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The Health Financing Transition:

A Conceptual Framework and Empirical Evidence

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Abstract

Almost every country exhibits two important health financing trends: health spending per person rises and the share of out-of-pocket spending on health services declines. In this paper, we describe these trends as a "health financing transition" to provide a conceptual framework for understanding shorter term analyses of health markets and public policy. We review the literature to show that health spending growth is a consequence of rising income and expanding medical technologies, while declining shares of out-of-pocket spending are a consequence of political movements and social change. Using 15 years of data from 126 countries, we examine these explanations for changes in health spending and its composition with regressions in levels and first differences.

We estimate that the income elasticity of health spending is about 0.7, confirming findings in the latest comparable studies. Our analysis also shows a significant secular trend in health spending – rising about 1 percent annually – which is associated with expanding use of new medical treatments and changing medical practices. The out-of-pocket share of total health spending is not related to income, but is strongly influenced by a country's capacity to raise general revenues – offering support to the hypothesis that the composition of health spending is largely determined by public policies.

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Introduction

Over long periods of time, almost every country manifests two basic health spending trends: health spending per person increases and the share of health spending that is paid out-of-pocket declines. In OECD countries from 1960 to 2010, per capita health spending grew by about 10 percent per year, and out-of-pocket health spending fell from more than one third of total health spending to less than 20 percent (see table 1). Similar trends are likely in developing countries, though consistent data for the same period are not available.

Table 1. Historical trends in total health expenditure in selected countries, 1960-2010

	Annual growth (%), 1960 to 2010	Out-of-pocket share of total health expenditure (%)		Share of GDP (%)	
		1960	2010	1960	2010
Australia	9.7	36	19	3.7	9.1
Finland	10.4	44	20	3.8	8.9
France	10.7	30	7	3.8	11.6
United States	10.6	47	12	5.1	17.6

Source: OECD Health Data 2012 (http://www.oecd.org/health/healthdata), accessed June 29, 2012.

An extensive literature has examined the determinants of the first trend – growing health expenditures – and finds that the major factors are rising incomes, new medical technologies and changing medical practices, and aging populations. The evidence indicates that total health spending would rise less rapidly than income, had it not been for expanding medical technologies and changing medical practices (e.g. more extensive and intensive use of treatments). In the economic literature, very little attention has been paid to explanations for the second trend – declining out-of-pocket health expenditures – though political scientists and historians have written extensively on the factors behind the public policies that drive this pattern.

This paper proposes that these trends should be considered together as a "health financing transition" (de Ferranti 2007; Savedoff et al. 2012a), analogous to the demographic and epidemiologic transitions.[1] As with the demographic and epidemiologic transitions, the health financing transition is not inevitable but it is widespread. Like the other two transitions, countries begin the health financing transition at different times, move through it at different paces, and sometimes may even undergo reversals. Economic, political and technological factors move countries through this transition, with public policies that expand pooled funding (through subsidized provision or mandatory insurance) playing a particularly important role. As a conceptual framework, the health

[1] On the demographic transition see Chesnais (1993) and on the epidemiologic transition see Omran (1971). This point is developed further in Savedoff et al. 2012a.

financing transition requires first establishing it as an empirical regularity and then analyzing its determinants.

The health financing transition has significant implications for public health, equity, and growth. Increasing real resources and buying more health care for more people have contributed to better population health (Bhokari et al. 2007; Moreno-Serra and Smith 2012). But it is the composition of spending and how it is spent that affects its efficiency and equity. Institutions which pool funding from large groups of people and manage health care spending on their behalf are not necessarily efficient, but they do appear to be a necessary condition for both improving the efficiency and equity of health care coverage. At a minimum, people living in countries with institutions for pooling health spending and limiting out-of-pocket health expenditures are less likely to be impoverished by health care costs (Xu et al. 2007).

This paper begins by describing the health financing transition and identifying some common patterns. Second, it reviews the literature on the determinants of total health spending and out-of-pocket health spending. Third, using data for 126 countries from 1995 to 2009, the paper analyzes the determinants of health spending and its composition, testing whether the health financing transition is observable in this relatively short time period. The paper concludes with projections of the size and composition of future health expenditures.

The health financing transition: a conceptual framework

What is the health financing transition?

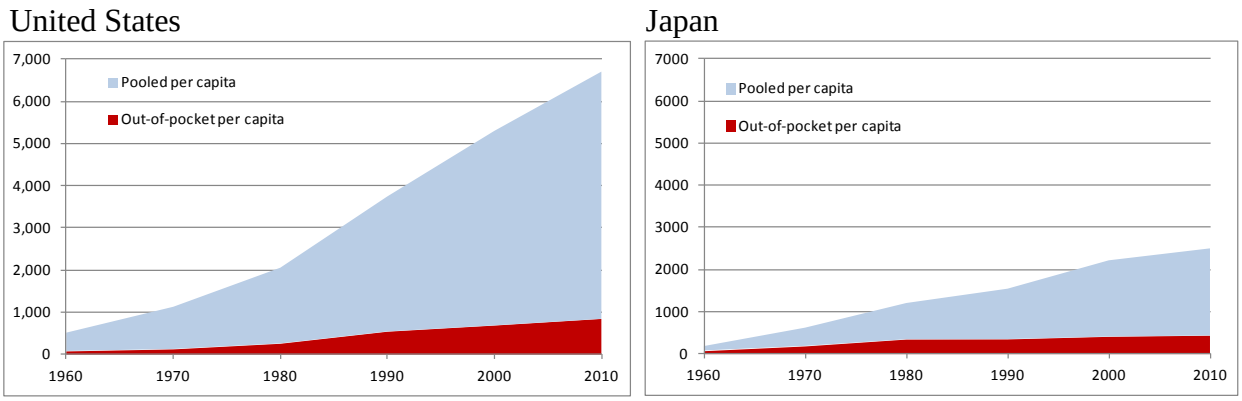
The health financing transition describes the major shift that most countries experience from an early period in which health spending is quite low and primarily out-of-pocket to a later period in which health spending is quite high and primarily pooled. Health financing before the 19th century was mainly comprised of out-of-pocket spending, with individuals compensating healers, midwives and doctors for services. Financial innovations emerged later, such as communities experimenting with paying caregivers on retainer and guilds pooling members' contributions to create insurance funds (Savedoff and Smith 2011). Broader social and political change has led most countries to adopt increasingly more prominent roles for government in promoting the expansion of non-governmental insurance institutions, establishing government-run insurance funds, or creating publicly-financed healthcare services.

These institutional changes in health financing are also related to economic and technological changes. Rising productivity has increased incomes, allowing households to spend more on healthcare services and providing a larger tax base for government programs. Technological change is another important driver of increased health spending, creating new services that contribute to maintaining or improving health. The decline in the out-of-pocket share, however, is driven primarily by the process of incorporating larger segments of the population into pooled health financing arrangements, whether

through enrolment in insurance schemes or as citizens in countries with publicly-provided care.

The easiest way to picture the health financing transition is as a rise in total health spending per person, accompanied by a less than proportional increase in out-of-pocket health spending. For example, from 1960 to 2008, health expenditures in the United States grew by more than 10 percent annually, from $148 to $7,668 per person, but out-of-pocket health expenditures grew only half as fast. As a result, such out-of-pocket spending fell from 47 percent of total health expenditure in 1960 to just 12 percent in 2008. A similar pattern can be seen in Japan where the out-of-pocket spending share fell from 40 percent to 20 percent between 1960 and 2008 (see figure 1 and Savedoff et al. 2012b).

Figure 1. Rising health expenditures and pooled shares in the United States and Japan



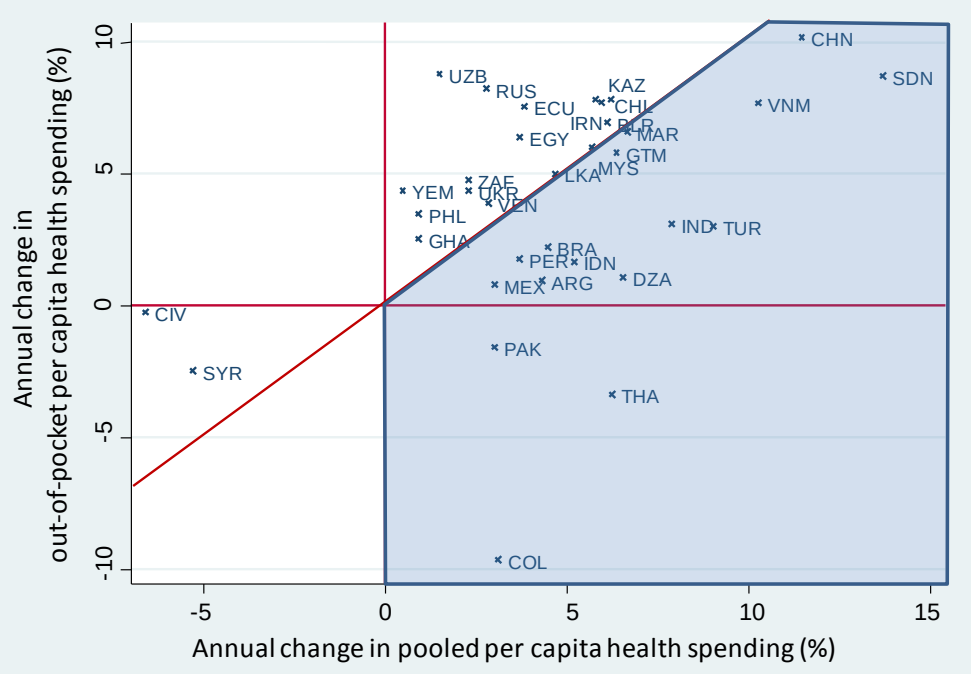
Source: Savedoff et al. 2012 using data from the Centers for Medicare and Medicaid Services for the United States and OECD for Japan.
Note: All expenditures are per capita in 2005 PPP$.

Even in shorter time frames, significant movement through the health financing transition can be observed. In our study, we will present findings that indicate that the share of out-of-pocket expenditures declined by 0.2 percentage points annually between 1995 and 2009 in a sample of 126 countries, after controlling for income and other factors. This shift is most apparent among the 46 low-income countries in which pooled health expenditures – i.e. health expenditures not funded out-of-pocket but rather through government or other insurance mechanisms – rose from an average of 47 percent to 53 percent over this time period. By contrast, the pooled share among 23 high-income countries remained essentially the same at 82 percent.

In most countries, out-of-pocket spending increases in absolute terms but its share of total health spending declines because pooled expenditures grow even faster (see figure 2). Three important patterns for the health financing transition are apparent when comparing the rate at which out-of-pocket and pooled spending change:

1. When pooled health expenditures rise and out-of-pocket spending declines or stays the same, countries move rapidly through the health financing transition (countries in the lower-right quadrant of figure 2). For example, Thailand's pooled health spending rose 6.2 percent annually, while out-of-pocket health spending fell by 3.4 percent annually. As a result, the pooled share of total health spending grew significantly, from 57 to 84 percent.
2. When pooled health spending rises faster than the pace at which out-of-pocket spending rises, countries progress through the health financing transition more slowly (countries in the lower triangle within the top-right quadrant of figure 2). For example, Brazil's pooled health spending rose 4.7 percent annually, twice the rate of out-of-pocket health spending which grew 2.2 percent annually. The pooled share of total health spending therefore rose from 61 to 69 percent.
3. When pooled health spending grows more slowly than out-of-pocket spending, countries regress (countries in the upper triangle within the top-right quadrant of figure 2). For example, pooled health spending in the Philippines grew 2.3 percent annually but out-of-pocket health spending grew even faster at a 3.5 percent rate. Therefore, the pooled share of total health spending fell from 50 to 46 percent.

Figure 2. Changes in pooled and out-of-pocket health spending, 1995-2009



Notes: Three-letter ISO country codes are displayed. Includes countries that had more than 1 million people in 1995 and which were classified in World Bank income groups 2 and 3 in 2012. Annual changes are calculated for per capita expenditures.

These varied experiences over a 15-year period reinforce the point that the health financing transition is not inevitable or automatic. Nevertheless, the majority of countries are clearly moving along this path and, when considered in a longer time frame, the social and political forces that have led most countries toward increasing shares of pooled health expenditures are likely to be apparent, even where the transition appears to be stagnant or

regressing. Researchers have analyzed the wide range of financial institutions that characterize diverse health systems and sought to understand the determinants of health spending, but few have examined the determinants of the composition of health spending and even fewer have analyzed these trends within an encompassing framework. The health financing transition provides such a framework.

Determinants of total health expenditures

Why does total health spending rise? Researchers have identified five major sources of expenditure growth: rising income; changes in medical technology and practices; population aging; higher prices; and changes in the financing and management of healthcare. Of these, income and technology are the most significant. Population aging has an impact that is more modest, while prices appear to contribute little to rising health expenditures.

National income growth explains much of the growth in total health spending. Initial studies using cross-country analyses estimated that a 1 percent increase in national income was associated with anywhere from 1.1 to 1.5 percent more health spending.[2] However, these findings from aggregate data were not consistent with micro-level analyses that show income elasticities range as low as 0.1 (Manning et al. 1987; Wagstaff 1986). The availability of panel data has allowed researchers to make more accurate measurements, finding that the income elasticity of total health spending is between 0.6 and 0.9 (Gerdtham and Jönsson 2000; Baltagi and Moscone 2010; Xu et al. 2011).

If income were the only factor, these new estimates suggest that health spending should *decline* as a share of income over time. This is effectively what happens in most countries with spending on normal goods such as clothing and food – spending on these normal goods rises with income but not as quickly and so their income shares decline. The finding that income causes less than proportional increases in health spending is consistent with the observation that countries are spending larger shares of income on health because factors other than income are also contributing to increased health spending.

Advances in medical technology contribute to rising health spending. The invention of new and improved medical interventions expands the kinds of health services and associated health benefits that can be obtained, thereby making it possible to spend more on healthcare. However, technological advances can also reduce spending by increasing productivity, providing similar services at lower cost through, for example, faster diagnostic testing, improved drugs, less invasive surgical procedures, shorter hospital stays, or delaying the onset of symptoms. The impact of technology on spending is thus an empirical question.

[2] See studies cited in Gerdtham and Jönsson 2000, as well as Musgrove et al. 2002 and van der Gaag and Štimac 2008.

Researchers have assessed the impact of technology on health spending in different ways. Using growth accounting frameworks, studies have estimated the contribution of observable factors such as income growth and population aging to health spending growth and have calculated the residual which can be attributed to unobservable changes, e.g. in technology.[3] In France between 1992 and 2000, morbidity for each age group declined, yet utilization of care increased. By decomposing these effects, Dormont et al. (2006) show that changes in medical practices and the application of new technologies explain about a third of the increase in total health spending in that period.

An alternative approach analyzes the utilization and costs of specific medical innovations – such as angioplasty, cataract surgery, and depression – to directly measure changes in productivity. Such studies find that most innovations reduce the unit cost of additional health benefits over time. They explain the rise in aggregate health spending as the result of more people being treated for more conditions and gaining more health benefits (Cutler and McClellan 2001).

Populating aging contributes modestly to health spending. Older people generally consume more healthcare services, so population aging is often blamed for rising health costs. Yet the same demographic and epidemiologic transitions that contribute to population aging are characterized by populations that are in better health and experience fewer health problems than people at similar ages in earlier generations (Fogel 2004; Freedman et al. 2002; Dormont et al. 2006). In addition, healthcare spending is more closely associated with an individual's proximity to death than it is to their age (Lubitz and Reilly 1993; Zweifel et al. 1999). As people live longer, these end-of-life expenditures are delayed, reducing the current aggregate financial burden.

Thus, most studies have found that population aging has only a limited impact on health spending. Using data from 20 countries between 1960 and 1988, Getzen (1992) shows that the correlation between health spending and population aging tends to disappear once changes in income and other time trends are accounted for. Studies of specific countries like the United States and France demonstrate that aging cannot account for observed growth rates in spending (Newhouse 1992; Dormont et al. 2006). Dormont et al. (2010) describe this as a common pattern of "healthy aging" and project that demographic changes will contribute modestly to increased health spending in OECD countries over the next fifty years. The effects of aging in non-OECD countries over the next few decades are likely to be smaller wherever the demographic transition is less advanced. The exceptions are countries with a continuing high burden of infectious disease, especially those with high prevalence of HIV/AIDS.

Prices for medical services do not explain rising health spending. Many observers have assumed that price inflation contributes to rising health expenditures because health care is a labor-intensive service sector, like education and the arts, and therefore subject to Baumol's "Cost Disease" (Baumol and Bowen 1966). However, health care is actually characterized

[3] See Chernew and Newhouse (2011) for a review of this literature.

by rapid productivity gains which are poorly measured and therefore fail to be incorporated in price indicators, leading to overestimates of health care inflation (Cutler and McClellan 2001; Chernew and Newhouse 2012).

Studies that demonstrate declining costs per unit of health gain seem to contradict the common view that health care is growing more and more expensive. The explanation for this apparent contradiction is that the most expensive and recently introduced treatments are foremost in people's minds when they think about the cost of care. Less salient are older technologies, including off-patent drugs and routine surgeries, as well as the additional health benefits that become possible with improvements. The overall cost of medical care has increased in every country because more, better quality, and newer services are being provided.

Health spending is influenced by healthcare financing, payment, and organization. Rising health expenditures can be explained in part by the expansion of insurance coverage. As health spending shifts from out-of-pocket expenditures toward pooled financing, moral hazard occurs (i.e. the tendency for people to use more of a service when the marginal cost is paid, in whole or in part, by someone else). This is an explicit goal of many public health programs and social insurance policies which seek to encourage people to use necessary health care services. Questions arise whether such health policies can simultaneously limit unnecessary care. Indeed, countries have experimented with containing costs through a range of mechanisms: establishing global budgets, regulating fees, restructuring provider payments to encourage efficient care, and limiting the adoption of new technologies with cost-effectiveness criteria (Gerdtham and Jönsson 2000; Docteur and Oxley 2003; Roberts et al. 2008).

Studies of households confirm that being insured increases utilization of care, but that being insured does not in itself account for the observed increases in health spending. The spread of health insurance in the United States from 1950 to 1980 can only account for a 50 percent increase in demand over that time period when real per capita expenditures grew by a factor of five (Manning et al. 1987; Newhouse 1992). Studies in other countries also confirm that household utilization of care increases with insurance, but not at rates required to account for most of the increased aggregate spending on health (Manning et al. 1987; Newhouse 1992; Docteur and Oxley 2003; Escobar et al. 2010).

Findings from cross-country studies are ambiguous at best. The available research does not present consistent results regarding the impact of different institutional arrangements – such as social insurance, integrated public provision, or separation of financing and provision – on total health spending (Leu 1986; Gerdtham and Jönsson 2000). There is little evidence that private insurance competition constrains spending, and in fact in the United States, public health spending has tended to grow more slowly than private insurance spending (Boccuti and Moon 2003). Xu et al. (2011) investigated whether 'mixed systems' – those in which financing arrangements are not dominated by either social insurance or government-financed care – may be less effective at controlling costs, but their analysis concludes by rejecting this hypothesis. Overall, the estimated effects of

different institutional arrangements tend to be small and are not robust to changes in samples or model specifications.

In sum, research shows that health expenditures are driven mainly by rising income and technology, with a modest contribution from population aging. The increasing burden of health spending for an aging population is mostly offset by the declines in age-specific morbidities. The shift from out-of-pocket spending toward pooled funding has an ambiguous effect; it clearly increases utilization of care, but it does not account for the rise in health spending in most countries. Therefore, healthcare institutions must be simultaneously increasing access to care and somehow offsetting the expected impact on total spending. While rising prices are often blamed for increases in health spending, this is largely due to the visibility of new and costly technologies. Many technological advances actually reduce the price of health benefits, with most studies demonstrating that changing medical practices and rising utilization are the main channels by which medical technology affects health spending growth. In general countries are spending more on healthcare largely because they are buying more health benefits with their growing incomes and improved technologies.

Determinants of out-of-pocket spending

Whereas many studies have explored the determinants of total health spending, few studies have examined its changing composition. In particular, the declining share of out-of-pocket spending and its complement, the rising share of pooled health spending, are extremely widespread phenomena with little explicit theoretical or empirical examination. A basic economic explanation for this shift toward pooled health spending would be the incentive for households to purchase insurance and reap welfare gains from pooling risk (Arrow 1963). Yet the early and major expansions of health insurance did not occur in response to market opportunities; rather, they emerged primarily through such non-profit collective initiatives as cooperatives, community associations, occupational guilds, and unions. For-profit health insurance has become significant only in countries with substantial public intervention to regulate or subsidize health insurance markets and represents a small share of health spending around the world (Sekhri and Savedoff 2005).

Only a handful of studies consider the determinants of public spending on health, aggregate out-of-pocket health spending, or the composition of total health spending from an economic perspective (Xu et al. 2011; Clemente et al. 2004; Hughes Tuohy, Flood, and Stabile 2004; Musgrove, Zeramdini, and Carrin 2002; Götze and Schmid 2012). While these studies analyze the composition of health expenditures, they do not provide explicit economic theories. Over time, nation-states have played an increasingly larger role in organizing health sector financing and are now the dominant forces in expanding the pooled share of health spending. Thus, the trend of declining out-of-pocket health spending and rise in pooled health financing mechanisms is more a political than an economic process and one which is generally characterized by social movements striving for universal health coverage (Immergut 1992; Bump 2010; Savedoff and Smith 2011).

Methodology

To analyze the determinants of total health spending and its major components, we apply econometric methods to a dataset of 126 countries from 1995 to 2009. We present regressions on the outcomes of interest in levels and in first-differences. We also test for and address cross-sectional dependence, serial correlation, and unit roots.

Data

Our analysis uses a WHO database with variables on health expenditure for 126 countries from 1995 to 2009 (WHO 2012). Using national health account methods, the WHO developed this database to track total spending in the health sector from all sources with information that is internationally comparable. The WHO updates the data annually by collecting, adjusting, and estimating the data based on reports from each country's government as well as international organizations. The estimates are then sent to each country's Ministry of Health for validation.

The variable "total health spending" includes all expenditures for healthcare services. This variable sums two parts, consumption of healthcare goods and services (by households, government, and non-profit institutions) and gross capital formation (i.e. demand for capital goods by health providers) (OECD, Eurostat, and WHO 2011). The variable "government health spending" is defined as all expenditures for healthcare that are financed through taxes or publicly mandated insurance contributions. The variable "out-of-pocket health spending" measures private expenditures that households pay for healthcare services directly to providers when they utilize such services. Note that the sum of government health spending and out-of-pocket health spending does not equal to total health expenditure. The residual contains non-government prepaid spending (e.g. through private insurance, non-profit institutions, or medical savings accounts) and some external resources. Foreign aid, however, can be spent through public or private channels and is not necessarily captured within this residual.

In addition to total health spending and its components, we are interested in analyzing out-of-pocket spending as a share of total health spending. Two other variables are included because of their likely impact on health spending and its components. The first of these is government expenditure as a proportion of gross domestic product (GE/GDP) which measures the capacity of governments to mobilize revenues. Countries with higher GE/GDP have the resources to implement public health policies at the same time that they have the discretion to allocate those resources to other priorities. The second variable is the proportion of the population aged 60 and older which is an indication of population aging. Whether population aging contributes to aggregate health spending growth is an empirical question as discussed previously.

WHO's dataset includes information on 144 countries. Our analysis focused on the 126 countries which had complete data on the variables of interest from 1995 to 2009. Sixteen countries were excluded because of missing data in one or more years (Afghanistan,

Bahrain, Cyprus, Guinea, Guyana, Kuwait, Malawi, Malta, Montenegro, New Zealand, Oman, Qatar, Romania, Sierra Leone, South Korea, and Suriname) and 2 countries were excluded because the data, in our judgment, appeared to be inconsistent with other information (Democratic Republic of Congo and Zimbabwe).

Table 2 presents a summary of this dataset. The table shows that on average a country's total health expenditure accounts for 6.2% of GDP and that out-of-pocket health spending accounts for 36.3% of total health expenditure. Table 2 also indicates that government health expenditure per capita (GHEpc) and out-of-pocket health expenditure per capita (OOPpc) account for the most of a country's total health expenditure per capita (THEpc).

Table 2. Means of variables in panel dataset

Variable	**Mean**	**SD**
Gross domestic product per capita (GDPpc)	10,233	12,008
Total health expenditure per capita (THEpc)	756	1,069
Government health expenditure per capita (GHEpc)	524	802
Out-of-pocket health expenditure per capita (OOPpc)	173	200
THE as proportion of GDP	0.062	0.221
OOP as proportion of THE	0.363	0.195
Proportion population over age 60	0.117	0.750
Proportion government expenditure of GDP	0.314	0.116

Notes: Variables are summarized for 126 countries which form a balanced panel over 1995-2009 as explained in the text. GDP per capita and health expenditure variables are all in 2005 PPP$.

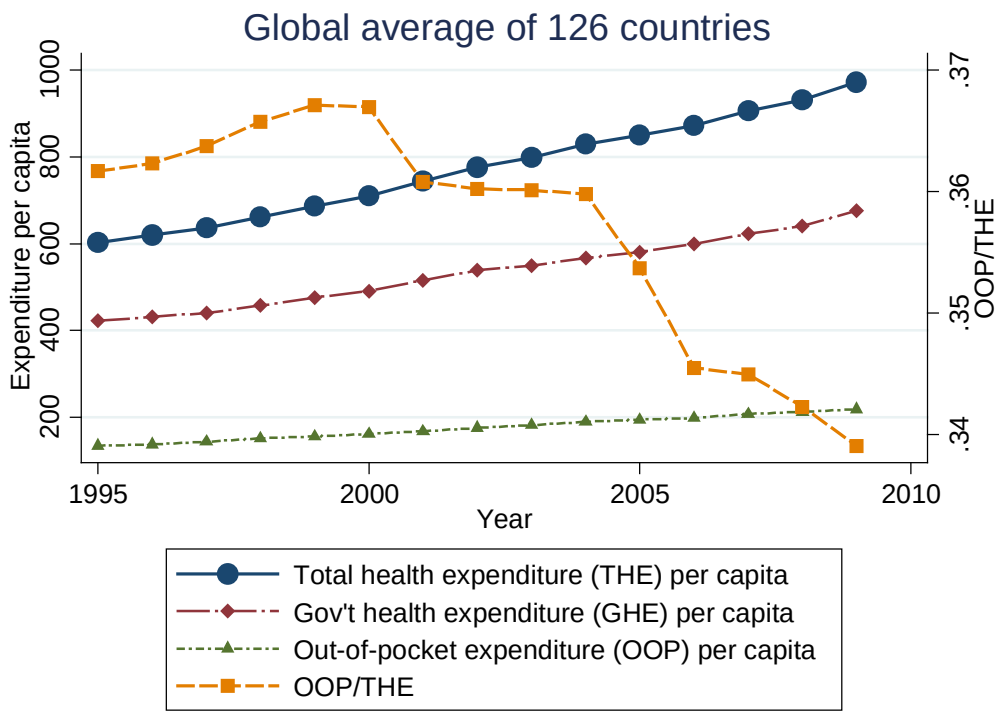
Figure 3 presents trends in the health financing transition – the increase in total health spending on the left y-axis and the decline of out-of-pocket spending as a fraction of total health spending (OOP/THE) on the right y-axis – and suggests that between 1995 and 2009 total health spending increased and the out-of-pocket share declined modestly. Table 3 also shows that the two trends of the health financing transition are occurring in most countries. Between 1995 and 2009, 119 out of 126 countries experienced an increase in THEpc (see table 3). Over the same period, GHEpc rose in 112 countries and OOPpc rose in 104 countries. In 67 of the countries, OOP/THE declined or stayed constant.

Table 3. Number of countries by changes in health spending, 1995-2009

	GHEpc		**OOPpc**		**OOP/THE**		
THEpc	*– / 0*	+	*– / 0*	+	*– / 0*	+	*Total*
– / 0	6	1	6	1	3	4	7
+	7	112	15	104	64	55	119
Total	13	113	21	105	67	59	126

Notes: – / 0 indicates the variable decreased or stayed the same; + indicates that the variable increased.

Figure 3. Total health expenditure and out-of-pocket spending as a share of total health expenditure, 1995-2009



Note: Figure drawn by authors using dataset described in text.

Estimation strategy

Our main regression is a fixed-effects model:

$$y_{it} = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \gamma \cdot t + \delta_i + \varepsilon_{it} \quad (1)$$

for country i in year t with a dependent variable y_{it}, which refers to the two main outcomes estimated in separate regressions – THEpc in natural logs and OOP/THE. The main independent variable of interest x_1 is per capita gross domestic product (GDPpc) in natural logs. In successive regressions, we included three other variables of interest, t, x_2 and x_3, which refer respectively to a year trend, government expenditure as a proportion of gross domestic product (GE/GDP), and the proportion of the population aged 60 and older. The coefficient γ will measure an annual rate of change over time in the dependent variable when the model is log-linear. This time trend measures any consistent annual changes that are not explained by other variables (such as income and population aging), and must be modeled for a weakly dependent trending series. In addition, δ_i is a vector of country fixed effects that capture time-invariant unobserved characteristics and ε_{it} is an error term. Robust standard errors clustered at country level were applied.

Our analysis of OOP/THE uses a similar model to equation (1) to test whether this variable is declining over time, *ceteris paribus*, and to test which factors other than time are associated with this dependent variable. If the coefficient γ on the year variable t is

negative, it indicates a linear declining trend in the dependent variable. Because the proportions range from 0 to 1, a linear probability model may produce incorrect standard errors even after correcting for heteroskedasticity with robust clustered standard errors. Hence, to check this result, we also estimate a generalized linear model (GLM) with a logit link function for a binomial distribution (Papke and Wooldridge 1996; McCullagh and Nelder 1989).

Based on the literature, we expect that THEpc is positively associated with GDPpc, GE/GDP, time, and proportion population aged 60 and older. If the coefficient on income is positive but less than one, then it will confirm the prevailing view that health is a normal good, not a luxury good (Getzen 2000). A key hypothesis of the health financing transition is that OOP/THE is decreasing over time, which would be captured by the time trend in regressions on OOP/THE. Based on our literature review, the most likely interpretation of this time trend is the effect of changing technology and medical practices. With regard to the components of total health expenditure – GHEpc and OOPpc – the literature provides less guidance; however, we expect each of these variables to be positively associated with income and with older populations. A priori, a secular time trend in these components could be positive or negative – positive if changing medical practices drive up government and out-of-pocket spending or negative if institutional changes mitigate and offset the pressures to increase spending.

In addition to the fixed effects estimator, we estimated a first differences model which is also unbiased and consistent if country fixed effects are correlated with other independent variables:

$$(y_{it} - y_{i,t-1}) = \mathrm{B}_1(x_{1,it} - x_{1,i,t-1}) + \mathrm{B}_2(x_{2,it} - x_{2,i,t-1}) + \mathrm{B}_3(x_{3,it} - x_{3,i,t-1}) + \Gamma + (\varepsilon_{it} - \varepsilon_{i,t-1}) \quad (2)$$

Our first differences model includes an intercept Γ which captures a linear time trend. First differences of logs can be interpreted as a proportionate change in the dependent variable. Results from first differences and fixed effects will differ in the relative efficiency of the estimators, which is determined by serial correlation in the error term. When the error term is not serially correlated, then fixed effects is more efficient than first differencing. If the error term follows a random walk (i.e. has a unit root process and has substantial positive serial correlation), then the difference of the error term is serially uncorrelated (Wooldridge 2000).

Our specifications are somewhat similar to a recent study by Xu et al. (2011) which uses the same WHO dataset and estimates fixed effects and dynamic models for total health expenditure and its key components. One major difference is that while Xu et al. (2011) use fixed effects in levels and dynamic models, we use fixed effects in levels and in first differences. The studies also differ over the specification of income elasticities. Xu et al. (2011) is interested in assessing the degree to which income elasticities and other factors might vary across income categories. Thus, their study estimates four separate regressions by dividing the WHO dataset into four income groups – low, lower middle, upper middle, and high. We build on the work in this earlier paper by testing for unit roots,

autocorrelation, and cross-sectional dependence, and judge the first-differences model to provide better estimates than the level fixed-effects models.

We checked the robustness of the fixed effects regressions by including dummy variables that capture year-specific shocks to health spending that would not otherwise be captured in the time trend variable. We also checked whether our findings were robust to the inclusion of countries that lacked data in one or more years (available upon request). We present variations of the main regressions with covariates included successively as an indication of consistency.

Cross-sectional dependence, autocorrelation, and unit roots

One obstacle to deriving accurate conclusions from our model is that the estimates may be biased if the panel data exhibits cross-sectional dependence. In our dataset, cross-sectional dependence would occur, for example, if health spending in a particular country and year were systematically influenced by similar changes in a neighboring country. Given that our dataset which has a relatively small number of years (T) and large number of countries (N), we use the Pesaran (2004) test for cross-sectional dependence (CD). A second problem commonly found in panel data analysis occurs when shocks in a given year are correlated with shocks in earlier years, known as auto-correlation, which would render standard errors not robust. Hence we conduct the Arellano-Bond (1991) test for autocorrelation (Roodman 2006).

Our estimates from level regressions will also be biased if the dependent variable exhibits a unit root process. Therefore, we test for unit root processes in the levels of each dependent variable using the augmented Dickey-Fuller (ADF) regression:

$$\Delta y_t = \alpha + \theta y_{t-1} + \rho t + \sum_{1}^{p} \gamma_p \Delta y_{t-p} + \varepsilon_t \quad (3)$$

The null hypothesis is $\theta = 0$ (that y_{it} has a unit root) and the one-side alternative is $\theta < 0$. We conduct the ADF test for up to three lags p, and also test whether the dependent variable is trend-stationary ($\rho_i = 0$). We conduct panel unit root tests which assume cross-sectional independence (i.e. Im, Pesaran, and Shin 2003; Maddala and Wu 1999). The test proposed by Im, Pesaran and Shin (IPS) involves separate unit root tests for each country *i*, after which the ADF t-statistic is then averaged for all countries:

$$\tilde{t}_{NT} = \frac{1}{N}\sum_{i=1}^{N} t_{iT}(\theta_i, \rho_i, \gamma_{i,p}) \quad (4)$$

Similarly to aggregate country-specific tests into a global test, Maddala and Wu (1999) proposed a Fisher-type statistic using the p-values of the test, e.g. ADF as follows:

$$P = -2\sum_{i=1}^{N} \log(p_i) \quad (5)$$

which has a chi-square distribution with 2N degrees of freedom. Both of these tests assume cross-sectional independence. If we fail to reject the null (i.e., the presence of a unit root), then regressions in levels may be spurious. In contrast, as noted earlier, the

error term is serially uncorrelated in regressions in first-differences where the variable has a unit root (integrated at order one).

Results

Overall, our findings are consistent with the idea of a health financing transition. We found statistically significant increases in total health spending between 1995 and 2009, and declines in the out-of-pocket share of health spending over the same period. The rise in health spending is due in part to rising incomes, with an income elasticity that is positive but less than one. Total health spending also exhibits an underlying upward trend which is consistent with other research regarding the impact of changing medical practices and technology on health spending. Government capacity to raise revenues is a significant factor in explaining changes in total health spending but not in the out-of-pocket share of spending. Population aging appears to be a factor in explaining government health spending, but does not influence total health spending.

Total health spending and its components

Table 4 presents regressions in which the dependent variable is total health expenditure per capita. The key findings relate to the income elasticity, time trends, and the significance of other factors.

The first column of table 4 presents a naïve regression in which, other than country fixed effects and a constant, the only dependent variable is national income. The income elasticity is estimated to be 1.15, comparable to estimates in studies which use cross-section data (Kleiman 1974; Newhouse 1977; Leu 1986; Schieber and Maeda 1999; Musgrove et al. 2002; van der Gaag and Štimac 2008). Including a time trend in the regression, as shown in the second column, generates an estimated income elasticity of 0.9, comparable to more recent studies which rely on panel data which can control for a range of problems that introduce bias in cross-section analysis (Gerdtham and Jönsson 2000; Baltagi and Moscone 2010; Xu et al. 2011). While additional explanatory variables (government expenditure and population aging) are sometimes statistically significant, they do not significantly alter the coefficient for national income in the level fixed effects models.

Table 4. Regressions for total health expenditure per capita

	(1)	(2)	(3)	(4)	(5)	(6) FD	(7)	(8) FD
Ln(GDPpc)	1.150***	0.896***	0.914***	0.915***	0.932***	0.708***	0.904***	0.723***
	(0.049)	(0.067)	(0.066)	(0.066)	(0.067)	(0.064)	(0.067)	(0.0607)
Proportion GE/GDP			0.938***	0.945***	0.948***	0.648***	1.024***	0.637***
			(0.148)	(0.148)	(0.154)	(0.111)	(0.146)	(0.113)
Proportion age 60+				0.914	1.053	0.626	1.967*	1.870*
				(0.893)	(0.923)	(0.812)	(1.066)	(0.961)
Year		0.013***	0.011***	0.010***	0.011***		0.001	

		(0.003)	(0.003)	(0.003)	(0.003)		(0.005)	
Constant	-4.129***	-27.374***	-25.176***	-22.906***	-24.535***	0.018***	-3.736	0.009**
	(0.421)	(5.003)	(4.731)	(5.722)	(5.541)	(0.003)	(9.374)	(0.004)
R^2 Within	0.717	0.740	0.765	0.765	0.767	0.177	0.780	0.220
F-statistic	547.4	366.8	263.5	217.3	63.6	42.4	125.3	24.46
Time FEs					Yes			
Reg'l dum							Yes	Yes
CD	Yes	Yes	Yes	Yes	No	Yes	No	No
AR(1)	6.83	6.64	6.54	6.51	6.46	-1.05	6.93	-1.06
	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.2936	<0.0001	0.2875

Notes: 1890 observations and 126 countries. Dependent variable is transformed into natural log. Robust standard errors clustered by country are in parentheses. *** Significant at 1%; ** Significant at 5%; * Significant at 10%. CD refers to the results of tests for cross-sectional dependence. AR(1) tests the null of no first-order autocorrelation.

As discussed above, the estimates in the level fixed-effects models may be biased if the error terms in the panel data are autocorrelated. In fact, in all six level fixed-effect models, the assumption that there is no autocorrelation is rejected. Fortunately, the first-differences models presented in columns 6 and 8 of table 4 are consistent with the assumption of no autocorrelation in the error terms and the fixed-differences model is therefore, in our judgment, the preferred specification.

The estimates are also subject to bias when the data has cross-sectional dependence, as indicated by the CD test in the first six columns of table 4. Following Baltagi and Moscone (2010), we address this problem by including regional averages of the dependent variable and independent variables for both the level fixed-effects and first-differences models (see columns 7 and 8 in table 4). With this addition to the specification, the regressions no longer exhibit cross-sectional dependence. Therefore, the first-differences model in the final column of table 4 remains our preferred specification.

The income elasticity increases slightly when including cross-sectional averaged variables, and is notably higher than the estimate of 0.446 which Baltagi and Moscone (2010) obtain for OECD countries in a regression with cross-sectional average of the dependent and independent variables.

Table 5. Unit root tests

	IPS unit root tests				
Variable	*L0*	*L0 Trend*	*L1 Trend*	*L2 Trend*	*L3 Trend*
GDPpc	13.20	1.86	2.78	1.64	4.14
THEpc	8.79	-6.14***	-0.86	-0.23	-1.71**
GHEpc	8.13	-6.01***	0.80	0.51	-0.77
OOPpc	8.46	-6.59***	-1.23	0.56	0.27
OOP/THE	0.29	-5.93***	0.14	-1.58*	1.67
	Fisher-type ADF				
Variable	*L0*	*L0 Trend*	*L1 Trend*	*L2 Trend*	*L3 Trend*

GDPpc	167.9	224.8	310.5***	268.9	248.6
THEpc	286.1	383.2***	377.6***	319.3***	401.6***
GHEpc	241.6	329.9***	331.9***	343.3***	436.7***
OOPpc	415.2***	345.9***	394.6***	345.3***	304.8***
OOP/THE	347.9***	280.1	373.5***	403.8***	268.6

Notes: *** significant at 1%; ** significant at 5%; * significant at 10%. For IPS unit root tests, t-tilde-bar values are presented. For Fisher-type ADF tests, inverse chi-squared statistics are presented. Natural logs of per capita variables were used. 'L' refers to the number of lags included and 'trend' indicates a test for trend-stationarity.

In terms of unit roots, both the IPS and the Fisher-type ADF tests suggest that at least one of the country series is stationary for the main dependent variables of interest (see table 5). The IPS test rejects the null hypothesis of a unit root except when lags are included. The Fisher-type ADF tests also reject the null in most cases, even when lags are included, except for the cases of GDP per capita and the out-of-pocket share of health spending. These results would suggest that non-stationarity is not a serious problem except for the fact that these unit root tests are not robust in the presence of cross-sectional dependence. Nevertheless, our tests for unit roots are similar to those found in Baltagi and Moscone (2010) who additionally apply a novel test that accounts for cross-sectional dependence, leading them to reject the hypothesis of a unit root when variables are analyzed in first-differences. This also confirms our preference for the results of the first-differences models.

The first-differences model that addresses cross-sectional dependence (column 8 in table 4) yields an estimate of 0.723 for the income elasticity of total health expenditure, which is significantly lower than the estimates in the level fixed-effects model and slightly higher than in the first-differences model that ignores cross-sectional dependence. The estimate of 0.723 is similar to the income elasticity of 0.674 presented by Baltagi and Moscone (2010) for a regression that addresses cross-sectional dependence without covariates. However, our estimate is higher than the estimate of 0.446 which they derive when covariates are included.

Our confidence in the first-differences model is strengthened by the results of regressions analyzing government health expenditure and out-of-pocket expenditures, shown in tables 6 and 7. In both cases, the level fixed-effects models generate income elasticities that are greater than one. Since these two categories explain 98% of the variance in total health expenditure, it seems inconsistent for the income elasticity of total health expenditure to be 0.9, while the income elasticities of both of its major components are greater than one. By contrast, the first-differences model generates estimates that are consistent with the income elasticity for total health expenditure. The first-differences models yield an income elasticity of 0.760 for government health expenditures and 0.695 for out-of-pocket expenditures (column 8 in table 6 and 7 respectively), both of which are statistically indistinguishable from the income elasticity of 0.723 estimated for total health expenditure.

Table 6. Regressions for government health expenditure per capita

	(1)	(2)	(3)	(4)	(5)	(6) FD	(7)	(8) FD
Ln(GDPpc)	1.127***	1.004***	1.037***	1.044***	1.058***	0.691***	1.043***	0.760***
	(0.084)	(0.145)	(0.151)	(0.146)	(0.152)	(0.150)	(0.150)	(0.161)
Proportion GE/GDP			1.801***	1.840***	1.842***	1.401***	1.923***	1.460***
			(0.284)	(0.286)	(0.302)	(0.246)	(0.314)	(0.270)
Proportion age 60+				5.048**	5.177**	4.263*	3.995**	2.070
				(2.030)	(2.156)	(2.233)	(1.983)	(2.067)
Year		0.006	0.004	-0.003	-0.003		0.005	
		(0.006)	(0.006)	(0.007)	(0.008)		(0.008)	
Constant	-4.656***	-15.931	-11.710	0.834	0.772	0.009	-9.561	0.0142*
	(0.716)	(10.825)	(10.625)	(13.310)	(14.758)	(0.008)	(14.442)	(0.00823)
R^2 Within	0.384	0.387	0.437	0.446	0.449	0.064	0.471	0.110
F-statistic	181.9	97.86	66.05	69.17	19.74	18.72	42.62	9.82
Time FEs					Yes			
Reg'l dum							Yes	Yes
CD	Yes	Yes	Yes	No	No	Yes	No	No
AR(1)	5.98	6.07	5.73	5.70	5.70	-3.01	5.89	-3.14
	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0026	<0.0001	0.0017

Notes: 1890 observations and 126 countries. Dependent variable is transformed into natural log. Robust standard errors clustered by country are in parentheses. *** Significant at 1%; ** Significant at 5%; * Significant at 10%.

Table 7. Regressions for out-of-pocket health expenditure per capita

	(1)	(2)	(3)	(4)	(5)	(6) FD	(7)	(8) FD
Ln(GDPpc)	1.131***	1.094***	1.093***	1.098***	1.144***	0.705***	1.020***	0.695***
	(0.073)	(0.098)	(0.098)	(0.097)	(0.100)	(0.065)	(0.094)	(0.0605)
Proportion GE/GDP			-0.050	-0.023	-0.003	0.159*	0.147	0.157*
			(0.229)	(0.227)	(0.226)	(0.094)	(0.251)	(0.0944)
Proportion age 60+				3.504**	3.890**	2.705*	3.243	3.561**
				(1.753)	(1.795)	(1.488)	(2.143)	(1.555)
Year		0.002	0.002	-0.003	-0.002		-0.006	
		(0.004)	(0.004)	(0.005)	(0.005)		(0.006)	
Constant	-5.175***	-8.589	-8.706	0.001	-2.404	0.012***	8.064	0.00535
	(0.625)	(7.693)	(7.837)	(9.068)	(8.623)	(0.004)	(10.384)	(0.00404)
R^2 Within	0.509	0.509	0.509	0.515	0.524	0.081	0.544	0.117
F-statistic	240.8	125.6	90.49	70.84	26.10	39.34	44.41	27.49
Time FEs					Yes			
Reg'l dum							Yes	Yes
CD	Yes	Yes	Yes	Yes	No	Yes	No	No
AR(1)	5.16	5.15	5.16	5.13	5.03	0.77	5.27	0.56
	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.4426	<0.0001	0.5750

Notes: 1890 observations and 126 countries. Dependent variable is transformed into natural log. Robust standard

errors clustered by country are in parentheses. *** Significant at 1%; ** Significant at 5%; * Significant at 10%.

Our models for total health expenditures in table 4 show a significant upward trend over time that is not attributable to income or other included variables. Our preferred model (column 8 in table 4) estimates that total health expenditure per capita is rising at a rate of 0.9 percent per year. This trend appears to be driven more by changes in government health expenditures than out-of-pocket expenditures. The preferred model in table 6 (column 8) shows that per capita government health expenditures are rising by 1.42 percent per year after controlling for other factors, while per capita out-of-pocket expenditures, analyzed in table 7, do not display a statistically significant trend, *ceteris paribus*.

Our analysis included two additional factors: government revenue mobilization and population aging. Government capacity to mobilize revenues appears to be a robust factor in explaining total health spending. In the preferred model, a one percentage point increase in the share of national income raised and spent by the public sector is associated with an additional 0.637 percent in total health spending (see table 4). This impact on aggregate health spending is primarily due to the effect on government health spending rather than on out-of-pocket spending. Table 6 shows that a 1 percentage point increase in the share of national income raised and spent by the public sector is associated with a 1.46 percent increase in government health expenditures; while table 7 shows that the effect on out-of-pocket spending is only about 0.16 percent and marginally significant (less than 10%).

The results of our analysis for population aging suggest that it does contribute to higher total health spending, largely through its effect on out-of-pocket health expenditures, though the levels of significance are not strong. Our estimates show that a one percentage point increase in the share of the population accounted for by people over 60 years old is associated with about a 1.9 percent increase in total health expenditure (table 4), a 3.6 percent increase in out-of-pocket expenditures (see table 7), but no significant change in government health expenditures (see table 6). The findings that population aging is associated with rising expenditures are consistent with other studies like Dormont et al. 2010 which find significant though small effects.

Out-of-pocket share of total health spending

Our analysis detects a small decline in the out-of-pocket share of total health spending over the study period which is consistent with the second trend of the health financing transition. Table 8 shows a decline of between 0.2 and 0.4 percentage points in the out-of-pocket share each year, according to the level fixed-effects models (columns 2 through 5). The first-differences model, which lacks autocorrelation and cross-sectional dependence, measures a time trend of 0.2 percent that is marginally significant at the 10% level.

Table 8. Regressions for the out-of-pocket share of total health expenditure

	(1)	(2)	(3)	(4)	(5)	(6) GLM	(7) FD	(8)	(9) FD
Ln(GDPpc)	-0.022	0.036	0.030	0.031	0.040	1.090	-0.011	0.013	-0.0208
	(0.019)	(0.024)	(0.024)	(0.025)	(0.026)	(0.678)	(0.015)	(0.024)	(0.0170)
Proportion GE/GDP			-0.326***	-0.320***	-0.315***	-0.330***	-0.190***	-0.298***	-0.193***
			(0.056)	(0.056)	(0.056)	(0.060)	(0.035)	(0.060)	(0.0344)
Proportion age 60+				0.818*	0.896**	0.319*	0.558	0.351	0.544
				(0.438)	(0.452)	(0.182)	(0.363)	(0.534)	(0.386)
Year		-0.003***	-0.002**	-0.003***	-0.003***	-0.004***		-0.002	
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)		(0.001)	
Constant	0.543***	5.806***	5.041***	7.074***	6.734***		-0.002*	3.783	-0.002*
	(0.161)	(1.753)	(1.765)	(2.210)	(2.205)		(0.001)	(2.722)	(0.001)
R^2 Within	0.006	0.033	0.100	0.109	0.120	..	0.033	0.154	0.084
F-statistic	1.339	4.915	14.29	11.21	3.586	..	10.12	10.72	13.85
Time FEs					Yes				
Reg'l dum								Yes	Yes
CD	Yes	Yes	Yes	Yes	No	..	No	No	No
AR(1)	6.58	6.67	6.56	6.63	6.64	..	-0.90	6.58	-0.76
	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		0.3693	<0.0001	0.4470

Notes: 1890 observations and 126 countries. Robust standard errors clustered by country are in parentheses. For GLM in column (6), average marginal effects are presented. *** Significant at 1%; ** Significant at 5%; * Significant at 10%.

The linear approximation implied by these models may not be appropriate because the dependent variable is bounded (between 0 and 100 percent). Therefore, we estimated a generalized linear model (GLM) with logit link function (table 8, column 6). The coefficients estimated in this way are similar to the preceding linear models suggesting that the results of the linear approximation are robust.

Table 8 also analyzes the impact of national income, government capacity, and population aging on the out-of-pocket share of health spending. National income is not a significant factor, nor does population aging demonstrate a robust impact on the out-of-pocket share. The absence of a relationship between national income and the composition of health spending suggests that market forces and changes in effective demand are not primarily driving the decline in the out-of-pocket share of spending. By contrast, government capacity does appear to influence the composition of health spending. According to our analysis, a one percentage point increase in the share of government spending in national income is associated with a 0.193 percentage point decline in the out-of-pocket share. This relationship is consistent with research that attributes changes in the out-of-pocket share of health spending to political and governmental action.[4]

[4] We are not entirely confident of this argument because when we included government expenditure in a model explaining the level of out-of-pocket expenditures, expecting a negative and statistically significant coefficient, the result was a positive and statistically insignificant coefficient. Results of that regression are available upon request.

Implications for future health spending and its components

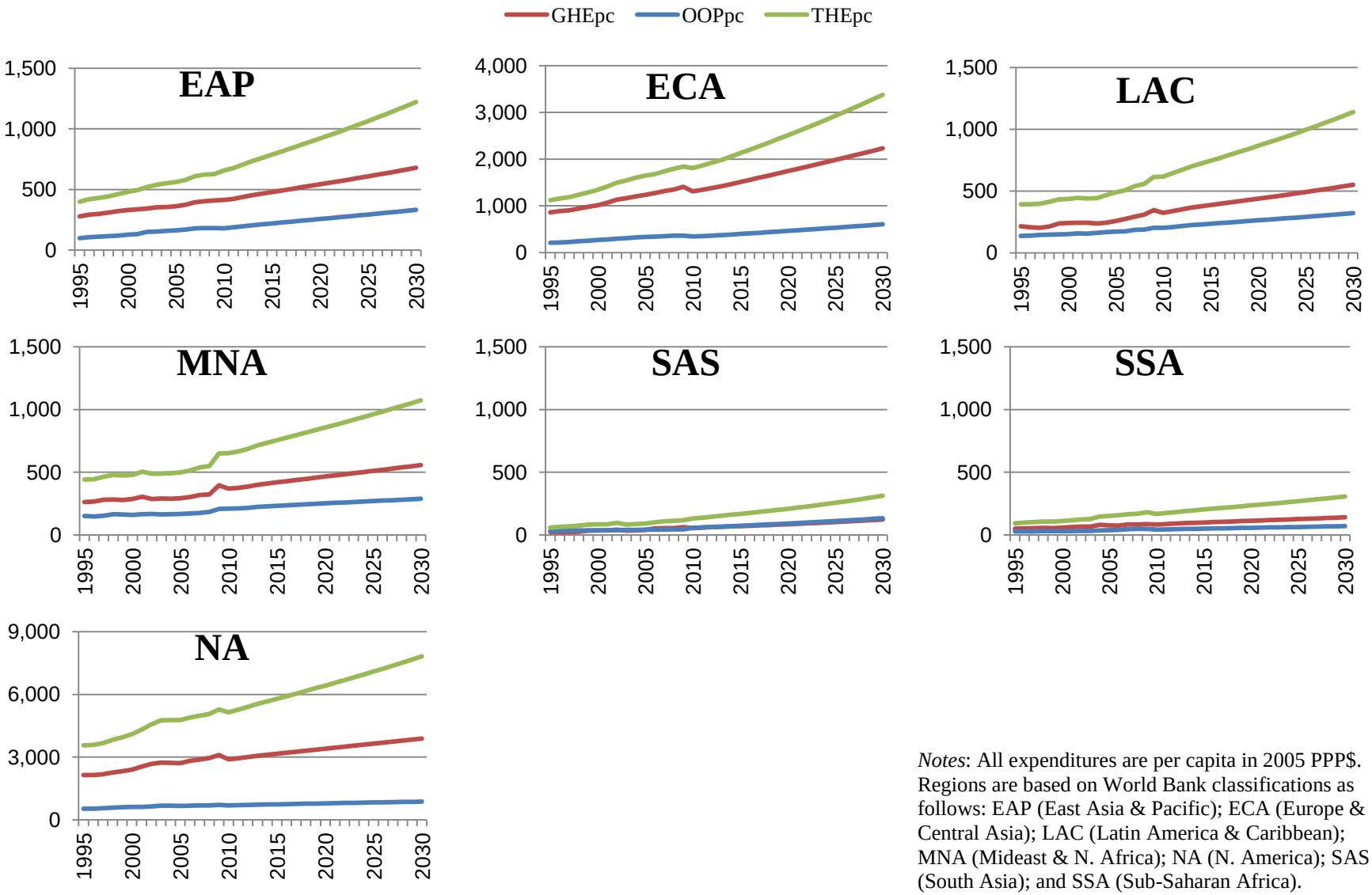
Since our analysis is consistent with the notion of a long-term health financing transition, we use our estimates to visualize future trends in health spending and its components through 2030. While a fully specified model would have been a better approximation, we did not have data on key explanatory variables projected into the future. Instead, we use the coefficients from column 2 in tables 4, 6 and 7 to project future health spending and its components. The projected spending levels are affected by the country dummies and a constant, while the trends are affected by the income and time coefficients. Thus, this exercise is strongly influenced by the underlying projections of per capita income, which we obtained from the Development Prospects Group of The World Bank. Moreover, estimates based only on income, time trend, and country fixed effects (in column 2) are likely to be an upper bound for per capita government health expenditures and out-of-pocket health expenditures, while the first-differences model suggests a more conservative role of income in projecting future such health expenditures and would likely be a lower bound estimate.

The equation used to calculate predicted per capita values for total health expenditure, government health expenditure, and out-of-pocket health expenditures is:

$$y_{it} = \alpha + \beta_1 x_1 + \gamma \cdot t + \delta_i \quad (6)$$

where the dependent variable (y_{it}) represents per capita expenditure for country *i* in year *t*; x_1 is the natural log of per capita gross domestic product; t is a year trend; δ_i is the vector of country fixed effects and α is a constant. The results of these projections are presented in figure 4 and table 9, denoted as 'high' projections.

Figure 4. Projections of total health expenditure: summary by geographic region



Notes: All expenditures are per capita in 2005 PPP$. Regions are based on World Bank classifications as follows: EAP (East Asia & Pacific); ECA (Europe & Central Asia); LAC (Latin America & Caribbean); MNA (Mideast & N. Africa); NA (N. America); SAS (South Asia); and SSA (Sub-Saharan Africa).

Table 9. Health expenditure per capita, out-of-pocket shares and shares of national income, 1995 to 2030 by region

Region	Total health exp.	Govt. health exp.	Out-of-pocket (OOP) health exp.	OOP share of total health exp.	Health exp. share of GDP	Total health exp.	Govt. health exp.	Out-of-pocket (OOP) health exp.	OOP share of total health exp.	Health exp. share of GDP
Original data										
	1995					**2009**				
EAP	398	278	99	0.365	0.041	626	410	183	0.331	0.049
ECA	1,120	861	210	0.270	0.068	1,840	1,405	360	0.283	0.082
LAC	394	215	137	0.393	0.063	615	347	203	0.353	0.07
MNA	443	262	151	0.414	0.053	650	395	208	0.406	0.059
NA	3,557	2,143	536	0.152	0.113	5,276	3,106	715	0.140	0.136
SAS	58	24	32	0.583	0.038	117	63	46	0.473	0.042
SSA	94	51	28	0.414	0.048	181	88	50	0.370	0.060
	2010					**2030**				
High projections										
EAP	656	413	181	0.344	0.049	1,221	679	332	0.312	0.060
ECA	1,808	1,310	344	0.285	0.079	3,374	2,230	604	0.261	0.096
LAC	617	325	202	0.358	0.069	1,140	551	321	0.309	0.086
MNA	651	369	210	0.382	0.061	1,073	557	289	0.321	0.076
NA	5,151	2,891	693	0.137	0.130	7,819	3,888	875	0.114	0.165
SAS	131	56	58	0.508	0.045	313	123	134	0.466	0.054
SSA	168	84	43	0.367	0.057	307	141	71	0.322	0.071
Medium projections										
EAP	609	351	161	0.331	0.046	1,132	575	296	0.3	0.056
ECA	1,677	1,112	307	0.274	0.073	3,127	1,889	538	0.251	0.089
LAC	573	275	180	0.344	0.064	1,057	467	286	0.297	0.080
MNA	604	313	187	0.367	0.056	994	472	257	0.309	0.071
NA	4,778	2,454	618	0.132	0.121	7,246	3,294	780	0.11	0.153
SAS	122	47	51	0.489	0.042	290	104	120	0.448	0.050
SSA	156	71	38	0.353	0.053	285	120	63	0.309	0.065
Low projections										
EAP	586	323	152	0.325	0.044	1,090	529	279	0.295	0.054
ECA	1,615	1,024	290	0.269	0.070	3,010	1,739	508	0.246	0.086
LAC	551	254	170	0.338	0.062	1,017	430	270	0.291	0.077
MNA	582	288	177	0.36	0.054	957	434	243	0.303	0.068
NA	4,601	2,261	584	0.129	0.117	6,976	3,033	736	0.107	0.147
SAS	117	44	48	0.479	0.040	279	96	113	0.439	0.048
SSA	150	66	36	0.346	0.051	274	110	60	0.303	0.063

Notes: All expenditures are per capita in 2005 PPP$. Regions are based on World Bank classifications as follows: EAP (East Asia & Pacific); ECA (Europe & Central Asia); LAC (Latin America & Caribbean); MNA (Mideast & N. Africa); NA (N. America); SAS (South Asia); and SSA (Sub-Saharan Africa).

Figure 4 illustrates health financing trends using actual data from 1995 to 2009 with the addition of our projections from 2010 to 2030. The figure shows average per capita expenditure across countries for each region. In each region, government health expenditure is larger than out-of-pocket expenditure, a difference which grows significantly over time. The one exception is the South Asia Region (SAS) which includes many countries where current government health expenditures are near or below the levels of out-of-pocket health spending.

Table 9 summarizes the original data and projected figures for total health expenditure per capita (THEpc) and its components (GHEpc and OOPpc), the out-of-pocket share (OOP/THE) and the share of health spending in GDP (THE/GDP). Total health expenditure per capita (in 2005 PPP$) is projected to more than double between 2010 and 2030 in the South Asia region (SAS), from $131 per capita to $313 per capita. Over the same time frame, total health expenditure is projected to grow 86 percent in East Asia and the Pacific (EAP) to $1221, 87 percent in Europe and Central Asia (ECA) to $3374, 85 percent in Latin America and the Caribbean (LAC) to $1140, and 83 percent in Sub-Saharan Africa (SSA) to $307. Growth in total health expenditure is expected to be more modest in the Middle East and North Africa (MNA), rising 65 percent to $1073; and in North America (NA) which is projected to grow 52 percent to $7819.

Table 9 also shows that, extrapolating from our model, out-of-pocket expenditures are expected to grow somewhat more quickly than government health expenditures in EAP, ECA and SAS and at about the same rate in SSA, with government health expenditure growing more rapidly than out-of-pocket expenditures in LAC, MNA and NA. Nevertheless, the relationship between out-of-pocket and total health expenditures shows a projected decline in all regions. The largest drop in the out-of-pocket share of total health expenditures is expected to take place in MNA, declining from 38.2 percent in 2010 to 32.1 percent in 2030. The smallest declines are projected to occur in the regions with more high-income countries: NA (from 13.7 percent to 11.4 percent) and ECA (from 28.5 percent to 26.1 percent). The South Asia region has the highest out-of-pocket share of all regions in 2010 at 56.8 percent and, even with a projected decline to 46.6 percent in 2030, it will remain significantly higher than other regions.

Due to the combination of income and time effects, total health expenditure as a share of GDP (THE/GDP) is projected to rise in all regions. The projected increase is highest in NA (from 13.0 to 16.5 percent of GDP) because this region's projected economic growth is slower than other regions and the relative contribution of the time trend for total health expenditure is therefore larger. In all other regions, the increase in the share of GDP spent on health is about one or two percentage points, being smallest in SAS (from 4.5 to 5.4 percent), EAP (from 4.9 to 6.0 percent) and SSA (from 5.7 to 7.1 percent).

Our estimates are uniformly high when compared with other recent international projections which focus primarily on OECD or high-income countries (OECD 2010, Garibaldi et al. 2010, and IMF 2010). The OECD (2010) report relied on official projections by countries along with an older set of cross-country projections. Garibaldi et al. (2010)

used different strategies but their main approach involved projecting health spending as a share of GDP, with projections further decomposed into a pure age effect, an adjustment for 'healthy aging', death-related costs, an income effect, and other non-aging residual effects. The methodological approach used by the IMF (2010) involved few explanatory variables and minimal modeling and, not surprisingly, developed projections which are closest to ours. Table 10 presents correlation coefficients between our projections and the other exercises. Our results were most strongly correlated with IMF (2010) and one set of results in Garibaldi et al. (2010). Our results were least correlated with national projections in OECD (2010); but these projections were also poorly correlated with IMF (2010) and Garibaldi et al. (2010).

Table 10. Comparison of projections: Pearson correlation coefficients

	(1)	(2)	(3)	(4)	(5)
OECD national (1)	1.00				
OECD low (2)	-0.26	1.00			
OECD high (3)	-0.21	1.00	1.00		
IMF (4)	0.20	-0.21	-0.19	1.00	
Garibaldi (5)	-0.16	0.04	0.04	0.48	1.00
Fan-Savedoff (6)	-0.09	0.19	0.19	0.87	0.76

Notes: (1) OECD (2010), national projections, 2050; (2) OECD (2006) low projections, 2050; (3) OECD (2006) high projections, 2050; (4) IMF (2010) projections, 2030; (5) Garibaldi et al. (2010), Table 4.1, 2050; (6) Fan and Savedoff, projections, 2030. Note that Fan-Savedoff high, medium, and low projections are perfectly correlated.

Because our initial projections appear to be high, we conducted a sensitivity analysis by calculating two more conservative estimates also presented in table 9. For these alternative projections, we maintained all of the coefficients in the regression but reduced the time trend by 1/50 and 1/75 of the standard error, corresponding to the 'low' and 'medium' projections, respectively, in table 9. The results in all cases project more modest changes in health spending and out-of-pocket shares. Even so, our more 'conservative' estimates remain high relative to the other studies.

The projections provide a crude illustration of how the health financing transition may look over the next twenty years. Based on our estimates from recent data, total health spending will approximately almost double in most regions between 2010 and 2030 and the out-of-pocket share of health spending is expected to decline modestly by between 2 and 6 percentage points. The actual evolution of these trends will be influenced by economic growth, changing medical practices, and demography. But it is public policy that will probably have the largest impact on the out-of-pocket share of spending, driving this change faster or slower than our projections would indicate.

Conclusions

This study began by proposing the health financing transition to describe two major trends that appear to characterize most countries: a long-term increase in health spending and a decline in the share of that spending that is paid out-of-pocket. We illustrated this transition with historical data and reviewed the literature to show that the transition is driven by economic, political and technological factors. While the health financing transition is meant to characterize long-term trends, we investigated whether we could detect such a pattern in recent cross-country data for a 15-year period. We also explored whether this data confirmed and extended findings in the literature regarding the determinants of health spending and its components.

Overall, our estimates are consistent with the idea of a health financing transition. Total health expenditure per capita is rising in most countries over time as a result of rising incomes (with an income elasticity close to 0.7) and a secular trend that is likely to be a consequence of changing medical technologies and practices (approximately 1 percent per year). Total health expenditure is also significantly influenced by political and demographic factors as indicated by government expenditure as a share of GDP and population aging. The two major components of health spending – government health expenditure and out-of-pocket expenditure – exhibit similar income elasticities, close to 0.7. Government health expenditure also exhibits a rising secular trend of about 1.4 percent per year unlike out-of-pocket expenditure which does not exhibit a clear time trend. Government capacity is positively related to government health spending but not out-of-pocket expenditure. By contrast, demographic factors seem to influence out-of-pocket health expenditure but not government health expenditures.

The second trend in the health financing transition – the declining share of out-of-pocket expenditures and concomitant increasing reliance on pooled financing mechanisms – is only partially confirmed by data in this 15-year period. While many specifications indicate that this share is declining over time, the final preferred estimates show no significant change after controlling for other factors. This may simply indicate how fundamentally the out-of-pocket share is determined by political choices which are historically contingent. Neither income, demographics nor time show significant statistical associations with changes in the out-of-pocket share. However, government capacity as measured by the share of GDP spent by the public sector is negatively associated with the out-of-pocket share. This confirms the findings in our literature review regarding the importance of political choices to the institutional changes that influence the out-of-pocket share of health spending.

References

Arellano, Manuel and Stephen Bond. 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies* 58: 277-97.

Arrow, Kenneth J. 1963. "Uncertainty and the Welfare Economics of Medical Care." *American Economic Review*, 53(5): 941-73.

Baltagi, Badi H. and Francesco Moscone. 2010. "Health care expenditure and income in the OECD reconsidered: Evidence from panel data." *Economic Modelling*, 27(4):804-11.

Baumol, William J. and William G. Bowen. 1966. *Performing Arts: The Economic Dilemma*. New York: The Twentieth Century Fund.

Boccuti, Cristina and Marilyn Moon. 2003. "Comparing Medicare and Private Insurers: Growth Rates in Spending Over Three Decades." *Health Affairs*, 22(2):230-237.

Bokhari, Farasat A.S., Yunwei Gai and Pablo Gottret. 2007. "Government health expenditures and health outcomes." *Health Economics,* 16:257-73.

Bump, Jesse. 2010. "The Long Road to Universal Health Coverage: A Century of Lessons for Development Strategy." Seattle, WA: PATH.

Chernew, Michael E. and Joseph P. Newhouse, eds. 2012. *Health Care Spending and Growth*. Oxford: Elsevier B.V.

Chesnais, Jean-Claude. 1993. *The Demographic Transition: Stages, Patterns, and Economic Implications: A Longitudinal Study of Sixty-Seven Countries Covering the Period 1720–1984*. Oxford: Oxford University Press. 633 pp.

Clemente, Jesus, Carmen Marcuello, Antonio Montañés, and Fernando Pueyo. 2004. On the international stability of health care expenditure functions: are government and private functions similar? *Journal of Health Economics.* 23(3):589-613. May.

Cutler, David and Mark McClellan. 2001. "Is technological change in medicine worth it?" *Health Affairs,* 20(5):11-29.

de Ferranti, David. 2007. "Improving equity in health financing." Presentation at The Health Leadership Conference, Madrid. April 14.

Docteur, Elizabeth and Howard Oxley. 2003. "Health-care systems: lessons from the reform experience." Paris: OECD.

Dormont Brigitte, Michel Grignon and Hélène Huber. 2006. "Health expenditure growth: reassessing the threat of ageing." *Health Economics*,15(9):947-63.

Dormont, Brigitte, Joaquim Oliveira Martins, Florian Pelgrin and Marc Suhrcke. 2010. "Health Expenditures, Longevity and Growth" in Pietro Garibaldi, Joaquim Oliveria Martins, and Jan van Ours, eds. 2010. *Ageing, Health, and Productivity: The Economics of Increased Life Expectancy*. Oxford: Oxford University Press.

Escobar, Maria-Luisa, Charles C. Griffin, and R. Paul Shaw, eds. 2010. *The Impact of Health Insurance in Low- and Middle-Income Countries.* Washington, DC: Brookings Institution.

Fogel, Robert W. 2004. "Changes in the process of aging during the twentieth century: findings and procedures of the early indicators project." *Population and Development Review, Supplement: Aging, Health, and Public Policy*, 30:19-47.

Freedman, Vicki A., Linda G. Martin and Robert F. Schoeni. 2002. "Recent trends in disability and functioning among older americans: a systematic review." *Journal of the American Medical Association*, 288(24):3137-46.

Garibaldi, Pietro, Joaquim Oliveria Martins, and Jan van Ours, Jan. 2010. *Ageing, Health, and Productivity: The Economics of Increased Life Expectancy*. Oxford: Oxford University Press.

Gerdtham, Ulf-G and Bengt Jönsson. 2000. "International comparisons of health expenditure: theory, data and econometric analysis," in Anthony J. Culyer and Joseph P. Newhouse, eds. *Handbook of Health Economics*. Amsterdam: Elsevier, pp. 11-53.

Getzen, Thomas E. 1992. "Population ageing and the growth of health care expenditures." *Journal of Gerontology*, 47:S98-104.

Getzen, Thomas E. 2000. "Health care is an individual necessity and a national luxury: applying multilevel decision models to the analysis of health care expenditures." *Journal of Health Economics*, 19(2):259-270

Götze, Ralf and Achim Schmid. 2012. "Healthcare Financing in OECD Countries: Beyond the Public-Private Split." TranState Working Papers No. 160. Available at SSRN: http://ssrn.com/abstract=1998037 or http://dx.doi.org/10.2139/ssrn.1998037

Hughes Tuohy, Carolyn, Collen M. Flood, and Mark Stabile. 2004. How Does Private Finance Affect Public Health Care Systems? Marshaling the Evidence from OECD Nations. *Journal of Health Politics, Policy and Law.* 29(3): 359-396.

International Monetary Fund (IMF). 2010. Macro-Fiscal Implications of Health Care Reform in Advanced and Emerging Economies. Prepared by the Fiscal Affairs Department. December 28.

Im, Kyung So, M. Hashem Pesaran, Yongcheol Shin. 2003. "Testing for Unit Roots in Heterogeneous Panels." *Journal of Econometrics,* 115: 53-74.

OECD, Eurostat, WHO. 2011. *A System of Health Accounts*. Paris: OECD Publishing. doi: 10.1787/9789264116016-en

OECD. 2006. "Projecting OECD Health and Long-term Care Expenditures: What Are the Main Drivers?" OECD Economics Department Working Paper, No. 477, Paris: OECD Publishing.

Immergut, Ellen. 1992. *Health Politics: Interests and Institutions in Western Europe*. Cambridge: Cambridge University Press.

Kleiman, E. 1974. "The Determinants of National Outlay on Health," in M. Perlman, ed. *The Economics of Health and Medical Care*. Macmillan, London.

Leu, Robert E. 1986. "Public and Private Health Services: Complementarities and Conflicts," in A. J. Culyer and B. Jönsson, eds. *Public and private health services : complementarities and conflicts*. Oxford: Blackwell.

Lubitz, James B. and Gerald F. Reilly. 1993. "Trends in medicare payments in the last year of life." *New England Journal of Medicine,* 328:1092-96.

Maddala, G.S. and Shaowen Wu. 1999. A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test. *Oxford Bulletin of Economics and Statistics*. 61(S1): 631-652.

Manning, Willard G., Joseph P. Newhouse, et al. 1987. "Health insurance and the demand for medical care: evidence from a randomized experiment." *American Economic Review*, 77(3):251–277.

McCullagh, Peter and John A. Nelder. 1989. *Generalized Linear Models.* 2nd ed. London: Chapman &Hall/CRC.

Moreno-Serra, Rodrigo and Peter C. Smith. 2012. "Does Progress towards Universal Health Coverage Improve Population Health? A Review of the Literature." *The Lancet*. September 7.

Musgrove, Philip, Riadh Zeramdini, and Guy Carrin. 2002. "Basic Patterns in National Health Expenditure." *Bulletin of the World Health Organization*, 80(2): 134-146.

Newhouse, Joseph P. 1992. "Medical Care Costs: How Much Welfare Loss?" *Journal of Economic Perspectives,*(Summer):3–21.

Newhouse, Joseph P. 1977. "Medical Care Expenditure: a Cross-National Survey." *Journal of Human Resources*, 12(1):115-125.

OECD. 2010. "Value for Money in Health Spending." OECD Health Policy Studies. Paris: OECD. doi: 10.1787/9789264088818-en

Omran, Abdel R. 1971. "The Epidemiologic Transition: A Theory of the Epidemiology of Population Change," *The Milbank Memorial Fund Quarterly,* 49(4, Pt. 1):509-538. October.

Papke, L. E. and J. Wooldridge. 1996. Econometric methods for fractional response variables with an application to 401(k) plan participation rates. *Journal of Applied Econometrics* 11: 619–632.

Pesaran, M. Hashem. 2004. General diagnostic tests for cross section dependence in panels. University of Cambridge, Faculty of Economics, Cambridge Working Papers in Economics No. 0435.

Roberts, Marc, William Hsiao, Peter Berman, and Michael R. Reich. *Getting Health Reform Right*. Oxford: Oxford University Press, 2008.

Roodman, David. 2006. How to Do xtabond2: An Introduction to "Difference" and "System" GMM in Stata. Working Paper 103. Center for Global Development, Washington.

Savedoff, William D. with Ricardo Bitrán, David de Ferranti, Victoria Y. Fan, Alberto Holly, Rodrigo Moreno-Serra, Priyanka Saksena, Amy L. Smith, Peter C. Smith, and Ke Xu. 2012a. "Final Report of the Transitions in Health Financing Project: Transitions in Health Financing and Policies for Universal Health Coverage." Washington, DC: Results for Development Institute.

Savedoff, William D., David de Ferranti, Amy L. Smith and Victoria Y. Fan. 2012b. "Political and economic aspects of the transition to universal health coverage." *The Lancet*. Sept. 7.

Savedoff, William D. and Amy L. Smith. 2011. "Achieving Universal Health Coverage: Learning from Chile, Japan, Malaysia and Sweden." Working Paper. Washington, DC: Results for Development Institute.

Schieber, George and Akiko Maeda. 1999. "Health care financing and delivery in developing countries," *Health Affairs,*18(3):193-205. May.

Sekhri, Neelam and William D. Savedoff. 2005. "Private Health Insurance: Implications for Developing Countries." *Bulletin of the World Health Organization* 83(2): 127-134. Feb. http://www.who.int/bulletin/volumes/83/2/en/127.pdf

van der Gaag, Jacques and Vid Štimac. 2008. "Towards a new paradigm for health sector development." The Rockefeller Foundation–Sponsored Initiative on the Role of the Private Sector in Health Systems in Developing Countries, Technical Partner Paper 3, New York: The Rockefeller Foundation.

Wagstaff, Adam. The demand for health: Some new empirical evidence. *Journal of Health Economics*. 5(3): 195–233

WHO. 2012. National health accounts. Website. http://www.who.int/nha/en/. Accessed 3 July 2012.

Wooldridge, JM. *Introductory econometrics: a modern approach*. Cincinnati, OH: South-Western College, 2000.

Xu, Ke, Priyanka Saksena and Alberto Holly. 2011. "The Determinants of Health Expenditure: A Country-Level Panel Data Analysis." Working Paper. Washington, DC: Results for Development Institute.

Xu, Ke, David B. Evans, Guy Carrin, Ana Mylena Aguilar-Rivera, Philip Musgrove and Timothy Evans. 2007. "Out-Of-Pocket Spending: Protecting Households from Catastrophic Health Spending." *Health Affairs*, 26:4972-983.

Zweifel, Peter, Stefan Felder and Markus Meiers. 1999. "Aging of the population and health care expenditure: a red herring?" *Health Economics*, 8:485-96.