0.00136. Specifications 2.5 and 2.6 were estimated not using instruments to control for the causality problem, so next we are going to report on regressions where instruments are used.

Specification 2.7 is the same as the specification 2.5 but now we do G2SLS random effect regression to estimate the model, using the government expenditures on general public services as an instrument for the public expenditures on health. While R-squared is equal to 0.67 we get insignificant coefficients.

Finally, in specification 2.8 we distinguish between transition countries and the ROW countries by using the interacted dummy. It is random effect G2SLS regression with –squared statistics equal to 0.66. Coefficients for the GDP per capita and mean age of population are significant and of expected sign. In Table 3 we can see that coefficient for the public expenditures on health is insignificant even at 10 per cent significance level. As it is a coefficient of interest we will focus on it: p-value for this coefficient is 0.182 and we are interpreting it as follows – at the 20 per cent significance level coefficient of the public expenditures on health is significant and equals to -0.192 indicating very low substitutability between the two types of expenditures on health.

Due to the fact that Breusch and Pagan Lagrange-multiplier test rejects the null hypothesis of var(u)=0 and that IV approach allows to control for the reverse causality problem we treat specifications 2.7 and 2.8 as the most trustworthy. We conclude that 1 per cent increase in per capita income results into 2.305 increase in per capita private expenditures on health. Also, one per cent decrease in the public expenditures on health results in 0.192 per cent increase in the private expenditures on health. It is important result that coefficient for the transition countries' interacted dummy is insignificant, implying that the relationship between the two types of expenditures is not significantly different for the transition countries.

As mentioned in section 3 changes in the public expenditure on health and private need time to react to each other. Therefore, we are going to run regression in differences for some particular years: 2000-1996 and 2005-2001 for

the case of 39 ROW countries and 2001-1998 and 2005-2002 for the case of 55 countries including 16 transition countries.

We are going to use government expenditure on education as an instrument for the public expenditures on health for these regressions, as differences of the logarithms of the government expenditures on education are much better correlated with differences of the logarithms of the public expenditures on health than government expenditures on general public services do. As the public expenditures on health and on education are decided in interaction and are both parts of total government expenditures, and for reasons described in section 3 we expect the government expenditures on education to be a good instrument for the public expenditures on health, satisfying both conditions for the good instrumental variable. We provide descriptive statistics for the variables used in Table A.1 in Appendix.

Also note that we do not use time dummies for previous regressions because we are following Guissan et al (2001) in a sense of model specification.

In Table 4 we are reporting the results for the case of 39 ROW countries.

Table 4

39 ROW countries' differences estimation results

Explanatory variable	d_prhe (3.1)	d_prhe (3.2)	d_prhe (3.3)	d_prhe (3.4)
d_age	-0.754	7.105	-0.754	7.378
	(1.82)	(6.61)	(1.82)	(6.81)
d_unst	0.27	0.044	0.27	-0.006
	(0.18)	(0.48)	(0.18)	(0.49)
d_gdp	0.578	-0.767	0.578	-0.72
	(0.42)	(1.34)	(0.42)	(1.29)
d_time	0.288***	-0.161	0.288***	-0.166
	(0.064)	(0.32)	(0.064)	(0.31)
d_ghe	0.191***	1.432*	0.191***	1.441*
	(0.063)	(0.77)	(0.063)	(0.75)
Constant	-0.141	-0.278	-0.141	-0.288
	(0.089)	(0.24)	(0.089)	(0.25)
R-squared	0.43	0.23	0.43	0.18

Note: Dependent variable is d_prhe

Specification 3.1 includes following variables: mean age of population, number of university students per thousand of population, GDP per capita, time dummy (that equals zero for the 2000-1996 difference and one for the 2005-2001 difference) and the public expenditures on health. As we mentioned in chapter 3 we construct differences for the variables as follows: we are taking logarithms for values and the subtract logarithm for 1996 from the logarithm for 2000. The same is done for years 2005 and 2001, and then we just pool these differences. Specification 3.1 is estimated using standard OLS regression, Breusch-Pagan test for the heteroskedasticity do not reject the null hypothesis of constant variance. It is interesting that the only significant coefficients are coefficients for the time dummy and the public expenditures on health, though the latter of the unexpected sign.

In regression 3.2 we are using 2SLS IV regression instrumenting the public expenditures on health with the government expenditures on education. We get much unexpected result: the only significant coefficient is of the public expenditures on health, but of magnitude and sign not supported by the theory. Also note that R-squared statistics is low, implying that the mode does not fit the data well.

Specification 3.3 results do not change much comparing to the regression 3.1 estimates. In regression 3.4 we are instrumenting the public expenditures on health and get unexpected results again: all coefficients but for the public expenditures on health are insignificant, moreover, the public expenditure on health's coefficient is of magnitude and sign that is not supported by the previous findings and theory. This can be explained by the fact that model fits the data badly (R-squared value is 0.18), and results cannot be trusted.

Due to the fact that Breusch and Pagan Lagrange-multiplier test rejects the null hypothesis of var(u)=0 and that IV approach allows to control for the reverse causality problem we treat specification 3.4 as the most trustworthy.

In Table 5 we resent results for the case of the 55 countries. Note that here we use differences of 2001-1998 and 2005-2002, due to problems with the number of yearly observation for the transition countries.

Table 5

55 countries' differences estimation results

Explanatory variable	d_prhe (4.1)	d_prhe (4.2)	d_prhe (4.3)	d_prhe (4.4)
d_age	-1.514	-1.29	-1.514	-1.29
	(1.17)	(1.28)	(1.17)	(1.28)
d_unst	0.209*	0.230*	0.209*	0.230*
	(0.12)	(0.13)	(0.12)	(0.13)
d_gdp	0.253***	0.265***	0.253***	0.265***
	(0.049)	(0.055)	(0.049)	(0.055)
d_time	0.243***	0.218***	0.243***	0.218***
	(0.039)	(0.063)	(0.039)	(0.063)
Inter	-0.0249	-0.146	-0.025	-0.146
	(0.057)	(0.11)	(0.057)	(0.11)
d_ghe	0.116**	0.213	0.116**	0.213
	(0.047)	(0.15)	(0.047)	(0.15)
Constant	-0.001	-0.01	-0.001	-0.01
	(0.03)	(0.032)	(0.03)	(0.032)
R-squared	0.68	0.67	0.69	0.67

Note: Dependent variable is d_prhe

Starting from specification 4.1 we distinguish between ROW and transition countries, therefore we include interacted dummy in model. Regression 4.1 is standard OLS regression, with Breusch-Pagan test not rejecting the null hypothesis of constant variance. Time dummy, university students and GDP per capita coefficients are significant and of expected sign. Positive value for the time dummy indicates that with time people increase the private expenditures on health growth. Sign of the public expenditures on health is positive and

coefficient equals to 0.116, also we get insignificant coefficient for the interacted dummy.

In regression 4.2 we are instrumenting the public expenditures on health and interacted dummy, so it is 2SLS regression. We get similar results for all variables but for the public expenditures on health, which is now insignificant.

Specification 4.3 we are estimating using panel data approach, with random effects GLS regression. Results obtained are just the same as the results for the specification 4.1 indicating that using panel data approach does not change results much for this particular case. The same can be said about specification 4.4: results obtained with random effect G2SLS IV regression do not differ from the results of regression 4.2. But due to the fact that Breusch and Pagan Lagrange-multiplier test rejects the null hypothesis of var(u)=0 and that IV approach allows to control for the reverse causality problem we treat specification 4.4 as the most trustworthy. University students, GDP per capita and time dummy coefficients are significant and of expected signs. What important is that interacted dummy is insignificant supporting the results obtained for logarithmic regressions. What surprises is that we get insignificant coefficient for the public expenditures on health; first possible explanation is not very good instrument used to control for the causality problem between the public and private expenditures on health.

Chapter 5

CONCLUSIONS

The purpose of this paper was to investigate the relationship between the public and the private expenditures on health care services and products. This can done by the estimating the degree of substitutability between both types of expenditures on health. Particular interest was the case of countries in transition; we were trying to answer a question of how the degree of substitutability is different for these countries from the ROW.

Following Guissan et al (2001) we estimated the degree of substitutability between the public and the private expenditures on health, controlling for the GDP per capita, number of university students per thousand of population and mean age of the population. Regressions on the majority of specifications produce positive coefficients for the public expenditures on health, implying complementary relationship between the public expenditures on health and the private expenditures. Though, in these regressions we do not use instruments for the government expenditures on health and interacted dummies involved. At the same time, when we do use instruments we get negative significant coefficients, indicating substitute relationship between the two types of expenditures on health. Latter estimations use IV approach to control for the causality problem, so their results are treated as most trustworthy. Our findings are consistent with previous investigations: on average a 1% decrease in the public expenditures on health would increase the private expenditures by 0.65%. So empirical evidence shows that there exist a substitution between the two types of expenditures on health and it is less than perfect. In case of poor versus rich countries coefficient near interacted dummy for the poor countries was found to be insignificant. For

the case of estimation with transition countries included into the sample, coefficient for the interacted dummy for countries in transition was found to be insignificant, indicating that the degree of substitution between the two types of expenditures on health is not significantly different for the transition countries. Coefficient for the GDP per capita was found to be positive and significant, which was expected, implying that richer countries could allow to spend more on the private health services and products. Possible explanation for the significant and negative coefficient for the mean age of population is that elderly on average have lower income than younger people, so that they tend to spend less on the private services.

We use the government expenditures on general public services to control for the reverse causality problem between the public and the private expenditures on health. For the first methodology using IV approach the obtained estimates are consistent with previous findings.

Under second approach, in terms of differences, we were trying to capture the "postponed" reaction in change of the private expenditures on health to some change in the public expenditures on health. We found positive and significant coefficients for the income and education, and we also found insignificant difference of the degree of substitution for the transition countries comparing to the ROW, which is consistent with the first methodology results.

In this paper we considered only quantitative aspect investigating the relationship between the pubic and the private expenditures on heath care services. In further research it would be appropriate to consider qualitative aspects and their influence on the degree of substitution between the two types of expenditures on health.

In general, results obtained are expected and support previous findings and theory. The degree of substitution between the two types of expenditures was found to be less than perfect implying that the private expenditures cannot equally match possible reduction in the government expenditures on health care services, contributing to the wealth fare loss to individuals. So that every attempt to cut the public expenditures on health should bear in mind not perfect substitutability between the two types of expenditures on health. What is interesting, empirical investigation showed that transition countries have the same relationship between the two types of expenditures on health.

BIBLIOGRAPHY

Atella, V. and G. Marini. 2002. *Can We Do Some Interesting Work With the OECD Data?* GHP meeting, faculty of economics University of Rome, 2002.

Creel, M. and M. Farrell. *Modelling Usage of Medical Services: Expenditure Panel Survey Data, 1996-2000*. Department of Economics and Economic History working paper, Universitat Autonoma de Barcelona, 2005.

Fabbri, D. and C. Monfardini. *Public vs. Private Health Care Services: Demand in Italy*. Department of Economics working paper, University of Bologna, 2002.

Giannoni, M. and Th. Hitiris. *The Regional Impact of Health Care Expenditure: the Case of Italy.* Working paper series of University of York, 1999.

Grossman, M. *On the Concept of Health Capital and Demand for Health*. Journal of Political Economy, 1972.

Guissan, M.C. and M. Arranz. *Consumption Expenditure on Health and Education: Econometric Models and evolution of OECD countries in 1970-1996*. Economic Development, 2001.

Hitiris, Th. *Growth and Containment of Health Care Expenditure in Industrial Countries*. Working paper series of University of York, 1999.

Konoreva T. *Investigating the role of health: is it really an Intangible Resource for Economic Growth?* MA Thesis, EERC, 2006.

Lehan, V., V. Rudiy and E. Nolt.. *Overview for Ukraine "Health Care Systems: Time for Changes"*. European Observatory of Systems and Health Care Policies, 2005.

Mahal, A. and P. Berman. *Health Expenditures and the Erderly: A Survey of Issues in Forecasting, Methods Used, and Relevance for Developing Countries*. The Global Burden of Disease 2000 in Ageing Populations, 2001.

APPENDIX

Figure 4

Public Expenditure on Health (Transition Countries)

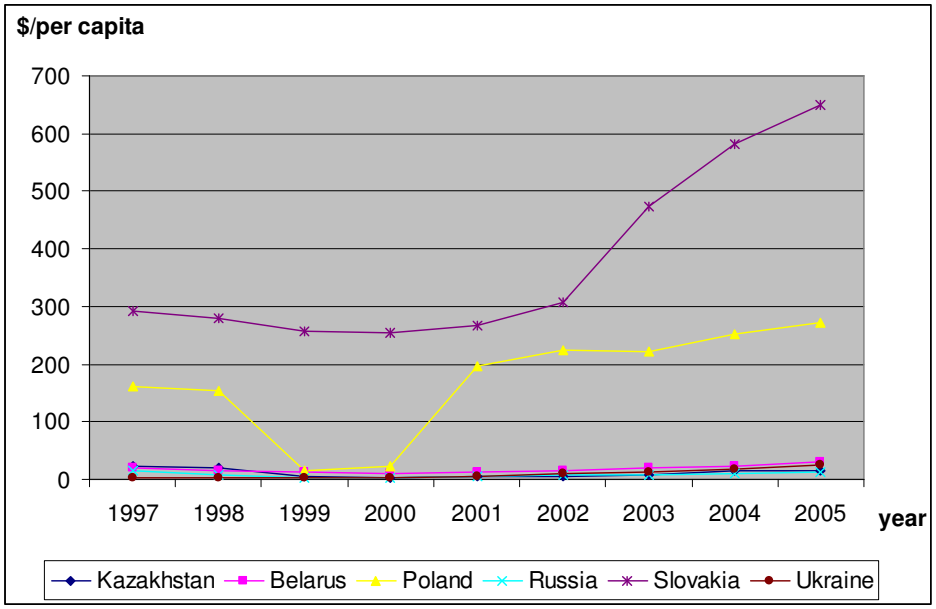


Figure 5

Government Expenditure on General Public Services (Transition Countries)

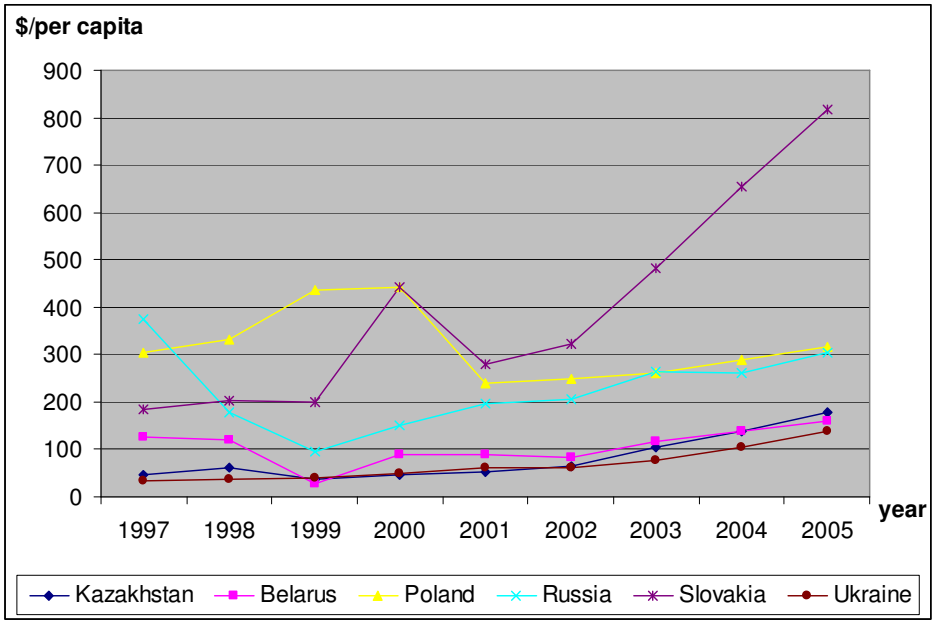


Table A.1
Descriptive statistics for the differences regression

Variable		Mean	Std. Dev.	Min	Max	Observations
id	overall	20	11.32747	1	39	N = 78
	between		11.40175	1	39	n = 39
	within		0	20	20	T = 2
time	overall	1.5	.5032363	1	2	N = 78
	between		0	1.5	1.5	n = 39
	within		.5032363	1	2	T = 2
d_age	overall	.0370753	.0182948	-.0095239	.1034356	N = 78
	between		.0168144	.0177968	.0971271	n = 39
	within		.0074597	.000339	.0738116	T = 2
d_prhe	overall	.1614358	.3367148	-.8179395	.796767	N = 78
	between		.1764446	-.3735121	.5316316	n = 39
	within		.2874865	-.3495617	.6724332	T = 2
d_ghe	overall	.2636075	.5280243	-.80496	2.664587	N = 78
	between		.3804027	-.3681208	1.729438	n = 39
	within		.3687583	-.6715414	1.198757	T = 2
d_gdp	overall	.1668177	.0771848	-.0330373	.436147	N = 78
	between		.0592877	.0780299	.3878268	n = 39
	within		.049881	.0328355	.3008	T = 2
d_unst	overall	.1490722	.1835959	-.2245899	.8493515	N = 78
	between		.1529765	-.1126754	.5820137	n = 39
	within		.1030026	-.141296	.4394405	T = 2
d_gpse	overall	.1085111	.4432636	-1.178197	1.205245	N = 78
	between		.2672378	-.5296805	.7012938	n = 39
	within		.3549565	-.904923	1.121945	T = 2
d_poor	overall	.3076923	.4645258	0	1	N = 78
	between		.4675719	0	1	n = 39
	within		0	.3076923	.3076923	T = 2
d_time	overall	.5	.5032363	0	1	N = 78
	between		0	.5	.5	n = 39
	within		.5032363	0	1	T = 2
d_edu	overall	.1776557	.4774492	-1.808262	2.067799	N = 78
	between		.2364058	-.759969	.5877746	n = 39
	within		.4156872	-1.760375	2.115686	T = 2