

# Retrenchment in public health unequally affects access to healthcare for income groups: a quasi-experiment during the Great Recession

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## Research

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1 **RETRENCHMENT IN PUBLIC HEALTH UNEQUALLY**  
2 **AFFECTS ACCESS TO HEALTHCARE FOR INCOME**  
3 **GROUPS: A QUASI-EXPERIMENT DURING THE GREAT**  
4 **RECESSION**

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10 **ABSTRACT**

11 **Background:** The Great Recession, starting in 2008, was characterized by an overall reduction in living standards. This pushed  
12 several governments across Europe to restrict expenditures, also in the area of healthcare. These austerity measures are  
13 known to have affected access to healthcare, probably unevenly among social groups. This study examines the unequal effects  
14 of retrenchment in healthcare expenditures on access to medical care for different income groups across European countries.

15 **Method:** Using data of two waves (2008 and 2014) of the European Union Statistics of Income and Living Conditions survey  
16 (EU-SILC), a difference-in-differences (DD) approach was used to analyse the overall change in unmet medical needs over time  
17 within and between countries. By adding another interaction, the differences in the effects between income quintiles (difference-  
18 in-difference-in-differences: DDD) were estimated. To do so, comparisons between two pairs of a treatment and a control case  
19 were made: Iceland versus Sweden, and Ireland versus the United Kingdom. These comparisons are made between countries  
20 with recessions equal in magnitude, but with different levels of healthcare cuts. This strategy allows isolating the effect of cuts,  
21 net of the severity of the recession.

22 **Results:** The DD-estimates show a higher increase of unmet medical needs during the Great Recession in the treatment cases  
23 (Iceland vs. Sweden: +3.24 pp; Ireland vs. the United Kingdom: +1.15pp). The DDD-estimates show different results over the  
24 two models. In Iceland, the lowest income groups had a higher increase in unmet medical needs. This was not the case in  
25 Ireland, where middle-class groups saw their access to healthcare deteriorate more.

26 **Conclusion:** Restrictions on health expenditures during the Great Recession caused an increase in self-reported unmet  
27 medical needs. The burden of these effects is not equally distributed; in some cases, the lower-income groups suffer most. The  
28 case of Ireland, nevertheless, shows that certain policy measures may relatively spare lower-income groups while affecting  
29 middle-class income groups more. These results bring in evidence that policies can reduce and even overshoot the general  
30 effect of income inequalities on access to healthcare.

31 **KEYWORDS (3 to 10):** Economic Recession, austerity, access to healthcare, unmet medical  
32 needs, inequity in health

### 33 **BACKGROUND**

34 One can expect that recessions do not only affect the living standard of populations, but also  
35 their access to healthcare. This expected effect may be due to the welfare loss of the  
36 population, but also to austerity measures taken by the government. The latter is the focus of  
37 this contribution. In particular, we expect that these effects are different between income-  
38 groups. We compare the effect of budget cuts in different countries on different income  
39 groups. Because the budget cuts often follow from the severity of the crisis, we select  
40 comparisons between similar countries who suffered at the same level through the Great  
41 Recession, but who responded differently in the retrenchment of the public health budgets.  
42 This strategy allows documenting whether the effects of budget cuts in healthcare are  
43 different between income groups, isolated from the overall effect of the recession.

44 The member states of the World Health Organization committed in 2005 to develop a  
45 healthcare system that gives access to healthcare to all people and protects them from  
46 financial hardship<sup>1</sup>. This commitment may have contributed to the development of universal  
47 coverage in almost all European countries. Despite this universal coverage, a considerable  
48 proportion of the citizens experience difficulties in taking up medical care, especially because  
49 of financial reasons. Moreover, these difficulties are more common in certain social groups,  
50 contributing to inequity in healthcare<sup>2</sup>.

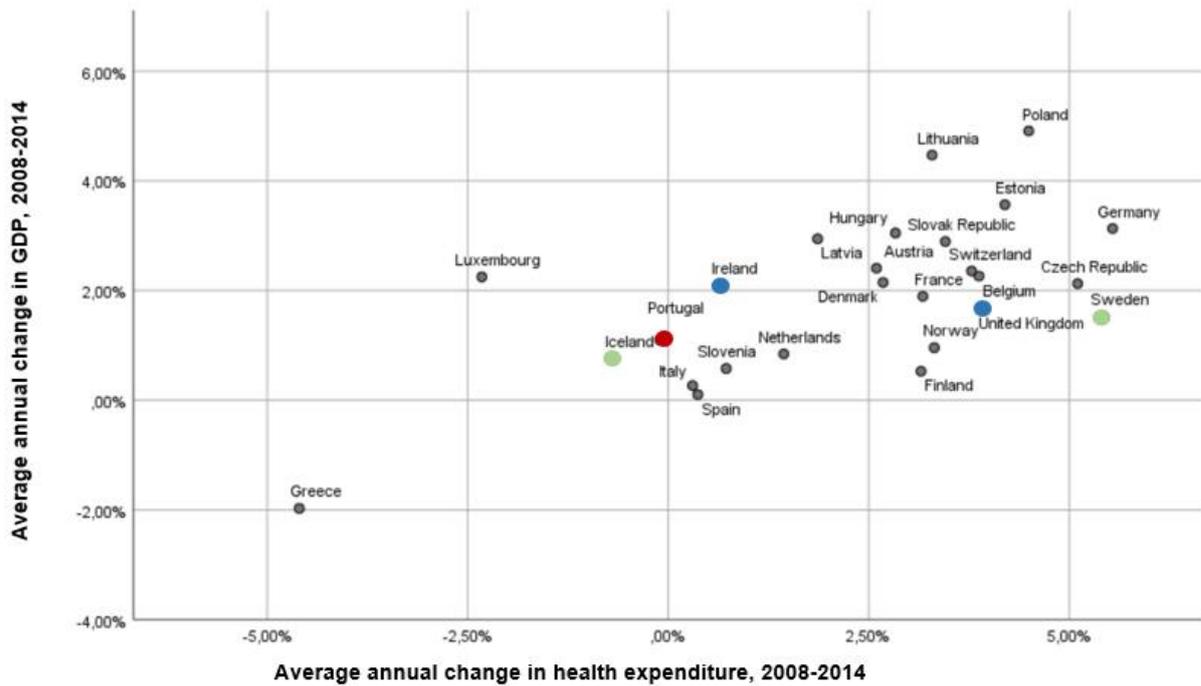
51 In 2008 Europe was hit by an economic crisis called the "Great Recession" because of its great  
52 impact on polities and people. It was characterised by the deepest and longest recession after  
53 the Great Depression in the 1930s<sup>3</sup>. In many countries, especially in Europe, this Great  
54 Recession forced governments to introduce austerity measures in different fields, also in  
55 healthcare, due to the increasing deficits in government budgets<sup>4</sup>. Previous research found  
56 that public spending on healthcare in Europe tended to fall when there is pressure for cuts in  
57 public spending, and this often at a faster pace than other types of government expenditure<sup>5</sup>.

58 As a result, a slower real annual growth rate in per capita health expenditures was noted in the  
59 period during and after the crisis in most OECD countries<sup>6</sup>. This was part of an attempt to keep  
60 the budget in balance<sup>4, 7</sup>. These reductions in health expenditures often increased out-of-  
61 pocket payments (OOP)<sup>4</sup>. The combination with a decline of the purchasing power in many  
62 countries, due to soaring unemployment and decreasing wages, made it more difficult for  
63 citizens to pay for the rising OOP for medical care<sup>8</sup>. This is expected to affect access to  
64 healthcare, measured by an increase of unmet medical needs (UMN)<sup>9</sup>.

65 The relationship between the average annual change in gross domestic product (GDP) and  
66 average annual change in health expenditures across countries in the European Union,  
67 Iceland, Norway, and Switzerland over the period 2008 – 2014 is presented in Figure 1.  
68 Overall, the figure illustrates the strong correlation between the severity of the recession and  
69 the public health budget trend ( $r = 0.603$ ;  $p < 0.001$ ).

70 At the same time, it is clear that it still is possible to find countries where the average annual  
71 change in GDP was almost the same, while there were strong differences in terms of average  
72 annual change in health expenditures. Even more so, some pairs of countries are quite similar  
73 in terms of socio-economic structures and institutions, welfare, and even welfare state  
74 institutions. The nominal average annual change in GDP over the period 2008-2014 in Sweden  
75 (SE) and Iceland (IE) was respectively 1.52% and 0.77%, while the average annual change in  
76 health expenditures varied much more (SE: 5.43%; IS: -0.69%). Similarly, the average annual  
77 change in GDP over the period 2008-2014 in the United Kingdom (UK) and the Republic of  
78 Ireland (IR) was quite close (UK: 1.66%; IR: 2.09%). The difference between the two countries  
79 was that the United Kingdom safeguarded its healthcare spending trends during the crisis,  
80 whereas Ireland reduced its health expenditures. In the United Kingdom, the real average  
81 annual growth of health expenditure was 3.94% during the period 2008-2014, while it slowed  
82 down considerably in Ireland during the same period (0.63%). We aim to isolate the effect of  
83 budgetary retrenchment from the severity of the recession. Therefore, it is crucial to learn that

84 at least two pairs of countries exist that are similar in the severity of the recession, and in many  
 85 other institutional, socio-economic, historical, and geographical aspects.



86  
 87 **Fig. 1.** Average annual change in GDP and government health expenditures across countries, 2008 – 2014. Source: own  
 88 representation of the OECD Economic References database<sup>10</sup> and Health expenditure and financing database<sup>11</sup>. Average  
 89 annual change in GDP as a percentage of average annual change between 2008-2014 in per capita, PPP, and Average annual  
 90 change in health expenditure as a percentage of average annual change between 2008-2014 in per capita, current prices,  
 91 current PPP.

92  
 93 In parallel with the variation in changes in healthcare spending, the areas in which healthcare  
 94 policies have been implemented after the Great Recession differ greatly from country to  
 95 country. Mladovsky et al.<sup>4</sup> categorized the policy measures implemented in the healthcare  
 96 sector in response to the economic crisis into three groups: *policies intended (a) to change the*  
 97 *level of contributions for publicly financed healthcare, (b) to affect the volume and quality of*  
 98 *publicly financed healthcare and (c) to affect the costs of publicly financed healthcare* (see  
 99 table 1).

**Table 1.** Implemented policy measure as a response to the Great Recession

<b>Policy measure</b>	<b>Country</b>
<b>Changing the level of contributions for publicly financed healthcare</b>	
Cutbacks	<b>IS, IR, IT, GR, PT, ES</b>
Increasing employee contribution rates	<b>GR, PT, SI</b>
Increasing or introducing user charges	<b>IR, CH, CZ, DE, ES, FR, GR, IT, LV, NL, PT, SI</b>
Expanding benefits, targeting low-income groups	<b>IR, AT, FR, IT</b>
<b>Affecting the volume and quality of publicly financed healthcare</b>	
Changing the scope of coverage	<b>IR, EE, , NL, PT</b>
Changing in the population of coverage	<b>IR</b>
<b>Affecting the costs of publicly financed healthcare</b>	
Reducing the salaries of health professionals	<b>IS, IR, UK, DE, FR, GR,, LI, PT, SI.</b>
Changing in provider infrastructure and capital investment	<b>IS, IR, DE, GR, GR, LI, LV,NL, PT, SI</b>
Centralization of the healthcare organisations (merging hospitals)	<b>IS, DE, GR, LV, PT, SI</b>
Reducing the tariffs paid to providers	<b>IR, EE, SI</b>

*AT* Austria, *CH* Switzerland, *CZ* Czech Republic, *DE* Denmark, *EE* Estonia, *ES* Spain, *FR* France, *GR* Greece, *IR* Ireland, *IS* Iceland, *LI* Lithuania, *LV* Latvia, *NL* the Netherlands, *PT* Portugal, *SI* Slovenia, *UK* United Kingdom  
Sources: own representation of Mladovsky, P., et al.<sup>4</sup>

100

101 First, some policies intend to change the level of contributions for publicly financed healthcare.  
 102 Some countries made cutbacks in the provision of healthcare services, others increased  
 103 employee contribution rates (either for the general public or for specific population subgroups),  
 104 and others increased or introduced user charges for health services. Further, some countries  
 105 reported expanding benefits, targeting low-income groups. These are important policy  
 106 measures, because user charges play an important role in the threshold for healthcare access,  
 107 both for low-value care and for high-value care (which is cost-effective). Chaupain-Guillot and  
 108 Guillot<sup>2</sup> report a positive relationship between the height of UMN and the height of OOP citizens  
 109 are to pay. Rice et al.<sup>12</sup> also found a link between the level of OOP expenditures and the non-  
 110 take-up of healthcare when it was considered necessary due to the high costs. They specified  
 111 that not only the height of the OOP was crucial, but also what citizens were accustomed to  
 112 paying. Forgoing medical care because of rising OOP is more likely to occur among lower-

113 income individuals<sup>13-16</sup>. This is consistent with the expectation that the relative burden of OOP  
114 decreases with the income, resulting in more inequity in access to healthcare.

115 Second, although some countries modified the coverage scope, they usually left population  
116 coverage untouched. Ireland was the only country where changes in population coverage took  
117 place for wealthy individuals over the age of 70. Although the population coverage did not  
118 change in Greece during the crisis, the rate of uninsured citizens increased, because citizens  
119 lost their coverage after two years of unemployment until 2014. While a 'Poverty Booklet' gave  
120 the long-term unemployed, who lived on low benefits, coverage for limited health services until  
121 2006, there was no insurance for them between 2006-2014. In June 2014, a new measure  
122 gave the uninsured people coverage for prescribed pharmaceuticals and services in  
123 emergency departments in public hospitals, as well as for non-emergency hospital care under  
124 well-defined conditions<sup>17</sup>.

125 Last, there were also policies intended to affect the costs of publicly financed healthcare. These  
126 included the reduction of the salaries of health professionals, as well as changes in provider  
127 infrastructure and capital investment. Some countries reorganised the healthcare sector,  
128 resulting in centralisation through hospitals merging. Although this centralisation may increase  
129 efficiency, it may also have an impact on the accessibility of healthcare.

130 It can be expected that policy measures, both budget cuts and other measures taken during  
131 the Great Recession in Europe have an impact on the accessibility of healthcare. Although  
132 several studies report a significant increase in unmet medical needs (UMN), none of these  
133 studies made use of a measure of the real reduction in health expenditures<sup>18-22</sup>. Some of  
134 them just analysed the evolution in one country by using measurements of UMN before and  
135 during the economic crisis<sup>20-22</sup>. Others used the change of GDP and the country's income  
136 inequality to compare the different evolution of UMN during the Great Recession between  
137 countries<sup>18</sup>.

138 Also, some of these previous studies allocated the citizens into different groups and reported  
139 a differential effect between these groups<sup>18, 20-22</sup>. Elstad<sup>18</sup>, who studied the effect of the Great  
140 Recession on access to healthcare in all EU-members, categorized people by using the level  
141 of income as well as the overall health condition. He documented a stronger increase in  
142 UMN in the group he defined as disadvantaged. The other three studies focused just on one  
143 country. In Greece, Zavras et al.<sup>22</sup> also used income groups and saw a more marked  
144 increase in UMN in the lower-income groups. In contrast, Schneider and Devitt<sup>21</sup> studied the  
145 Irish case and reported a higher increase of UMN in the two highest income quartiles.  
146 Legido-Quigley et al.<sup>20</sup> allocated the Portuguese people by their employment status and  
147 found a greater increase in UMN in the employed than in the unemployed. It can be expected  
148 that a differential effect of public expenditures on UMN for distinct income groups is  
149 contingent on the policy decisions taken. Scientific attention to the effects of budget cuts on  
150 healthcare takeup is important because the underconsumption of healthcare when it is  
151 needed can lead to a further deterioration of health<sup>23, 24</sup>, and avoidable hospital admissions in  
152 the medium term. These negative effects do not only affect life expectancy and the quality of  
153 life, but they may also increase the net costs in the longer term<sup>25</sup>.

154 This article aims to study whether a reduction in health expenditures affects access to  
155 healthcare differently between income-groups.

156 Using a difference-in-difference-in-differences (DDD) approach enables us to investigate the  
157 extent to which budget cuts affect income groups differentially. Overall, recessions imply a  
158 decrease in living standards, which affect their access to healthcare because of the increased  
159 relative weight of OOP in households' budgets. This direct effect is not our central research  
160 question, as this effect has been documented quite well in the existing literature. Our research  
161 question looks at the indirect impact of the recession, through the ensuing healthcare budget  
162 retrenchment. Our central research question is as to whether the latter affects lower-income  
163 groups harder than middle-class and high-income groups.

164 The results of this study can inform policymakers in their decisions on how to deal with future  
165 challenges that require cuts in public spending while avoiding the increase of unequal barriers  
166 to healthcare, which facilitate health inequity. Thus, it may help to avoid or limit large increases  
167 in UMN, or at the very least to reduce inequitable effects for low-income groups.

168

## 169 **METHODS**

### 170 *DATA*

171 This study uses individual and household data from the European Union Statistics on Income  
172 and Living Conditions program (EU-SILC). The EU-SILC is a harmonized representative  
173 population survey on living standards, income, and social inclusion<sup>26</sup>. The survey is conducted  
174 each year in the EU countries as well as in Iceland, Norway, and Switzerland. Since the Great  
175 Recession started in 2008 with most of the policy measures implemented in 2008-2014, this  
176 study builds on the data of the 2008 and the 2014 data waves. This allows us to estimate the  
177 impact of the measures introduced.

178 In the survey, the respondents were asked if they needed medical care but were unable to  
179 take it up during the past 12 months. This indicator, “unmet medical needs” (UMN), can be  
180 used as a proxy for experienced barriers in access to care. This approach has been adopted  
181 in a large number of previous studies<sup>18-20, 27, 28</sup>.

182 Additionally, respondents are asked about the reason for not taking up medical care, choosing  
183 between eight options: could not afford care, waiting times, lack of time, travel distance, fear,  
184 wait and see, lack of knowledge, or others. A binary outcome variable was constructed  
185 indicating the presence of UMN because of cost-related reasons (direct costs, waiting lists, or  
186 travel distance). This variable, also used in previous research<sup>18, 28</sup>, is likely to reflect difficulties  
187 in access to medical care due to situations associated with an economic crisis, such as budget  
188 cuts, an insufficient supply of healthcare, higher co-payments, and lack of household economic  
189 resources. Income groups were created based on the equivalized income; it is the total income

190 of a household, after tax and other deductions, divided by the equivalized household size. The  
191 equivalized household size is based on the modified equivalence scale created by the  
192 Organisation for Economic Cooperation and Development (OECD). By doing so, the real living  
193 standards of households, net of their size or composition, were used for the analyses.

#### 194 *DESIGN*

195 To identify whether the impact of budget cuts in the healthcare sector on access to care is  
196 different between income-groups, we developed a difference-in-difference-in-differences  
197 (DDD) styled regression approach. This regression model adds an extra level to the difference-  
198 in-differences (DD) design. The DD is widely used in public health research and policy  
199 evaluation, where data are available from different groups, countries, or regions at different  
200 times<sup>29</sup>. The technique allows us to estimate effects by comparing a change over time in a  
201 treated group (the first difference) with the difference over the same period in a control group  
202 (second difference). The difference between the difference in the treated group (the first  
203 difference) and the difference in the control group (the second difference) is the difference-in-  
204 differences<sup>30, 31</sup>. The addition of an extra interaction term, namely income-group (the third  
205 difference), in the DDD allows us to estimate, not only the different changes between countries  
206 over time but more specifically whether the effects are different between income-groups.

207 The proportion of participants who reported UMN due to a lack of means in 2008 is compared  
208 with the same proportion in 2014 in the treated country. This difference is compared with the  
209 equivalent change in the proportion of participants who experienced UMN due to a lack of  
210 means in 2008 and 2014 in the control country. To estimate these differences under the control  
211 of control variables, we use linear regressions. One definite advantage of linear regressions is  
212 that they allow a comparison of coefficients between different regression estimates. This is the  
213 most important reason why we choose these models and not logit or probit regressions, where  
214 the comparison between different regression estimates is problematic<sup>32</sup>. Previous research  
215 shows that the use of linear probability models is legitimate, as long as the problem of

216 heteroscedasticity is tackled<sup>33</sup>. For this purpose, we estimate cluster-robust standard errors  
217 clustered at the level of countries within years.

218 With this DDD-technique a natural experiment is set up comparing European countries that  
219 responded differently in their spending on healthcare, while they suffered from the same  
220 recession in order of magnitude. The selection of countries is based on both quantitative  
221 (minimizing the difference in change in GDP, maximizing the difference in health expenditure  
222 evolution for the period 2008-2014) and qualitative (the type of measures) elements, which  
223 were described above (figure 1 and table 1). On top of that, we were able to select pairs that  
224 are quite similar in terms of welfare state provisions and the overall institutional and policy-  
225 related functioning of the countries. The selection results in 2 comparisons:

- 226 1. Treatment: Ireland – control: United Kingdom
- 227 2. Treatment: Iceland – control: Sweden

228 In the two cases, the change in GDP is quite similar between the compared countries, while  
229 there is a strong difference in terms of change in health expenditures (see figure 1). This allows  
230 analysing the impact of budget cuts, isolated from the effects of the Great Recession. In the  
231 natural experiment, the cases do not only differ from one another in health expenditure trends  
232 but also in a qualitative way: measures taken in Ireland provided greater protection for the  
233 lowest income groups<sup>4</sup>.

234 To estimate whether retrenchment in healthcare affects the access to care differentially  
235 according to the income-group, a DDD is set up.

236 The regression equation of the DDD is:

$$\begin{aligned} 237 \quad Y &= \hat{\beta}_0 + \hat{\beta}_1 \cdot \text{country} + \hat{\beta}_2 \cdot \text{time} + \hat{\beta}_3 \cdot \text{income} + \hat{\beta}_4 \cdot \text{country} \cdot \text{time} + \\ 238 \quad &\hat{\beta}_5 \cdot \text{country} \cdot \text{income} + \hat{\beta}_6 \cdot \text{time} \cdot \text{income} + \hat{\beta}_7 \cdot \text{country} \cdot \text{time} \cdot \text{income} + \hat{\beta}_8 \cdot \text{control} + e \end{aligned}$$

239 We compare pairs of countries between the years 2008 and 2014. Therefore, country and  
240 time are dummy variables, indicating whether the observation was in a treated country, post-

241 treatment (in 2014). The equivalized income-groups are divided into quintiles, to analyse the  
242 difference between the first quintile (the 20% of the population with the lowest income) with the  
243 other groups. This allows us to discover potential non-linear effects, especially to test whether  
244 the middle class has evolved differently from the lowest or higher-income quintiles. The  
245 interaction term  $\hat{\beta}_7$  (country\*time\*income) is of central interest. It reflects the degree to which  
246 the change in access to healthcare has increased or decreased in the period 2008 – 2014 in  
247 the different income quintiles compared to the first income quintile. We include a vector of  
248 control variables, inspired by earlier research investigating access to healthcare<sup>18-20, 34</sup>. Control  
249 variables in the model are age, gender, marital status, urbanization, basic activity, general  
250 health, suffering from a chronic illness, and limitations because of health status.

251 DD(D) techniques start from an equal trends assumption, namely that in the absence of the  
252 treatment (in our design: the budget cuts in healthcare), the trends between the two groups  
253 would have evolved parallel to one another<sup>30</sup>. Because it is not possible to observe the  
254 counterfactual in the real world, one often checks whether the trends were parallel in a period  
255 before the treatment. Unfortunately, the EU-SILC has not run long enough to test the parallel  
256 trends assumption in a pre-treatment period. We developed several other tests and arguments  
257 that support the plausibility of equal trends.

258 First, some scholars have recently argued estimations become more plausible if the cases are  
259 similar in levels *before* the treatment<sup>35</sup>. This indeed seems to be the case in our two pairs. In  
260 Sweden (2.4%) and Iceland (1.6%), the reported prevalence of UMN is not that far apart, and  
261 the difference is opposite to the post-treatment situation: access to healthcare in Iceland, as  
262 measured by UMN, is better before the budget cuts, and worse after. In our main comparison  
263 between Ireland (1.7%) and the United Kingdom (1.1%), the pre-treatment differences are  
264 particularly small.

265 The second argument supporting the parallel trends assumption is that, before 2008, EU  
266 countries invested in the coordination of health policies through the Open Method of

267 Coordination. This favoured EU-policy in healthcare and other social policy domains, agreed  
 268 upon in 2000, started to bear some fruit. Scholars seem to argue that the OMC helped to  
 269 counterbalance potential divergence in policy<sup>36,37</sup> which would be some reassurance of parallel  
 270 trends.

271 Finally, we test an alternative empirical strategy that has been proposed. We tested the equal  
 272 trends assumption by repeating the analysis on cases that are evenly treated. We, therefore,  
 273 replicated the regressions for the treated countries (Iceland and Ireland) with a country where  
 274 both the change in GDP and the change in health expenditures are close to the treated country  
 275 (Iceland – Portugal, and Ireland – Portugal).

276 All analyses are conducted in Stata/15.

## 277 RESULTS

### 278 DESCRIPTIVE ANALYSIS

279 The descriptive analysis of the control variables used in this study can be found in additional  
 280 file 1. The results are shown separately for each treatment and control country (Iceland,  
 281 Sweden, Ireland, the United Kingdom, and Portugal) for both years 2008 and 2014. Table 2  
 282 shows the results of the descriptive analysis of the variable of interest, UMN due to causes  
 283 related to an economic crisis, respectively for 2008 and 2014, separate for each country. In  
 284 2008 the highest amount of UMN was reported in Sweden (2,4%), while in 2014 in Sweden  
 285 (1,4%) the lowest amount of UMN was found. In 2014 the highest amount of UMN was reported  
 286 in Iceland (4,4%).

**Table 2.** Descriptives - UMN due to situations related to an economic crisis, 2008-2014

		IS		SE		IE		UK		PT	
		n	%	n	%	n	%	n	%	n	%
2008	Unmet medical needs*	47	1.6	181	2.4	170	1.7	161	1.1	140	1.4
	No unmet medical needs**	2 835	98.4	7 240	97.6	9 940	98.3	14 879	98.9	9 952	98.6
	Missing	3 732	56.4	7 468	50.2	6	0.1	1 783	10.6	9	0.1
	Total	6 618	100	14 889	100	10 116	100	16 823	100	10 101	100

2014	Unmet medical needs*	132	4.4	81	1.4	410	3.9	367	2.1	567	3.9
	No unmet medical needs**	2 862	95.6	5 705	98.6	10 219	96.1	17 524	97.9	14 130	96.1
	Missing	3 940	56.8	5 491	48.7	0	0.0	14	0.1	4	0.0
	Total	6 934	100	11 277	100	10 629	100	17 905	100	14 701	100

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*GR* Greece, *AOC* All other countries except Greece, *IS* Iceland, *SE* Sweden, *IE* Ireland, *UK* United Kingdom, *PT* Portugal.

Source: Authors' analysis of EU-SILC 2008 and 2014.

\*Unmet medical needs limited to reasons due to situations related to an economic crisis (due costs, waiting lists, or travel difficulties).

\*\* No unmet medical needs or other reasons for unmet medical needs.

287

## 288 *REGRESSION ANALYSIS*

289 To estimate the effect of budget cuts in healthcare on the accessibility of care in general a  
 290 difference-in-differences approach was used. Since this is not the main interest of this paper,  
 291 the results are presented only briefly. In both cases (Iceland compared with Sweden and  
 292 Ireland compared with the United Kingdom), the UMN increase more in the country that  
 293 introduced budget cuts compared with the countries that did not. In Iceland, the UMN increased  
 294 more compared to Sweden (3.24 pp), as well as in Ireland compared with the United Kingdom  
 295 (1.15 pp). The output of the DD is found in additional file 2.

296 The core analyses of this paper are the difference-in-difference-in-differences estimations. The  
 297 DDD tests the impact of reducing health expenditures on access to healthcare in depth. The  
 298 overall effect of a differential impact of income on UMN, was first estimated by adding  
 299 equivalized income to the regression as a continuous variable. These results are found in  
 300 additional file 2. Table 3 presents only the results of the DDD-test where the equivalized  
 301 income is separated into income quintiles and analyzed categorically. Hereby, the second,  
 302 third, fourth, and fifth income quintiles are compared to the lowest income quintile. This  
 303 approach allows discovering potential non-linear effects. A significant negative effect is found  
 304 in Iceland for all income quintiles compared to income quintile 1. The threshold for access to  
 305 healthcare (UMN) thus increases less for those in a higher income quintile. The increase of

306 UMN in Iceland is similar in quintiles 2, 3, and 4 (respectively: -1.96 pp; -1.62 pp; -1.83 pp),  
307 while the difference in trend is even much more marked in quintile 5 (-3.51pp). The results are  
308 quite different in Ireland, where UMN increases more in income quintiles 2, 3, and 4 compared  
309 to the lowest income group. In income quintile 3 the highest increase in UMN is found  
310 compared to income quintile 1 (1.60 pp) over the period 2008-2014. To test the significance of  
311 this difference between the income quintiles a  $\chi^2$  tests were carried out. For each year, a  
312 separate  $\chi^2$  test was carried out per quintile, using quintile 1 as a reference. This means that  
313 4  $\chi^2$  tests were performed per year (quintile 1-2, quintile 1-3, quintile 1-4, and quintile 1-5). In  
314 2008, no significant relationship was found between the income quintile and reporting UMN  
315 except from the test with quintiles 1 and 5 (people in quintile 5 were significantly less likely to  
316 report UMN than those in quintile 1). In contrast, in 2014, a significant relationship was also  
317 found in the  $\chi^2$  test with quintile 3 ( $\chi^2$  (1, n= 4,252) = 7.5; p= 0.006). People in income quintile  
318 3 have a higher risk on UMN in 2014 than those in income quintile 1 (additional file 3). The full  
319 output of the DD- and DDD-analyses is attached in additional file 2.

**Table 3.** DDD-Estimates: the impact of the reduction in health expenditures on UMN over countries and between income groups, 2008-2014

	Iceland		Ireland	
	$\beta$	(SE)	B	(SE)
Income quintile 2	-0.0196**	(0.0005)	0.0029**	(0.0002)
Income quintile 3	-0.0162*	(0.0019)	0.0160**	(0.0003)
Income quintile 4	-0.0183**	(0.0007)	0.0058*	(0.0006)
Income quintile 5 (highest)	-0.0351**	(0.0011)	0.0005	(0.0005)
Control country	Sweden		United Kingdom	
Control variables	yes		yes	
Clustered robust SE (country / year)	yes		yes	

Reference category: quintile 1

SE, standard error. \*p < 0.01; \*\*p < 0.001.

Unmet medical needs limited to reasons due to situations related to an economic crisis (due costs, waiting lists, or travel difficulties).

Source: Author's own analysis of EU-SILC 2008-2014.

320

## 321 **DISCUSSION**

322 This study aims to estimate whether the effects of budget cuts in the healthcare sector on the  
323 accessibility of medical care are different between income groups. To estimate these effects,  
324 this study evaluates the change in access to healthcare between income-groups over the  
325 period 2008-2014, between countries with similar shocks in the business cycle, but differences  
326 in the decrease in health expenditures. This approach allows us to analyse whether the effects  
327 of budget cuts on access to healthcare are different between income-groups, isolated from the  
328 effects of the recession on living standards. The core contribution of this study deals with the  
329 expected differential impact of budget cuts by income group. In this respect, the outcome is  
330 dramatically different between Iceland, where no specific measures were taken to protect the  
331 lowest income groups, and Ireland, which introduced measures intending to protect low-  
332 income groups. In Iceland, the lowest income groups were hit especially hard. In contrast, in  
333 Ireland, where the introduced measures had the intention to protect the lowest income group,  
334 the middle-income group was hit hardest.

335 This finding shows that the type of measures taken during a recession impacts who is affected  
336 by the measure. The equitable distribution of the burden depends on whether or not income-  
337 related measures are taken.

338 The comparison of Iceland versus Sweden and Ireland versus the United Kingdom in a natural  
339 experiment allows focusing on the supply-side effects (healthcare budgets) because the  
340 effects on the demand side (severity of the recession) were almost similar in treatment and  
341 control groups in the period 2008-2014. This isolates the effects of spending on healthcare  
342 from the general and direct effects of the Great Recession on people's living standards. In  
343 short, governance matters for an equitable healthcare system. This is an important added  
344 value of this research and addresses a gap in previous research. Previous research that also  
345 reported an increase of UMN during the Great Recession<sup>18, 20-22, 24</sup>, used the business cycle  
346 (the Great Recession) as a proxy of reductions in health expenditures; which is imprecise.

347 Furthermore, earlier research only focused on changes through time within countries and does  
348 not compare between countries. The DD design allows taking that into account too.

349 Our central contribution, nevertheless, pertains to the difference in the evolution between  
350 income groups. Here, the results for Iceland are different from those from Ireland. In Iceland,  
351 higher-income groups are affected less than those in the lowest income group, which is  
352 consistent with previous research<sup>18, 22</sup>. By contrast, in Ireland, the middle-class (income  
353 quintiles 2, 3, and 4) is more affected. Thus, it is not the most vulnerable low-income group  
354 that experienced the greatest increase in UMN. On the contrary, the largest effect is found in  
355 income quintile 3. In 2014, there was a significantly higher proportion who reported UMN in  
356 quintile 3 than in quintile 1, while this pattern was not present in 2008. The explanation for this  
357 outcome can be found in the policy measures Ireland introduced during the recession. In  
358 Ireland, some are holders of a medical card, which gives them free access to a general  
359 practitioner (GP) and hospital care, and to prescribed medication at a reduced cost (category  
360 I). Others have to pay these costs themselves (category II)<sup>38</sup>. In 2014, the number of medical  
361 cardholders was nearly 40%<sup>39, 40</sup>. As entitlement to such a medical card depends on the level  
362 of income, most beneficiaries are in income quintile 1 and, to a lesser extent, in income quintile  
363 2. As the policy measures implemented by Ireland affected people exclusively from Category  
364 II (e.g., increase in user charges and the abolition of automatic entitlement to medical cards  
365 for people above 70 years), they were able to guarantee access for low-income groups that  
366 were medical cardholders<sup>41</sup>. Our findings confirm the concerns expressed in earlier research  
367 about unequal access to care in Ireland, especially for those who are just above the income  
368 level to be entitled to a medical card<sup>42</sup>. Also, Schneider and Devitt<sup>21</sup> report a higher increase  
369 in UMN during the Great Recession in the higher income groups but no increase in the lower-  
370 income groups in Ireland.

371 These findings demonstrate the importance of research on the impact of healthcare cuts on  
372 access to care, isolating these cuts from changes in living standards. In addition, in-depth

373 research is important to understand which groups of the population are most affected by the  
374 measures.

### 375 *STRENGTHS AND LIMITATIONS*

376 The use of a difference-in-differences (DD) approach makes it possible to set up a stronger  
377 causal design since the effect of budget trends can be isolated, net of differences that already  
378 existed before the crisis. This is, even more, the case for the difference-in-difference-in-  
379 differences design. This allows us to adequately test inequities in healthcare access for  
380 different income groups. Thereby the careful selection of treatment and control cases  
381 effectively isolates changes in health expenditures, net of the impact of the crisis on living  
382 standards. Moreover, the use of multiple cases makes it possible to distinguish between  
383 different effects among countries, depending on the type of measures taken by a country. To  
384 the best of our knowledge, this more sophisticated set of techniques has not been used before  
385 to investigate the differential effect of austerity measures in healthcare on access to care for  
386 different income groups.

387 Despite several strengths, this study has some limitations.

388 First, difference-in-differences designs are based on a common trend assumption: in the  
389 absence of the treatment, the change in both groups remains the same. It is not possible to  
390 test this directly. Therefore, this is typically tested for a period where the treatment did not take  
391 place. Since data are only available from 2004 or 2005 to 2016 or 2017, the period before and  
392 after the crisis is far too short to test the common trend assumption. To meet this limitation, we  
393 brought in some logical arguments that in favour of the design. First, the selected comparisons  
394 between treatment countries and controls, are similar in levels *before* the treatment (as  
395 suggested in the recent literature<sup>35</sup>). In Iceland the small difference is opposite to the post-  
396 treatment situation. The pre-treatment difference between Ireland and the United Kingdom is  
397 particularly small. Second, social policy scholars see little reason to suspect a divergence in  
398 policies before 2008, especially in EU countries. These countries invested considerable effort

399 in the so-called 'Open Method of Coordination'. OMC probably helped to prevent a potential  
400 divergence in policy<sup>36, 37</sup>. Finally, a placebo test was carried out between countries where both  
401 the change in wealth (change in GDP) and change in health expenditures over the crisis period  
402 are very similar.

403

404 A second limitation lies in the variable of interest, self-reported unmet medical needs (UMN).  
405 For one thing, the sampling method varies between countries. There are also differences in  
406 the nonresponse rate, which is, in particular, higher in Iceland and Sweden. Since there is no  
407 other data available, the results of the model with Iceland and Sweden should be interpreted  
408 with some caution. Nevertheless, the results of this model are in line with the theoretical  
409 expectations and with previous empirical results<sup>9</sup>. In consequence, the model of Ireland,  
410 compared to the United Kingdom, is the central case in our contribution. Furthermore, self-  
411 reporting may lead to variation in bias between income groups and over time, amongst others,  
412 due to adaptation. The subjective relative deprivation theory hypothesizes that, in economic  
413 downturns, people adapt their preferences so that those who lose economic resources switch  
414 their opinion from 'cannot afford' to 'do not want' to shield themselves from unrealistic goals<sup>43</sup>.  
415 Although this theory has only been tested on consumption goods, it might have an impact on  
416 a person's perception of healthcare needs. This could lead to an underestimation of the results  
417 found. A possible solution would be to use objective data in addition to subjective data, such  
418 as real take-up of healthcare (GP consults, number of admissions). Since both subjective and  
419 objective data have their limitations, combining both data can increase the quality of research,  
420 which is in line with the proposals of Thompson et al.<sup>44</sup>. Moreover, the variable UMN is taken  
421 up in the cross-sectional part of the EU-SILC survey. Because cross-sectional data have  
422 certain limitations, the use of panel data is recommended for this purpose<sup>44</sup>.

423

424 Last, in this study, the effect of a decrease in UMN was measured per income quintile.  
425 However, low income is but one dimension of deprivation<sup>45</sup>. Further research can make use of

426 multidimensional approaches to poverty, social exclusion, and deprivation to make a more in-  
427 depth analysis.

## 428 **CONCLUSION**

429 The difficulties in access to healthcare (measured as unmet medical needs) increase more  
430 strongly in countries where budget cuts in healthcare were higher (e.g., Iceland and Ireland)  
431 during the period 2008-2014. We compare these trends with countries that experienced the  
432 same change in wealth (change in GDP) but limited their budget cuts in healthcare (e.g.,  
433 Sweden and the United Kingdom). Important differences in the effect of budget cuts in  
434 healthcare can be seen between income groups, contributing to an increase in inequity. In  
435 particular, where low-income earners in Iceland are hit harder than the others, this effect did  
436 not occur in Ireland. This can be attributed to accompanying measures with the retrenchment,  
437 specifically aimed at low-income groups in Ireland, and which were absent in Iceland. These  
438 policies can reduce and even overshoot the general effect of income inequalities on access to  
439 healthcare. Introducing well-thought-out measures, while guaranteeing equal access to care  
440 for as many residents as possible, is important and is recognised as a core objective in the  
441 European Union since 2005<sup>1</sup>. Not taking up necessary medical care has quite strong negative  
442 effects on health, well-being, and social and socioeconomic resilience<sup>22</sup>. Unequal access to  
443 healthcare leads to an avoidable increase in health inequity.

## 444 **LIST OF ABBREVIATIONS**

445 AOC: all other OECD countries except Greece, AT: Austria, CH: Switzerland, CZ: Czech  
446 Republic, DE: Denmark, DD: difference-in-differences, DDD: difference-in-difference-in-  
447 differences, EE: Estonia, ES: Spain, EU-SILC: European Union Statistics on Income and  
448 Living Conditions, FR: France, GDP: Gross domestic product, GR: Greece, IR: Ireland, IS:  
449 Iceland, LI: Lithuania, LV: Latvia, NL: the Netherlands, OECD: Organisation for Economic  
450 Co-operation and Development, OOP: out-of-pocket payment, pp: percent points, PT:  
451 Portugal, SE: Sweden, SI: Slovenia, UMN: unmet medical need, UK: United Kingdom

452 **ETHICS APPROVAL AND CONSENT TO PARTICIPATE**

453 This study was approved by the ethical commission of the Ghent University Hospital  
454 (reference: 2019/1437).

455 **CONSENT FOR PUBLICATION**

456 Not applicable.

457 **AVAILABILITY OF DATA AND MATERIALS**

458 The data that support the findings of this study are available from Eurostat, but restrictions  
459 apply to the availability of these data, which were used under license for the current study,  
460 and so are not publicly available. Data are, however, available from the authors upon  
461 reasonable request and with permission of Eurostat.

462 Supplementary data are available at OECD online.

463 **COMPETING INTERESTS**

464 The authors declare that they have no competing interests.

465 **FUNDING**

466 No new funding was received for this work.

467 **AUTHORS' CONTRIBUTIONS**

468 LT, SA, SW were responsible for the design of the study. LT created the syntax and do-files  
469 for the analyses and interpreted the results. SA ran the regression estimations. SW contacted  
470 policymakers for a deeper insight into the policy measures implemented. SL was involved in  
471 reviewing the literature. All authors contributed to writing the manuscript and read and  
472 approved the final manuscript.

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475 **REFERENCES**

- 476 1. World Health Organization. Health systems financing: the path to universal coverage.  
477 World health report 2010. Geneva: WHO; 2010.
- 478 2. Chaupain-Guillot S, Guillot O. Health system characteristics and unmet care needs in  
479 Europe: an analysis based on EU-SILC data. The European Journal of Health  
480 Economics. 2015;16(7):781-96.
- 481 3. Redbird B, Grusky DB. Distributional effects of the Great Recession: Where has all  
482 the sociology gone? Annual Review of Sociology. 2016;42(1):185-215.
- 483 4. Mladovsky P, Srivastava D, Cylus J, Karanikolos M, Evetovits T, Thomson S, et al.  
484 Health policy responses to the financial crisis in Europe 2012.
- 485 5. Cylus J, Mladovsky P, McKee M. Is there a statistical relationship between economic  
486 crises and changes in government health expenditure growth? An analysis of twenty-  
487 four European countries. Health services research. 2012;47(6):2204-24.
- 488 6. OECD. Society at a glance Paris: OECD Publishing, 2019.
- 489 7. Hou X, Velényi EV, Yazbeck AS, lunes RF, Smith O. Learning from economic  
490 downturns: How to better assess, track, and mitigate the impact on the health sector:  
491 The World Bank; 2013.
- 492 8. OECD, European Union. Health at a glance. Paris: OECD Publishing, 2014.
- 493 9. Allin S, Masseria C. Unmet need as an indicator of health care access. Eurohealth.  
494 2009;15(3):7-9.
- 495 10. Economic references [database on the Internet]. 2016. Available from:  
496 <https://www.oecd-ilibrary.org/content/data/data-00548-en>.
- 497 11. Health expenditure indicators [database on the Internet]. 2014. Available from:  
498 <https://www.oecd-ilibrary.org/content/data/data-00349-en>.
- 499 12. Rice T, Quentin W, Anell A, Barnes AJ, Rosenau P, Unruh LY, et al. Revisiting out-of-  
500 pocket requirements: trends in spending, financial access barriers, and policy in ten  
501 high-income countries. BMC health services research. 2018;18(1):371.

- 502 13. Gemmill MC, Thomson S, Mossialos E. What impact do prescription drug charges  
503 have on efficiency and equity? Evidence from high-income countries. *International*  
504 *journal for equity in health*. 2008;7(1):12.
- 505 14. Lohr KN, Brook RH, Kamberg CJ, Goldberg GA, Leibowitz A, Keesey J, et al. Use of  
506 medical care in the RAND Health Insurance Experiment: diagnosis-and service-  
507 specific analyses in a randomized controlled trial. *Medical care*. 1986;24(9):S1-S87.
- 508 15. Manning WG, Newhouse JP, Duan N, Keeler EB, Leibowitz A. Health insurance and  
509 the demand for medical care: evidence from a randomized experiment. *The American*  
510 *economic review*. 1987:251-77.
- 511 16. Newhouse JP. *Free for all?: lessons from the RAND health insurance experiment:*  
512 *Harvard University Press; 1993.*
- 513 17. Eurofound. *Access to healthcare in times of crisis*. Luxembourg: Publication Office of  
514 the European Union, 2014.
- 515 18. Elstad JI. Income inequality and foregone medical care in Europe during the great  
516 recession: multilevel analyses of EU-SILC surveys 2008–2013. *International journal*  
517 *for equity in health*. 2016;15(1):101.
- 518 19. Karanikolos M, Gordeev VS, Mackenbach JP, McKee M. Access to care in the Baltic  
519 States: did crisis have an impact? *The European Journal of Public Health*.  
520 2016;26(2):236-41.
- 521 20. Legido-Quigley H, Karanikolos M, Hernandez-Plaza S, de Freitas C, Bernardo L,  
522 Padilla B, et al. Effects of the financial crisis and Troika austerity measures on health  
523 and health care access in Portugal. *Health Policy*. 2016;120(7):833-9.
- 524 21. Schneider SM, Devitt C. Accessing healthcare in times of economic growth and  
525 economic downturn: Evidence from Ireland. *Journal of European Social Policy*.  
526 2018;28(4):357-69.
- 527 22. Zavras D, Zavras AI, Kyriopoulos I-I, Kyriopoulos J. Economic crisis, austerity and  
528 unmet healthcare needs: the case of Greece. *BMC health services research*.  
529 2016;16(1):309.

- 530 23. Peters DH, Garg A, Bloom G, Walker DG, Brieger WR, Hafizur Rahman M. Poverty  
531 and access to health care in developing countries. *Annals of the New York Academy*  
532 *of Sciences*. 2008;1136(1):161-71.
- 533 24. Wagstaff A. Poverty and health sector inequalities. *Bulletin of the world health*  
534 *organization*. 2002;80:97-105.
- 535 25. Weissman JS, Gatsonis C, Epstein AM. Rates of avoidable hospitalization by  
536 insurance status in Massachusetts and Maryland. *Jama*. 1992;268(17):2388-94.
- 537 26. Iacovou M, Kaminska O, Levy H. Using EU-SILC data for cross-national analysis:  
538 strengths, problems and recommendations. ISER working paper series, 2012.
- 539 27. Kentikelenis A, Karanikolos M, Reeves A, McKee M, Stuckler D. Greece's health  
540 crisis: from austerity to denialism. *The Lancet*. 2014;383(9918):748-53.
- 541 28. Rodrigues R, Zolyomi E, Kalavrezou N, Matsaganis M. The impact of the financial  
542 crisis on unmet needs for healthcare. Brussels: 2013.
- 543 29. Wing C, Simon K, Bello-Gomez RA. Designing difference in difference studies: Best  
544 practices for public health policy research. *Annual Review of Public Health*.  
545 2018;39(1):453-69.
- 546 30. Angrist J, Pischke J-S. Mostly harmless econometrics. An empiricist's companion.  
547 Princeton: Princeton University Press; 2009.
- 548 31. Gertler PJ, Martinez S, Premand P, Rawlings LB, Vermeersch CMJ. Impact  
549 evaluation in practice. Second Edition ed. Washington, DC: Inter-American  
550 Development Bank and World Bank; 2016. 335 p.
- 551 32. Karlson KB, Holm A, Breen R. Comparing regression coefficients between same-  
552 sample nested models using logit and probit: a new method. *Sociological*  
553 *Methodology*. 2012;42(1):286-313.
- 554 33. Mood C. Logistic regression: Why we cannot do what we think we can do, and what  
555 we can do about it. *European Sociological Review*. 2010;26(1):67-82.

- 556 34. Elstad JI. Dental care coverage and income-related inequalities in foregone dental  
557 care in Europe during the great recession. *Community dentistry and oral*  
558 *epidemiology*. 2017;45(4):296-302.
- 559 35. Kahn-Lang A, Lang K. The promise and pitfalls of Differences-in-Differences:  
560 Reflections on 16 and pregnant and other applications. *Journal of Business &*  
561 *Economic Statistics*. 2019:1-14.
- 562 36. De La Rosa S. The OMC processes in the health care field: what does coordination  
563 really mean? *European Papers - A Journal on Law and Integration*. 2018;3(1):215-34.
- 564 37. Vanhercke B. From the Lisbon strategy to the European pillar of social rights: the  
565 many lives of the social Open Method of Coordination. In: Vanhercke B, Ghailani D,  
566 Spasova S, Pochet P, editors. *Social policy in the European Union 1999-2019: the*  
567 *long and winding road*. Brussels: European Trade Union Institute and European  
568 *Social Observatory*; 2020. p. 99-123.
- 569 38. Layte R, Nolan A, Nolan B. *Poor prescriptions: poverty and access to community*  
570 *health services*: Combat Poverty Agency; 2007.
- 571 39. Burke SA, Normand C, Barry S, Thomas S. From universal health insurance to  
572 universal healthcare? The shifting health policy landscape in Ireland since the  
573 economic crisis. *Health Policy*. 2016;120(3):235-40.
- 574 40. Government of Ireland. *Health in Ireland: Key Trends 2018*. Department of Health,  
575 *Epidemiology Unit*, 2018.
- 576 41. Thomson S. *Health system responses to financial pressures in Ireland*. Copenhagen:  
577 *European Observatory on Health Systems and Policies*, 2014.
- 578 42. Brick A, Nolan A, O'Reilly J, Smith S. *Resource allocation, financing and sustainability*  
579 *in health care. Evidence for the Expert Group on Resource Allocation and Financing*  
580 *in the Health Sector*. Dublin: Department of Health and Children and Economic and  
581 *Social Research Institute*, 2010.

- 582 43. Halleröd B. Sour grapes: relative deprivation, adaptive preferences and the  
583 measurement of poverty. *Journal of Social Policy*. 2006;35(3):371-90. Epub  
584 2006/06/26.
- 585 44. Thompson K, van Ophem J, Wagemakers A. Studying the impact of the Eurozone's  
586 Great Recession on health: Methodological choices and challenges. *Economics &*  
587 *Human Biology*. 2019;35:162-84.
- 588 45. Haughton J, Khandker SR. *Handbook on poverty and inequality*. Washington, DC:  
589 World Bank; 2009.

590 **ADDITIONAL FILE**

591 Additional file 1: descriptives of the control variables

592 Additional file 2: output of DD and DDD

593 Additional file 3: output of chi<sup>2</sup>-test Ireland, different income quintiles

# Figures

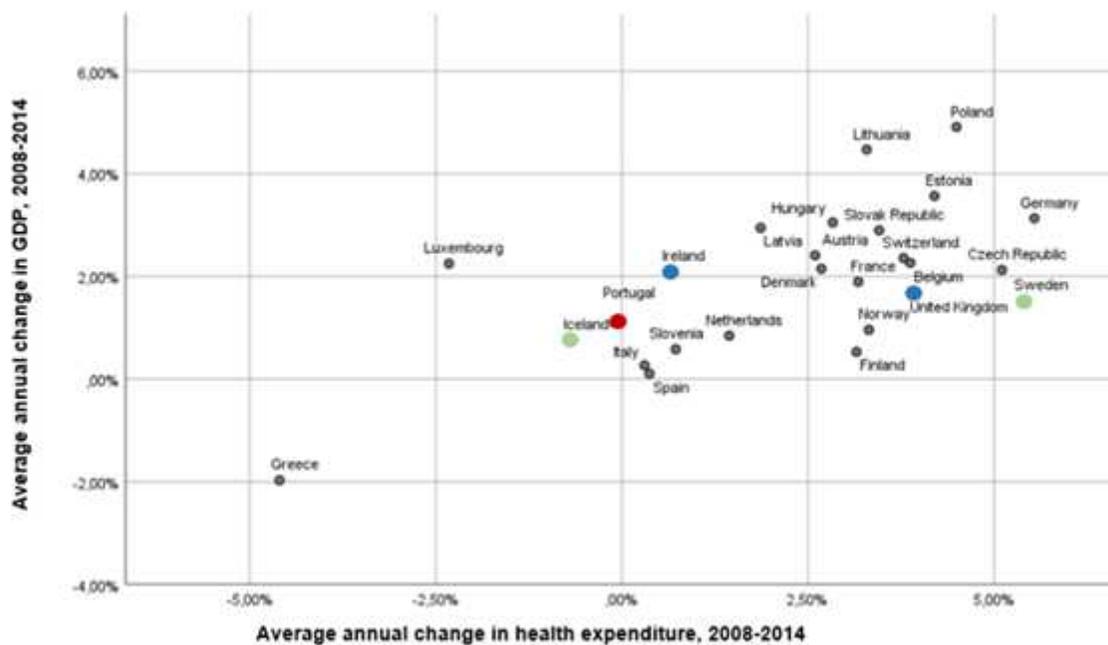


Figure 1

Average annual change in GDP and government healthcare expenditures across countries periods 2008 - 2014. Source: OECD Economic References database (OECD, 2020) and Health expenditure and financing database (OECD, 2020). Average annual change in GDP as percentage of average annual change between 2008-2014 in per capita, PPP and Average annual change in health expenditure as percentage of average annual change between 2008-2014 in per capita, current prices, current PPP.

## Supplementary Files

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