

# Measuring recession severity and its impact on healthcare expenditure

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**Abstract** The financial crisis that manifested itself in late 2007 resulted in a Europe-wide economic crisis by 2009. As the economic climate worsened, Governments and households were put under increased strain and more focus was placed on prioritising expenditures. Across European countries and their heterogeneous health care systems, this paper examines the initial responsiveness of health expenditures to the crisis and whether recession severity can be considered a predictor of health expenditure growth. In measuring severity we move away from solely gross domestic product (GDP) as a metric and construct a recession severity index predicated on a number of key macroeconomic indicators. We then regress this index on measures of total, public and private health expenditure to identify potential relationships. Analysis suggests that for 2009, the Baltic States, along with Ireland, Italy and Greece, experienced comparatively severe recessions. We find, overall, an initial counter-cyclical response in health spending (both public and private) across countries. However, our analysis finds evidence of a negative relationship between recession severity and changes in certain health expenditures. As a predictor of health expenditure growth in 2009, the derived index is an improvement over GDP change alone.

**Keywords** Economic and financial crisis · Recession severity · Healthcare expenditures

**JEL Classification** H120 · H510 · I180

## Introduction

The global financial crisis that manifested itself in late 2007 was without equal since the Great Depression of the 1930s. Pre-crisis there were long periods of ‘rapid credit growth, low risk premiums. . . soaring asset prices and the development of bubbles in the real estate sector’ (European Commission 2009). As a result of over-stretched leveraging positions,

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a correction in a relatively small corner of the financial system (the US subprime market) was sufficient to topple the whole structure. The financial crisis quickly transformed into an economic one with credit restraint and falling confidence resulting in EU real gross domestic product (GDP) shrinking by 4.3 % in 2009, the sharpest contraction in its history (European Commission 2009).

The public finances of individual EU countries were consequently put under significant strain. State revenues declined as a result of falling tax revenues. Simultaneously, there was an increase in demand for public resources as unemployment increased and income levels declined. This resulted in ubiquitous and growing budget deficits throughout the EU. Compounding this, a distinctive feature of this crisis has been the ‘substantial widening in sovereign risk spreads’ which have exposed many of the worst affected Member States to a ‘vicious circle of higher debt and higher interest rates’ (European Commission 2009). In terms of response, therefore, the competing objectives of containing deficits and protecting households from the effect of crisis, pose conundrums for policymakers (Lewis and Verhoeven 2010)

Within Europe, health systems differ greatly in terms of emphasis placed on general tax, social insurance and the private market as sources of health care financing. However, as economic contractions squeeze public and private resources, all varieties of health systems are forced to compete for funds with potential knock-on consequences for health care supply and system performance. Compounding problems for the public health care system, decreasing health spending, increased cost of treatment, reduced family income and/or private insurance coverage can result in a lower demand for private care with a consequent transfer of demand to the public sector (WHO 2009). In times of economic difficulties, Governments therefore tend to face the problem of increased demand for public health services combined with a strain on available resources to provide these services.

With this in mind, our focus is on identifying the initial relationships between the economic crisis and changes in public and private health expenditure. Specifically, do Governments and households initially protect spending and how is this response related to the severity of the recession? While variation in health expenditures, levels and growth, have historically been explained through variations in GDP (Barros 1998; Xu and Saksena 2011), in looking at periods of recession (or crisis) GDP metrics are subject to certain limitations (Layton and Banerji 2003). As we argue, analysing recession severity should consider other important macroeconomic indicators, not just exclusively GDP. Motivated by this, we develop a *recession severity index* for 2009, taking into account broader measures than simply GDP growth, which ranks countries by degree of severity. Derivation of this index is an innovative and worthwhile exercise in and of itself, as we are unaware of any other framework for comparing recession severity across countries. However, our derived index is then utilised as part of a simple bivariate analysis, to estimate the link between recession severity and national measures of total, private and public health expenditure change in 2009.

### Health expenditure and the economy

As noted, an important factor in explaining health expenditure growth is GDP growth. As GDP growth is predominantly positive, results from a number of studies have shown that when GDP increases, health expenditures in general increase (Xu and Saksena 2011). The exact nature of this relationship can be understood in terms of income elasticity. That

is the percentage change in health expenditure given a percentage change in income (Di Matteo 2003). Such ratios can classify health care as a luxury (income elasticity  $>1$ ) or a necessity (income elasticity  $>0$  and  $<1$ ) good. Early empirical studies estimated elasticities above one, however, more recent studies utilising robust econometric models estimate health care expenditure as a necessity good (Farag et al. 2012). Along these lines, Farag et al. (2012) find health care least responsive to income change in low-income countries, more so in high-income countries, with the highest response in middle-income countries.

More recent empirical work has looked at the response of public health spending to economic cycles. For example, Darby and Melitz (2008), examining a panel of OECD countries from 1982–2003, argue that government health spending responds to economic cycles in a stabilising manner. Here, several theoretical reasons are advanced as to why health spending might increase in times of recession. Firstly, the lower opportunity cost of time during recession can lead to greater focus on health care. Recessions provide an opportunity, similar to how firms operate, to undertake major repairs and renovations to existing capital not prioritised during boom times. It has also been suggested that an explanation for counter-cyclical movements in health care has been the fact that more people may become eligible for government sponsored health programmes during recession. This is an example of the automatic stabiliser argument, more commonly observed in welfare spending. Contrary to this, Del Grenado et al. (2010), find that public spending on health care follows a pro-cyclical pattern in developing countries (but less so during ‘bad times’) and an acyclical pattern in developed countries. Recently, Cylus et al. (2012) reported a slowdown in total public health expenditure growth, predicated partially on cost-shifting behaviour, in European countries, in response to recession.

However, research on the effects of crises on health care spending is quite limited. Theoretically, behaviour is hard to predict. To the extent that public health expenditure is free to users, there is a greater reliance on publicly provided health care services. From a normative perspective therefore, Musgrove (1997) argues that public health care expenditure policies should be counter-cyclical in order to cope with ‘fluctuation of needs’ between the public and private sectors, following economic crisis. However, as noted by Lewis and Verhoeven (2010), ‘Financial crises. . .can prove highly disruptive. . .leading to responses that truncate systematic policy development and undermine long-term objectives’. While crisis can also provide the opportunity, and motivation, to undertake major structural reforms that otherwise might not be considered.

Empirically, analysis suggests that government health expenditure tends to fall in times of crisis. Public health expenditures in Thailand, Indonesia, Argentina and Russia during previous financial crises fell significantly and took many years to reach pre-crisis levels (The World Bank 2009). Similarly, Musgrove (1997) notes the absence of a ‘counter-cyclical commitment’ when analysing the policy response of several Latin America and Caribbean countries in the 1980s.

Previous evidence suggests that private health expenditures also exhibit pro-cyclical tendencies. Changes in utilisation rates, away from the private sector, were documented during the 1997–1998 Asian financial crisis (WHO 2009). Moreover, a World Bank Survey (2002) from Argentina revealed that, as a consequence of the 2001–2002 crisis, by mid 2002, 38 % of households reported greater use of public health centres instead of private services (The World Bank 2009).

## Methodology

### Defining a recession

While there is no agreed upon homogeneous definition of what constitutes a recession, business cycle analysts usually refer to ‘weak economic phases where duration, depth and diffusion exceed the usual bounds’ (Arberger and Nierhaus 2008). Thus the concept of recession is multi-dimensional with economic activity needing to decline substantially, be spread across most, if not all, the economy and have some degree of persistence. With this in mind, the most ubiquitous characterization of recession to have arisen is the ‘two quarters of negative growth’ rule, attributed to Julius Shiskin in the *New York Times* (Layton and Banerji 2003). This defines a recession as a decline in GDP in at least two successive quarters. While the intuitive aspect of this definition is appealing, it has been subject to criticism. For example, ‘if an economy grows by 2% in one quarter and then contracts by 0.5% in the next two quarters it is deemed to be in recession. However, if the economy contracts by 2% in the first quarter, then expands by 0.5% and subsequently contracts by 2%, then it is not considered to be in recession even though it is clearly weaker’ (The Economist 2008). This is not just a theoretical proposition, for example, two severe recessions in Japan in the 1970s would not have been recognised if defined purely by Shiskin’s criterion (Layton and Banerji 2003). Another criticism of Shiskin’s rule is its exclusive focus on output fluctuations (as measured by GDP) in measuring economic activity. Layton and Banerji (2003) argue that a recession should be regarded as more than a cyclical downturn in ‘measured output’. Rather defining recession should include dimensions of (particularly) employment and household income. Although it is argued that output measures capture these effects, these relationships can vary significantly over a given cycle and from one cycle to another (Layton and Banerji 2003).

### *Debt as an indicator?*

A particular characteristic of the current crisis is that it has put considerable strain on the public finances in the euro area, in particular on government debt (ECB 2010). While public debt levels are not considered as an indicator of recession, they can provide an insight into the severity of recessions. One channel through which public debt accumulation can affect growth is through long-term interest rates. Higher long-term interest rates, a consequence of more debt-financed government budget deficits, can crowd-out private investment and hinder growth (ECB 2010). Indeed, higher sovereign debt yields, could incentivise a transfer of funds from the private sector to the public sector. This may result in private interest rate increase and consequently decrease in private spending growth, both by households and firms (ECB 2010). While long-term interest rates could themselves also be argued as a proxy for fiscal health, it was difficult to obtain comparable data for all countries (for example, Estonia tends not to issue government bonds). Available data also chiefly relate to secondary market rates which may not accurately reflect the ability of States to raise new debt.

Furthermore, in terms of the current crisis, we would argue that it is the effect of high levels of debt that restrict government financing capabilities and result in certain States embarking on tough austerity policies. Empirically, the ECB (2010) analysing 12 Euro-area countries over 40 years, find a negative non-linear causal relationship between government debt and growth. Government debt-to-GDP above 90–100 % has a negative impact on growth. Although it is unclear what the impact of public debt on growth is below this turning point, statistical analysis suggest that the negative effect of high debt might already start at levels as low as

**Table 1** Government debt to GDP weighting (DW)

Average debt/GDP (%)	Weighting
<70	0
70–89	2
>89	5

70–80 % of GDP. Similarly, [Reinhart and Rogoff \(2009\)](#) find a negative relationship between government debt and GDP at a threshold of around 90 % debt-to-GDP. Consequently, as an additional measure, we include a government debt indicator in our index.

### Developing an index

In defining a recession we require some measures of depth, diffusion and duration. While Shishkin's rule provides a duration parameter, its arbitrary nature has led to criticism in its efficacy in adequately capturing periods of recession. In this analysis we therefore consider *annual* reductions in GDP as definitively defining recessionary periods. Furthermore, while GDP can be considered the most comprehensive measure of economic activity ([Arberger and Nierhaus 2008](#)), covering concerns of both depth and diffusion, it is prudent to include other metrics. In this analysis, therefore we will consider unemployment and public debt alongside GDP in measuring recession.

In order to comparatively capture the severity of recession across countries an index is developed adapting a specification utilised by ([Forum Oeconomicum 2010](#)). [Forum Oeconomicum \(2010\)](#) compare the severity of subsequent recessions in the United States to that of the Great Depression using maximum unemployment, minimum real growth and years of recession as indicators.

In contrast our index is calculated as follows,

$$V_i = (GDP_i - UNP_i - DW_i) \times YR_i \quad (1)$$

where, for each country  $i$ ,  $GDP$  represents the minimum annual real growth rate of real GDP.  $UNP$  represents the unemployment rate from the global peak to trough over the recession period, in this way we negate the influence high structural unemployment (for example, in countries such as Spain) and try to capture the rise in unemployment explicitly associated with the recessionary period.  $DW$  is our metric of public debt. We assign a non-linear weighting to debt-to-GDP levels averaged over the recession period (See [Table 1](#)).  $YR$  represents the recessionary period (in this case, either 1 or 2).  $V$  then represents the cumulative severity score.

The construction of our index inevitably requires a certain amount of subjectivity in selection and derivation of indicators. Therefore, for completeness we subject the index to a sensitivity analysis. In all we look at five additional specifications. All specification changes are relative to the baseline model. The first additional model utilises the highest unemployment level over the crisis period rather than the change from peak to trough over the crisis. The second additional model, removes the  $YR$ , years of recession, indicator. The third, fourth and fifth specifications make use of alternative weightings of the  $DW$ , debt weighting, indicator, as it is the most subjective measure included in the index. Specific definitions and results of auxiliary models are presented in [Table 6](#) and [7](#), respectively ([Appendix](#)).

## Recession severity and health expenditure

Following calculation of our index we then proceed to estimate simple bivariate relationships between recession severity and health expenditure growth. We make the assumption that causality runs from recession severity to health expenditures. Although there may be a theoretical basis for reverse causation, where health expenditure affects GDP (Xu and Sak-sena 2011), it is fairly reasonable to assume that the recession severity effect associated with the economic and financial crisis is exogenous. Thus, we employ a standard bivariate linear regression technique to model this effect. As separate dependent variables we consider total, public, private and OOP (out of pocket) health expenditure growth in 2009.

### Data

All data relate to the EU-27 countries in addition to Norway and Turkey, over the period 2007–2009. Variables included or derived for use in the recession severity index calculation are taken from the Eurostat database. Poland is dropped from the analysis as it did not experience a decline in GDP over the period. Descriptive statistics related to these variables are presented in Table 2.

Health expenditure variables are taken, or derived, from WHO, National Health Accounts (NHA) database. For comparability across countries, health expenditure data are measured in purchasing power parity international dollars. An international dollar is a hypothetical currency that is used as a means of translating and comparing costs from one country to another using a common reference point, the US dollar. Descriptive statistics related to these variables are presented in Table 3.

## Results

### Descriptive statistics

Table 2 presents descriptive statistics of macroeconomic indicators on which the recession severity index is predicated. Data are presented for the period 2007–2009, over which our recessionary period for each country is determined. An aggregate decline in economic activity is observable over this period as mean (median) GDP growth declined from 4.7 (4.1) to  $-5.9$  ( $-5.0$ ) % while mean (median) unemployment increased from 6.2 (6.1) to 8.8 (7.8) %. Minimum (maximum) GDP growth in our sample was 0.1 (10.5) % in 2007 compared with  $-17.7$  ( $-1.7$ ) % in 2009. In tandem, as noted, certain countries saw debt levels balloon as they attempted to lessen the impact of declining economic activity on their respective countries. At the aggregate level, however, the mean (median) government debt-to-GDP ratio in our sample of countries saw a somewhat small increase from 44.0 (39.8) to 55.4 (49.7) % of GDP, over the period. The crisis appears to have also brought with it increased variability across countries as measured by increasing standard deviations in these macroeconomic indicators.

Table 3 presents descriptive statistics on total, public, private and OOP health expenditure indicators. Both public and private health expenditure growth display strong initial resilience to declining real GDP in 2009. Private health expenditure seems, however, to track declining GDP growth more so than public health expenditure. On average, in 2007 GDP increased by 4.7 % while private (public) health expenditure increased by 7.4 (6.6) %. When average

**Table 2** Macroeconomic indicators, descriptive statistics 2007–2009

	Real GDP growth	Unemployment	Average debt/GDP ratio
2007			
Mean	4.7	6.2	44.0
Median	4.1	6.1	39.8
Standard deviation	2.6	2.0	27.5
Minimum	0.1	2.4	3.7
Maximum	10.5	11.6	107.4
2008			
Mean	1.1	6.2	46.9
Median	0.9	6.2	42.2
Standard deviation	2.7	2.2	28.0
Minimum	−3.7	2.3	4.5
Maximum	7.3	14.9	113.0
2009			
Mean	−5.9	8.8	55.4
Median	−5.0	7.8	49.7
Standard deviation	3.9	3.8	29.5
Minimum	−17.7	3.0	7.2
Maximum	−1.7	20.1	129.4

Source Eurostat database

**Table 3** Health expenditure indicators, descriptive statistics 2007–2009

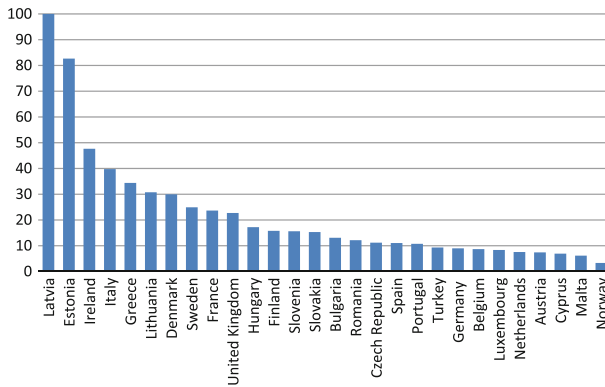
	Total health expenditure per capita (% change)	Public health expenditure per capita (% change)	Private health expenditure per capita (% change)	Out of pocket payments per capita (% change)
2007				
Mean	6.9	6.6	7.4	7.8
Median	5.3	4.8	6.2	6.1
Standard deviation	6.0	6.9	6.8	7.2
Minimum	−3.6	−6.6	0.8	0.8
Maximum	20.0	21.6	29.1	27.0
2008				
Mean	8.7	9.2	7.5	7.9
Median	8.2	8.0	6.0	8.2
Standard deviation	5.2	5.9	7.7	8.3
Minimum	−0.8	0.0	−9.2	8.0
Maximum	21.6	23.1	30.5	7.9
2009				
Mean	4.1	4.3	3.3	3.2
Median	2.8	4.5	2.9	2.2
Standard deviation	5.0	6.3	6.1	6.9
Minimum	−10.2	−11.4	−8.2	−14.6
Maximum	15.4	21.2	19.3	18.5

Source Taken, or derived, from WHO, NHA database

GDP growth fell to 1.1 % in 2008 private (public) health expenditure grew by 7.5 (9.2) %. In 2009, average GDP growth was −5.9 %, compared to 3.3 (4.3) % growth in private (public) health expenditure.

### Recession severity index

Figure 1 presents the recession severity index scores, scaled in terms of Latvia, the highest scoring country in our index. Rankings appear fairly intuitive. The three Baltic States, along



**Fig. 1** Recession severity index 2009

with the economies of Ireland, Italy, Greece, Denmark, Sweden, France and the United Kingdom comprise the top ten of our index. The severity of the crisis in the Baltic countries has been well-documented (for example, see Alvarez-Plata and Engerer 2009; Cameron 2010) and Latvia, Estonia and Lithuania place first, second and sixth in our index, respectively. Latvia, in particular, appears to have experienced by far the worst crisis out of all economies. This finding is re-enforced by Bite (2010), describing Latvia as ‘having suffered from one of the deepest recessions in the world’. Furthermore, in 2010, Ireland and Greece required high-profile external financial assistance in the form of EU/IMF loans due to the severity of their respective economic situations. Our sensitivity analysis suggests that our index is fairly robust to plausible changes in its specification (see Appendix).

### Bivariate analysis

Figures 2, 3, 4, and 5 (see Appendix) present, graphically, the relationship between changes in total, public and private health expenditures per capita and recession severity, respectively. In terms of cyclical response, despite declining national output in 2009, health expenditures of many countries continued to grow. In particular, 25 out of 28 countries saw total health expenditure per capita increase as GDP declined. Disaggregating this figure into its component parts we see that public health expenditure is slightly more resilient to economic contraction than private health expenditure, with over 82 % (23/28) of countries increasing public health expenditure in 2009 as compared with 75 % (21/28) of countries increasing private health expenditure. The same proportion of countries (75 %) saw increases in OOP expenditure, related to the fact that, across many countries, OOP expenditure constitutes the largest part of private health expenditure.

Table 4 provides estimates of the linear regression coefficients associated with the impact of our derived recession severity index on various measure of health expenditure growth. Visual inspection would suggest, and statistical tests indicate, that Estonia and Latvia exert disproportional impacts on regression statistics. Therefore, for the purposes of prudence, the regression analysis is re-run omitting these observations. For comparative purposes we also run a separate set of models with GDP growth in 2009 as the regressor. These estimates are also presented in Table 4. Standard diagnostic tests suggest that these models meet the principal assumptions underlying linear regression analysis. Visual inspection of scatter plots suggest relationships can be modelled linearly, while we cannot reject the null hypotheses that residuals are distributed normally and have constant variance.



**Table 4** Bivariate regression analyses

Dependent variable	Specification 1 Recession severity index 2009 (all observations)	Specification 2 Recession severity 2009 (excl. Estonia and Latvia)	Specification 3 GDP growth 2009
Growth rate of total health expenditure 2009	-0.1259 (0.0360)***	-0.1244 (0.0722)*	0.6875 (0.2158)***
Observations	28	26	28
$R^2$	0.3196	0.11	0.2807
Growth rate of public health expenditure 2009	-0.1443 (0.0473)***	-0.1431 (0.0974)	0.8323 (0.2769)***
Observations	28	26	28
$R^2$	0.2632	0.0824	0.2578
Growth rate of private health expenditure 2009	-0.0734 (0.0508)	-0.0560 (0.1034)	0.3182 (0.2759)
Observations	28	26	28
$R^2$	0.0745	0.0121	0.0487
Growth rate of OOP 2009	-0.0679 (0.0587)	-0.2776 (0.1127)**	0.1831 (0.3491)
Observations	28	26	28
$R^2$	0.0489	0.2017	0.0105

\*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  $p < 0.1$ . Standard errors in parentheses

Analysis of the full sample indicates evidence of statistically significant relationships between certain types of health expenditure growth and recession severity. Coefficient estimates indicate a strong negative relationship between total health expenditure growth and recession severity. Our index explains almost 32 % of variation in aggregated health expenditure growth in 2009. A similar negative relationship is evident in terms of public health expenditure with recession severity explaining 26 % of the variation in public health expenditure growth in 2009. However, neither private health expenditure nor OOP expenditure growth appear to be influenced by recession severity.

The relationship between recession severity and total and public health expenditure growth, respectively, is much weaker when excluding Latvia and Estonia from the analysis. In contrast, this sample suggests recession severity has some explanatory power over OOP expenditure growth, estimating a negative relationship. GDP growth in 2009 is, similar to specification one (Table 4), a statistically significant predictor of total and public health expenditure growth, although explaining comparably less variation.

## Discussion

Overall, health expenditures display counter cyclical tendencies in 2009. This implies that initial national responses to the crises were to protect health expenditures. This is concordant with some recent empirical evidence for developed countries that find public health expenditures tend to respond to recession in a stabilising (or possibly acyclical) manner. In order to meet demand for public health care resources, the vast majority (82 %) of countries adopt counter-cyclical spending, at least initially. For example, despite the severe recession in Estonia in 2009, public health expenditure was maintained, thanks largely to a legally required risk-reserve and retained earnings on their social health insurance fund. This mandated that savings be accumulated in the good times so that they could be called on in the bad times. This expenditure smoothing insured that once the crisis hit in Estonia, there was an initial

protection of public health expenditure (Vork et al. 2010). A similar policy was observed in Lithuania, also financed primarily through a social health insurance system (Jankauskiene and Medaiskis 2010).

Although response to crises would suggest a fall in public health expenditure, available evidence relates more so middle-income countries which may be less able to protect spending.<sup>1</sup> Furthermore, we cannot predict whether this counter-cyclical response will remain as robust across countries as the financial and economic crisis evolves. Evidence from Ireland would suggest that although per capita public spending fell only marginally in 2009, 2010 saw a significant reduction in public expenditures as the seriousness of the country's fiscal problems became more apparent (Ó Cinnéide and Considine 2010).

Similarly, the majority of countries maintain private health expenditure growth in 2009, although this expenditure is slightly less resilient to recession than public health expenditure. That said, any 'fluctuation of need' effect, where there is a shift away from private health care utilisation, appears quite weak. As far as 2009, across countries, private health expenditure growth remains fairly resilient to forces of the crisis.

In addition, total and public health expenditure growth are also influenced by the degree of recession severity experienced. Countries that experience more severe recession will in general tend to have lower growth rates of total and public health expenditure. A priori, this is what would be expected and is empirically verified. Although there are observable policies of counter-cyclicity across countries, those that experienced more severe recessionary shocks are less able to maintain total and public health expenditure growth than those who experienced less of a shock. However, this relationship is subject to variation, as unobserved individual country responses also play a part. Latvia, for example, the country calculated by our index to have experienced the most severe recessionary shock, saw government expenditure on health care plummet in 2009. Specifically, in 2009, in the acute sector, the numbers of hospitals were reduced dramatically. This was compounded by Government policy only to treat emergency cases publicly. Other treatments, including planned surgeries, were provided only if the patient could cover the expenses (Bite 2010; Cameron 2010; Cylus et al. 2012). In comparison, while Estonia too experienced a comparatively severe recession, as noted, prudent policy insured they managed to maintain positive expenditure growth in 2009.

Infact, Estonia and Latvia seem to exert strong authority on the relationship, as removing them from the analysis weakens the predictive power significantly. For the sub-group of countries that experienced less extreme recessions there is only a weak statistically significant ( $p = 0.098$ ) relationship between total health expenditure growth and recession severity. There is no observable statistically significant relationship between public health expenditure growth and recession severity for this sub-group of countries.

Although, on average, private health expenditure appears more responsive to recession, there is little evidence to suggest a relationship with recession severity across countries. Coefficient estimates for both samples of countries, while negative, are both statistically insignificant. Disaggregating private health expenditure into OOP expenditures, also suggest no statistically significant relationship between changes in OOP expenditures and recession severity, in terms of the full sample. However, there is some evidence that, once we remove the extreme cases of Latvia and Estonia from the analysis, countries with more severe recession tend to see lower growth in OOP expenditures. Overall, this unresponsiveness of private spending to recession severity could be explained in that certain OOP spending is inelastic in nature while long-term investments in insurance provide protection against financial prob-

<sup>1</sup> Infact, dividing our sample dichotomously based on median income suggests that lower income countries show a stronger negative correlation between recession severity and change in public health expenditure and were less likely to maintain spending in 2009.

lems manifested in crises (Lewis and Verhoeven 2010). Although less counter-cyclical than public expenditure, behaviour towards private spending may therefore be relatively more homogeneous, despite variation in recession severity across countries. This analysis highlights possible differences in public and private responses to crisis and crisis severity and could have implications for health system financing arrangements.

While specification one and three (Table 4) suggest that recession severity and GDP are respective predictors of total and public health expenditure in the initial crisis phase, our derived index is able to account for slightly more variation in both cases. This implies GDP dynamics alone are not the best predictor of initial health expenditure responses to economic crisis. When auxiliary dynamics of unemployment, public debt and the length of recession are also considered, we get a more complete picture of the economic landscape when crisis hits, and consequently are better able to account for total and public health expenditure responses across countries.

### Limitations

The original nature of this analysis has left it exposed to certain limitations which need to be noted.

First, construction of our index unavoidably requires a certain amount of subjectivity. Particularly, arguments could be raised against the weighting we apply to our public debt measure and its potential to distort the results of the analysis. To address this and related issues, a sensitivity analysis is conducted that suggests our index is fairly robust to specification change. Furthermore, countries rankings in our index appear reasonable. For example, other commentators have made reference to the deeper crises experienced by the Baltic Nations and Ireland (Alvarez-Plata and Engerer 2009; Ó Cinnéide and Considine 2010).

In terms of our analysis of health expenditure dynamics, the nature of the index restricts us to a small sample size, consequently constraining us to a basic bivariate analysis. This limited amount of data place restrictions on the amount of parameters we can estimate in the model. Undoubtedly, there are many other potential factors (see, Xu and Saksena 2011) that affect health expenditure dynamics other than simply recession severity. However, a multivariate analysis of the determinants of health expenditure per capita is beyond the scope, and not the focus, of this research. Similarly, refinement of our health expenditure variables (such as to incorporate pre-crisis growth paths or the percentage change in growth rates) could offer further insights in this research area.

This paper is concerned with the initial recession severity experienced by countries and how this affected health expenditures in 2009. How Governments and households adjust their health expenditure decisions as the crisis develops was not explored. While not all countries analysed explicitly experience recession (as defined by GDP reductions) in 2010, the impact of the crisis, in terms of fiscal constraints and unemployment, will still be likely to affect health expenditures decisions, both publicly and privately. In this situation, the crisis period could be expanded to incorporate periods of positive but weak growth. In this context, a key question would be whether countries' overall initial health expenditure protection is maintained as we continue further on into the crisis.

### Conclusion

Although debate still exists as to the magnitude of the association, a strong and positive relationship between national income and health expenditure has been well established in the

health economics literature (Farag et al. 2012). However, as countries generally operate in an environment of positive economic growth, less is known about the impact of recession, and particularly, strong negative economic shocks, on aggregate health expenditure dynamics. The recent economic and financial crisis that swept across Europe provided an opportunity to analyse this relationship. In order to better assess the impact of the economic crisis on health expenditures we argued the need to consider more than simply changes in GDP as a metric. Consequently, we develop a severity index based on a number of macroeconomic indicators. Focusing on 2009, the results of this index suggest that the Baltic States, Ireland, Italy and Greece were the worst affected countries in terms of recession severity. Analogous to previous research on the cyclical response of health spending in developed countries, we find total, public and private health expenditures, overall, were initially resilient to the effects of the crisis. Furthermore, there is also evidence that total and public health (and possibly OOP) expenditure growth is negatively related to severity of recession experienced. Our index also tended to explain more variation in health expenditure growth than GDP dynamics alone.

A considerable fraction of this paper was devoted to developing a methodology to rank countries by degree of recession severity. And while the construction of this index is innovative and intrinsically valuable of itself, its application in analysing cross country comparisons of health care expenditure in times of crisis is, hopefully, also an important contribution leading to increased understanding of health system expenditure responses to macroeconomic shocks. Since this methodology is now in place, we also believe further, more complicated statistical analysis of the relationship between recession severity and health expenditure growth could be the focus of supplementary research in this area. Additional research focusing on developing and refining this index, and exploring how health expenditure responds as countries were forced to adapt to the crisis past 2009 would also be of merit.

**Conflict of interest** The authors declare that they have no conflict of interest.

## Appendix

See Tables 5, 6, and 7 and Figs. 2, 3, 4, and 5.

**Table 5** County-level determinants of recession severity index 2009

Country	Real GDP growth	Change in unemployment over recessionary period	Debt weight	Years of crisis
Austria	-3.8	0.9	0	1
Belgium	-2.8	0.7	2	1
Bulgaria	-5.5	2.8	0	1
Cyprus	-1.9	2.5	0	1
Czech Republic	-4.7	2.4	0	1
Denmark	-5.8	3.7	0	2
Estonia	-14.3	11.9	0	2
Finland	-8.4	1.6	0	1
France	-3.1	2.4	2	2
Germany	-5.1	0.6	0	1
Greece	-3.3	2.6	5	2
Hungary	-6.8	2.1	2	1
Ireland	-7	8.1	0	2
Italy	-5.5	2.1	5	2
Latvia	-17.7	14	0	2
Lithuania	-14.8	4.7	0	1

**Table 5** continued

Country	Real GDP growth	Change in unemployment over recessionary period	Debt weight	Years of crisis
Luxembourg	-5.3	0	0	1
Malta	-2.7	1.2	0	1
Netherlands	-3.5	1.3	0	1
Norway	-1.7	0.4	0	1
Portugal	-2.9	1.9	2	1
Romania	-6.6	1.1	0	1
Slovakia	-4.9	4.8	0	1
Slovenia	-8	1.9	0	1
Spain	-3.7	3.3	0	1
Sweden	-5	2.9	0	2
Turkey	-4.8	1.1	0	1
United Kingdom	-4.4	2.8	0	2

**Table 6** Recession severity index—sensitivity analysis specification

Model	Indicators
1 (Specification utilised in analysis)	Lowest real GDP growth over recession period Change in unemployment rate over recession period Debt weighting (<70 = 0, 70–89 = 2, >89 = 5) Years of recession
2	Lowest real GDP growth over recession period Highest unemployment rate over recession period Debt weighting (<70 = 0, 70–89 = 2, >89 = 5) Years of recession
3	Lowest real GDP growth over recession period Change in unemployment rate from peak to trough of recession period Debt weighting (<70 = 0, 70–89 = 2, >89 = 5)
4	Lowest real GDP growth over recession period Change in unemployment rate over recession period Debt weighting (<70=0, 70–89=4, >89=10) Years of Recession
5	Lowest real GDP growth over recession period Change in unemployment rate over recession period Debt weighting (<70=0, 70–89=1, >89=2.5) Years of recession
6	Lowest real GDP growth over recession period Change in unemployment rate over recession period Debt weighting (<70=0, 70–89=2, >89=10) Years of recession

**Table 7** Recession severity index—sensitivity analysis results

Model 2	Index	Model 3	Index	Model 4	Index	Model 5	Index	Model 6	Index
Latvia	100	Latvia	100	Latvia	100	Latvia	100	Latvia	100
Estonia	79.9	Estonia	82.6	Estonia	82.6	Estonia	82.6	Estonia	82.6
Italy	59.2	Lithuania	61.5	Italy	55.5	Ireland	47.6	Italy	55.5
Greece	56.3	Ireland	47.6	Greece	50.2	Italy	31.9	Greece	50.2
Ireland	53.6	Italy	39.7	Ireland	47.6	Lithuania	30.8	Ireland	47.6
Lithuania	47.5	Hungary	34.4	Lithuania	30.8	Denmark	30	Lithuania	30.8
France	45.8	Greece	34.4	Denmark	30	Greece	26.5	Denmark	30
Sweden	40.8	Finland	31.5	France	30	Sweden	24.9	Sweden	24.9
United Kingdom	36.7	Slovenia	31.2	Sweden	24.9	United Kingdom	22.7	France	23.7
Spain	36.2	Slovakia	30.6	United Kingdom	22.7	France	20.5	United Kingdom	22.7
Denmark	35.1	Denmark	30	Hungary	20.3	Finland	15.8	Hungary	17.2
Hungary	31.3	Bulgaria	26.2	Finland	15.8	Hungary	15.6	Finland	15.8
Turkey	28.9	Sweden	24.9	Slovenia	15.6	Slovenia	15.6	Slovenia	15.6
Slovakia	28.2	Romania	24.3	Slovakia	15.3	Slovakia	15.3	Slovakia	15.3
Finland	27.6	France	23.7	Portugal	13.9	Bulgaria	13.1	Bulgaria	13.1
Portugal	25.9	United Kingdom	22.7	Bulgaria	13.1	Romania	12.1	Romania	12.1
Slovenia	23.1	Czech	22.4	Romania	12.1	Czech	11.2	Czech	11.2
Romania	22.4	Republic		Republic		Republic		Republic	
Germany	21.5	Spain	22.1	Belgium	11.8	Spain	11	Spain	11
Belgium	21.1	Portugal	21.5	Czech	11.2	Turkey	9.3	Portugal	10.7
Bulgaria	20.6	Turkey	18.6	Spain	11	Portugal	9.1	Turkey	9.3
Czech	19	Germany	18	Turkey	9.3	Germany	9	Germany	9
Republic	17.4	Belgium	17.4	Germany	9	Luxembourg	8.4	Belgium	8.7
Luxembourg	17.4	Luxembourg	16.7	Luxembourg	8.4	Netherlands	7.6	Luxembourg	8.4
Malta	16.1	Netherlands	15.1	Netherlands	7.6	Austria	7.4	Netherlands	7.6
Austria	14.3	Austria	14.8	Austria	7.4	Belgium	7.1	Austria	7.4
Cyprus	12.1	Cyprus	13.9	Cyprus	6.9	Cyprus	6.9	Cyprus	6.9
Netherlands	12	Malta	12.3	Malta	6.2	Malta	6.2	Malta	6.2
Norway	8	Norway	6.6	Norway	3.3	Norway	3.3	Norway	3.3

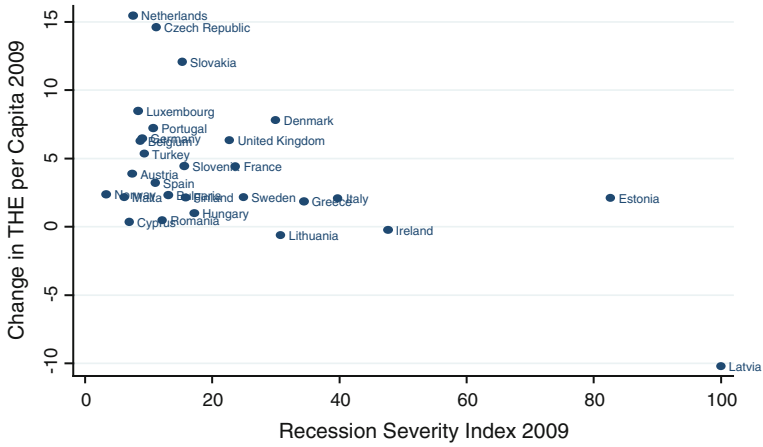


Fig. 2 Bivariate analysis of recession severity on total health expenditure per capita 2009

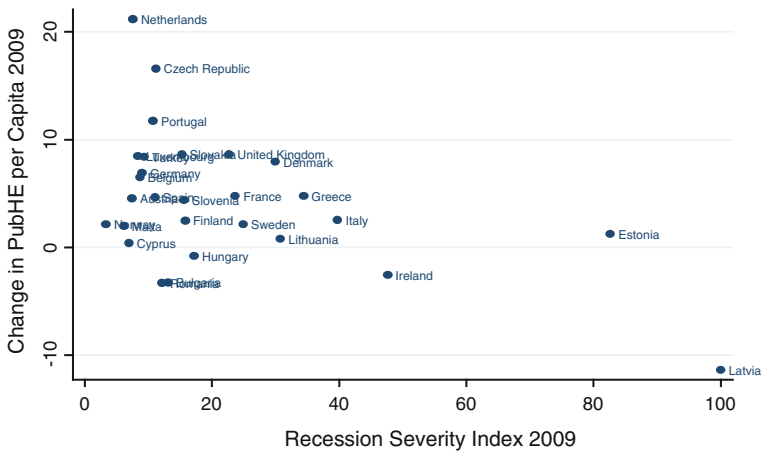


Fig. 3 Bivariate analysis of recession severity on public health expenditure per capita 2009

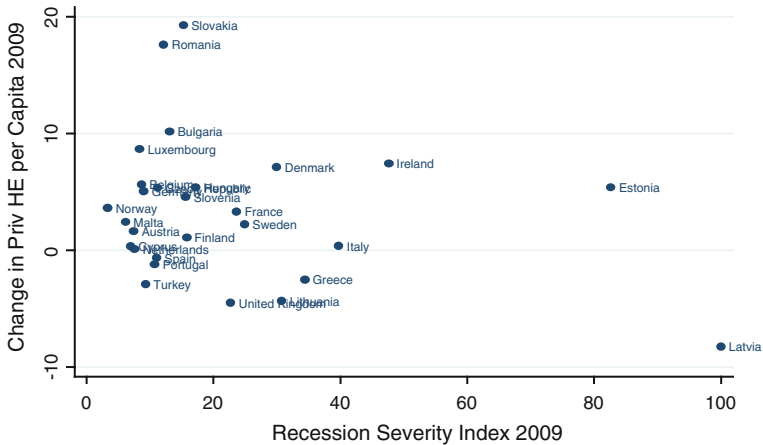
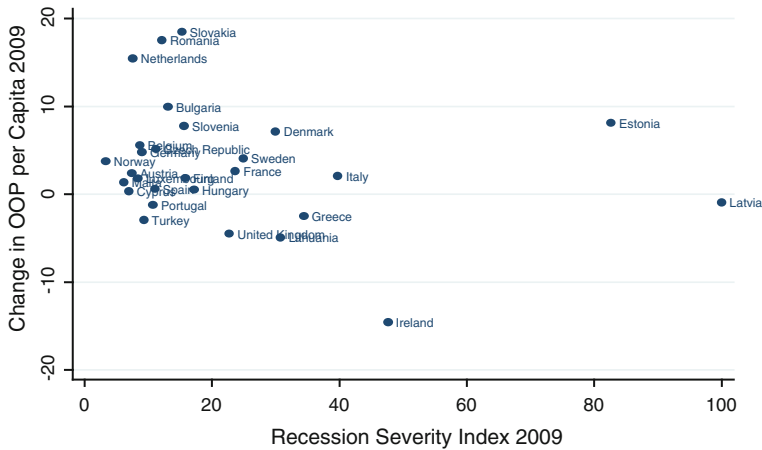


Fig. 4 Bivariate analysis of recession severity on private health expenditure per capita 2009



**Fig. 5** Bivariate analysis of recession severity on OOP expenditure per capita 2009

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