Convergence of per capita health care expenditures in OECD Countries

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Autobiographical Note

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ABSTRACT

In this article it is investigated the convergence of health care expenditures per capita in OECD during the 1970–2005 period by applying Lima and Resende (2007) persistence methodology. Departures across countries were evaluated in terms of panel data unit root tests advanced by Im et al. (2003). The evidence illustrated that one cannot reject the null hypothesis of unit root for the (log) of the ratio of health care expenditures of each country relative to a reference unit except average of per capita health expenditures The results, therefore, favour a very strong form of persistence for OECD expenditures inequality.

I. Introduction

The analysis of the convergence of the GDP structure and its components dynamics has been widening in recent years within identifiable regions of the world or between developing and developed countries. Borrowing the concept of economic convergence from neoclassical growth theory, a group of health economists have recently considered convergence of health care expenditure between the OECD countries or between the EU member countries (Hitiris, 1997; Nixon, 1999; Hitiris and Nixon, 2001; Hofmarcher et al., 2004; Okunade et al., 2004, Narayan 2007 and Wang 2008).

The argument is that as income tends to converge between countries, the income-dependent health expenditure should also follow similar paths. Other important factors that drive convergence in health expenditure include integration in health care markets and common policies to promote health and living and working conditions, and to coordinate medical and health research (Wang, 2008).

This paper reports on the application of adapted methods within this discipline to the area of health care expenditure in Organization for Economic Cooperation and Development (OECD) countries in order to determine if differences in health care expenditures (HCE) are diminishing over time.

Health care expenditure, which in most developed countries was rising sharply for more than three decades, has recently come under pressure for cost containment and budgetary control. The provision of health care services now constitutes one of the largest industries in the OECD countries (Anderson et al., 2000).

A central issue in the convergence literature is the assessment of the speed of convergence among regional units and, therefore, any additional formal testing strategies for the persistence HCE inequality might constitute a relevant endeavour. Recent methodological advances in terms of unit root testing for panels (see e.g. Levin and Lin, 1992, 1993, Im et al., 2003) allow examining persistence phenomena even for short time periods.

One of the most important issues in the unit root literature since the work of Nelson and Plosser (1982) is the implications of the presence of unit roots for macroeconomic theory and policy. The argument used by Nelson and Plosser (1982) is that most of the fluctuations in output should be attributable to changes in the trend component, in a trend versus cyclical decomposition, which would presumably be unaffected by monetary factors. In other words, the existence of unit roots leads to the inference that movements in output are persistent. Since the cyclical component is assumed to be stationary, it follows that fluctuations are mostly associated with the secular component.

Examples of applications of aforementioned unit root tests include Fleissig and Strauss (2000, 2001) that respectively deal with purchasing power parity and per capita gross domestic product (GDP) in OECD countries. In a similar paper, Resende (2004) that tests Gibrat's law for cities in Brazil; Resende and Lima (2005) for assessing market share instability in the Brazilian industry. In addition Lima and Resende (2007) investigated the convergence of real gross domestic product (GDP) per capita at the state level in Brazil during the 1985–1999 periods.

On the other hand, there are not sufficient papers that test whether or not per capita HCE converges each other's. Nixon (2000) and Hitiris and Nixon (2001), analysed the convergence in health (and healthcare expenditure) among the countries of the European Union before the latest expansion (EU-15), using as indicators the life expectancy of men and women, and Infant Mortality. Their results point to a statistically significant convergence in the period 1960–1995 for sigma (σ) convergence and of beta (β) convergence for the period 1980–1995.

In a different method, Narayan (2007) examined that whether or not per capita health expenditures of OECD countries converge to the per capita health expenditures of the USA over the period 1960–2000. And found that while univariate and panel tests that do not incorporate structural breaks fail to find evidence of convergence, univariate and panel LM tests that allow for structural breaks find strong evidence of convergence of per capita health expenditures of the UK, Canada, Japan, Switzerland, and Spain to that of the USA. By examining the degree of convergence in per capita health care expenditure and its components, Wang (2008) investigated the issue across the US states from 1980 to 2004. The major finding is the moderate evidence of convergence in total health care expenditure and the diverse performance of the expenditure components regarding convergence.

In the present study, it is investigated the magnitude of inequality persistence by means of a panel data unit root test devised for heterogeneous panels and applied in the most recent of the aforementioned studies, but mostly in other contexts.

The paper is organized as follows. Section II provides basic background on panel data unit root testing. Section III describes the data construction procedures and presents the empirical results. Section IV brings some final comments.

II. Panel Data Unit Roots

It is well known that traditional unit root tests possess low power against near unit root alternatives (Diebold and Nerlove, 1990). The development of panel data unit root tests addresses this aspect and additionally allows considering data sets with a short time dimension. Early treatments appear in Quah (1994). The most disseminated results were developed by Levin and Lin (1992, 1993) and Im, Pesaran and Shin (2003) and surveys on the topic appear in Banerjee (1999) and Maddala and Wu (1999).

Im et al. (2003), provide a panel data unit root test that considers unit-specific slope coefficients and, therefore, relaxes a restrictive assumption of the tests advanced by Levin and Lin (1992, 1993). Considering the model given in expression but with parameter varying across units as given below:

$$\Delta y_{i,t=\alpha_i} + \beta_i\, y_{i,t-1} + \varepsilon_{i,t}, \qquad i=1,\ldots\ldots,N,\ t=1,\ldots\ldots,T \tag{1}$$

IPS propose test where H_0: $\beta_i=0$ and H_1: $\beta_i<0$ The simplest test proposed by IPS, the so called t-bar statistic is defined as the average of the individual Dickey–Fuller (DF) or augmented Dickey–Fuller (ADF), say t-bar statistics

$$\tau_i = \frac{\hat{\beta}_i}{\hat{\sigma}_{\beta_i}} \text{ where } \quad \bar{t} = \frac{1}{N}\sum_{i=1}^{N}\tau_i \tag{2}$$

Where $$\sqrt{N}(\bar{t} - E(\tau_i \mid \beta_I = 0)/(Var(\tau_i \mid \beta_I = 0)^{\frac{1}{2}} \sim N(0,1) \tag{3}$$

The means $E(\tau_i \mid \beta_I = 0)$ and variances $Var(\tau_i \mid \beta_I = 0)$ were obtained by IPS by means of Monte Carlo simulations.

III. Empirical Analysis

The empirical analysis are based on 19 OECD countries, namely Austria, Belgium, Canada, Denmark, Finland, Germany, Iceland, Ireland, Japan, Luxemburg, Netherland, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK and USA. This sample of countries is dictated by data availability. Time series data at 2000 GDP Price level are annual and for the

period 1970–2005. All data are obtained from the OECD health database 2005, and were converted into natural logarithmic form before the empirical analysis.

In this section, they are presented in Table 1and Table 2 the empirical results for the panel data unit root tests for the log of the referred ratio of per capita HCE and log of the gaps from the USA for OECD countries.

Table 1. Panel data unit root tests HCE (1970–2005)

Augmenting lag	Test statistic
P=1	0.587 (0,721)
P=2	0,982(0,837)
P=3	1,256 (0,895)
Automatic Selection	
MSIC	-0,298 (0,388)
MAIC	0,056 (0,522)

Note: p-values appear in parentheses

It is considered a strong form of inequality persistence as the non-rejection of the unit root hypothesis would indicate that the gap among the different states and gaps from the USA would be infinitely persistent in OECD countries.

It is well known that both per capita health expenditures and health expenditures as a proportion of GDP are the highest for the USA compared to any other country. In this light, an important issue that remained unresolved in the health economics literature was whether per capita health expenditures of other countries converged to that of the USA. In order to examine whether per capita health expenditures for OECD countries would indicate persistence that of the USA, Lima and Resende (2007) persistence methodology is applied

Table 2. Panel data unit root tests ($HCE_{i,t}$ /$HCE_{USA,t}$) (1970–2005)

Augmenting lag	Test statistic
P=1	0.977 (0,835)

P=2	1,478 (0,930)
P=3	0,750 (0,773)
Automatic Selection	
MSIC	1,281 (0,899)
MAIC	1,344 (0,916)

Note: p-values appear in parentheses

In contrast, Table 1 and Table 2, test based on average of per capita health expenditures would illustrate that the gap among OECD countries would not be persistence.

Table 3. Panel data unit root tests ($HCE_{i,t}$ /$HCE_{average,t}$) (1970–2005)

Augmenting lag	Test statistic
P=1	-3.326 (0,00)
P=2	-1,635(0,005)
P=3	-0,720 (0,235)
Automatic Selection	
MSIC	-2,93 (0,001)
MAIC	-2,77 (0,002)

Note: p-values appear in parentheses

The estimations employed in this study made use of the software E-views 6.0 and the corresponding results for the IPS test are reported in Table 1-3.

First, it is considered different lag possibilities and the evidence indicated that one cannot reject the null hypothesis of unit root except Table 3. In order to be more confident on the lag choice, it can be relied on the procedure suggested by Holmes (2002) that built on the criterion advanced by Said and Dickey (1984) in the context of the IPS test. The referred criterion would establish ($P = T^{1/3}$) which in the present case would favour a lag between 2 and 3.

The issue of choosing the lag has been the subject for considerable discussion in the literature (Lopez et al., 2005). It is followed the approach suggested by Ng and Perron (2001). They

show that the use of modified criteria yields unit root tests with better size as well as power even in smaller samples, and that the modified criteria are superior to other selection criteria such as Ng and Perron (1995) as the latter may lead to over parameterisation with subsequent loss of power. Therefore, it is considered an automatic lag choice procedure that allows for different lag horizons in different states and is based on the Modified Schwarz Information Criterion (MSIC) and Modified Akaike Information Criterion (MAIC) as readily implemented in the aforementioned software.

In that case, once more the evidence favours the non-rejection of the null hypothesis except average convergence. Altogether, the evidence is consistent with a very strong form of persistence for per capita HCE as the gaps across OECD countries does not seem to fade away in the long run.

However, as it occurs with traditional time series unit root tests, one should be concerned with the ability of capturing near unit root behaviours. In any case, the evidence supports a very high degree of inequality persistence.

IV. Final Comments

In this article it is aimed at providing formal tests for the degree of inequality persistence of real per health care expenditures for 19 OECD countries. The issue of health expenditure convergence has attracted substantial attention in the empirical literature. The evidence indicated highly persistent inequality patterns but formal testing of the magnitude of the phenomenon was absent. In that sense, this article has undertaken panel data unit root tests that indicated a very strong form of persistence associated with null hypothesis of unit root.

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