

# Real GDP growth rates and health care spending – Comparison between the G7 and the EM7 countries

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## Research

**Keywords:** real GDP growth, health care expenditure, G7, EM7

**Posted Date:** January 2nd, 2020

**DOI:** <https://doi.org/10.21203/rs.2.19900/v1>

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**Version of Record:** A version of this preprint was published on July 16th, 2020. See the published version at <https://doi.org/10.1186/s12992-020-00590-3>.

## Abstract

**Background:** Accelerated globalization has substantially contributed to the rise of emerging markets worldwide. The G7 and Emerging Markets Seven (EM7) behaved in significantly different macroeconomic ways before, during, and after the 2008 Global Financial Crisis. Average real GDP growth rates remained substantially higher among the EM7, while unemployment rates changed their patterns after the crisis. Worldwide economic growth began to accelerate again, starting from year 2017. However, approximately one half of this growth is attributable to the EM7, while only a quarter to the G7 nations. This paper aims to analyse the association between the health spending and real GDP growth in the G7 and the EM7 countries.

**Results:** In terms of GDP growth, the EM7 exhibited higher degree of resilience during the 2008 Global Crisis, compared to the G7. Unemployment in the G7 nations was rising significantly, compared to pre-recession levels, but, in the EM7, it remained traditionally high. In the G7, the austerity (measured as a percentage of GDP and in PPP basis) significantly decreased the public health expenditure, even so in than in the EM7. Out-of-pocket health expenditure grew at far more concerning pace in the EM7 compared to the G7 during the Crisis, exposing vulnerability of citizens and households living close to poverty line. Regression analysis demonstrated that, in the G7, real GDP growth had positive impact on out-of-pocket expenditure measured as a percentage of current health expenditure expressed as a percentage of GDP (CHE). In the EM7, it affected negatively CHE, CHE per capita in PPP in constant 2011 international USD, and out-of-pocket expenditure per capita in PPP international USD.

**Conclusion:** The EM7 countries showed stronger endurance withstanding the consequences of the global economic crisis as compared to the G7 economies. Evidence of that were most visible in real growth rates and unemployment rates, before, during, and after the crisis. It influenced health spending patterns in both groups, although they tended to diverge instead of converging in several important areas.

## Introduction

Accelerated globalization taking place primarily after the end of the Cold War Era has substantially contributed to creating conditions for the occurrence of rapidly developing large economies worldwide, labeled “emerging markets” [1]. World economy growth was generally quite stable from the beginning of the XXI century until the occurrence of the Global Financial Crisis triggered by the Lehman Brothers’ bankruptcy in the USA in autumn 2007. It had disastrous consequences both in the mature, high-income free market economies and in the rapidly growing major emerging economies. In this study, we observe the largest and most representative national economies in both groups. Therefore, the authors of this paper decided to further elaborate the World Bank’s adopted comparison of real GDP growth rates and health care spending between the first group presented by the G7 nations and the second one marked as Emerging Markets Seven (EM7). The G7 was formed as a formal gathering in 1976 before the oil crisis. The EM7 were observed as a group of similar economies by the economists John Hawksworth and Gordon Cookson at PricewaterhouseCoopers in 2006, 30 years later [2].

These two groups behaved in significantly different macroeconomic ways before, during, and after the crisis. Average real GDP growth rates remained substantially higher among the EM7, while unemployment rates changed the pre-crisis pattern into the novel post-crisis one. Worldwide economic growth began to accelerate again in 2017 and continued in 2018–2019. However, approximately one half of this growth is attributable to the EM7 and only one quarter to the G7 nations. This gradual, but profound change in global health expenditure is largely attributable to the financial globalization and we seek to understand the underlying causality. The purpose of this paper is to analyse the association between the health spending and real GDP growth in the G7 and the EM7 countries.

Observing the 2000–2016 period is particularly useful to understand the ability of these emerging nations to invest into the health care [3, 4, 5, 6, 7]. So far, the existing studies focused on certain countries only [8, 9]. We seek to understand underlying hidden patterns and long-term trends in order to explain why rather modest share of increasing national wealth is ending up allocated for medical care provision. Since early 1990s, insufficient health expenditure leads to unacceptably high out-of-pocket spending by ordinary citizens, gradually increasing in terms of percentage of GDP.

## Data And Methods

For the patterns’ analysis, we compared the following groups of nations in accordance to the recent opinions presented by the Brookings Institute and the World Bank. The G7 included the USA, Japan, Germany, the UK, France, Italy, Canada, while Emerging Seven Markets (EM7) encompassed China, India, Russia, Brazil, Indonesia, Mexico, and Turkey. Time period analysed was 2000–2016, limited by some data unavailability. Data source used were WHO Global Health Expenditure Database for the following indicators of health expenditure: Current health expenditure (CHE) as percentage of GDP, current health expenditure (CHE) per capita in USD constant 2010, current health expenditure (CHE) per capita in PPP (constant 2011 international USD), domestic general government health expenditure (GGHE-D) as percentage of current health expenditure (CHE), out-of-pocket Expenditure (OOPS) per capita in PPP International USD, out-of-pocket (OOPS) as percentage of current health expenditure (CHE).

The International Monetary Fund (IMF) served as a complimentary data source for the following variables: GDP (nationwide in terms of million PPP) and real GDP growth rate (percentage), while the World Development Indicators Database from the World Bank was a source for unemployment (percentage of total labor force; modeled ILO estimate), governance effectiveness, life expectancy at birth (total, years), and number of physicians per 1,000 people.

We utilised panel regression analysis with country fixed effects and year fixed effects separately for the G7 and the EM7 countries. We specified the basic model as follows:

$$Y_{it} = \beta_1 * \text{Real GDP Growth}_{it} + \beta X_{it} + \alpha_i + \varepsilon_{it},$$

where  $\alpha_i$  is intercept for each country;  $Y_{it}$  was a vector of dependent variables ( $i$  is county,  $t$  is year), such as current health expenditure (CHE) as percentage of GDP (models 1–2), CHE per capita in US\$ constant 2010 (models 3–4), CHE per capita in PPP in constant 2011 international USD (models 5–6), domestic general government health expenditure (GGHE-D) as percentage of CHE (models 7–8), out-of-pocket expenditure (OOPS) per capita in PPP international USD (models 9–10), OOPS as percentage of CHE (models 11–12);  $\varepsilon_{it}$  is the error term. Real GDP growth was independent variable, while  $X_{it}$  was a vector of control variables, which included GDP per capita, inflation, unemployment, population density, and life expectancy. The last indicator was included as a proxy for burden of all diseases [10]. In the extended models, we included governance effectiveness and number of physicians per 1,000 people.  $\beta_1$  is the coefficient for the independent variable, while  $\beta$  is a vector of the coefficients for control variables.

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Tables 1 and 3 provide descriptive statistics and cross-correlation matrix for the variables for the G7 and the EM7 countries respectively. Tables 2 and 4 provide models estimates for the G7 and the EM7 countries respectively. Variance inflation factors from preliminary OLS regressions do not suggest issues of multicollinearity.

Table 1  
Summary statistics and cross-correlation matrix for the G7

Variable	Obs	Mean	Std. Dev.	Min	Max	chegdp	chepc	chepcPPP	ghed	oospCPPP	oopsche
CHEGDP	119	10.214	2.492	5.972	17.073	1					
CHEPC	119	4086.352	1724.677	1520.454	9869.742	.9153*	1				
CHEPCPPP	119	3917.370	1715.360	1570.207	9869.742	.9558*	.9656*	1			
GGHE-D	119	74.939	11.018	44.189	85.138	-.6475*	-.4937*	-.5418*	1		
OOPSPCPPP	119	538.452	22.296	182.132	1094.227	.7720*	.7764*	.8375*	-.6037*	1	
OOPSCHE	119	14.174	4.163	7.138	26.464	-.2852*	-.2946*	-.2374*	-.0739	.3125*	1
Real GDP growth	119	1.398	1.931	-5.600	5.200	.0145	.0119	.0298	-.1189	-.0421	-.1284
GDP per capita	119	37026.510	6972.833	26293.750	57807.660	.7865*	.9033*	.9166*	-.3426*	.8131*	-.1675
Inflation	119	1.433	1.038	-1.381	3.856	.1288	.1126	.1199	-.3161*	.1285	-.0157
Unemployment	119	7.051	2.166	3.100	12.683	.0100	-.1400	-.0858	-.0613	-.0093	.1768
Life expectancy	119	8.432	1.724	76.637	83.985	-.3329*	-.1979*	-.2470*	.5391*	-.1120	.2512*
Population density	119	17.634	116.480	3.374	351.339	-.5283*	-.4402*	-.4862*	.6143*	-.4314*	.1015
Gov. effectiveness	112	1.457	.433	.198	1.990	.2031*	.2129*	.1862*	-.0725	-.1823	-.7186*
Physicians	81	2.949	.758	1.887	4.400	-.1461	-.2109	-.1461	.2468*	.0508	.4547*

\*  $p < 0.05$ .

Table 2  
Panel regression analysis estimates with fixed effects for the G7

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
VARIABLES	chegdp	chegdp	chepc	chepc	chepcpcpp	chepcpcpp	gghed	gghed	oopspcpp	oopspcpp	oopspcpp
Real GDP growth	-.0507*	-.0484	-38.97	4.62	-12.78	-1.920	-.0834	.477	2.094	3.987	.16
	(.0276)	(.0433)	(24.97)	(36.66)	(12.32)	(19.65)	(.228)	(.432)	(1.879)	(3.219)	(.0
GDP per capita	.000155***	.000170***	.202***	.225***	.231***	.255***	.00168***	.00198***	.0154***	.0169***	-.0
	(2.81e-05)	(3.49e-05)	(.0254)	(.0295)	(.0125)	(.0158)	(.000232)	(.000348)	(.00191)	(.00259)	(6.
Inflation	.0321	.0344	43.79	92.47	-23.41	-2.185	-.873*	-.689	-9.396**	-4.997	-.0
	(.0603)	(.0696)	(54.61)	(59.00)	(26.94)	(31.63)	(.498)	(.695)	(4.109)	(5.181)	(.1
Unemployment	.134***	.146***	87.39**	87.91*	113.0***	125.3***	.227	.182	.876	-.602	-.0
	(.0411)	(.0527)	(37.25)	(44.64)	(18.38)	(23.93)	(.340)	(.526)	(2.803)	(3.920)	(.0
Life expectancy	-.0665	-.119	-141.9	-288.0	-364.9***	-464.8***	-7.235***	-7.824***	13.35	7.657	.46
	(.161)	(.206)	(146.1)	(174.7)	(72.08)	(93.63)	(1.331)	(2.058)	(1.99)	(15.34)	(.3
Population density	.0313*	.0485**	-7.196	-12.09	6.089	8.356	.100	.0132	4.435***	5.285***	.14
	(.0173)	(.0203)	(15.71)	(17.18)	(7.751)	(9.207)	(.143)	(.202)	(1.182)	(1.508)	(.0
Governance effectiveness		1.095**		-1,473***		131.6		-8.189		47.44	
		(.496)		(42.4)		(225.3)		(4.953)		(36.91)	
Physicians		-.219		-319.3		-243.9		-3.741		-21.58	
		(.351)		(297.7)		(159.6)		(3.508)		(26.14)	
Constant	3.560	3.647	8,626	23,070*	22,949***	30,040***	577.3***	645.5***	-1,858**	-1,545	-39
	(1.77)	(13.94)	(9,758)	(11,814)	(4,814)	(6,333)	(88.93)	(139.2)	(734.2)	(1,037)	(2)
Observations	119	76	119	76	119	76	119	76	119	76	11
R-squared	.749	.774	.811	.842	.942	.949	.431	.496	.907	.899	.23
Number of countries	7	7	7	7	7	7	7	7	7	7	7

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

Table 3  
Summary statistics and cross-correlation matrix for the EM7

Variable	Obs	Mean	Std. Dev.	Min	Max	chegdp	chepc	chepcPPP	gghed	oopspppp	oopsche
CHEGDP	119	4.915	1.677	1.916	9.206	1					
CHEPC	119	32.469	265.220	16.254	1025.490	.7033*	1				
CHEPCPPP	119	605.822	396.038	82.294	1401.007	.7263*	.9411*	1			
GGHE-D	119	46.145	16.832	17.982	8.498	.2552*	.5454*	.6327*	1		
OOPSPCPPP	119	215.886	126.762	39.367	538.159	.6703*	.8061*	.8570*	.3241*	1	
OOPSCHE	119	42.594	15.770	14.508	74.106	-.4273*	-.6118*	-.6808*	-.8923*	-.3086*	1
Real GDP growth	119	5.129	3.808	-7.800	14.200	-.4219*	-.4594*	-.5317*	-.1989*	-.5464*	.2695*
GDP per capita	119	1156.540	6266.597	2039.533	26223.770	.3615*	.8006*	.8907*	.7692*	.7242*	-.6924*
Inflation	119	5.731	3.290	-.711	2.374	.0352	.2149*	.3417*	.3464*	.1533	-.3536*
Unemployment	119	6.065	2.588	2.268	12.552	.4242*	.3455*	.4518*	.6315*	.0674	-.8202*
Life expectancy	119	71.074	3.768	62.505	76.860	.4291*	.6057*	.5686*	.4818*	.5104*	-.4673*
Population density	119	122.078	124.591	8.716	445.484	-.5247*	-.6054*	-.6699*	-.6040*	-.5871*	.7204*
Gov.effectiveness	112	-.044	.248	-.720	.409	.1662	.1847	.1412	.2804*	.0881	-.1472
Physicians	93	1.681	1.111	.130	4.309	.3512*	.5362*	.6579*	.5789*	.6061*	-.4651*

\* p < .05.

Table 4  
Panel regression analysis estimates with fixed effects for the EM7

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
VARIABLES	chegdp	chegdp	cheperc	cheperc	chepcpcppp	chepcpcppp	gghed	gghed	oopspcppp	oopspcppp	oopspcppp
Real GDP growth	-.0472*** (.0109)	-.0402*** (.0134)	-.162 (3.202)	-.374 (4.188)	-7.521*** (1.756)	-6.794*** (1.983)	.0295 (.164)	.192 (.194)	-3.343*** (1.107)	-2.845* (1.536)	-.0001 (.0001)
GDP per capita	-3.95e-05** (1.73e-05)	-3.43e-05* (1.93e-05)	.0169*** (.00508)	.0235*** (.00602)	.0416*** (.00279)	.0467*** (.00285)	.00122*** (.000261)	.00101*** (.000279)	.00900*** (.00176)	.00872*** (.00221)	-.0001 (.0001)
Inflation	-.0341** (.0145)	-.0208 (.0145)	-8.901** (4.271)	-11.76** (4.531)	-.613 (2.343)	-2.142 (2.146)	-.167 (.219)	.0763 (.210)	1.057 (1.476)	1.792 (1.662)	-.0001 (.0001)
Unemployment	.0826*** (.0287)	.0962*** (.0351)	-13.70 (8.441)	-1.13 (1.93)	8.963* (4.629)	6.856 (5.177)	1.722*** (.433)	2.366*** (.507)	-6.646** (2.917)	-3.928 (4.009)	-1.0001 (.0001)
Life expectancy	.152*** (.0514)	.111* (.0562)	51.86*** (15.15)	43.07** (17.51)	25.54*** (8.309)	12.08 (8.294)	-.780 (.778)	-.492 (.813)	1.83** (5.236)	16.42** (6.423)	1.0001 (.0001)
Population density	-.00877** (.00420)	-.00886** (.00440)	-3.924*** (1.236)	-2.771** (1.371)	-2.359*** (.678)	-1.415** (.649)	.144** (.0635)	.0870 (.0636)	-.662 (.427)	-.981* (.503)	-.0001 (.0001)
Governance effectiveness		.0923 (.295)		-245.1*** (91.83)		-87.88** (43.49)		5.885 (4.260)		-53.18 (33.68)	
Physicians		.113 (.123)		61.08 (38.41)		36.39** (18.19)		4.134** (1.782)		-21.28 (14.09)	
Constant	-4.454 (3.182)	-1.788 (3.511)	-2,947*** (937.4)	-2,631** (1,094)	-1,415*** (514.1)	-662.0 (518.1)	6.28 (48.13)	36.71 (5.76)	-526.0 (324.0)	-856.6** (401.2)	-1.0001 (.0001)
Observations	119	87	119	87	119	87	119	87	119	87	119
R-squared	.279	.289	.697	.739	.946	.961	.466	.582	.782	.786	.3
Number of countries	7	7	7	7	7	7	7	7	7	7	7

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

## Results

### Patterns analysis based on group's averages

Over the sixteen years (2000–2015) total GDP for both groups of nations grew significantly, while the EM7 at much faster pace (Fig. 1). Approximately, in early 2012 their joint share in world GDP exceeded the one of the G7. Both groups reacted to global macroeconomic crisis in a similar way and downward slope in economic activity and recovery went mostly in a parallel manner. Before, during, and after the crisis average Real GDP growth rates of the EM7 economies were almost constantly twice as much as those of the G7 (Fig. 2). Unemployment rates were on average slightly lower among the G7 before the crisis (2000–2008) and somewhat higher among the G7 after the crisis (2009–2016) (Fig. 3).

These dynamic changes affected health spending in a non-linear and unpredictable way. We identified the following patterns.

Current health expenditure (CHE expressed as a percentage of GDP) was steadily growing in both groups (Fig. 4). However, it remained significantly higher among the G7 during entire period. The average difference of 3.85% between the two groups in 2000 increased to almost 6% in 2015. This is in clear contrast with overall stronger GDP growth trend in the EM7, pointing at lower priority of health investment among governments in emerging economies and shifting of newly acquired national wealth towards other priority areas. In per capita PPP terms, upward trends are obvious, but strongly divergent in favor of the G7, following the changes noted above (Fig. 5).

Domestic governmental health expenditure expressed as a percentage of CHE also exhibited distinctive difference (Fig. 6). The G7 level was exceptionally stable at 72–74% with essentially no change at the group average level over the entire period. At the same time, the EM7 governmental share of spending rose from 35% in 2000 to 50% in 2015. There was strong upward growth in the early 2000s and sudden drop due to some governments' austerity measures in reaction to the 2010 global crisis. Recovery to pre-crisis levels was already evident in 2011.

Out-of-pocket health expenditure expressed in USD PPP basis per capita, had more than doubled among the EM7 from \$135 on average in 2000 up to \$298 in 2015 (Fig. 7). Among the G7, this increase was also substantial, jumping from \$377 in 2000 to \$666 in 2015. Out-of-pocket spending observed as percentage share of GDP was surprisingly quite stable among the G7 (beginning with 15% coming to 14% level), while it was downsizing among the EM7 nations from 46–39% (Fig. 8).

## Panel regression analysis

Interestingly, real GDP growth affects different aspects of health care expenditure in the compared groups. In the G7 countries, real GDP growth had positive, statistically and economically significant impact on out-of-pocket expenditure expressed as a percentage of CHE only (see Table 2). In the EM7 countries, real GDP growth had negative, statistically and economically significant effect on current health expenditure expressed as a percentage of GDP, CHE per capita in PPP in constant 2011 international USD, and out-of-pocket expenditure (OOPS) per capita in PPP international USD (see Table 4). The impact of other control variables was not systematic in both groups. Real GDP growth had negative, statistically and economically significant effect only on current health expenditure expressed as a percentage of GDP and CHE per capita in USD constant 2010.

## Discussion

The world economy has experienced profound changes in the past few decades and is expected to undergo uneven globalization trends. The increasing influence of the large emerging economies on the global economy has become an important issue that calls for more rigorous research and policy attention [11]. This growth is expected to be primarily driven by the emerging markets and developing nations, with the EM7 economies growing at an annual average rate of almost 3.5% during the next 34 years. In contrast, an annual average growth rate of 1.6% is predicted for the G7 countries [12]. It further elucidates that the EM7 could account for nearly 50% of the globe's GDP by 2050, while the G7's share of global GDP might decline to just over 20%. It is due to the population aging [13] and lack of natural resources [14]. It clearly indicates that the EM7 is expanding, while the G7 is shrinking [15].

However, it takes more time to implement universal health care (UHC) in the EM7 because there is still no policy and program priority for health [16]. Except for the United States, the G7 countries have already achieved UHC. Coverage of universal health insurance should be in high priority for the EM7 countries [16]. Ordinary citizens' capacity concerning the acquisition spread efficiently, but not fast to enough follow-up disproportionate rapid growth of out-of-pocket spending [17]. In the XXI century, the G7 countries invest in health more than 10 percent of current health expenditure [18], along with energy and infrastructure [19]. In contrast, the EM7 countries have invested in health less than five percent of current health expenditure [20] and set priority to infrastructure and the economic growth.

Lastly, the results of the regression analysis related to the composition of indicators affected by the real GDP growth as well as the predicted direction of effect can be attributed to the differences in budget planning priorities and GDP per capita in the compared groups.

A set of economic inefficiencies among emerging markets are also attributable to the double economic burden of the unliquidated pool of infectious diseases associated with non-communicable affections [21]. Contribution of population aging to the growing demand for long-term medical care and pharmaceuticals is probably the most vivid when comparing Japan with China. These two are most typical representatives of both groups. In demographic terms, Japan remains in the most advanced stage of population aging. Yet, even with the recent abolishment of one-child policies, China has exhibited only a sudden, but temporary upward shift in fertility rates during the early 2010s, returning back to the ratio of 1.1 child per woman. This is far below simple population replacement threshold of 2.1, and China is most likely to become the fastest aging nation by 2050.

In addition to the accumulation of incidence of autoimmune, cancer, and dementia morbidity among the elderly citizens, here we face another important phenomenon. It is the so-called "the last year of life". Its costs of intensive, palliative, and home-based medical care requiring nursing staff due to gradual disappearance of family caregiving across Asia, generates costs which are on average equal to the entire life-time medical consumption of that individual citizen.

Thus, the economic implications for the health system workload and financial burden for the social support systems in the societies with ever-larger populations of elderly citizens are clear in both the G7 and the EM7. Yet, the latter group of countries finds itself confronted with a much more serious challenge. Namely, population aging as the third demographic transition does not only become global phenomenon (with 17–18 outlier African nations and Afghanistan), but it is accelerating across the globe. Unlike the Western hemisphere, in the EM7, such changes were driven by spreading of globalization and sexual revolution during and after the XX century, leading to the absorption of women into the labor markets worldwide. Ultimate outcome of this equation was creation of financial incentives by the contemporary societies, Eastern and Western alike to attract women into the workforce, which in turn had a negative effect of fertility ratios. Here we come up to the important disadvantage of the emerging nations in this struggle. Aging itself in Western European societies had its roots in the XIX century. Thus, if one observes the time that was necessary to double the population of senior citizens from 7–14%, in France it took 115 years, while in Brazil 21 year only. It is clear that the G7 nations, experiencing these changes historically in a much earlier momentum had far more time to evolve gradually their social support and health insurance coverage systems to meet the challenge [22]. However, in the emerging, rapidly developing nations, which with the notable exception of the former Soviet Union [23], were largely non-industrialised countries, it happened much faster.

Indonesia, Mexico, and Turkey face similar problems related to the double burden of infectious illnesses, non-communicable diseases, and lack of social capital and medical staff capacities to cover these needs. These same matters were already elaborated in academic literature on BRICS with Russia having historically the earliest developed capacities in preventive medicine and screening procedures. Even today in a leading Chinese nation with abundant national welfare, cancer-screening procedures leading to serious long-term savings, are only being systematically pursued in coastal and some urban areas.

The approaching health policy reforms in the EM7 is likely to enforce these priorities even despite the reluctance of their governments to push for higher health care investments. Actually, among the BRICS, as the core subgroup of the EM7, all states except India, have managed to increase their GDP share of national health spending from one to two percentage points on average since 1990 [24]. This positive trend needs more financial resources and development to be a par with the G7 countries.

This is how we try to explain the core finding of this research. How could it be possible that the EM7, despite their better performance in terms of real GDP growth throughout the crisis, did not channel more welfare into the population health? The answer lies in the fact that the XIX century European-style health systems were entirely built upon in the era of sustainable demographic growth [25]. Working citizens contributed to various social and health insurance models through mandatory taxes to support the devaluating and insufficiently large pensions and retirement funds for the elderly. Long decades of the post-WWII European social evolution resulted in the creation of the welfare state. In France, an average citizen could enjoy up to 24 years of state-sponsored pension with full pension and release from any mandatory work after his or her retirement [26]. Given the current stage of fertility falls and increased longevity post-war generations of baby boomers have long forgone. We face nowadays ever-shrinking cohorts of work-capable citizens in their best age. At the same time cohorts of elderly become annually more and more massive leading to severe distortion of healthy demographic pyramids. The only partial exemption from this case, driven by Latin American immigration are the USA [27]. All other Western nations follow the very same pattern with Germany and Italy being among the worst ones in the most advanced stage of the third demographic transition [28]. Here we easily observe that the base of taxpayers is getting smaller and base of tax consumers is getting larger and heavier. Currently foreseen strategies, some of them imposed by the European Commission, refer to extending life work age [29] and thresholds for retirements including re-integration of cancer-survivors [30] and other people with decreased working ability back to the labour markets. These measures, including immigration of foreign-born work force, so far imply the limited outreach [31]. Therefore, the health expenditures among the G7 are likely to continue growing at least twice faster than overall economy size (with notable exception of Japan) in the upcoming decades [32]. Obviously, mature economies of the G7 and rapidly evolving economies of the EM7 each following its own distinctive historical pathway, are likely to conform similar challenges, but from entirely different perspectives [33]. Likewise, their strategies to cope with the burden of medical care spending, and citizen out-of-pocket spending in particular are likely to be profoundly different and tailored at their own needs.

## Conclusion

Globalization and its underlying processes have contributed to the creation of conditions for the rise of the EM7 economies. Major emerging markets exhibited stronger endurance to withstand the consequences of the global economic crisis as compared to traditional industrial high-income nations [34]. Evidence of that is most visible in real growth rates and unemployment rate levels, before, during, and after the crisis. This situation affected health spending patterns in both groups, although they tend to diverge instead of converging in several important areas.

It was quite surprising to discover that GDP was growing faster than out-of-pocket health spending. One should not forget that in absolute terms it is substantially higher today compared to the beginning of the XXI century in both groups of nations. Keeping in mind social insurance programs and affordability of medical care among the G7 citizens, it is well known that such change will lead to far worse consequences among the emerging nations. Vulnerability of ordinary citizens, particularly those living in rural areas far away from the cities and industrial areas, might lead to increased health expenditure.

Regression analysis showed that real GDP growth affects different aspects of health care expenditure in the compared groups [35]. While in the G7 countries, real GDP growth had positive impact on out-of-pocket expenditure expressed as a percentage of CHE only. In the EM7 countries, it affected negatively on current health expenditure expressed as a percentage of GDP, CHE per capita in PPP in constant 2011 international USD, and out-of-pocket expenditure per capita in PPP international USD.

Governments in the emerging economies shall be challenged to increase their investment into health care systems, in order to support current economy growth in the long run [36]. Currently, serious social inequalities in terms of access and affordability of medical care and pharmaceuticals among most of the EM7 countries shall be smoothed to some extent by continuous growth of middle class in China and India and economic recovery in Russia and Brazil in 2015–2016. The G7 nations preserve their stable allocation of resources for health care in the first decades of the XXI century, although with concerning long-term sustainability perspective, primarily due to population aging consequences.

## Declarations

### *Availability of data and materials*

The datasets generated and/or analysed during the current study are available in the WHO Global Health Expenditure Database, <https://apps.who.int/nha/database>; the World Development Indicators Database, <https://databank.worldbank.org/source/world-development-indicators>; and the IMF Data Mapper repository, <http://www.imf.org/external/datamapper/>

### *Competing interests*

The authors declare that they have no competing interests.

## Funding

This study was funded by the Ministry of Education Science and Technological Development of Serbia (Grant OI 175 014) and FORTE Grant (Diary number 2017-02235; decision number DELG-2017/0024). Publication of results was not contingent upon neither Serbian Ministry's nor Swedish Science Fund's censorship or approval.

## Acknowledgements

The authors are thankful to Ulf-Göran Gerdtham from Lund University for his valuable comments.

## Authors' contributions

MJ was responsible for the study design and research questions definition, obtained funding, supervised and coordinated the joint efforts. MJ, NR, POF, JPT, YT and VR provided administrative and technical support. NR acquired the data. MJ and YT interpreted the results of analysis. MJ and YT drafted the manuscript. All authors read and approved the final manuscript.

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## Figures

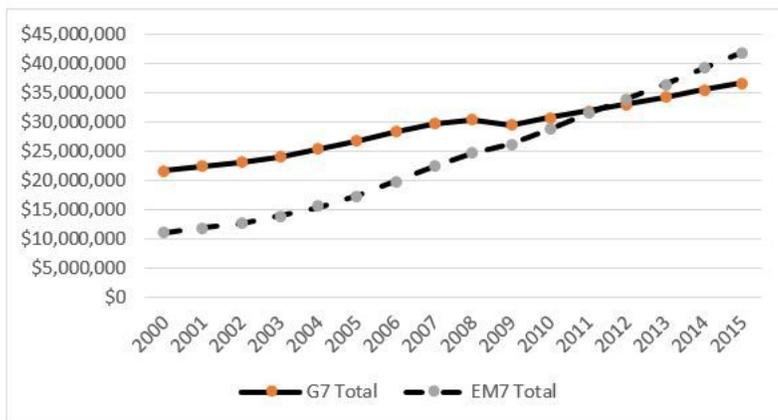


Figure 1

Gross Domestic Product in million current PPP (constant 2011 international USD) in the G7 and the EM7 in 2000-2015. Source: IMF

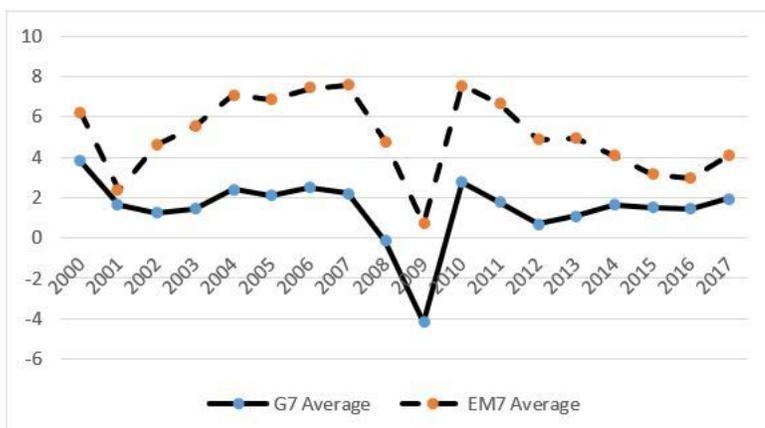


Figure 2

Real GDP growth (Annual percent change) in the G7 and the EM7 in 2000-2017. Source: IMF

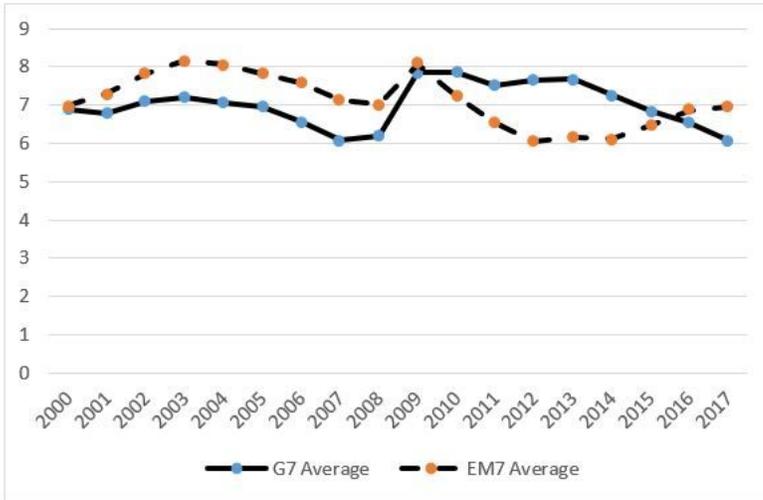


Figure 3

Unemployment rate (Percent) in the G7 and the EM7 in 2000-2017. Source: IMF

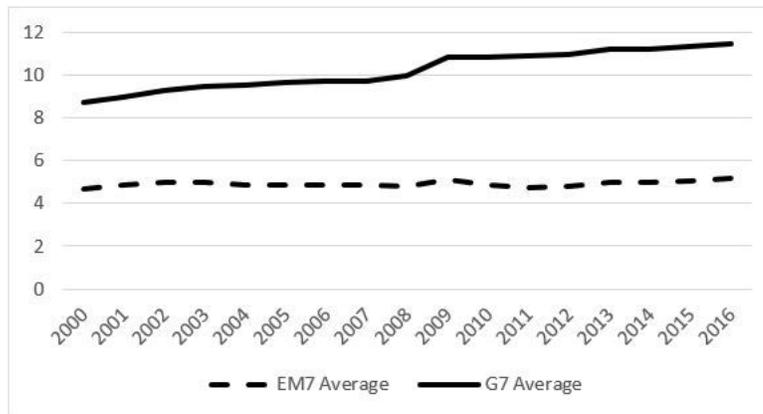


Figure 4

Current Health Expenditure (CHE) as percentage of GDP in the G7 and the EM7 in 2000-2016. Source: WHO Global Health Expenditure Database

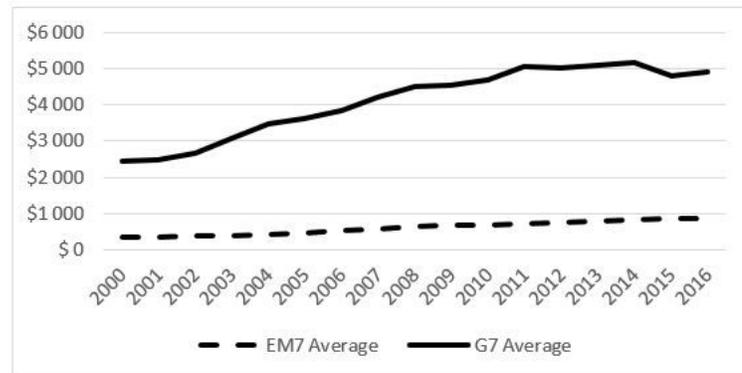
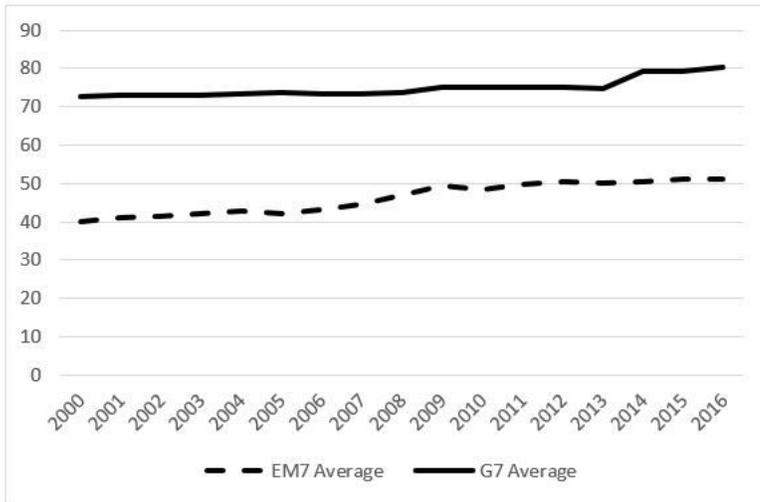
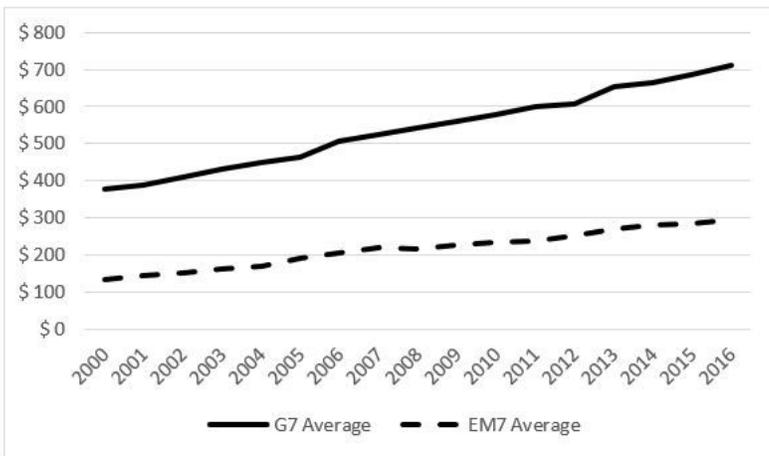


Figure 5

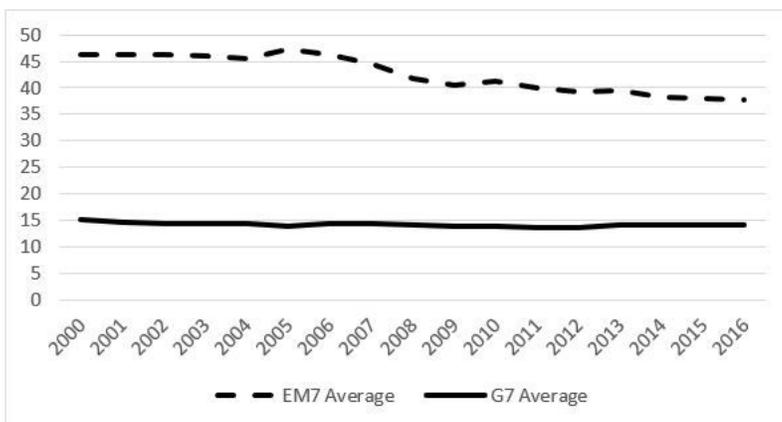
Current Health Expenditure (CHE) per Capita in PPP (current international USD) in the G7 and the EM7 in 2000-2016.. Source: WHO Global Health Expenditure Database



**Figure 6**  
Domestic General Government Health Expenditure (GGHE-D) as a percentage Current Health Expenditure (CHE) in the G7 and the EM7 in 2000-2016. Source: WHO Global Health Expenditure Database



**Figure 7**  
Out-of-Pocket Expenditure (OOPS) per Capita in PPP International USD in the G7 and the EM7 in 2000-2016. Source: WHO Global Health Expenditure Database



**Figure 8**  
Out-of-Pocket (OOPS) as a percentage of Current Health Expenditure (CHE) in the G7 and the EM7 in 2000-2016. Source: WHO Global Health Expenditure Database