Are GCC Countries Converging or Diverging: Evidence from 1983–2011

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Abstract

In this paper we shed light on the six countries of the Gulf Cooperation Council (GCC) by empirically investigating the presence of convergence across these six countries, over a period (1983–2011). In this period there are significant events that affected these countries, including different episodes of expansions and recessions, fluctuations of oil prices, Gulf Wars (I, II, and III) and the 2008 financial crisis. In line with numerous studies on convergence, we use cross-state regressions to determine the existence or lack of convergence among the GCC countries. The empirical tests give some support to absolute and conditional β-convergence; however we don't find significant evidence of σ-convergence.

Keywords: growth, Beta convergence, Sigma convergence

1. Introduction

Since Solow's (1956) growth framework, differences in living standards and income throughout space and time have created a great debate in the literature. In the literature many attempts were done to measure the speed at which countries and regions move not only towards their own steady states but also towards income per capita of other countries and regions, which is defined as convergence. The literature has considerable research examination into the reasons and sort of differences in growth rates across regions and countries over time because of its considerable impact on peoples' standards of living, and because income disparities across-country and across-region are on the rise over time.

Convergence, which was initiated by Solow (1956) and verified by Baumol (1986), and Barro and Sala-i-Martin (1995), describes the process by which relatively poorer regions or countries grow faster than their rich counterparts. In the empirical research, convergence is generally divided into β-convergence, σ-convergence and club convergence. β-convergence exists when the partial association between income growth over time and its initial level is negative (Young et al., 2008). The β-convergence can be divided into absolute β-convergence (unconditional convergence) and conditional β-convergence. As for the σ-convergence, it means that the dispersion of real income across a group of economies falls over time, so the average GDP standard deviation of economic system possesses a descending trend.

The absolute β-convergence means that poor economic systems have quicker development speed than rich ones which implies that all countries or regions are converging to a common steady state level of income. As for the conditional β-convergence, which is the main argument of the "new theory" of endogenous growth, it implies that economies converge to a different steady-state point of growth since they have different structures (Barro & Sala-i-Martin, 1992). β-convergence remains a primary focus of growth empirics, perhaps because, intuitively, it seems to be necessary for σ-convergence (Young et al., 2008). The absolute and conditional convergence hypotheses have been examined by numerous academics using different practices, procedures and data sets and appear to be strongly accepted by some of the data sets and rejected by others. Club convergence defined as that incomes per capita of countries identical in structural characteristics (technologies, rates of population growth, preferences, government policies, etc.) converge to one another in the long run given that their initial conditions are similar as well (Galor, 1996).

The objective of this paper is to empirically investigate whether there is a tendency for convergence among the six members of the Gulf Cooperation Council (GCC) countries. The Gulf Cooperation Council (GCC) was

established in 1981, containing six countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the U.A.E with the objective of strengthening economic integration and coordinating monetary and financial policies towards achieving a monetary union between the members in the long-run. The six member countries have a lot in common in terms of social, historical, cultural, and religious standards. These factors along with geographic proximity facilitated interaction and created homogeneous characteristics. The paper sheds light on the income gap between these countries if it has narrowed or rather widened over the past 29 years (1983–2011). The paper contributes to the literature by being the first attempt (up to our knowledge) to examine convergence among the GCC members using a sample that contains significant and dramatic changes in the GCC economies. These effects include different episodes of expansions and recessions, fluctuations of oil prices, Gulf Wars (I, II, and III) and the 2008 financial crisis. These events may have impacted the countries differently. In line with numerous studies on convergence, we use cross-country regressions for determining the existence or lack of convergence among the six countries. The empirical tests give some support for absolute and conditional β-convergence; however we don't find significant evidence of σ-convergence.

The remainder of this paper is organized and structured as follows. Section 2 reviews the litrature. Section 3 discusses the conceptual and methodological estimation of convergence, besides describing the data set used. Section 4 summarizes our empirical findings and estimation results, whereas Section 5 concludes.

2. Litrature Review

In testing convergence hypothesis, most of the studies used cross-sectional data to investigate the correlation between initial per capita income and growth rates in cross-country and cross-regional studies. The evidence of convergence is documented by a negative association between income differences and initial income levels, as it indicates that the per capita income growth rate of the initially poorer economies is growing faster than those richer economies. This method provided evidence in favor of the convergence (Baumol, 1986; Barro, 1991; Barro & Sala-i-Martin, 1991, 1992; Mankiw et al., 1992; Engelbrecht & Kelsen, 1999; Zhang, 2003).

Using time series techniques to examine convergence hypothesis is another line in the literature. Under this technique, the empirical literature study output convergence using unit root and cointegration tests. Bernard and Durlauf (1996) highlighted that the cross-section perception of convergence is weaker than the time series perception. They showed that evidence of a negative association between income differences and initial income levels within the cross-sectional framework cannot be taken as indication of income convergence. Instead, it only suggests the idea of catching-up but not yet convergence. Bernard and Durlauf (1996) proposed two definitions of convergence, namely weak notion of catching-up and strong notion of long run convergence. Both definitions are testable within the time series framework. Utilizing time series techniques to investigate differences across countries in the long run behavior of per capita income was also utilized by Carlino and Mills (1993), Bernard and Durlauf (1995), Oxley and Greasley (1995), Evans and Karras (1996), Loewy and Papell (1996), Li and Papell (1999), St Aubyn (1999), Tsionas (2000) and Zhang et al. (2001) among others. However, time series evidence has not been entirely supportive of the convergence hypothesis (Gomez-Zaldivar & Ventosa-Santualaria, 2010).

Despite the extensive empirical work, the convergence debate continues entitled to the fact that the researchers are confronted with many statistical and conceptual drawbacks because of the measurement and assessment of convergence. In testing β-convergence, Barro and Sala-i-Martin (1992) examines the convergence of gross income for 92 countries and show that if the determinant factors of the steady-state income remain constant the convergence can be achieved. Mankiw et al. (1992) use a cross-section methodology for a sample of 98 countries and find evidence of conditional convergence when controlling for population growth and capital accumulation. Islam (1995) points out that conditional convergence occurs for real income per capita, using panel estimation techniques. Lee et al. (1997) develop four different techniques to test β-convergence with data from 102 countries. They find noteworthy differences for the steady-state growth rates across countries. Durlauf et al. (2005) point out that economies converge to their own different steady states implied by a negative coefficient (β) on initial income in a cross-section approach. Moreover, Pesaran (2007) contends that β-convergence indicates convergence within an economy.

For σ-convergence, many empirical studies use the variance of the logarithm of GDP per capita as a measure of inequality or dispersion. Dalgaard and Vastrup (2001) show, using GDP per worker data for 121 countries, that the coefficient of variation and the variance suggest different trends in inequality. Young et al. (2008) demonstrate, using U.S. county-level data containing over 3,000 cross-sectional observations, that σ-convergence cannot be detected during that time period or within the large majority of the individual U.S. states considered separately. Critics of σ-convergence argue that it provides a necessary, but not sufficient,

condition for observing reductions in real per capita income dispersion (Quah, 1993). The time series approach, in general, has rejected convergence. For example, Bernard and Durlauf (1995) find that time-series forecast convergence can be rejected across all OECD economies using Maddison (1982, 1989) time-series data. Similarly, Hobijn and Franses (2000), find little evidence of convergence across 112 countries for the period 1960–1989. Pesaran (2004) confirms the findings of little convergence for both Maddison and Penn World data sets. Evans and Karras (1996) use the cross-country variances of per capita real income for 15 countries, and indicate that income reverts to a common trend. However, the utilization of unit root tests and cointegration to test output convergence is subject to a number of severe drawbacks (Apergis et al., 2011).

3. Model and Data

Barro and Sala-i-Martin (1992) report two broad concepts of convergence; β-convergence and σ-convergence. The former refers to convergence of per capita income through the catch-up growth process, while the latter implies the convergence of cross-sectional dispersion of per capita income. As shown previously, testing convergence hypotheses was applied utilizing different methodologies. In line with Baumol (1986) and Baro and Sala-i-Martin (1992, 1995), the majority of the tests involved fitting cross-country regressions, where a negative correlation between growth rates and the initial per capita income implies absolute convergence.

Following Barro and Sala-i-Martin (1992), we specify the following regression equation to measure absolute β-convergence among the economies of the six GCC members:

$$(ln\, y_{i,T} - ln\, y_{i,0})/T = \alpha - \beta\, ln\, y_{i,0} + \varepsilon_i \tag{1}$$

where $ln\, y_{i,0}$ is per capita real GDP in year 0, $ln\, y_{i,T}$ is per capita real GDP in year T, T is number of years in observation period, α is a constant and ε_i is normally and independently distributed error term. From equation (1), a positive β indicates that the data exhibits absolute β-convergence.

On the other hand, conditional β-convergence implies that a country or a region is converging towards its own steady state. To test for conditional β-convergence, we extend equation (1) by using a set of variables (X_1, X_2) to control for country-specific effects that differ between individual countries and affect the change in the per capita growth rate. By accounting for these unobserved differences for all six countries, it can be determined whether or not country-specific effects influence the test of convergence. The following regression equation measures conditional β-convergence among the six countries:

$$(ln\, y_{i,T} - ln\, y_{i,0})/T = \alpha - \beta\, ln\, y_{i,0} + \lambda_i X_{i,t} + \varepsilon_i \tag{2}$$

where $X_{i,t}$ is a vector of explanatory variables (gross saving as percentage of GDP, and annual population growth). When the estimated coefficient β is positive, it indicates that the data exhibits conditional β-convergence.

The σ-convergence indicates that during the growth process the income levels of six countries will become more equal, and the variation between their per capita GDP levels will gradually decrease. The σ-convergence measures the dispersion of real income or product per capita among regions based on the standard deviation of the cross-section series. When the standard deviation decreases over time, it indicates that the differences of the income per capita between regions in absolute terms tend to decrease with the passage of time, which is a support of convergence. On the other hand, the increases in the standard deviation of the series in terms of the income per capita over time imply divergence. A mixed process of converge and divergence takes place when the standard deviation does not show any clear tendency, but instead, increases or decreases alternatively. Barro and Sala-i-Martin (1995) point out that the dispersion can be measured by calculating the standard deviation of the per-capita logarithm for each year. The following formula is used to estimate the standard deviation for each year:

$$\sigma_t = \sqrt{\frac{1}{n}\sum_{t=1}^{n}(ln\, x_{i,t} - ln\, \bar{x})^2} \tag{3}$$

where σ_t is the standard deviation at period t, $ln\, \bar{x}$ is the logarithm of the average per capita GDP of countries at period t, and $ln\, x_{i,t}$ is the logarithm of per capita GDP in country i at period t respectively; and n is the number of countries. σ-convergence exists if σ_t is less than σ_{t-1}, but if σ_t is more than σ_{t-1}, then σ-convergence does not exist.

The data used to test convergence among the six GCC countries are from the World Bank. The data are annual and cover the period 1983–2011. This time span covers periods of recession and growth. It also captures several shocks to the GCC economies, such as the three Gulf Wars (1980–1988, 1990–1991, 2003), and oil price fluctuations (Note 1). The data set includes per capita real GDP by country (constant 2005 U.S. dollars), gross saving as percentage of GDP, and population annual growth. Variables used here are proxies for the differences among the six countries, where the effect of the economic crises or shock was different among them. Regarding

"β" and "σ" convergence, a noteworthy question stands out is which of the two concepts is more desirable. Sala-i-Martin (1994) points out that both concepts are valuable, because they measure convergence or divergence in a different way and they present different information. However, "β" convergence is a more appealing concept since it looks at whether poor economies are anticipated to grow faster than rich ones, and how fast the convergence process is. He also underlines that these issues can be examined independently of whether the "σ" convergence predicts that the aggregate cross-sectional variance is decreasing or increasing over time.

4. Empirical Analysis

To investigate convergence among the GCC countries, we start with a visual inspection of the per capita real GDP where we plot the per capita real GDP for the GCC countries to check if the gap among the countries tends to fall over time. Figure 1 reports these plots.
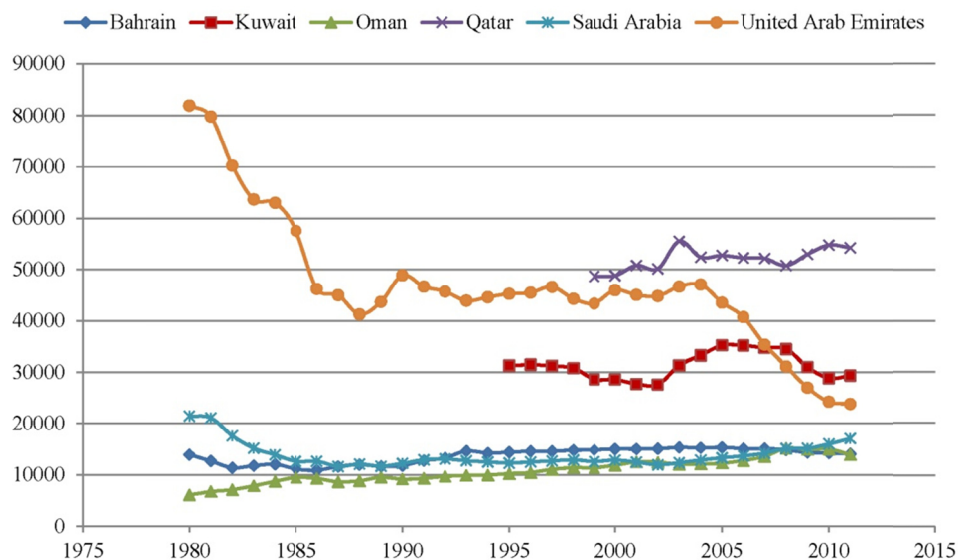

Figure 1. Per capita real GDP (1980–2011)

The plots show weak evidence that the countries are closing the gap and therefore, converging. For example, Qatar is diverging away from the rest of the countries. The UAE was slowing down, but the gap compared to Saudi Arabia, Bahrain and Oman is still not closing. Kuwait is showing divergence with respect to the rest. So figure 1 does not indicate encouraging results about states converging to the same steady state of growth, and therefore we proceed with our empirical examination by testing the three types of convergence.

Table 1. The regression of absolute convergence

Variable	Coefficient
β	0.0171*
	(0.0075)
constant	0.171*
	(0.0712)
convergence rate (Θ)	0.06%
R^2	0.263
number of observations	6

Note. The dependent variable is $(ln\,y_{i,T} - ln\,y_{i,0})/T$. Convergence rate (Θ) is calculated as $= -\ln(\beta +1)/T$, where $T = 29$ (the number of years in the time period). Robust standard errors are reported in parenthesis.

* Significant at the 10% level.

In order to obtain a deeper understanding of the convergence process among the countries, we proceed with the empirical test. We start by estimating equation (1), which models absolute β-convergence (unconditional) among the six countries. The model was estimated using Ordinary Least Squares (OLS) technique. The estimation results are presented in Table 1.

The estimated β coefficient of the initial per capita income level is positive and significant, confirming the proposition of the absolute income convergence over the 29 years period as theorized by the neoclassical growth model. The estimation shows evidence that all six countries are converging to a common steady state during the period 1983–2011. Thus, there exists unconditional β-convergence across the GCC countries. This result coincides with Sala-i-Martin (1996) who presented evidence of absolute convergence for US states and regions. Following Lim (2003), we calculate the annual rate of income convergence over the 29 years period and find it to be 0.1% (The convergence rate is calculated as: θ = −ln(β +1) / T, where T is the number of years in the time period). The convergence rate measures how fast economies converge towards the steady state. Then 0.06% of the gap between the states vanishes in 1 year.

For further analysis, we test if the dramatic changes in the GCC economies such as rising oil prices, Gulf Wars (I, II, and III), and the world sub-prime mortgage crisis in 2008 may have impacted the six countries differently, and affected the convergence process or it did not where its effect was negligible. To do so, we estimate equation (2) that captures conditional β-convergence within the data set, using OLS. Table 2 reports the results. The regression results indicate that including the control variables (gross saving as percentage of GDP, and population annual growth) did not change the significance or the sign of the coefficient of the initial per capita income level; where β is still positive and significant, thus indicating conditional convergence. The estimation shows evidence that each country is converging toward its own steady state during the period 1983–2011. The annual rate of income convergence (convergence rate) over the 29 years period now is 0.04%. Then 0.04% of the gap between country's real GDP and its steady-state value vanishes in 1 year. Conditional convergence suggests that each country possesses its own steady-state per capita real GDP to which it is converging. The steady state in each country is conditioned on the state of its economy. However, in both models, absolute and conditional, our annual rate of convergence is less than 2% rate found by Baro and Sala-i-Martin (1992). This could be because our data set is shorter, and it could be capturing different economic events and crises.

Table 2. The regression of conditional convergence

Variable	Coefficient
β	0.0238***
	(0.0002)
gross saving as percentage of GDP	0.0008***
	(0.00004)
Annual population growth	0.0046***
	(0.00001)
constant	0.1821***
	(0.003)
convergence rate (Θ)	0.04%
R^2	0.331
number of observations	6

Note. The dependent variable is $(ln\, y_{i,T} - ln\, y_{i,0})/T$. Convergence rate (Θ) is calculated as = - ln(β +1) / T, where $T = 29$ (the number of years in the time period). Robust standard errors are reported in parenthesis.

*** Significant at the 1% level.

Finally, we test sigma convergence by estimating equation (3) (Note 2). The calculation of the standard deviation of 1983 (initial year) and 2011 shows that σ-convergence does not exist, since σ_{2011} exceeds σ_{1983}. Sala-i-Martin (2000) shows that β-convergence is necessary but not sufficient condition for σ-convergence, where one could find β-convergence without finding σ-convergence. Sala-i-Martin, when using a sample of 110 countries over the period 1960–1990, does not observe the cross-country variance to decline, and therefore finds no evidence for σ-convergence.

5. Conclusion

The hypotheses of absolute and conditional convergence have been examined by numerous researchers through different approaches and data sets, and appear to be solidly discarded by some data sets and recognized by others. This paper is an attempt to comprehend and re-examine the convergence process (poorer countries catching-up with richer ones) among the six countries of the GCC from 1983 to 2011. The contribution of this paper is that it tests new data set that captures different economic shocks and crises, and it uses latest data available. The empirical tests give some support for absolute and conditional β-convergence; however we don't find significant evidence of σ-convergence.

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Notes

Note 1. By the end of 2001, oil prices started to steadily increase reaching $40–50 by the end of 2004. Then Crude oil prices surged to a record high above $60 in June 2005, over $77 in July 2006, above $90 in October 2007, and reaching a new record of all time of $147 in July 2008 (see Kisswani, 2011).

Note 2. Results can be submitted by authors upon request.

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