Equity in Health Care Finance in Slovakia - the Impact of the Reform

ERASMUS UNIVERSITY ROTTERDAM

Faculty of Economics and Business

Supervisor: Dr. Leon Bettendorf
Name: Stefan Kiss
Exam number: 305198
E-mail address: 305198sk@student.eur.nl
Abstract: Health care reform in Slovakia in 2003-2004 constitutes a unique natural experiment. We analyze the impact of the reform on the equity of health care finance using household budget survey data after adjusting for methodology changes using post stratification weights in quota samples. We find that reform did have a significant impact on OOP as households spent increasing proportion of their income on health. We also observe pronounced distributional impact. The regressivity of OOP increased throughout the examined period while slight progressivity of mandatory health insurance increased, although the latter effect was not statistically significant. The most significant change occurred between 2003 and 2004, when major part of the reform took place.
1. Introduction

Slovakia underwent several reforms during the years 2002-2006. One of them was health care reform which took place mainly in 2004 and, taking into account the rapid pace of changes, constitutes a unique natural experiment even from an international perspective. Overall the reform efforts were aimed to increase the efficiency of the system but involved measures directly influencing health expenditure of the population, hence affecting financial equity.

In health care, equity is usually recognized to be an important policy objective. Even though redistribution of wealth is not necessarily an objective of health policy it has, to various extent, a redistributitional impact and it is of interest of public policy to analyse and react to such changes. The redistribututive effect depends on four factors: i) the progressivity of the health care financing system, ii) the proportion of income spent on health care, iii) the degree of horizontal inequality iv) and the extent of any reranking of the households in the move from pre-payments income distribution to the post-payment distribution (Van Doorslaer et al., 1999). Analysis of health policy impact on the income distribution provides important information in an effort to improve the performance of the health financing system since especially protecting households from excessively large or catastrophic health payment has played prominent role in national policy debates.

There is good evidence that policy-makers not only in OECD are concerned about the effects of health care financing arrangements on the distribution of income as well as who receives health care. Equity issue is more pronounced in Western Europe comparing to U.S., where policy makers have attached less importance to equity than their counterparts in most other OECD countries (Van Doorslaer et al., 1999). This is also reflected in actual state of equity in these countries. In US income distribution is one of the most unequal in the OECD, overall health payments are also highly regressive. The results in Europe vary from country to country. Scandinavian countries have traditionally equal societies as well as systems of health payments (Kiss and Siskovic, 2006; Wagstaff et al. 1999).
Analyzing impact of health policy on equity is especially relevant in transition (or developing) economies, where reform – once taking place – usually involves more significant changes to the system than reforms in well developed economies.

Poverty is often an issue in transition economies and it is of interest to financially protect people from catastrophic or poverty impact of health care costs. What makes an explicit analysis in these countries desirable is the fact that reforms in the Eastern Europe have, contrary to Western Europe, usually not focused on the equity dimension and left it unnoticed. Equity argument has also been recently stressed by international agencies surveying the Slovak economy (OECD, 2007).

After persistent crisis of health care system in 1990s, Slovakia adopted revolutionary approach to the reform instead of an evolutionary one. Previous liberal-conservative government (2002-2006) enacted laws that prepared the way for a transition from a state-run, monopolistic health care system to a pluralistic and decentralized one. It pursued a market-oriented approach, placing emphasis on deregulation, privatization, increased competition and mobilizing of private resources. By creating market-oriented framework conditions, the government tried to strengthen health insurers and transform them into active purchasers who exploit as yet untapped potential for efficiency gains through customer orientation and quality. Since both insurance contributions and the scope of benefits are provided by law, health insurers can differentiate their insurance products from competitors only through marketing and customer service.

As part of the larger reform package, there are several arrangements that directly influenced the expenditure of the population devoted to health care services. Since 1st June 2003 20 SKK\(^1\) fees per practitioner visit and per drug prescription and 50 SKK fee per night in hospital were put in place. Even though main purpose of introducing these fees was not to increase revenue but to reduce excess demand it did increase the out-of-pocket payments (OOP) – cash payments of the population devoted to health care. The other major change affecting OOP was made in the magnitude of co-payments patients have to make to obtain drugs. Fixed co-payments for all drugs were introduced in October 2003, while before some drugs, mainly antibiotics, were for patients free of charge. The other five changes in the

\(^1\) Average exchange rate in 2004 1 EUR = 40.03 SKK
categorization followed in 2004, where increased VAT from 10% to 19%, additional changes in co-payments for particular drug groups, as well as migration of drugs between categories took place.

Summing up the enacted measures, we expect rather strong upward move in OOP. Larger co-payments and other fees influence the consumption of health care and as a consequence they can influence health care utilization and the health status of the population as well (Newhouse, 1987).

Health care is typically financed from four sources: taxes, social insurance, private insurance and OOP. We are going to analyze two of them. OOP are the first one. The Statistical Office of the Slovak Republic reported an increase in OOP health spending from 1.6 to 2.4% of gross household income between 2003 and 2004, as well as 100% increase in the nominal sum of OOP spending between 2001 and 2005. Since there was need for adjusting data in order to be comparable and we suspect these results stem from raw, unadjusted data, we challenge the results and come up with our own estimations.

Even regardless of the data issues, OOP are especially relevant subject to analysis. In the absence of private health insurance, OOP in Slovakia equal total private revenue of the health care system. Mandatory health insurance is the other expenditure we analyze not only because base of assess was also subject to changes during the reform years.

There is widespread commitment amongst policy-makers in the OECD countries to finance health care according to ability to pay (ATP). The empirical literature to date on equity in health care financing has focused on the issue of how far health care is financed according to this ability. This can be interpreted in terms of both vertical equity (in this case, persons or families of unequal ability to pay making appropriately dissimilar payments for health care) and horizontal equity (persons or families of the same ability to pay making the same contribution) (Wagstaff and Van Doorslaer, 1998).

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2 Drugs are classified into several categories according to the magnitude of co-payments. Term categorization is in Slovakia used for changes in this magnitude as well as drugs being reclassified into different category.

3 Described below
A separate issue, as far as equity is concerned, is the progressivity of the health care financing system. OOP in Slovakia were relatively regressive even before the reform. The health care, social system and tax reforms constituted major structural changes and it is of our interest to investigate their impact on progressivity.

The focus of our paper is threefold; we investigate i) the trend in OOP broken down into income quintiles, we continue with examining ii) the progressivity of health care finance, iii) the catastrophic impact of health care finance, especially OOP. Furthermore, we will compare the progressivity of Slovak health payments internationally using previous comparative studies (Van Doorslaer et al., 1999).

The outline of the paper is as follows: after introduction second part surveys literature done on the progressivity in health expenditure, catastrophic impact and literature dealing not only with health expenditure but - more broadly - with income distribution in Slovakia. In third part data issues are covered, fourth part is devoted to methods and measures used in the analysis. In fifth part we report results and discuss them and finally we present conclusions.
2. Literature review

Progressivity – Vertical equity

Cantor (1988) belongs among early works assessing progressivity of health care finance. As opposed to Hurst (1985) comparing only absolute values of health payments, Cantor calculated health payments as a share of income in the United States. He shows that health system is regressive - the proportion of income spent on health is lower for high income groups. Gottschalk, Wolfe and Haveman (1989) use different approach as they compare share of income received by each income decile, as well as share of health care payments.

None of these approaches, however, allows us to compare the extent of the progressivity of different systems. Computing proportion of income spent on health care or the shares of income and health care payments attributed to income quantiles only tells us if the system is progressive, regressive or proportional. Overall progressivity indices are needed for cross-country comparisons (Waagstaff, Van Doorslaer and Paci, 1989).

Lambert (1993) brings together many strands of formal analysis of income distribution and redistribution which have been developed since the beginning of the 1970s and proposed several indices to measure the tax progressivity. Only one of them, the Kakwani index, however, is suitable also for measuring health care payments progressivity (Kakwani, 1977).

Kakwani aimed to show how the distributional effect of taxation is influenced by changes in the average tax rate. Kakwani index measures to what extent the tax (or in general a source of finance) departs from the proportionality. This method allows us to study the contribution of individual taxes and expenditure items to the overall progressivity.

The most extensive contribution to empirical analysis on equity of health care finance has been brought forward in articles by Wagstaff and Van Doorslaer (1992), Wagstaff et al. (1999) and Van Doorslaer et al. (1999). The two more recent ones improve the methodology to allow for wider cross-country comparability. They include more countries and provide trends in financing mixes and progressivity. We use their results for OOP and social insurance progressivity to compare the progressivity of health care payments with Slovakia.
In their comparative analysis, they show that direct taxes used to finance health care are progressive in all countries, being especially progressive in UK, Ireland and Germany, and far less progressive in Scandinavian countries (Denmark and Sweden). Indirect taxes are regressive in every examined country. General taxation, computed as a weighted sum of direct and indirect taxes is progressive everywhere.

Social insurance is progressive everywhere but in Netherlands and Germany, where higher income groups do not pay compulsory sickness fund insurance. In France, high earners are not excluded and pensioners and unemployed pay much lower contribution rates.

In case of private insurance, it is important to distinguish the coverage that private insurance buys in each country. In this respect, Wagstaff et al. and Van Doorslaer et al. recognize three broad groups. In the first group of countries like France and Denmark, private insurance buys cover against public sector co-payments. It is progressive in Denmark but regressive in France. In the second group, private insurance is a supplementary product and can be considered as a luxury good. It includes Italy, Spain, Portugal and the UK. In these countries private insurance is progressive. The third group of countries is comprised from countries where private insurance, although mostly subsidized, is the only source of cover for the part of the population. In includes Germany, Netherlands, US and Switzerland. In the latter two, where majority of population relies on this type of cover, private insurance is highly regressive. As opposed to these two, Dutch and German private insurance is progressive, since it is bought almost exclusively by higher income groups.

The most regressive means of financing health care system are the OOP. They are especially regressive in US and Switzerland, where low earners usually fully rely on OOP, whereas in many European countries they would be exempted from payments. On the other hand, OOP are particularly less regressive in Italy, Germany and the Netherlands.

As far as overall progressivity is concerned, the studies confirm that systems relying on social insurance - Germany and Netherlands - have regressive financing systems, while in France system is progressive. The tax-financed systems like UK, Denmark, Finland and Sweden typically have proportional or mildly progressive systems. Only in Portugal the overall health
finance is regressive. In the US and Switzerland, predominantly privately financed systems, health care payments are regressive.

The progressivity of health care payments has also been the focus of country-specific analyses. Holahan and Zedlewski (1992) show the regressivity of health care system in the United States. In addition they discuss how alternative health system reform approaches are likely to change the distribution of health spending and financing burdens. Janssen, Van Doorslaer and Waagstaff (1994) assess the progressivity implications of the Dekker health insurance reform in Netherlands.

Australian health care system was highly progressive before introducing universal public-coverage in 1984. Expansion of private insurance and direct payments reversed the progressivity and made the system mainly proportional by 1989 (Lairson, Hindson and Hauquitz, 1995). Yi, Maynard, Liu, Xiong and Lin (2005) evaluate the effects of the Chinese urban employee health insurance reform on equity in health care financing. They found that new scheme financed by personal medical savings plus a social-risk pooling account is regressive.

Davies and Hoy (2007) assess the progressivity implications of public health insurance funding in Canada adopting standard distributional impact methodology based on Atkinson’s cost of inequality approach. Cissé, Luchini and Moati (2007) apply concentration curves and indices previously used for developed countries in four francophone West Africa capitals – Abidjan, Bamako, Conakry and Dakar. The results strongly suggest the regressive pattern of health payments in all of them. Paper made some recommendations for the use of equity measures in order to evaluate future African health care reforms.

Catastrophic impact

We define payments to health care as catastrophic once they exceed certain substantial fraction of the household income. The choice of the threshold is to a large extent arbitrary, although 10% of total expenditure has been a common choice (Pradhan and Prescott 2002; Van Doorslaer et al. 2005; and others).
Studying the catastrophic impact is usually more important in developing countries, nonetheless, large reforms with direct impact on population call for analysis also in the OECD country. Typically, catastrophic impact is measured as a percentage of expenditure (income) remaining after subsistence needs have been met (discretionary income) (for example, Lancet 2003). Similarly, threshold is an arbitrary choice, with 40% being the common approach (Lancet, 2003).

There have been some comparative studies examining catastrophic impact of health care payments. Waagstaff and Van Doorslaer (2002) present and compare two threshold approaches to measuring the fairness of health care payments, one requiring that payments do not exceed a pre-specified proportion of pre-payment income, the other that they do not drive household into poverty.

Van Doorslaer et al. (2006) measure prevalence and intensity of high shares of OOP on expenditure aimed to examine impoverishment of health care payments for 81% of Asian population. Sample of 59 countries is examined in Lancet (2003).

**Slovakia-specific literature**

As far as literature on income distribution in Slovakia is concerned, there has been very little work done so far. Even less was produced on equity in health care. World Bank (2005) in its report on Slovakia shows that Gini index, concentration index for taxes, Kakwani index and Reynolds-Smolensky index all increased between 2002 and 2004 when major tax reform took place. The Kakwani index increased from 15.4% to 19.2%. Only concentration index for income slightly decreased.

Krajcir and Odor (2005) comprehensively assess the tax reform in Slovakia. They compute the proportion of each type of taxes and social payment on income by deciles before (2003) and after (2004) the tax reform, and confirmed that overall progressivity measured by Kakwani after the reform increased. Their analysis was based on unadjusted data (using original samples), which constitutes a major issue for full data comparability over time and hence they provide only rough estimates of income distribution and progressivity (see annex 1).
Kiss and Siskovic (2006) compute Gini coefficient in Slovakia since the early 1990s and compare it across OECD countries. They show on the microcensus data that after the fall of the communism Gini increased from 19% in 1988 to 26.4% in 2004. They also note that Gini was decreasing from 1960s till the end of 1980s. Compared to other OECD countries Slovakia belongs together with Scandinavian countries, Netherlands and Czech Republic among the most egalitarian countries. On the other hand Mexico, Turkey, Poland and U.S. are the OECD countries with largest income differences.
3. Data

Our type of analysis requires data at the household level which include income variables and contribution of financing source to health care – OOP and mandatory insurance. We use household budget survey data starting from 2000 till 2005 which are inconsistent and hence significant adjustments are needed in order the data to be comparable. The Statistical Office of the Slovak Republic (SO SR) finally changed the sampling methodology in 2004, by coincidence, exactly between the years where we observe natural experiment not only in health-care but also in other areas like taxes and social system. Up to 2004 the SO SR used so called quota sampling where population is divided into groups according to selected criteria and statistical unit seeks households in order to fill up defined quotas. In case of Slovak household survey, the SO SR applied the distribution from census preceding the household budgeted sampling.

The SO SR chose following criteria: region (8 administrative units), occupation of the head of the household (manual worker, non-manual worker, agriculturist and pensioner), number of children (0, 1, 2 and 3 or more), and gross income (4 quartiles). Households with pensioners at the head of the household were further classified by number of persons in the household (1 and 2 or more) and one-pensioner household by sex.

Besides this less than optimal sampling frame, two other sample characteristics, that the SO SR applied, are worrying. First is sampling size which was comparatively small at around 1,600 household. Second and more troubling is the fact that there is no household with unemployed person, disabled or single mother as a head of the household. This feature of the sampling design (originated in communist era) is a concern not only for Slovakia where unemployment was peaking in the beginning of 2000s but for any economy since it - by arbitrary decision - underrepresents some groups of the population and hence may depart from representativeness.

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4 See annex for detailed description of the samples and adjustments
Since 2004 the SO SR has been using - for these types of surveys - conventional simple random sampling, or random sampling without replacement which is - compared to the previous sampling - representative. In the simple random sampling, n distinct units are selected from the N units in the population in such a way that every possible combination of n units is equally likely to be selected in the sample. The SO SR divided population according to regional administrative units and size of the town applying the distribution from last census and chose households randomly from within each region and town-size category.

Even a quick check on descriptive statistics suggests that samples are not comparable and adjustment is necessary. Using original weights average gross income in 2004 decreased significantly while there is no reason to expect such a slump since salaries – large part of the income rose sharply during these years. The other macroeconomic indicators including employment developed positively as well. Average household size changed only between the years when methodology change took place while we observe similar discrepancies in case of other variables. Pattern in OOP is much more volatile. This can be seen even more clearly on the average OOP disaggregated by quintiles.
In order to make the samples between 2003 and 2004 comparable we exclude household from 2004 and 2005 that are not present in the quota samples (unemployed, disabled and single mothers at the head of the household) and construct weights using post stratification weights where they are attributed to each observation in the stratified sample according to probability of occurrence in the simple random sampling (Holt and Smith, 1979). As Holt and Smith note the theory developed shows that neither the post stratification estimator nor the sample mean is uniformly best in all situations but empirical investigations indicate that post stratification offers protection against unfavourable sample configurations and should be viewed as a robust technique.
We use similar household characteristics for attributing the weights than those used for stratifying the sample however due to methodological discrepancies between “old” and “new” methodology and small sample size of quota samples we use broader groups. We merge regions into two groups, merge agriculturalists with manual workers, do not differentiate according to number of children and according to sex of the pensioner in case of one-member pensioner household.

We report the results in years 2004 and 2005 for reduced samples where we investigate changes between years and for full sample where we intend to show the most recent value of the indicator. Results for both reduced and full sample, however, differ only slightly. Since the variables in the random samples are reported – contrary to stratified samples - on a monthly basis, we multiply the variables in 2004 and 2005 by twelve.
4. Methods and Measures

We start our analysis with computing average shares of income spent on health. The dissaggregation of OOP expenditure by income quintiles provides important view on the impact on different socio-economic groups.

Common approach in current work on equity is to use comprehensive progressivity indices (Wagstaff and Van Doorslaer, 1992; Van Doorslaer et al. 1999; Wagstaff et al. 1999). We use the Kakwani index which measures to what extent a source of finance departs from proportionality. The Kakwani index is calculated as the difference between health payments’ concentration index and Gini coefficient of the ATP variable – income in our case – and it can range from -2 to 1. Positive sign of Kakwani index means that financing is progressive, whereas negative sign refers to regressivity. In case of proportionality, the concentration index corresponds to the Lorenz curve and the index is zero. We calculate the Kakwani for OOP, mandatory insurance and overall payments computed as the sum of both means of payments. We calculate Kakwani using convenient regression method (Wagstaff, Van Doorslaer, 1992):

\[ 2\sigma^2\frac{h_i}{\eta} - \frac{y_i}{\mu} = \alpha + \beta R_i + u_i \]  

(1)

where \( h_i \) is a health payment variable for household \( i \) and \( \eta \) its mean, \( y_i \) is the gross income and \( \mu \) its mean, \( R_i \) is the household fractional rank in the income distribution and \( \sigma^2 \) is the sample variance of the fractional rank. The OLS estimate of \( \beta \) is the Kakwani index.

To measure catastrophic impact we compute catastrophic payment headcount, payment gap and mean positive gap following World Bank technical note for health equity analysis standard methods used in works measuring catastrophic impact (Van Doorslaer, 2005; and others).

Catastrophic payment headcount is the percentage of the population whose expenditure on health care exceeds arbitrary chosen threshold level of ATP - gross income in our case.

Besides the most typical 10% threshold level we deploy also alternative thresholds of 5%, 15% and 20%.

The equation⁷ is:

\[ H = \frac{1}{N} \sum_{i=1}^{N} E_i \]  
(2)

where \( E \) is an indicator which equals 1 if OOP is higher than the threshold and zero otherwise and \( N \) is the sample size. Catastrophic payment gap captures the average degree by which payments exceed the threshold level. The equation is:

\[ G = \frac{1}{N} \sum_{i=1}^{N} O_i \]  
(3)

where \( O \) is defined as excess by which the payment fraction exceeds the catastrophic threshold level. Mean positive gap is then defined as the ratio of the headcount and gap:

\[ MPG = \frac{G}{H} \]  
(4)

Throughout the analysis, we use equalized gross household income applying OECD modified equivalence scale⁸ (Haagenars et al., 1994) and apply weights - original ones for simple random samples (2004 – 2005) and constructed weights for stratified samples (2000-2003) (Holt, Smith, 1979). All the absolute values are reported in Slovak krouns (SKK) on annual basis.

To estimate 95% confidence intervals for both progressivity and catastrophic impact measures we use bootstrapping. Bootstrapping is a robust technique generally used for estimating the sampling distribution of an estimator by resampling with replacement from the original sample. We use 10 000 bootstrap samples as number of recommended samples is increasing with available computing power. Main advantage of this method is that it requires only minimum assumption when the normality assumption does not need to be met. We do not

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⁷ Equations used from Van Doorslaer, E., et al. (2004)
explicitly report all the confidence intervals but perform significance testing for changes in point estimates between years and indicate where the statistical significance is of particular interest.
5. Results and Discussion

Average household income rose on average by 5.8% throughout the analyzed years, while increase was sharper in the first years and was decreasing throughout the period. After the adjustment of the data using the method described in the annex (Holt and Smith, 1979), income rose also in 2004, although by a lower pace. OOP rise significantly outpaced the income increase throughout whole period. Sharpest increase occurred in 2004 when major part of the reform took place.

Private health expenditure as a share of total (population weighted) expenditure in Slovakia equalled 20.1% in 2005 compared to 23.7% in EU15 (2004) and 35.9% in OECD (2002). Optimal share of private expenditure as well as OOP is in academic literature largely
discussed and rather controversial (Newhouse, 1993; Buchanan et al., 1991; Manning and Marquis, 1996). Slovak particularity is that private expenditure on health care – in the virtual absence of private health insurance – equals cash payments, whereas private expenditure is higher in most countries. Average OOP in EU is similar to Slovak 20%.

Drugs account for highest proportion of the total OOP, rising from 55% in 2001 to 64% in 2005. Share of inpatient services was rising only slightly. Share of equipment and appliances and outpatient services was in 2005 roughly at the same level as in 2001, the former fluctuating sharply throughout the period. On the other hand, other products’ proportion was slightly decreasing.

The share of gross income on health care was constantly rising throughout the whole period, jumping up from 1.38% in 2000 to 2.95% in 2005. After computing average OOP share by quintiles we can observe similar patterns for the first and the fifth quintiles. For the middle three quintiles, the share was also rising but slipped down slightly in 2005. First quintile recorded sharpest increase by more than 3 percentage points which significantly outpaced overall average increase by 1.57 percentage points.

**Figure 6: Percentage of income spent on health**
The strongest increase in OOP as share of gross income occurred in 2004 - rising by 50.1% in comparison to 2003. The hike was especially sharp for first three quintiles. Even if we adjust for the trend (average percentage change in 2000-2003), results are qualitatively similar. The change in 2004 (adjusted for the trend) is still very high, but since we observe rising trend in the years preceding the reform, it is less pronounced.

Rise in OOP in absolute as well as relative terms was especially high between 2003 and 2004. There are several reasons which might have caused this increase. The main ones are higher co-payments for expensive and frequently used drugs and introduction of fees per drugs prescription, seeing the practitioner and night in hospital. Also, increased fees for health care services, higher value added tax and partial legalization of the under-the-table payments are potential sources of increased OOP⁹.

As noted, OOP rose across the income spectrum, but the increase was not proportional as different income quintiles experienced different change of income proportion spent on health.

⁹ See annex 2 for detailed description of the reform.
Due to differential increases there was also an observable redistributio
onal impact. We capture overall redistributive effect by Kakwani index.

There is different pattern of progressivity for OOP and mandatory health
insurance. OOP were regressive in 2001 and regressivity rose throughout
the period. Similarly as for OOP share on income, significant change occu-
red in 2004 jumping to -0.25 from -0.19 in 2003, result statistically signif-
icant at the 95% level of significance. In 2005 it was slightly corrected
by 2 points, change statistically not significant. Mandatory health insurance
is progressive and
was held relatively constant throughout the period while the progressivity slightly increased in
2004 and 2005 result statistically not significant. Kakwani for overall health payments,
measured as the sum of OOP and mandatory insurance is roughly proportional. It became
slightly regressive in 2003 onwards from being slightly progressive before, as regressivity
effect for OOP dominated and influenced overall progressivity/regressivity more strongly.

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<th>Table 4: Kakwani index in Slovakia</th>
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<td>Overall</td>
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As far as international comparison is concerned, we compare our results with Wagstaff et al.
(1999), who report Kakwani index for thirteen OECD countries. Since we do not include
taxes in our analysis, we cannot compare overall payments, but only OOP and mandatory
health (social) insurance separately. Social insurance in Slovakia belongs among the most
progressive while United Kingdom and Portugal have the most progressive ones. On the other
hand, Netherlands, Spain and Germany are the only countries with regressive social
insurance. OOP are regressive in each examined country except of Spain. Despite the increase
of progressivity throughout the examined period, Slovak OOP are still among the less
regressive, while Sweden, U.S., Switzerland and France top the ranking with the most
regressive OOP.

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<th>Table 5: Kakwani Index</th>
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Source: Wagstaff et al. (1999)

Progressivity measures, however, do not capture the impact on the poorest groups of the population. We analyze this issue by measuring catastrophic impact. Relatively high reliance on OOP as means of health care financing poses a risk for the households to be impoverished due to high health payments as severe and immediate medical needs can force household to expend a large fraction of the household budget on health care.

Payment headcount ratio increased strongly between 2003 and 2004 for all examined threshold levels while changes between 2000-2003 and 2004-2005 are not statistically significant. The same holds for payment gap and mean positive gap. Percentage of people paying more than 5% on health care rose from 7.3% in 2003 to 16.1% in 2004 and from 1% to 4.5% in case of 10% threshold level. Until 2004 there was no household spending more than 20% of its gross income on health care while in 2004 statistically significant jump to 1.1% occurred. We observe similar pattern for 15% threshold while there was not statistically significant change in 2002 and 2003.
The jump between 2003 and 2004 was more pronounced for payment gap and mean positive gap. Since catastrophic payment gap captures the average degree by which payments exceed the threshold, this suggests that households, once above threshold level, are on average further
above the threshold in 2004 and 2005 than in previous years. Mean positive gap reflects this as it is uniquely determined by the previous two measures.

Catastrophic indicators are slightly lower in case of reduced samples. This sounds intuitive since they do not include unemployed, disabled and single mothers as heads of the household, usually the most socially vulnerable groups.

![Figure 11: Catastrophic payments as share of income](image-url)
6. Conclusions

There was an apparent need to analyse equity in health care finance in Slovakia, not only because of the major health care reform – among other measures directly influencing OOP - which took place mostly in 2004 but also because, according to our knowledge, there has not been conducted any similar analysis before.

After large data adjustments allowing for comparability over time we found that people spent increasing proportion of their income on health care throughout the examined period. The increase was more pronounced in bottom income quintiles and occurred mainly in 2004. Rise in 2004 is substantial even if we adjust for the trend from previous years. At the same time, expenditure on pharmaceuticals account for the largest and rising proportion of OOP.

Regressivity of OOP rose throughout the period and is still in line with international benchmark measured by thirteen OECD countries. The highest difference occurred in 2004. Contrary to OOP, mandatory health insurance is progressive. The progressivity of mandatory insurance was held relatively stable until 2003, rising in 2004 as well as in 2005, changes statistically not significant. Overall health payments as a sum of OOP and mandatory insurance are roughly proportional. It slipped from slightly progressive to slightly regressive in 2003, as regressivity effect caused by OOP dominated the one caused by social insurance.

We observe similar trend also for catastrophic payments. The proportion of households paying more than a certain threshold share of income on health care was rising throughout the period. Again, strong and statistically significant rise occurred in 2004. The hike in 2004 was even more pronounced in case of payment gap and was reflected also in mean positive gap.

Statistically significant change between 2003 and 2004 for all analysed indicators except for mandatory health insurance is the main finding of our analysis.
References


Annex 1 – Data issues

At the start of the project there was evidence that due to an inferior sampling technique the data from before 2004 were not representative and therefore not comparable with subsequent years. This was important since, by coincidence, the change in the sampling frame occurred at the same time as the natural health care experiment we aim to evaluate. In 2004 the Statistical Office of the Slovak Republic (SO SR) finally switched from sampling households by the method called quota sampling and started using - for these types of surveys - conventional simple random sampling which is - compared to the previous sampling - representative.

In case of quota sampling population is divided into groups according to selected criteria and statistical unit seeks individuals (households) in order to fill up defined quotas. In case of Slovak household survey, the SO SR applied the distribution from census preceding the household budged sampling. First it stratified the population by eight administrative regions (TABLE). Next it was stratified according to characteristics of head of household by the following criteria: first criteria was the occupation (manual worker except of agriculturalist, non-manual worker, agriculturalist and pensioners), then, in case of pensioners whether it is one member household or two- and more-member household. One-member pensioner household was further classified by sex. Economically active population was further divided by number of children (0, 1, 2 and 3 and more). Four income groups selected according to gross income for both economically active and non-active population was the last criterion. Threshold values were applied from the microcensus preceding the household survey. Income quartile groups for last quota sampling in 2003 were applied from microcensus in 1996. This way strata were identified and quota for each strata were computed such that the distribution would correspond to the distribution in latest census. The quotas were not sampled randomly within each stratum, but people were selected on unobserved grounds.

| Table X1: Criterions selected to define stratas for household budged survey until 2003 in Slovakia |
|-----------------------------------------------|-----------------------------|-----------------|----------------|-------------------|
| Criterion 1 | Criterion 2                  | Criterion 3a | Criterion 3b | Criterion 4     |
| Region     | Occupation                   | Economically active | Manual worker |                  | Income quartiles |
| 1          | Economically active          | Nonmanual worker | Agriculturalist |                  |                 |
| 2          | Manual worker                | Agriculturist    | Self-employed | # kids           |                 |
| 3          | Pensioners                  | # pensioners    | Male          |                  |                 |
| 4          | Economically not active      |                  | Female        |                  |                 |
| 5          | Economically not active      |                  |               |                  |                 |
| 6          | Economically not active      |                  |               |                  |                 |
Besides this less than optimal sampling frame, two other sample characteristics, that the SO SR applied, are worrying. First is sampling size which was comparatively small at around 1,600 household. Second and more troubling is the fact that there is no household with unemployed person, disabled or single mother as a head of the household. This feature of the sampling design makes the sample unrepresentative, since obviously, there are households with unemployed couples, disabled or single mother at head of the household and hence it underrepresents these groups of the population.

Such approach origins in communist era when this survey started to be conducted. Typical feature of communist regime is full employment which actually was a reality in 1950s-1980s. Everybody had a job no matter how efficient it was and very small fraction of “voluntary” unemployed was not even subject of concern. After the fall of communism this has obviously not been true anymore and quota sample did not cover this fraction of population which in the years of transformation started to rise sharply peaking 19.2% in 2001. Therefore unemployed together with disabled and single mothers are underrepresented in the sample causing discrepancy especially in health-care analysis where socially weak are important part of the analysis. Surprisingly the SO SR continued with quota sampling 14 years after the regime changed even though the sample was obviously not representative anymore.

The SO SR performs simple random sampling, or random sampling without replacement since 2004. In simple random sampling, n distinct units are selected from the N units in the population in such a way that every possible combination of n units is equally likely to be selected in the sample. The SO SR divided population according to regional administrative units and size of the town applying the distribution from last census and chose households randomly from within each region and town-size category.

Even quick check on the descriptive statistics suggests that there is significant discrepancy between 2003 and 2004. There is strong increase in OOP which we cannot judge from a brief look since this is subject of our analysis. However, according to unadjusted data, there was strong decrease of gross monetary income in 2004 while there is no rationale behind this slump. The economy was doing very well during these years, GDP rose strongly, supported
by healthy development of other indicators, especially unemployment (Table X3). Salaries, large part of the income, rose relatively sharply too. In addition, according to original household data, average household size decreased sharply in 2004 while it was steady until then and afterwards; very counterintuitive result. We observe similar discrepancies for other descriptive statistics as well.

Table X2: Descriptive statistics using unadjusted samples (original weights, in thousands SKK)

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean household income (UN equalized)</td>
<td>314</td>
<td>327</td>
<td>342</td>
<td>284</td>
<td>297</td>
</tr>
<tr>
<td>% change</td>
<td>13.6%</td>
<td>4.0%</td>
<td>4.6%</td>
<td>-16.9%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Mean equalized household income</td>
<td>160</td>
<td>167</td>
<td>175</td>
<td>153</td>
<td>159</td>
</tr>
<tr>
<td>% change</td>
<td>14.0%</td>
<td>4.3%</td>
<td>4.4%</td>
<td>-12.3%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Mean equalized OOP</td>
<td>1.65</td>
<td>1.87</td>
<td>2.32</td>
<td>3.76</td>
<td>4.11</td>
</tr>
<tr>
<td>% change</td>
<td>17.8%</td>
<td>13.0%</td>
<td>24.0%</td>
<td>62.5%</td>
<td>9.1%</td>
</tr>
<tr>
<td>Average household size</td>
<td>3.3</td>
<td>3.3</td>
<td>3.3</td>
<td>2.9</td>
<td>2.9</td>
</tr>
</tbody>
</table>
In order to make the samples comparable we exclude households from 2004 and 2005 that are not present in the quota samples (unemployed, disabled and single mothers at the head of the household) and construct weights using the post stratification weights (Holt and Smith, 1979). Holt and Smith view post stratification as a robust technique, comparatively free of assumptions, which can be applied in a wide variety of situations. It may however not be the most efficient technique which is why post stratification is usually judged in the context of the variance of the post stratification estimator taken over all possible sample configurations appropriately weighted by the probability of occurrence, in our case probability of occurrence in the simple random sampling (in 2004 and 2005). As Holt and Smith note the theory developed shows that neither the post stratification estimator nor the sample mean is uniformly best in all situations but empirical investigations indicate that post stratification offers protection against unfavourable sample configurations and should be viewed as a robust technique.

First step in constructing weights is to define the characteristics which we use to define the sample. We use similar household characteristics for attributing weights than those used for quota sampling although our groups are broader. We merge region variable into two groups compared to eight regions used by SO SR, skip the selection by number of children but in case of the households with pensioners we distinguish between one-member household and two- or more-member household. As far as occupation criterion is concerned we merge

<table>
<thead>
<tr>
<th>Table X3: Macroeconomic indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP growth (constant prices)</td>
</tr>
<tr>
<td>Average real wage</td>
</tr>
<tr>
<td>Average nominal wage</td>
</tr>
<tr>
<td>CPI</td>
</tr>
<tr>
<td>Unemployment</td>
</tr>
</tbody>
</table>

Source: The SO SR

<table>
<thead>
<tr>
<th>Table X4: Criterions selected to define groups used for computing weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criterion 1</td>
</tr>
<tr>
<td>Occupation</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Income quartiles
agricultural workers with manual workers and leave four income groups as it is used by the SO SR.

The reasons to restrict the number of groups were threefold. Firstly, from an econometric point of view only variables should be included that are likely to cause endogenous selection, i.e. selection that results from both explanatory and explained variables. Secondly, there were too many groups used for quota sampling. In some cases we found combination of characteristics that did not include any household therefore it would be impossible to construct weights. Thirdly, we were unable to find some variables in 2004 that would correspond with 2003 since in 2004 not only sampling method changed but the SO SR also classified the answers according to different criteria. Even though we had to describe some characteristics from 2003 by combination of characteristics obtained from several variables in 2004, this was for example the case of agricultural workers who we were not able to identify in 2004.

After defining groups’ characteristics we compute the proportion of each group in the weighted and representative 2004 sample and for the unweighted 2003 sample and construct the weights computed as the ratio of each group’s proportion between 2004 and 2003. Weights are then attributed to each household according to corresponding characteristics. Similarly we compute ratios for 2002, 2001 and 2000. In order to determine gross income quartiles threshold values we compute the income growth of marginal households between 2004 and 2005. Applying the assumption of stable income growth we impose this growth backwards to years 2003-2000 in a difference in difference analysis.
**Annex 2 – Health care reforms in Slovakia (2002-2006)**

*Market reforms (2003-2006)*

The health care system in Slovakia experienced a persistent crisis since the 1990s, characterized by meagre payment practices, poor quality of service delivery and physicians-managers with limited managerial skills. Moreover, the healthcare system was fully centralized, with more than 75 percent of all services provided in state-owned and -run facilities under the Ministry of Health.

As a therapy, Slovak liberal-conservative government (2002-2006) adopted a revolutionary zeal for reform instead of an evolutionary approach. It pursued a market-oriented approach, placing emphasis on deregulation, privatization, decentralization, increased competition and the mobilizing of private resources. By creating market-oriented framework conditions, the government envisioned strengthening health insurance companies (HICs) and their transformation into active purchasers, in the process exploiting untapped potential for efficiency gains through customer orientation and quality. Since both insurance contributions and the scope of benefits were set by law, health insurers were able to differentiate their insurance products from competitors only through marketing and customer service. Government phased the reform into three stages: i) stabilisation measures aimed at bringing the debt growth to a halt, ii) systemic measures aimed at making the health-insurance scheme more efficient and iii) network measures aimed at enhancing the quality and efficiency of health care providers. In theory, the reform attempted to address more or less explicitly many of the market and government failure prevailing in the health care system at the time.

The overall result of the reform was, however, mixed. Main success of the adopted measures was partial financial stabilization of the system, which was in a desperate condition. Hence, the government successfully implemented only the first phase of its planned three-stage reform. On the other hand, implementation of the other two phases failed or was attempted half-heartedly, and stated goals of efficiency and quality were not accomplished. Implementation was not made easier by the fact that the government was of its term in the minority position in the latter half. Furthermore, although the reform to some extent curbed petty corruption, traditionally prevalent corruption and rent-seeking practices were
supplemented by sometimes questionable activities of private-equity groups and other for-profit investors, which entered the health system through privatization of providers and deregulation of health insurance system. Reform was also, to a large extent, perceived negatively by health care professionals as well as general public, and may have contributed to the change of the government in 2006.

**Measures with direct impact on OOP**

As a part of the large reform package, there were several arrangements directly influencing the expenditure of the population devoted to health care services. Since 1st June 2003, some generic fees for health care services were put in place. These included payments for outpatient visits (20 SKK\(^{10}\) per visits) overnight stays in hospitals (50 SKK per night). Stated purpose of introducing these fees was not to increase revenue, but to reduce excess demand.

Potentially even more important change (given the importance of pharmaceuticals in health expenditure in upper-middle income countries) was made in co-payments for drugs. In a Slovak system, all drugs are classified into the categories, setting reimbursement levels and patient copayments in a process called *categorization*. First categorization – which took place on 15th October 2003 – introduced fixed co-payments for all drugs. This included many drugs, mainly antibiotics, which were free of charge before. Technical categorization, less important from a policy standpoint, followed on 1st January 2004 where the prices (including co-payments) were adjusted for the fact that VAT increased from 10% to 19%. Other categorizations took place on 1st February, 1st May, 1st July and 1st October 2004. Since 1st January 2005, they have been taking place quarterly.

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Table Y1: Co-payments for prescription drugs (in billion SKK)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>1.8</td>
<td>2.1</td>
<td>2.9</td>
<td>3.1</td>
</tr>
</tbody>
</table>

*Source: Health Policy Institute*

There were also other, rather minor changes influencing OOP. Starting 2005, people have to see the dentist at least once a calendar year. Otherwise they would not be compensated by insurance company and would have to pay for the services provided during the following year.

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\(^{10}\) Average exchange rate in 2004 - 1 EUR = 40.03 SKK
in full. Also, outpatient physicians have been allowed to charge for skipping waiting list since 1st September 2005.

As a rudimentary form of social protection against higher out-of-pocket payments, compensation in the magnitude of 50 SKK per month has been granted to people in material need seeking health care service since 1st January 2004. Since health expenditures are concentrated, this contribution did not address the catastrophic impact of health expenditure on very sick, but rather provided additional safety net for the poor.

Changes in health insurance system

The government envisaged that the new Health Insurance Act and the development of a private health insurance market would help formalize informal payments and made certain hidden phenomena, such as waiting times, become visible. The expected result was that under-the-table payments would be substituted by open queues, transparent fees, and open rationing as a mechanism to equilibrate demand and supply.

Slovak public health insurance is structured along the lines of a standard Bismarckian social insurance system. In Slovakia, the system traditionally consisted of nominally independent and competing quasi-public health insurance companies, which were in practice heavily regulated. As a result of the reform, the system was gradually transformed into a managed (i.e. regulated) competition, with HICs incorporated as private joint-stock companies, with independent ownership and profit incentives. More stringent budgetary constraints, accompanied by a profit motive, may have changed the nature of the equity-efficiency tradeoff, and contributed to the results of this paper.

New government – turning the tide in 2006

New left-wing government built its election campaign on strong criticism of the reforms of the previous government, and the need to reverse them. Maybe the most heavily criticized among them was the health-care reform. Among the first steps of the new government after taking the office in July 2006 was almost complete abolition of the fees paid for health care services. Other measures pursued by new government include lower VAT on drugs (10%

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11 The system, originating in the late 19th century Germany, is prevalent in German speaking Europe, e.g. in Germany, Austria, Switzerland, the Netherlands, but also in Central Europe and Israel (Mossialos, 2002).
instead of 19%) on 1st January 2007 and changes in drugs categorization including 6.6% price cut for most of the drugs in April 2007.

The other significant initiative - accompanied by strong opposition and criticism - is the declared effort to introduce the system of one state-owned HIC (which was abandoned in favour of the current competitive system in early 1990s). This – politically rather ambitious – goal is preceded by several other measures aimed in effect at restraining the activity of the private HICs. These include more stringent financial regulation - administrative expenditures of HIC cannot exceed 3%\(^\text{12}\) of the revenues, they must be accounted for separately from the rest of revenues, and any resulting profits can be used only for provider payments, not for redistribution of dividends to shareholders. These measures are currently in the legislation process.

Some other measures are planned or in the approval process. The most important is - repeatedly proposed – optimalization of the too extensive network of inpatient providers (in effect shutting down some hospitals) aimed at increasing efficiency. Although already attempted by the previous government, it failed due to political reasons. Ministry of Health also proposes degressive margin on drugs, with more expensive drugs having smaller relative margins compensating distributors and pharmacies. Re-introduction of the gatekeeping function of the general practitioners is also discussed.

Current Slovak government declares to continue pushing significant health care initiatives. Even though the return to the single-payer model may not materialize, some other measures have already been approved and some others will probably follow suit. These actions – in particular those affecting out-of-pocket payments – may again constitute natural experiment in health care finance, and will be an interesting subject matter for an economic analysis in the future.

\(^{12}\) Down from 4% limit, already approved by the current government. Before, there was no limit, with some HIC's administrative costs approaching almost 10%.
Annex 3 – Do File

This annex is aimed to show the way we proceeded in our analysis. It provides the set of stata commands we used from the very beginning where we showed some descriptive statistics, through data adjustment procedure until the actual equity analysis consisting of reporting relevant statistics broke down into quintiles, progressivity analysis and catastrophic impact analysis. We report the do file for year 2004, do files for the other years slightly differ as some variables have different names and number of observations differs.

Do file starts here:

```stata
set mem 20m
use "D:\shorterru04.dta", clear
**** We start with creating some helping variables.
*** We derive variable age from the variable showing the year of birth of each household member
gen age1 = 2004 - m3r2s1
gen age2 = 2001 - m3r2s2
gen age3 = 2004 - m3r2s3
gen age4 = 2001 - m3r2s4
gen age5 = 2004 - m3r2s5
gen age6 = 2001 - m3r2s6
gen age7 = 2004 - m3r2s7
gen age8 = 2001 - m3r2s8
gen age9 = 2004 - m3r2s9
gen age10 = 2004 - m3r2s10

*** Throughout the paper we report the statistics using modified equivalence OECD scale\(^{13}\). Therefore we create some helping variables which we use.
gen equivalizedHH_size=1
replace equivalizedHH_size=equivalizedHH_size +0.5 if m3r1s2>0 & age2>14
replace equivalizedHH_size=equivalizedHH_size +0.5 if m3r1s3>0 & age3>14
replace equivalizedHH_size=equivalizedHH_size +0.5 if m3r1s4>0 & age4>14
replace equivalizedHH_size=equivalizedHH_size +0.5 if m3r1s5>0 & age5>14
replace equivalizedHH_size=equivalizedHH_size +0.5 if m3r1s6>0 & age6>14
replace equivalizedHH_size=equivalizedHH_size +0.5 if m3r1s7>0 & age7>14
replace equivalizedHH_size=equivalizedHH_size +0.5 if m3r1s8>0 & age8>14
replace equivalizedHH_size=equivalizedHH_size +0.5 if m3r1s9>0 & age9>14
replace equivalizedHH_size=equivalizedHH_size +0.5 if m3r1s10>0 & age10>14
replace equivalizedHH_size=equivalizedHH_size + 0.3 if m3r1s2>0 & age2<15
replace equivalizedHH_size=equivalizedHH_size + 0.3 if m3r1s3>0 & age3<15
replace equivalizedHH_size=equivalizedHH_size + 0.3 if m3r1s4>0 & age4<15
replace equivalizedHH_size=equivalizedHH_size + 0.3 if m3r1s5>0 & age5<15
replace equivalizedHH_size=equivalizedHH_size + 0.3 if m3r1s6>0 & age6<15

```
replace equivalizedHH_size = equivalizedHH_size + 0.3 if m3r1s7>0 & age7<15
replace equivalizedHH_size = equivalizedHH_size + 0.3 if m3r1s8>0 & age8<15
replace equivalizedHH_size = equivalizedHH_size + 0.3 if m3r1s9>0 & age9<15
replace equivalizedHH_size = equivalizedHH_size + 0.3 if m3r1s10>0 & age10<15

gen equivalizedHH_income = grossmon/equivalizedHH_size
gen OOP_equivalized = x6000000/equivalizedHH_size
gen mand_insurance_equivalized = x201021/equivalizedHH_size

*** Descriptive statistics using unadjusted sample and original weights

*** Income quintiles
xtile quint_inc = x300000, nquantiles(5), [aw=vahy04s]

*** Health quintiles
xtile quint_health = x6000000, nquantiles(5), [aw=vahy04s]

*** Average gross income, by quintile
mean x300000, over(quint_inc), [aw=vahy04s]
mean x300000 [aw=vahy04s]

*** Average health expenditure, by income quintile
mean x6000000, over(quint_inc), [aw=vahy04s]
mean x6000000 [aw=vahy04s]

*** Average household size
gen a=0
gen b=0
gen c=0
gen d=0
gen e=0
gen f=0
gen g=0
gen h=0
gen i=0
gen j=0
replace a=1 if m3r1s1>0
replace b=1 if m3r1s2>0
replace c=1 if m3r1s3>0
replace d=1 if m3r1s4>0
replace e=1 if m3r1s5>0
replace f=1 if m3r1s6>0
replace g=1 if m3r1s7>0
replace h=1 if m3r1s8>0
replace i=1 if m3r1s9>0
replace j=1 if m3r1s10>0
gen HH_members = a + b + c + d + e + f + g + h + i + j
label var HH_members "# of Household members"
mean HH_members [aw=vahy04s]

*** We save the file here, as we will need created variables and will need to reopen the files at certain stages
save "D:\shorterru04.dta", replace

*** Average health expenditure, by category
* products */
mean x6100000 [aw=vahy04s]
* drugs */
  mean x61010 [aw=vahy04s]
* other products */
  mean x61020 [aw=vahy04s]
* outpatient */
  mean x62000 [aw=vahy04s]
* equipment and appliances */
  mean x6300100 [aw=vahy04s]
* outpatient */
  mean x6200000 [aw=vahy04s]
* inpatient */
  mean x6300100 [aw=vahy04s]

*** Average relative health expenditure (gross income and net discretionary
income as base), by quantiles of itself

gen relative_oop= x6000000/x300000
sum relative_oop, detail

*** Descriptive statistics using adjusted sample and original weights

*** Income quintiles
xtile quint_inc_equivalized = equivalizedHH_income [aweight = vahy04s],
nquantiles(5)

*** Health quintiles
xtile quint_health_equivalized = OOP_equivalized [aweight = vahy04s],
nquantiles(5)

*** Average gross income, by quintile
mean equivalizedHH_income [aweight = vahy04s], over(quint_inc_equivalized)
mean equivalizedHH_income [aweight = vahy04s]

*** Average health expenditure, by income quintile
mean OOP_equivalized [aweight = vahy04s], over(quint_inc_equivalized)
mean OOP_equivalized [aweight = vahy04s]

*******************************************************************************
*** Progressivity analysis
*******************************************************************************

*** In progressivity analysis we follow the procedure\textsuperscript{14} suggested by The World
Bank. The following sets of commands computes the point estimates using
convenient regression method as well as estimates derived by bootstrap technique.

*******************************************************************************
**** bootstrap OOP
use "D:\shorterru04.dta", clear

program kakwaniOOP_bootstrap, rclass
version 9

*** As suggested in the Technical Note, weights should sum up to one, ***
therefore we divide weight variable by the sum of it which is
*** 1 900 344

gen vahy_kakwani= vahy04s/1900344

*** fractional rank

glcurve7  equivalentHH_income [aw=vahy_kakwani], glvar(Lorenz) pvar(rank)
lorenz nograph
label variable rank "Cum. Prop. Hholds."
label variable Lorenz "Lorenz curve"

*** OOP

glcurve7  OOP_equivalized [aw=vahy_kakwani], gl(oop_cc)
sortvar(equivalentHH_income ) lorenz nograph
label variable oop_cc "OOP payments"

*** calculate its (weighted) mean and variance
egen m_rank=sum(rank*vahy_kakwani)
egen v_rank=sum(vahy_kakwani*(rank-m_rank)^2)
egen m_equivalentHH_income =sum( equivalentHH_income *vahy_kakwani)
egen m_OOP_equivalized =sum( OOP_equivalized *vahy_kakwani)

*** create a variable corresponding to the left-hand-side of (1) (tech note
16) and regress this on the fractional rank

gen d_OOP_equivalized =(2*v_rank)*((OOP_equivalized /m_OOP_equivalized )-
(equivalentHH_income /m_equivalentHH_income ))
regr d_OOP_equivalized  rank [pw=vahy_kakwani]
mat results = e(b)
return scalar result = results[1,1]
end

bootstrap r(result), reps(10000): kakwaniOOP_bootstrap
estat bootstrap, bc
program drop kakwaniOOP_bootstrap

******************************************************************************
**** bootstrap mandatory health insurance

use "D:\shorterru04.dta", clear

gen health_overall = OOP_equivalized + mand_insurance_equivalized

program kawmaniiinsurance_bootstrap, rclass
version 9

gen vahy_kakwani= vahy04s/1900344
*** fractional rank

glcurve7  equivalentHH_income [aw=vahy_kakwani], glvar(Lorenz) pvar(rank)
lorenz nograph
label variable rank "Cum. Prop. Hholds."
label variable Lorenz "Lorenz curve"

*** mandatory insurance

glcurve7  mand_insurance_equivalized [aw=vahy_kakwani], gl(insurance_cc)
sortvar(equivalentHH_income ) lorenz nograph
label variable insurance_cc "mandatory health insurance"
*** calculate its (weighted) mean and variance
egen m_rank=sum(rank*vahy_kakwani)
egen v_rank=sum(vahy_kakwani*(rank-m_rank)^2)
egen m_equivalizedHH_income =sum( equivalizedHH_income *vahy_kakwani)
egen m_mand_insurance_equivalized =sum( mand_insurance_equivalized *vahy_kakwani)

*** create a variable corresponding to the left-hand-side of (1) (tech note 16) and regress this on the fractional rank
gen d_mand_insurance_equivalized =2*v_rank)*((mand_insurance_equivalized /m_mand_insurance_equivalized )-(equivalizedHH_income /m_equivalizedHH_income ))
regr d_mand_insurance_equivalized rank [pw=vahy_kakwani]

*** create a variable corresponding to the left-hand-side of (1) (tech note 16) and regress this on the fractional rank
egen m_equivalizedHH_income =sum( equivalizedHH_income *vahy_kakwani)
egen m_mand_insurance_equivalized =sum( mand_insurance_equivalized *vahy_kakwani)

*** create a variable corresponding to the left-hand-side of (1) (tech note 16) and regress this on the fractional rank
gen d_mand_insurance_equivalized =2*v_rank)*((mand_insurance_equivalized /m_mand_insurance_equivalized )-(equivalizedHH_income /m_equivalizedHH_income ))
regr d_mand_insurance_equivalized rank [pw=vahy_kakwani]
**Catastrophic impact analysis**

*** In catastrophic impact analysis analysis we follow the procedure\(^{15}\) suggested by The World Bank


```
mat results = e(b)
return scalar result = results[1,1]
end

bootstrap r(result), reps(10000): kakwanioverallBootstrap
estat bootstrap, bc
program drop kakwanioverallBootstrap
```

```
***********************************************************************
*** Catastrophic impact analysis
***********************************************************************
*** In catastrophic impact analysis we follow the procedure\(^{15}\) suggested by The World Bank

***********************************************************************
*** z - threshold value z= 0.1
use "D:\shorterru04.dta", clear

gen zcat = .10
gen oopshre = x6000000/ x300000
gen catgap = oopshre - zcat
replace catgap = 0 if catgap < 0
gen catcount = (catgap>0)
glcurve x300000 [aw=vahy04s], pvar (exprank)
cor exprank catcount catgap [aw=vahy04s], c m

*** generate the fractional rank variable p in descending order of oopshre
gen recshre = 1 - oopshre
glcurve oopshre , gl(glshre) pvar(p) sortvar(recshre)
```

```
***********************************************************************
*** z =0.05
use "D:\shorterru04.dta", clear

gen zcat = .05
gen oopshre = x6000000/ x300000
gen catgap = oopshre - zcat
replace catgap = 0 if catgap < 0
gen catcount = (catgap>0)
glcurve x300000 [aw=vahy04s], pvar (exprank)
cor exprank catcount catgap [aw=vahy04s], c m

*** generate the fractional rank variable p in descending order of oopshre
gen recshre = 1 - oopshre
glcurve oopshre , gl(glshre) pvar(p) sortvar(recshre)
```

```
***********************************************************************
*** z =0.025
use "D:\shorterru04.dta", clear

gen zcat = .025
gen oopshre = x6000000/ x300000
```
gen catgap = oopshre - zcat
replace catgap = 0 if catgap < 0
gen catcount = (catgap>0)

glcurve x300000 [aw=vahy04s], pvar (exprank)
cor exprank catcount catgap [aw=vahy04s] , c m

*** generate the fractional rank variable p in descending order of oopshre

-gen recshre = 1 - oopshre
glcurve oopshre , gl(glshre) pvar(p) sortvar(recshre)

***********************************************************************
************
z =0.01
use "D:\shorterru04.dta", clear

-gen zcat = .01
-gen oopshre = x6000000/ x300000
gen catgap = oopshre - zcat
replace catgap = 0 if catgap < 0
gen catcount = (catgap>0)

glcurve x300000 [aw=vahy04s], pvar (exprank)
cor exprank catcount catgap [aw=vahy04s] , c m

*** generate the fractional rank variable p in descending order of oopshre

-gen recshre = 1 - oopshre
glcurve oopshre , gl(glshre) pvar(p) sortvar(recshre)

*** Bootstraping the catastrophic impact analysis follows here

*************************************************************
z = 0.1
use "D:\shorterru04.dta", clear

-gen zcat = .10
-gen oopshre = x6000000/ x300000
-gen catgap = oopshre - zcat
replace catgap = 0 if catgap < 0
gen catcount = (catgap>0)

-program catastrophic_impact, rclass
-version 9
-mean catcount [aw=vahy04s]
-mat results = e(b)
-return scalar result = results[1,1]
-end
-bootstrap r(result), reps(10000): catastrophic_impact
estat bootstrap, bc
-program drop catastrophic_impact

-program catastrophic_impact, rclass
-version 9
-mean catgap [aw=vahy04s]
-mat results = e(b)
-return scalar result = results[1,1]
-end
-bootstrap r(result), reps(10000): catastrophic_impact
estat bootstrap, bc
program drop catastrophic_impact

********************************

z = 0.05

use "D:\shorterru04.dta", clear

gen zcat = .05

gen oopshre = x6000000/ x300000

gen catgap = oopshre - zcat

replace catgap = 0 if catgap < 0

gen catcount = (catgap>0)

program catastrophic_impact, rclass
version 9
mean catcount [aw=vahy04s]
mat results = e(b)
return scalar result = results[1,1]
end
bootstrap r(result), reps(10000): catastrophic_impact
estat bootstrap, bc

program drop catastrophic_impact

********************************

z = 0.025

use "D:\shorterru04.dta", clear

gen zcat = .025

gen oopshre = x6000000/ x300000

gen catgap = oopshre - zcat

replace catgap = 0 if catgap < 0

gen catcount = (catgap>0)

program catastrophic_impact, rclass
version 9
mean catcount [aw=vahy04s]
mat results = e(b)
return scalar result = results[1,1]
end
bootstrap r(result), reps(10000): catastrophic_impact
estat bootstrap, bc

program drop catastrophic_impact
Above we showed whole analysis we did to obtain all the statistics reported in the paper. However, this is not whole work since adjustments were needed in order to make data comparable over time. As described in annex 1 we did to major adjustments: i) we constructed our own weights using post stratification technique for the years 2000 – 20003 ii) and in 2004 and 2005 dropped households with unemployed, invalid and single mother at head of the household. We use files in 2004 and 2005 with dropped observations and 2000-2003 with newly constructed weights for the purposes specified in the paper. In order to construct weights we proceeded as follows (we show the procedure on 2003 file, procedure is similar for 2000-2002):

use "D:\shorterru03.dta", clear
*** We create helping variable which are defined according to criteria described in annex 1.
  gen kraj_newquota=0
  replace kraj_newquota=1 if kraj<5
  replace kraj_newquota=5 if kraj>4
  gen job_newquota=spsk1
  replace job_newquota=1 if spsk1==5
*** These are the income values of the marginal households.
*** 97896   129402   174693

```
gen income_newquota=0
replace income_newquota=1 if equivalentedHH_income < 97896
replace income_newquota=2 if 97895.99 < equivalentedHH_income & equivalentedHH_income < 129402
replace income_newquota=3 if 129401.99 < equivalentedHH_income & equivalentedHH_income < 174693
replace income_newquota=4 if 174692.99 < equivalentedHH_income

gen pensioners_newquota=0
replace pensioners_newquota=1 if (spsk1==7 | spsk1==8) & (spsk2==0)
replace pensioners_newquota=2 if (spsk1==7 | spsk1==8) & (spsk2!=0)

gen new_var= 0
replace new_var=kraj_newquota*1000 + job_newquota*100 + income_newquota if (spsk1==7)
tab new_var, gen (w)
```

use "D:\shorterru04.dta", clear

*** Similarly we create helping variables in 2004 file.

```
gen kraj_newquota=0
replace kraj_newquota=1 if kraj<500
replace kraj_newquota=5 if kraj>499

gen job_newquota=.
replace job_newquota=1 if (m3r8s1==1 & m3r10s1!=1 & m3r10s1!=2 & m3r9s1==6 | m3r9s1==7 | m3r9s1==8 | m3r9s1==9) | (m3r8s1==1 & m3r10s1!=1 & m3r10s1!=2) & ((m3r9s1==0 | m3r9s1==88 | m3r9s1==5) & m3r6s1!=3))
replace job_newquota=2 if m3r8s1==1 & m3r10s1==1 | m3r10s1==2)
replace job_newquota=3 if (m3r8s1==1 & m3r10s1!=1 & m3r10s1!=2 & m3r9s1==1 | m3r9s1==2 | m3r9s1==3 | m3r9s1==4)) | (m3r8s1==1 & m3r10s1!=1 & m3r10s1!=2 & (m3r9s1==0 | m3r9s1==88 | m3r9s1==5) & m3r6s1==3))
replace job_newquota=7 if m3r8s1==4
```

*** These are the income values of the marginal households.
*** 8645   11345   15557

```
gen income_newquota=0
replace income_newquota=1 if equivalizedHH_income < 8645
replace income_newquota=2 if 8644.999 < equivalizedHH_income & equivalizedHH_income < 11345
replace income_newquota=3 if 11344.999 < equivalizedHH_income & equivalizedHH_income < 15557
replace income_newquota=4 if 15556.99 < equivalizedHH_income

gen pensioners_newquota=.
replace pensioners_newquota=1 if m3r8s1==4 & m3r8s2==0
replace pensioners_newquota=2 if m3r8s1==4 & m3r8s2!=0

gen new_var= 0
replace new_var=kraj_newquota*1000 + job_newquota*100 + income_newquota if m3r8s1!=4
replace new_var=kraj_newquota*1000 + job_newquota*100 + pensioners_newquota*10 + income_newquota if m3r8s1==4

tab new_var, gen (w)

use "D:\shorterru03.dta", clear

**** constructing weights in 2003

gen wweight03=0
replace wweight03=0.023659374 if new_var==1101
replace wweight03=0.023990543 if new_var== 1102
replace wweight03=0.013115157 if new_var==1103
replace wweight03=0.007464646 if new_var==1104
replace wweight03=0.04366818 if new_var== 1201
replace wweight03=0.02506877 if new_var==1202
replace wweight03=0.017596659 if new_var==1203
replace wweight03=0.009894315 if new_var==1204
replace wweight03=0.016532809 if new_var==1301
replace wweight03=0.018437676 if new_var==1302
replace wweight03=0.017955775 if new_var==1303
replace wweight03=0.010582331 if new_var==1304
replace wweight03=0.022754301 if new_var==1711
replace wweight03=0.014703091 if new_var==1712
replace wweight03=0.01940808 if new_var==1713
replace wweight03=0.02587744 if new_var==1714
replace wweight03=0.044926111 if new_var==1721
replace wweight03=0.049119215 if new_var==1722
replace wweight03=0.040309089 if new_var==1723
replace wweight03=0.062537146 if new_var==1724
replace wweight03=0.021514383 if new_var==1725
replace wweight03=0.02749478 if new_var==1726
replace wweight03=0.015711303 if new_var==1727
replace wweight03=0.018231833 if new_var==1728
replace wweight03=0.012332217 if new_var==1729
replace wweight03=0.015095173 if new_var==1730
replace wweight03=0.021110543 if new_var==1731
replace wweight03=0.017208497 if new_var==1732
replace wweight03=0.00879833 if new_var==1733
replace wweight03=0.03072946 if new_var==1734
replace wweight03=0.011706461 if new_var==1735
replace wweight03=0.010782267 if new_var==1736
replace wweight03=0.00970404 if new_var==1737
replace wweight03=0.050232677 if new_var==1738
replace wweight03=0.036480002 if new_var==1739
replace wweight03=0.06307626 if new_var==1740
replace wweight03=0.084101679 if new_var==1741

In order to drop variables, we proceed as follows:

use "D:\shorterru04.dta", clear
drop if m3r8s1==3 | m3r8s1==5 | m3r8s1==6 | m3r8s1==7 | m3r8s1==9
*** similarly for 2005
use "D:\shorterru05.dta", clear
drop if m3r8s1==3 | m3r8s1==5 | m3r8s1==6 | m3r8s1==7 | m3r8s1==9