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Is there any convergence in health expenditures across EU countries?

Claudiu T Albulescu
Management Department, Politehnica University of Timisoara

Cornel Oros
CRIEF, University of Poitiers

Aviral K Tiwari
Montpellier Business Scholl

Abstract

The purpose of this paper is to investigate the degree of convergence in health expenditures for six EU countries over the time-span 1972 to 2013, namely Austria, Finland, Germany, Netherlands, Portugal and Spain. To examine the convergence of health expenditures we rely on the health expenditures to GDP ratio group average. Different from previous essays, we draw a comparison between overall expenditure, governmental expenditure and private expenditure and we use recent developments in unit root testing of bounded series. Our findings show that the health expenditures spread from the group average follows in general a non-stationary process. We posit thus, there is no significant convergence in terms of health expenditures to GDP ratio, although there are few progresses in the case of the private sector for Finland and in the case of public sector, for Spain.

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Contact: Claudiu T Albulescu - claudiual@yahoo.com, Cornel Oros - cornel.oros@univ-poitiers.fr, Aviral K Tiwari - aviral.eco@gmail.com.
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1. Introduction

Europe is confronted nowadays with a severe ageing process, which, together with innovative and costly medical technologies, triggers an increase in health expenditures.[1] Although this increase in health expenditures is recorded in most of the European Union (EU) countries, noteworthy discrepancies persist in terms of health care frameworks and access to health primary services.[2] The economic literature failed to provide a reliable proof against, or in the favor, of an increased convergence regarding the health care expenditures in the EU countries. If for example Hitiris (1997) and Lau *et al.* (2014) find no convergence in health care expenditures per capita, Hitiris and Nixon (2001) report the existence of a convergence process, both in terms of expenditures per capita and expenditures to GDP ratio. Further, for a set of 19 EU countries, Montarani and Nelson (2013) show that the convergence exits only for private healthcare financing.

A common method to measure the convergence process is to assess the stationarity of the spread of the health expenditures recorded in each country, vis-à-vis a reliable benchmark. Compared to the existing studies, our work contributes to the health expenditures convergence literature in three ways. First, we focus on the overall health expenditures to GDP ratio but also to the structure of the expenditures, investigating the degree of convergence in terms of public and private expenditures. Moreover, we look to the health expenditures to GDP ratio, and not to the health expenditures per capita. The health expenditures per capita are strongly influenced by the level of economic development. As Baltagi and Moscone (2010) show, the level of income explains the differences between countries in terms of health expenditure level and growth ratio, while Boungnarasy (2011) and Murthy and Okunade (2016) document the existence of a long-run relationship between income and health expenditure in Asia and respectively, in the United States (US). Consequently, in order to assess the convergence level, it is recommended to consider the budgetary effort made by each country to finance the health care sector (Hitiris and Nixon, 2001).

Second, relying on the health expenditure to GDP ratio, we test for the existence of a convergence phenomenon using bounded unit root tests advanced by Cavaliere (2005) and Cavaliere and Xu (2014). The mixed results reported in previous papers on health expenditures convergence (see for example the results reported by Hitiris (1997)), can be explained by the use of different families of linear, non-linear, or structural breaks tests. Nevertheless, the health expenditure to GDP ratio is bounded and is meant to vary between some limits. Bounded series are usually considered as being stationary but the concept of I(1) series can coexist with a limited process (Cavaliere, 2005). Granger (2010) also underlines the interest to study non-stationary processes that are bounded.

Finally, we focus on six EU countries where common policies are implemented in order to achieve a higher degree of convergence regarding the health care system[3]. On the other hand, considering US as an etalon and benchmark (the 'catching up' theory) can represent a misleading direction. Indeed, US are characterized by a high-level of health expenditures per

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[1] According to OECD statistics, the average health expenditure to GDP ratio has increased from 4.4% in 1970, to 9.1% in 2013.

[2] For instance, the full time equivalent hospital staff per hundred thousand inhabitants varies from 196 in Netherlands, to 254 in Austria (Eurostat statistics for 2013). The same database shows that the number of hospital beds per hundred thousand inhabitants in 2013 was 339 in Portugal, against 820 in Germany.

[3] The selection of six countries (Austria, Finland, Germany, Netherlands, Portugal and Spain) is made based on data availability. The purpose is to study the convergence process on the longest available time-span and to include in the analysis the beginning of the 1970s when ample reforms were carried out in the EU countries in terms of health care systems. Further, longer time-series are necessary to avoid potential pitfalls associated with a power loss of the Cavaliere and Xu's (2014) test, for small finite samples.

capita, well above the EU average. However, a system without a universal coverage, and where there is no access to primary and preventive care for all citizens, cannot be considered a truly high-value system, or an etalon. That is why we focus on several selected EU countries, which have in place different health care systems, and we consider the group average as a benchmark for testing the convergence process. From an integration policy perspective, it is desirable that an EU member sees its health expenditure adjusting itself to those of its partners.

2. Methodology: bound unit root tests

Cavaliere and Xu (2014) advance a series of unit root tests to approach the case of near-integrated time series whose range is constrained or bounded. The authors propose a new approach for computing the critical values of classic unit root tests (i.e. Phillips-Perron test – PP; Augmented Dickey-Fuller test – ADF; Ng-Perron test – MZ), in the case where time series are bounded. First, Cavaliere (2005) advance a PP unit root test statistics for bounded series. Let X_t be a stochastic process which is bounded between $\underline{b}$ and $\overline{b}$ (that is, $X_t \in [\underline{b}, \overline{b}]$, $\forall\, t$), than, at each t the increment $\Delta X_t \in [\underline{b} - X_{t-1}, \overline{b} - X_{t-1}]$.

A simple way to analyze the bounded or limited time-series process is to consider a constant deterministic component (Cavaliere and Xu, 2014):

$$X_t = \theta + Y_t \text{ , and} \quad (1)$$

$$Y_t = \alpha Y_{t-1} + u_t, \alpha = 1 \quad (2)$$

where $u_t = \Delta X$ can be decomposed such as $u_t = \varepsilon_t + \underline{\vartheta}_t - \overline{\vartheta}_t$ and where ε_t is an AR(1) process. $\{\underline{\vartheta}_t\}, \{\overline{\vartheta}_t\}$ are non-negative processes and the regulators $\underline{\vartheta}_t > 0$ only if $Y_{t-1} + \varepsilon_t > \underline{b} - \theta$, while $\overline{\vartheta}_t > 0$ if and only if $Y_{t-1} + \varepsilon_t > \overline{b} - \theta$.

Let us define $\underline{c}$ and $\overline{c}$ as a measure to influence the bounds in finite samples, such as $\underline{b} = \underline{c}\lambda T^{1/2}$, $\overline{b} = \overline{c}\lambda T^{1/2}$, and $X_0 = c_0 \lambda T^{1/2}$, where $\underline{c} \le c_0 \le \overline{c}$ and λ^2 represents the long-run variance of ε_t. At the same time, let $\hat{\rho}_T$ be the series first-order autoregressive coefficient such as $\hat{\rho}_T \sum X_{t-1}^2 = \sum X_{t-1} \Delta X_t$ and $t \in [1, T]$.

If no limits ($\underline{b}$ or $\overline{b}$) are imposed for bounded-integrated processes, namely if $\underline{c} = -\infty$ and $\overline{c} = +\infty$, as in Phillips (1987), $\hat{\rho}_T$ has the asymptotic distribution $T(\hat{\rho}_T - 1) \overset{\omega}{\rightarrow} \frac{B(1)^2 - \sigma^2/\lambda^2}{2\int_0^1 B(s)^2 ds}$ (where $\sigma^2 := \lim_{T\to\infty} T^{-1} \sum_{t=1}^{T} \varepsilon_T^2$). In the particular case where $\lambda^2 = \sigma^2$, the previous asymptotic distribution is known as the unit root distribution Z_ρ.

If $\hat{\lambda}^2, \hat{\sigma}^2$ are the consistent estimators of λ^2, σ^2, than $\hat{Z}_\rho$ is the outcome of the PP test:

$$\hat{Z}_\rho := T(\hat{\rho}_T - 1) - \frac{\frac{1}{2}(\hat{\lambda}^2 - \hat{\sigma}^2)}{T^{-2}\sum_{t=1}^{T} X_{t-1}^2} \quad (3)$$

Cavaliere (2005) also proposes a Phillips' modified t test, called $\hat{Z}_t$:

$$\hat{Z}_t := (\hat{\sigma}/\hat{\lambda}) Z_t - \{T(\hat{\sigma}^2 - \hat{\lambda}^2)/(2\hat{\lambda})\}(\textstyle\sum X_{t-1}^2)^{-1/2} \quad (4)$$

Further, Cavaliere and Xu (2014), advance two robust approaches for bounded series unit root tests based on the Said–Dickey–Fuller (ADF) test (Dickey and Fuller, 1979; Said and Dickey, 1984), and on the Ng and Perron (2001) MZ statistics.

For a finite sample X_t the ADF statistics are derived from an OLS regression as follows:

$$\hat{X}_t = \alpha \hat{X}_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta \hat{X}_{t-i} + \varepsilon_{t,k} \quad (5)$$

where $\hat{X}_t$ are the residuals from the X_t regression on a constant term.

The two ADF statistics are in this case $ADF_\alpha := \frac{T(\hat{\alpha}-1)}{\hat{\alpha}(1)}$ and $ADF_t := \frac{\hat{\alpha}-1}{s(\hat{\alpha})}$, where $\hat{\alpha}(1) := 1 - \sum_{i=1}^{k} \hat{\alpha}_i$, $\hat{\alpha}_i$ represents the OLS estimator of α_i and $s(\hat{\alpha})$ are the OLS standard errors of $\hat{\alpha}$.

If $\hat{X}_t$ has the characteristics of an GLS de-meaned series, the M statistics are defined as $MZ_\alpha := \frac{T^{-1}\hat{X}_T^2 - T^{-1}\hat{X}_0^2 - s_{AR}^2(k)}{2T^{-2}\sum_{t=1}^{T}\hat{X}_{t-1}^2}$, $M\&B := \left(T^{-2}\sum_{t=1}^{T}\hat{X}_{t-1}^2 / s_{AR}^2(k)\right)^{1/2}$, and $MZ_t := MZ_\alpha \times M\&B$, where $s_{AR}^2(k)$ is an autoregressive estimator of spectral density.

If the series X_t is unbounded (that is $\underline{b} = -\infty, \overline{b} = +\infty$), the asymptotic (null) distributions of the ADF and M statistics are according to Ng and Perron (2001): $ADF_\alpha, MZ_\alpha \xrightarrow{\omega} \frac{1}{2}(F_B(1)^2 - F_B(0)^2 - 1) \times \left(\int_0^1 F_B(s)^2 ds\right)^{-1} =: \zeta_1$, $M\&B \xrightarrow{\omega} \left(\int_0^1 F_B(s)^2 ds\right)^{\frac{1}{2}} =: \zeta_2$ and $ADF_t, MZ_t \xrightarrow{\omega} \zeta_3 := \zeta_1\zeta_2$, where $F_B := B - \int_0^1 B(r)dr$ and B is a standard Brownian motion.

In the presence of known bounds $(\underline{b}, \overline{b})$, Cavaliere and Xu (2014) define first nuisance parameters $(\underline{c}, \overline{c},)$ that are consistent:

$$\hat{\underline{c}} := \frac{\underline{b} - X_0}{s_{AR}(k)T^{1/2}}, \hat{\overline{c}} := \frac{\overline{b} - X_0}{s_{AR}(k)T^{1/2}} \quad (6)$$

Second, the authors perform simulation tests where the key ingredients are represented by the consistent parameters $\hat{\underline{c}}$ and $\hat{\overline{c}}$. In this line, they build a càdlàg process B_n^* that satisfies $B_n^* \xrightarrow{\omega} B_{\underline{c}}^{\overline{c}}$, where $B_{\underline{c}}^{\overline{c}}$ is a regulated Brownian motion. For example, the simulation-based ADF_α test asymptotic distribution takes the form:

$$ADF_\alpha^* := \frac{\tilde{X}_n^*(1)^2 - \tilde{X}_n^*(0)^2 - 1}{2\int_0^1 \tilde{X}_n^*(s)^2 ds} \quad (7)$$

where the corresponding càdlàg process $\tilde{X}_n^*(s) := X_n^*(s) - \int_0^1 X_n^*(u)du$ and $s \in [0,1]$.

For all tests, we use both OLS and GLS de-meaned data. All series are bounded between -1 and 1[4] and the critical values of unit root tests for bounded series, as well as the p-values are generated following Cavaliere (2005) and Cavaliere and Xu (2014).

3. Data and results

3.1. Data

We use the annual data (1972-2013) for the six EU countries using the OECD database. The summary statistics are presented in Table 1.

Table 1. Summary statistics (spread from the group average)

	Austria	**Finland**	**Germany**	**Netherlands**	**Portugal**	**Spain**
Overall expenditure as % in GDP						
MIN	-0.400	-1.550	1.017	-0.967	-1.967	-1.683
MAX	1.367	0.933	2.217	1.317	0.517	-0.550
MEAN	0.486	-0.478	1.643	0.196	-0.771	-1.076
SD	0.534	0.734	0.366	0.551	0.756	0.243
Governmental expenditure as % in GDP						
MIN	-0.433	-1.383	0.750	-1.150	-2.100	-1.417
MAX	1.367	1.208	2.117	2.217	0.267	-0.083
MEAN	0.378	-0.229	1.553	0.268	-1.165	-0.805
SD	0.484	0.730	0.423	0.851	0.725	0.291
Private expenditure as % in GDP						
MIN	-0.233	-0.450	-0.383	-0.983	-0.367	-0.833
MAX	0.700	0.033	0.417	0.550	1.083	0.217
MEAN	0.136	-0.238	0.098	-0.050	0.410	-0.355
SD	0.232	0.122	0.196	0.450	0.385	0.276

[4] The series are bounded between -1 (-100%) and 1 (100%) as the spread from the average is retained into analysis.

The sample selection is based on the data availability. The OECD data for the EU countries are available starting with 1970 only for Austria, Finland, Germany, Portugal and Spain. Data for Netherlands are available starting with 1971 while for other EU countries we find data starting with 1975. Consequently, we have decided to retain into the analysis six countries, and 1972 as starting year (the series stops in 2013).

3.2. Results

In what follows, we present three series of results (overall health expenditure, governmental and private). Table 2 presents the findings of bounded unit root tests for overall health expenditure to GDP ratio. We can notice that there is no evidence of convergence, in terms of total health care expenditure to GDP ratio between the 6-EU countries. None of the bounded unit root tests indicates convergence. An exception is represented by Austria, when the GLS de-meaned series are used. In this case, most of the tests show the presence of stationarity, which is equivalent with an increased convergence with the group average. Austria is one of the countries with a developed cross-border health-care provision for neighbor countries (see Hofmarcher, 2013), which explains the efforts of harmonization of health care systems in terms of costs.

Table 2. Results for bounded unit root tests – overall health expenditure as % in GDP

	Austria	**Finland**	**Germany**	**Netherlands**	**Portugal**	**Spain**
OLS de-meaned series						
$\hat{Z}_\rho$	-8.325 (0.188)	-4.432 (0.507)	-2.349 (0.761)	-5.127 (0.420)	-5.339 (0.394)	-6.097 (0.336)
$\hat{Z}_t$	-2.137 (0.232)	-1.746 (0.424)	-1.042 (0.759)	-1.727 (0.406)	-2.324 (0.198)	-1.847 (0.348)
ADF^*_α	-7.378 (0.264)	-2.772 (0.665)	-2.114 (0.787)	-3.611 (0.575)	-5.098 (0.424)	-6.007 (0.340)
ADF^*_t	-2.074 (0.260)	-1.129 (0.705)	-1.010 (0.767)	-1.537 (0.511)	-2.360 (0.174)	-1.880 (0.336)
MZ^*_α	-6.714 (0.302)	-3.889 (0.577)	-2.059 (0.791)	-3.452 (0.591)	-4.781 (0.456)	-5.567 (0.376)
MZ^*_t	-1.888 (0.354)	-1.660 (0.476)	-0.984 (0.771)	-1.470 (0.553)	-2.214 (0.216)	-1.742 (0.386)
$M\&B^*$	0.281 (0.304)	0.427 (0.683)	0.478 (0.795)	0.426 (0.675)	0.463 (0.763)	0.313 (0.422)
GLS de-meaned series						
$\hat{Z}_\rho$	**-6.619** (0.088)	-1.926 (0.336)	-1.288 (0.464)	-2.637 (0.288)	-1.606 (0.388)	-4.013 (0.174)
$\hat{Z}_t$	**-1.885** (0.060)	-0.911 (0.356)	-0.609 (0.492)	-1.195 (0.218)	-0.912 (0.318)	-1.357 (0.164)
ADF^*_α	-6.114 (0.106)	-1.117 (0.470)	-1.096 (0.499)	-1.889 (0.350)	-1.617 (0.396)	-4.982 (0.128)
ADF^*_t	**-1.840** (0.066)	-0.546 (0.499)	-0.548 (0.527)	-1.042 (0.282)	-0.927 (0.316)	-1.418 (0.140)
MZ^*_α	-5.658 (0.122)	-1.696 (0.376)	-1.082 (0.501)	-1.846 (0.352)	-1.586 (0.396)	-4.810 (0.136)
MZ^*_t	**-1.703** (0.094)	-0.849 (0.356)	-0.540 (0.527)	-1.018 (0.288)	-0.909 (0.320)	-1.481 (0.136)
$M\&B^*$	0.301 (0.168)	0.501 (0.474)	0.500 (0.474)	0.552 (0.521)	0.573 (0.533)	0.308 (0.148)

Notes: (i) The null hypothesis for all tests is the presence of unit root (p-values with bounds in brackets). A p-values > 0.1 means that the null cannot be rejected at 10% significance level and the process is non-stationary; (ii) results marked in bold show the existence of a convergence process.

However, if the results for overall care expenditure show no convergence, we still may have convergence in terms of public expenditures. Similar to the previous results, we report the lack of convergence (Table 3). Signs of convergence appear in the case of Spain, for the OLS de-meaned data, where the PP- and the ADF-based bounded unit root tests indicate the absence of a unit root process. In 2002, Spain has undergone a reform where the health competences were transferred at a regional level. We have a similar system in Austria and Germany with the Länder and local authorities, as well as in Finland and Netherlands, with an increased role of municipalities in the health care system. This similarity might explain the weak convergence with the group average, unregistered by Spain. However, when the GLS de-meaned series are used, no convergence is reported, which underlines the fragility of the stationarity results.

Table 3. Results for bounded unit root tests – governmental health expenditure as % in GDP

	Austria	**Finland**	**Germany**	**Netherlands**	**Portugal**	**Spain**
OLS de-meaned series						
$\hat{Z}_\rho$	-6.802 (0.226)	-3.456 (0.613)	-2.194 (0.727)	-4.344 (0.482)	-3.250 (0.707)	**-11.60** (0.090)
$\hat{Z}_t$	-2.232 (0.156)	-1.485 (0.541)	-1.012 (0.715)	-1.334 (0.595)	-1.627 (0.515)	**-2.973** (0.034)
ADF_α^*	-6.844 (0.214)	-2.156 (0.771)	-1.946 (0.751)	-2.352 (0.713)	-3.183 (0.711)	**-13.45** (0.058)
ADF_t^*	-2.280 (0.136)	-0.953 (0.783)	-0.973 (0.725)	-0.937 (0.771)	-1.650 (0.503)	**-3.130** (0.028)
MZ_α^*	-6.273 (0.274)	-3.162 (0.643)	-1.900 (0.757)	-2.284 (0.731)	-3.060 (0.725)	-7.410 (0.244)
MZ_t^*	-2.090 (0.200)	-1.439 (0.563)	-0.950 (0.733)	-0.911 (0.777)	-1.586 (0.545)	-2.395 (0.132)
$M\&B^*$	0.333 (0.414)	0.455 (0.749)	0.500 (0.827)	0.399 (0.647)	0.518 (0.891)	0.323 (0.428)
GLS de-meaned series						
$\hat{Z}_\rho$	-3.225 (0.180)	-1.559 (0.396)	-0.645 (0.539)	-3.253 (0.222)	-1.378 (0.527)	-4.278 (0.164)
$\hat{Z}_t$	-1.360 (0.138)	-0.784 (0.392)	-0.327 (0.561)	-1.207 (0.206)	-0.820 (0.462)	-1.532 (0.120)
ADF_α^*	-3.541 (0.164)	-0.968 (0.496)	-0.453 (0.589)	-1.904 (0.368)	-1.449 (0.529)	-0.176 (0.663)
ADF_t^*	-1.433 (0.118)	-0.486 (0.511)	-0.244 (0.603)	-0.902 (0.336)	-0.851 (0.442)	-0.146 (0.665)
MZ_α^*	-3.388 (0.180)	-1.500 (0.412)	-0.450 (0.591)	-1.860 (0.372)	-1.423 (0.535)	-0.801 (0.545)
MZ_t^*	-1.371 (0.132)	-0.770 (0.396)	-0.243 (0.603)	-0.881 (0.340)	-0.836 (0.462)	-0.702 (0.428)
$M\&B^*$	0.405 (0.306)	0.513 (0.472)	0.539 (0.545)	0.474 (0.426)	0.588 (0.753)	0.877 (0.841)

Notes: (i) The null hypothesis for all tests is the presence of unit root (p-values with bounds in brackets). A p-values > 0.1 means that the null cannot be rejected at 10% significance level and the process is non-stationary; (ii) results marked in bold show the existence of a convergence process.

The last set of analyses using bounded unit root tests addresses the private health care expenditure (Table 4). Different from previous cases, it appears that the convergence is more visible, contrary to our expectations. Especially in Finland, we notice a convergence phenomenon with the group average, both for OLS and GLS de-meaned data. In Finland, the national health insurance partially reimburses the private expenditure (about one third). Another sign of convergence appears for the Austria, Germany and Portugal, although they are not underlined by all bounded unit root tests.

Table 4. Results for bounded unit root tests – private health expenditure as % in GDP

	Austria	Finland	Germany	Netherlands	Portugal	Spain
OLS de-meaned series						
$\hat{Z}_{\rho}$	-7.236 (0.266)	**-15.622** (0.048)	-5.457 (0.384)	-2.910 (0.779)	-10.16 (0.146)	-2.352 (0.755)
$\hat{Z}_{t}$	-1.976 (0.306)	**-3.237** (0.024)	-1.664 (0.448)	-0.913 (0.875)	**-2.851** (0.064)	-0.893 (0.791)
ADF_{α}^{*}	-5.800 (0.370)	**-14.850** (0.050)	-5.665 (0.370)	-2.940 (0.777)	-10.86 (0.132)	-3.624 (0.623)
ADF_{t}^{*}	-1.831 (0.380)	**-3.258** (0.024)	-1.738 (0.412)	-0.948 (0.869)	**-2.951** (0.058)	-1.214 (0.697)
MZ_{α}^{*}	-5.390 (0.410)	**-12.161** (0.088)	-5.274 (0.402)	-2.834 (0.793)	-9.429 (0.184)	-3.464 (0.643)
MZ_{t}^{*}	-1.702 (0.428)	**-2.668** (0.084)	-1.618 (0.474)	-0.914 (0.877)	-2.560 (0.116)	-1.160 (0.721)
$M\&B^{*}$	0.316 (0.444)	0.219 (0.124)	0.307 (0.354)	0.323 (0.460)	0.271 (0.276)	0.335 (0.494)
GLS de-meaned series						
$\hat{Z}_{\rho}$	**-5.760** (0.092)	**-7.336** (0.074)	-5.309 (0.122)	-2.400 (0.308)	-3.227 (0.180)	-2.466 (0.294)
$\hat{Z}_{t}$	**-1.704** (0.076)	**-2.058** (0.038)	**-1.665** (0.098)	-0.770 (0.422)	-1.311 (0.144)	-0.956 (0.316)
ADF_{α}^{*}	-4.752 (0.132)	-3.460 (0.236)	-5.541 (0.114)	-2.453 (0.296)	-4.705 (0.118)	-3.680 (0.212)
ADF_{t}^{*}	-1.568 (0.106)	-1.232 (0.234)	**-1.720** (0.094)	-0.792 (0.416)	**-1.586** (0.092)	-1.237 (0.224)
MZ_{α}^{*}	-4.476 (0.146)	-3.722 (0.222)	-5.166 (0.128)	-2.380 (0.304)	-4.435 (0.122)	-3.515 (0.220)
MZ_{t}^{*}	-1.477 (0.122)	-1.446 (0.162)	-1.604 (0.108)	-0.769 (0.436)	-1.495 (0.104)	-1.182 (0.244)
$M\&B^{*}$	0.330 (0.198)	0.389 (0.308)	0.310 (0.152)	0.323 (0.174)	0.337 (0.154)	0.336 (0.212)

Notes: (i) The null hypothesis for all tests is the presence of unit root (p-values with bounds in brackets). A p-values > 0.1 means that the null cannot be rejected at 10% significance level and the process is non-stationary; (ii) results marked in bold show the existence of a convergence process.

In conclusion, it is hard to admit the existence of a convergence process in terms of health care expenditure to GDP ratio in the selected EU countries. We report a slight convergence for Austria for overall expenditure, for Spain for governmental expenditure, and for Finland, for private expenditure. Nevertheless, the results are influenced by the use of OLS de-meaned or GLS de-meaned data, which show their fragility. The power of the bounded tests might also be affected by the sample size, which is smaller than the sample used by Cavaliere and Xu (2014) in their finite sample simulations. We conclude, then, that the convergence process in terms of health expenditure as percentage of GDP is limited in the selected EU countries.

4. Conclusion

Testing the convergence process of health care expenditure for EU countries is of great interest for both European and national authorities. These countries made noteworthy efforts to improve the quality of health services and to ensure a universal coverage. However, most of the previous studies assessed the convergence using the health expenditure per capita. This indicator is highly correlated with the economic development, and not necessarily with the budgetary efforts made by each country in terms of health care expenditure. Similar budgetary efforts indicate a process of integration and quality harmonization. Starting from this evidence, our study takes into consideration the specific characteristic of the health expenditures to GDP ratio, i.e. the fact that this indicator is bounded. Consequently, bound unit root tests should be used to study the convergence process.

Our results show the general lack of convergence, although worthless signs of integration are reported in Austria (overall expenditure), for Spain (public expenditure) and Finland (private expenditure). On the one hand, these findings can be explained by the diversity of national health care systems and by their complexity. Even if the efforts are oriented toward an increased quality and universal coverage, the reforms are very different and so is the financing procedure. On the other hand, this lack of convergence has some policy implications for the national and European authorities. The high budgetary deficit recorded by most of these countries (Germany is an exception) can impend the health care reform implementation, which is a sign of a persistent lack of convergence. At the same time, some of these countries experience an increased demand for nurses and physicians, which put in question the harmonization in terms of service quality, although financial efforts are made. With the introduction of the European Health Insurance Card in 2011, the EU countries should focus on finding solutions to common problems. This is a main reason for increased necessary efforts in terms of health expenditures convergence.

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