**Are structural policies in countries Bordering Mediterranean appropriate to economic convergence: Panel ARDL Application**

Wajdi Bardi[[1]](#footnote-1),a ; SaifEddine Ayouni[[2]](#footnote-2),b and Mekki Hamdaoui [[3]](#footnote-3), c

**Abstract**

Our main contribution in this paper consists at analyzing long-run interactions between structural policies and economic growth accounting for possible convergence. For this purpose, we are based on a sample of eight countries bordering the Mediterranean during the period 1975-2012. We used a technique based on panel ARDL methods recently developed. This method allows us to study potential long-term effects of structural economic policies on growth as well as to capture possible link between candidate variables and the trend of convergence in terms of per capita GDP. Our empirical results support convergence processes of GDP per capita in all bordering Mediterranean countries. Moreover, we find that increased number of secondary schools enrollment through public expenditure on education, greater economic openness and fluid foreign direct investments stimulate economic growth.

**Keywords:** Convergence; Economic policies; Panel Autoregressive Distributed Lag; Mediterranean region.

1. **Introduction.**

The issue of origins and nature of differences between growth rates and the living standards detected between countries has been a subject of frequent debates over the past few years. This literature raises the problem of decreasing factor productivity in a considerable number of developed economies during the 1970s years. These realities put pressure on the classical theory and challenges the neoclassical growth model which advocates economic convergence. The rising doubt on the validity of the neoclassical analysis is largely associated to its fundamental hypothesis of technical progress or “fallen down from the sky”. This theory is based on a steadiness of growth rate and concludes to a unique growth trajectory that should be followed by any economies experiencing the same level of growth at a given time. Despite the fact that this current of thought gained ground during the 1980s and contributes to the enrichment of economic theory through explanation of differences and by identifying determinants of economic growth, it shows its limits in recent years.

The history of economic events has been marked, in addition to the limits recorded to the classical models, by the emergence of new lines of research focusing on the development strategies and the state’s role in the process of economic liberalization pushed by neoliberals. This increasing research stream focuses on the new role of the state in the process of growth and in the economy in general. In this context, it has been developed endogenous growth theories and takes more interest since the mid-1980s (Romer, 1986; 1990; Lucas, 1988; Barro, 1990; Grossman and Helpman, 1994; King and Levine, 1993a; b). These theories give real boost to macroeconomic research in terms of growth and represent a solution or guide to developing countries by showing how they can improve their long-term growth prospects.

Unlike the Solow standard growth framework, endogenous growth theory insists on the role of economic policy in the growth process, which is neutral according to Solow model. These theories highlight the different mechanisms by which growth becomes endogenous and suggest a new role for the state's economic policy at the center of economic activity. In particular, they focused on policy related to human capital development, innovation, technical progress, financial development and the opening of economies to external trade. With these theoretical advances, convergence has become conditional. Otherwise, using economic policies, a country that is lagging behind can accelerate its growth and can catch up with the developed countries. Despite abundant researches studying convergences, they do not take into account long run effect of state’s policy on convergence to steady state. Particularly, recent works highlights importance of taking into account such indicators to study possibility of economic catching up. So, we aim in this paper to overcome such limits introducing many potential determinants of countries’ convergence evolved by more recent endogenous growth theory. Otherwise, we test if taking account of these economic policies influence convergence rhythms of economies using an Autoregressive Distributed Lag (ARDL) approach. This method permits to overcome previous techniques shortcomings in terms of studying variables not integrated of same order or don’t’ admit long run association-ship according to a restricted VECM or unrestricted VAR regression.

So, we seek to study the dynamics of growth and convergences in eight countries bordering the Mediterranean during the period 1975-2012 using a Solow-Swan model. We are based on a recently developed dynamic panel heterogeneity analysis build on the technique introduced by Pesaran *et al.* (1999) to assess validity of convergence hypothesis in this region. This methodology permits us produce consistent and efficient estimators of the parameters in presence of country-specific heterogeneity issue.

The rest of this work is organized as follows. In section 2, we present a review of the literature concerning convergence and we detailed structural policies that can influence economic growth. In section 3, we develop econometric approach proposed to respond to our objective of studying economic convergence. Section 4 provides discussions and interpretations of our main results. Finally, section 5 concludes this study giving recommendations in terms of economic policies.

1. **Literature Overview**

Our paper is at the crossroads of two strands of the literature, one investigating the link between structural policy and economic growth and the other studying the models of convergence.

* 1. **The importance of economic growth policies**

* + 1. **Education Policy**

Lucas (1998) takes into account the role of human capital and integrates the decision of individuals to acquire knowledge. The core insight of the idea is that human capital can be accumulated like physical capital, but unlike the latter, it is produced according to a process of increasing return in relation to itself because it is its own production factor. In the Lucas model, the rate of growth should depend solely on the time to the formation of human capital. It is positive as soon as this value is positive. Thus, the State can engage in an education policy which encourages the accumulation of human capital and thereby promotes economic growth. The State may subsidize the training activity, it can thus distribute scholarships or it can cover all or part of the cost of training, that is to say, putting in place a public education system. Since private agents do not take into account the external effects that can be linked to human capital, public intervention can be an incentive for private agents to invest more in the formation of human capital. As Schubert (1996) has shown, "The State may grant each agent a subsidy that corresponds to the amount of time devoted to training and partially compensating the loss of wage increase".

D'Autume and Michel (1994) have tried to examine the different education policies, especially when physical capital is needed to produce human capital. They assume funding through taxation of this educational physical capital. They find that a subsidy to education has a positive influence on the growth rate. This makes it possible to correct the externality effects by encouraging each agent to acquire further experience and training which has a positive impact on the other agents. The taxation of capital income, used to finance this subsidy, has no influence on the growth rate provided that it does not affect human capital, defined as the core growth of the model. Benhabib and Spiegel (1994) have criticized the allocation of human capital according to the model of Lucas (1988).They have noted that the impact of human capital on economic performance takes two forms. It intervenes as a supposed potential growth engine according to the terminology borrowed from the theories of endogenous growth according to Lucas. It is also a vector for technological catch-up. Indeed, their approach is borrowed from Nelson and Phelps (1966) approach and from what the Schumpeterian literature has recently revived. This approach considers the stock of human capital as the main growth engine. Thus, this stock of human capital determines the country’s ability to innovate and catch up with the most developed neighboring countries. Consequently, if there are differences in growth rates between countries, they are determined by the differences that may exist between their stocks of human capital and their capacities to enhance technical progress [Aghion.,Ph and Howitt., P. (2000) and Benhabib and Spiegel (1994)].Also include the work of Baldacci, Clements, Gupta and Cui (2008), Bhattacharyya (2009), Seetanah (2009), Lee and Kim (2009), Benos and Karagiannis (2010), Tsai, Hung and Harriott (2010) and Suri, Boozer, Ranis and Stewart (2011) find a positive growth-secondary enrollment relationship.

It is noted throughout, whether in developed or developing countries, that education policy seems to be a major strategic trend in economic development. Of course, public authority is extensively involved in educational choices.It invests to provide individuals, very often, with a free-of-charge education system. It affects individual choices through a system of taxation and subsidies. The reasons for this intervention are twofold. In the presence of externalities, the State can compensate both the market and individual choices in order to improve the efficiency of resource allocation and thus increase the growth rate. It can also intervene in the interests of fairness and social justice.

* + 1. **Research and development policy**

Technical progress has the nature of fostering the marginal productivity of factors and preventing its long-term cancellation. To endogenize technical progress is, in fact, to explicitly include in the model a sector of "research and development" producing new technologies. Knowledge, in this sense, is the consequence of the accumulation not only of physical capital (a rivalrous factor) but also of knowledge (a non-rivalrous).The focus was, therefore, on the particular role of technological innovation and on the importance of resources devoted to research and development. The model of Romer (1990) supports the idea developed by Lucas (1988) which explains the non-convergence of the economies. Indeed, an economy with high level of human capital will grow faster because it will devote more resources to the accumulation of knowledge. However, a low level of human capital will lead to a reduction in the rate of growth since the existing human capital will be devoted to production. Thus, underdevelopment exists in the model of Romer (1990). Another important conclusion of Romer's model is that when there is an integration of two identical countries, this doubles human capital but more importantly it doubles the growth rate; the effectiveness of this capital increases along with its size.

Based on this model, a number of desirable economic policies capable of influencing the long-term growth rate can be identified in order to bring the competitive equilibrium closer to the social optimum. First, we note that the variable "human capital" may positively influence economic growth. Romer develops in his model the idea of ​​having a threshold based on the level of human capital that explains the international differences between growth rates. Thus, a policy of support to education seems to be favorable and effective on economic growth. The second possible economic policy is the subsidy for the purchase of intermediate goods. In other words, the State can stimulate the supply of these goods in order to eliminate the distortion effect due to monopoly pricing. Indeed, Romer points out that the difference between the equilibrium growth rate and the decentralized growth rate depends, heavily, on the margin of the monopoly. A policy that will reduce this monopoly margin has to increase the equilibrium growth rate to reach the optimal (decentralized) growth rate. Another possible economic policy embodied in research grants. In fact, granting more subsidies seems to be efficient in increasing economic growth. Thus, a research grant and cuts in public spending, intended to promote the accumulation of technological capital in order to internalize the externality created by the current research on the productivity of future research, seems to have a positive influence on economic growth because it encourages private agents to invest in research and development at a high level.

Developed countries give major priority on research and development expenditures in their budgets. They currently account for about 2% of GDP. However, in the case of developing countries, due to a lack of insufficient financing resources and the limited capacity of these countries to innovate, the portion of these expenditures is around 0.65% of the gross domestic product (GDP) of all developing countries.

It is to be noted that South and East Mediterranean countries (SEMCs) tend to give no importance for research and development expenditure. They expect to emulate the various innovations available from developed countries. In order to have the internal capacities necessary for an effective use of this technology, it is essential, from our point of view, to improve the level of skills and training of the population. Indeed, most SEMCs are not yet able to develop their own research and development activities to a sufficient level. Thus, they are turning towards foreign technologies. Their research and development systems should, in this sense, supplement and support the technology acquired through transfers or imports of capital goods. Thus, the adoption of foreign technologies requires a skilled and competent workforce capable of adapting technologies to the specificities of national economies, thereby improving the competitiveness of their industry.

* + 1. **Public Infrastructure Policy**

In addition to taking account of external effects, the State has a direct influence on the efficiency of the private sector: public investment contributes intuitively to private productivity. Thus, Barro (1990) develops a model that highlights the dual effects of taxation. It shows that public activities are also a source of self-sustaining growth. Thus, government spending, such as the provision of public infrastructure, has a positive effect on the levels and growth rate of the economy and is considered complementary to private capital.

Glomm and Ravikumar (1997) propose a version of the Diamond model of capital accumulation (1965). They present a dynamic model of general equilibrium taking into consideration public expenditure. In this model, the authors try to study the effect of public spending on infrastructure and education on long-run growth. These expenditures are considered as inputs into the production function. The model identifies the positive effects of public investment in infrastructure (productive investment) on the long-run growth rate of the economy. They also show the dual effect of taxation on the growth rate, which makes it possible to define a so-called "optimal" size of the State.

Studies in terms of the causality of public expenditure show highly disparate results. For example, Ashan, Kwan and Sahni (1992) have found that, among the seven major OECD countries, the United Kingdom would dominate a causality of public spending on income, while France and Italy show a two-way causality, and that the United States and Canada would show a more fragile relationship, from income to expenditure.

Agenor (2000) indicates that the lack of reliable empirical evidence for some studies about the relationship between fiscal policy and growth could be related to the non-linear nature of the relationship between these variables. In fact, growth increases when taxes and spending are at low levels and then growth falls as taxation effects exceed the beneficial effects of public goods. Thus, public spending and economic growth are, on the one hand, positively linked when public spending is below the amount considered optimal, and, on the other hand, negatively linked when it is above and uncorrelated when public authorities provide the optimal amount of services. Empirical sectional studies were generally unable to explain this nonlinearity and may therefore be unable to detect it in the data.

Ultimately, it appears that infrastructure investments, based on the results of the two approaches (primal or dual) and the developed theoretical models, have a significant effect on private sector productivity and on economic growth. Although there are mixed results in some econometric studies, investment in road infrastructure and telecommunications is the most productive public capital investment because it supports private activities and thus generates spillover effect.

* + 1. **Financial development policy**

Different researches of the OECD Development Center, studying the case of a number of African countries, show the importance of a financial development policy to accelerate growth in these countries through a better mobilization of saving resources towards productive employment. The link between the development of financial intermediation and the experience of financial institutions, and the growth rate is obvious. Indeed, what differentiates rich countries from poor countries is the efficiency with which they use their resources. Precisely, it is the contribution of a financial system to growth that makes it possible to increase this efficiency.

Pagano (1993) presents three channels of financial development transmission towards economic growth. The first channel is the allocation of savings to firms. In fact, in the process of the transformation of savings into investments, financial intermediation absorbs resources. Thus, a portion of the savings is lost between the lending and borrowing transactions. This loss is related to the various fees that banks charge. In this context, Roubini and Sala-i-Martin (1992) show that, in the intermediation activity, there are charges on banks in the form of taxes (at the level of reserve requirement, transaction taxes) or in the form of restrictive rules imposed on the financial system. Within this framework, an economic policy which is favorable to the development of the financial sector and which will increase the efficiency of the latter in order to mobilize more savings towards investment, will be crucial to increase the growth rate of the economy. Therefore, a developed and competitive financial system must be characterized by reduction in taxes and any other restrictions concerning its functioning. The second channel that can be attributed to financial intermediation is the allocation of resources to projects with high marginal productivity of capital. Indeed, financial intermediation acts positively on the productivity of capital, which influences growth, by two means: (i) collecting information that allows for a better evaluation of investment projects, (ii) reducing Individual risks of the possibility of investing in bad projects by diversifying risks that can lead to better productivity. A fairly well-developed financial system has a positive effect on capital productivity, which is in line with Beck, Levine and Loayza (1999), who emphasize the significant influence of the development of the banking sector on capital productivity. This is an essential factor in the development of investment and hence of economic growth. Thus a policy of financial system reforms will be beneficial for the economy. The third determinant of growth moves through the savings rate. For this the view that the development of the financial sector has a positive influence on saving is being accepted, although this relationship is often somehow ambiguous. Thus, a savings policy could have a positive impact on long-term economic growth. Pagano tries to demonstrate that the channels through which financial factors influence growth are of crucial importance for a country that seeks to develop its financial system and improve its growth prospects. Ultimately, it can be noted that one of the requirements of domestic policy is the modernization of financial systems.

Many theoretical as well as empirical studies based on endogenous growth theories have demonstrated the existence of a positive correlation between financial development and economic growth[Greenwood and Jovanovic (1990), Blackburn and Hung (1993),De la Fuente and Marin (1995),De Gregorio andGuidotti (1995), Demirguç-Kuntandand Levine (1996), Levine and Zervos (1998), Arestis and Demetriades (1997), Levine, Loayza and Beck (2000), Abu-Bader and Abu-Qarn (2008), Luintel, Khan, Arestis and Theodoridis (2008), Beck, Demirguc-Kunt and Levine (2009), Lartey (2010), Bittencourt (2012), Abdelhafidh (2013) etc.]. Thus, a financial development policy seems to be important for a better channeling and an efficient allocation of scarce resources towards productive employment. An economy with a repressed financial system struggles to develop. Thus a developed financial system has a positive effect on economic growth.

* + 1. **Openness and economic integration policy**

Inspired by the models of endogenous growth, Gould and Ruffin (1995) assume that economic integration into the global market provides human capital, at the national level, with externalities that are not accessed under autarky. As long as economies are not fully integrated with each other, increasing the level of human capital will increase the growth rate of the economy, if it opens its economy. Aubin (1994), in an endogenous growth model, shows that the gains in terms of growth depend on the existence of a coordination between the different economic policies, that is to say, the existence of a public intervention seeking the optimum not within the framework of each of the economies taken separately but rather the union of these economies. Consequently, this confirms, in this sense, the advantage of a regional economic integration. Indeed, openness exposes the national economy to foreign competition and leads to the selection of new and more efficient techniques, which accelerates productivity growth.

Several empirical studies have emphasized the importance of both the degree of openness and, more generally, the openness strategy in terms of growth; although this empirical literature on openness and international trade faces several conceptual as well as data problems. Indeed, the problem is essentially linked to the benchmarking of trade policy, for which the barriers to trade, such as the countless tariff rates, must be translated into an index of openness and of foreign trade regime, etc. The literature is rich in empirical studies that highlight the positive link between the proxy variable of openness and the economic growth. The following works can be cited as examples: [Balassa (1985), Dollar (1992), Edwards (1993), Coe and Helpman (1995), Ben-David (1996), Harrison (1996), Sachs and Warner (1997), Pissarides (1997), Markusen and Venables (1999), Rodrick (1998), Frankel and Romer (1999), Greenaway, Morgan and Wright (2002), Kim, Lin, and Suen (2010), Shahbaz and Rahman(2012), Le and Tran-Nam (2017) etc.]. A wide and diverse range of studies come to the same fundamental conclusion which is that free trade and openness to the outside world stimulate growth. In addition, the empirical literature invalidates the pessimistic view according to which trade liberalization undermines growth prospects and economic development. This reinforces our analysis of the possible positive effect of a free trade policy. Indeed, economic growth is strengthened thanks to economies of scale, exposure to competition and the spread of knowledge.

Definitely, the benefits of regional economic integration are obvious. In the face of globalization and regionalization movements in the world, countries, such as the Southern and Eastern Mediterranean countries (SEMCs), find themselves obliged to integrate into a regional economic zone. As Rodrick (2001) acknowledges: “...there is a widespread agreement that openness to trade is the most suitable way known to man to reach economic growth”. He adds, repeating Fisher’s (2000) words, “Integrating into the global economy is the best way for a country to grow”. Moreover, Rodrik's analysis (2001) shows that “No country has developed successfully by turning its back on international trade and long-term capital flows. Also very few countries have experienced long periods of growth without increasing the share of trade in their domestic product”. In this regard, countries like the SEMCs must seek to achieve, successfully, international integration by implementing major structural reforms and signing association agreements with the European Union.

The SEMCs are convinced that they cannot achieve this integration effectively and remain at the margin only if they achieve high and sustainable levels of growth. The FEMISE report (2002) insists that the present growth process in the countries of the region must be transformed, to allow for a greater per capita income in the long term. The report estimates the growth rate that should be reached as 7% per year. Thus, strengthening their growth prospects seems to be the challenge facing the SEMCs for the success of their economic integration (see Table 1).Under these conditions, these countries hope to converge in terms of per capita growth rates with southern European countries.

**Table1. Effectiveness conditions for the Euro-Mediterranean Partnership**

|  |  |  |
| --- | --- | --- |
| Objective | The expected benefits ex-ante | Ex-ante potential costs |
| Establishment of a free trade area | - Increase in competitiveness.-Development of synergies and exploitation of increasing returns to scale. | -Contraction of the amount of customs duties (fiscal policy to redefine). -Search for specialization in promising sectors |
| **Reallocation of resources and convergence** | **- Increase in living standards.** -Social progress: **raising the standard of living** - Decrease in unemployment. **Reduction of regional disparities.** | - **Structural reforms** aimed at liberalization and macroeconomic stabilization. **-Development of infrastructures, heavy investment (education, research, health ..)** |

Source : Lhéritier (2001) p 19.

* 1. **Convergence models: the debate**

The notion of convergence emerged in the late 1980s in conjunction with the emergence of new theories of endogenous growth and especially with the availability of international comparative statistical databases. Since then, several papers have discussed the economic convergence phenomenon as well as the best approach to grasp it. A special area of focus will be on comparisons of national growth performance. Firstly, we propose to recall the definitions of convergence (in the literature we find several notions of convergence), then we will expose a model of convergence retained in this empirical literature.

There are three types of convergence in the literature. The first notion of convergence is the-convergence which is defined as the reduction of the dispersion of the per capita GDP distribution. In other words, we study the dynamic evolution of a dispersion indicator of the per capita GDP distribution in logarithm. This indicator is most commonly the variance or standard deviation, in cross-section, of the per capita GDP distribution. Thus, for a given sample of countries, if the average deviations decrease between the initial date and the final date, within this framework, the hypothesis of -convergence is accepted: the per capita GDP is said to converge towards the average value of the sample. This notion of convergence was introduced by Sala-i-Martin (1990).

The second notion of convergence is unconditional or absolute *β*-convergence. This convergence examines the relationship between the per capita growth rate and the initial level of per capita GDP. We try then to assess if the living standards of the various economies of poor countries tend to move closer by focusing on the catching-up of developed countries. It is said that there is unconditional *β*-convergence if, for a given period, the per capita growth rate of a country is higher than its initial per capita GDP.

The statistical estimation used to test this hypothesis consists in regressing, in cross-section, the growth rate, for example per head, over the period, constantly and the initial GDP in log. Thus, if the initial GDP coefficient is negative and statistically significant, we accept the hypothesis of unconditional*β*-convergence.

Extensive empirical studies have tested this hypothesis. They confirm the non-validation of this notion of convergence. In fact, the divergence of countries' experiences in terms of growth rates shows the non-validation of the neo-classical theory as formulated in the Solow growth model on the convergence of economies towards identical paths of equilibrium growth. Other so-called control variables have been introduced to explain the non-convergence, hence the notion of conditional *β*-convergence.

Among these works, one can cite that of Barro and Sala-i-Martin (2004). Like most cross-sectional studies, they consider a regression of general form:

 (1)

Whereis the growth rate in per capita GDP over a period (from 0 to T); lny0is the logarithm of the per capita GDP at time 0 and i identifies each country.

Barro and Sala-i-Martin (2004) have considered a group of *N* countries with a real per capita income, for the country i, given by. They have also considered the following regression model, in discrete time, of *yi* on a constant term,, and its delayed value:

 (2)

Where is a parameter to be estimated; is a disruption term of mean-zero with constant variance, which captures temporary shocks of production technology, the average propensity to save. This term is also supposed to be independent over time and between countries. The previous equation can also be written as follows:

 *(3)*

This equation shows that for the*β*-convergence to occur, the condition must be satisfied. Indeed, implies the inversion of the mean because the annual growth rate of the income per capita given by, is, inversely, related to . The higher the value is the greater the tendency to converge.

In the long run, assuming that, the expected real income per capita is:

 (4)

Where *E(.)*is the mathematical expectation operator.

Thus, conditional *β*-convergence occurs in a group of countries if the partial correlation between the growth rate of real income per capita and its initial level is negative. To illustrate this concept, Barro and Sala-i-Martin (2004) have considered a regression in sections of the per capita income growth rates relative to the initial per capita income and various other control variables summarized in the vectorwhich takes into consideration other determinants of income, such as inflation, openness, public investment, quality of human capital, and so on. The equation is given by:

Le Pen (1997) defines conditional *β*-convergence follows: "The inverse relationship between the per capita growth rate and the initial per capita GDP is verified provided that the countries in the sample reach common levels for certain economic and non-economic variables. These variables are supposed to control the heterogeneity of long-term trajectories". Thus, differences in per capita incomes can be maintained or even strengthened over time. The basic idea is that the differences observed are related to the initial structural differences between countries, hence the notion of "conditional" convergence. In this context, convergence is conditioned by the initial allocation of countries.

One of the major limitations of convergence of the cross-section approach is the hypothesis of an initial level of technology similar for all countries because the technology is unobservable (as Mankiw, Romer and Weil (1992) have pointed out).If this hypothesis is not verified, then we are in the case of omission of a relevant variable correlated with the other explanatory variables, causing significant distortion in the set of coefficients of the convergence regression. A first solution consists in estimating the relationship on panel data by introducing individual heterogeneity in the form of fixed effects (Islam 1995 and Berthélémy and Varoudakis (1998).Indeed, Islam (1995) provided an approach in terms of panel data to regressions on conditional convergence that allows certain parameters of the production function to be different from one country to another. His approach, however, retains the assumption that the rate of technical progress is the same for all countries.

1. **Data and Methodology**

We used annual data for eight countries bordering the Mediterranean during the period 1975-2012. We take the real per capita GDP as our dependent variable since we aim to access to level of divergence between countries in terms of living standards taking into account inflation disparities. Otherwise, our main objective is to analyze the dynamics of growth and convergence in this region using a model à la Barro (1991) which is the first to introduce conditional convergence concept. For the choice of the variables introduced us explanatory determinants of potential convergence we are based on the set of variable making a large consensus by the most recent literature of endogenous growth theory. This dataset contains two mediating variables such us human capital accumulation measured by total secondary schools enrolment and domestic credit to private sector in percent of GDP as a proxy for financial development which stimulates economic growth. In addition, we introduced openness and foreign direct investment in order to control for external influences on the macroeconomic stability and public sector activity[[4]](#footnote-4). For example, an increased inflows of foreign capital declines the costs of R&D and so the costs of innovation (Borensztein et al., 1998) improving long-run growth. Data descriptions and resources are presented in table A.1 (see appendix)

For the choice of our methodology, we referred largely to the technique introduced by Pesaran et al. (1999). This method is the more appropriate in studying this type of question such us county-convergence. Indeed, panel data methods are used to verify convergence hypothesis in our sample. Particularly, the paper uses panel ARDL methods to produce consistent and efficient estimators of the parameters in the presence of country heterogeneity contrary to previous studies based on variables integrated with the same order[[5]](#footnote-5).

***3.2.1. Growth and Convergence***

***3.2.1.1.. Solow framework convergence***

Growth theories provide a framework to assess the convergence hypothesis involved by the Solow-Swan augmented model. Barro (1991) used this model to estimate the speed of convergence in 98 countries. The concept of σ-convergence differs from the *β*-convergence concept. The idea behind the σ-convergence is that the dispersion of real per capita GDP across countries tends to fall over time. We present below a figure which investigates the σ-convergence assumption in CBM countries. The figure presents the path standard deviation of distribution of per capita GDP.

**Figure 1. *Dispersion of real per capita GDP in CBM countries, 1975-2012***



Figure 1 shows no clear indication of presence of σ-convergence among CBM countries over the period 1975-2012. Indeed, it presents a period of increasing divergence (1975-2007), and a period of strong reduction in divergence (2007-2010). It can be shown that the dispersion of standard deviation of real per capita GDP decreases when the speed of β-convergence increases[[6]](#footnote-6). We can assume that the high dispersion of real per capita GDP, essentially before 2007, submits a weak speed of adjustment of CBM countries toward a common steady-state way and a weak convergence of poor countries toward richer countries.

We present in the next figure the evolution of real per capita GDP in each country in CBM region. Figure 2 shows the initial conditions in CBM countries were very different with a real per capita GDP in Italia, the richest country in the region, 23.5 times larger than in Egypt, the poorest country, in 1975 (the beginning of period). This figure shows a weak progress in closing the income gap with the richer countries (Italy, Spain and Greece). We conclude that there is, in general, an evidence of “catch-up” prediction of the Augmented Solow-Swan *(ASS)* model for this region, since the real per capita GDP of these countries have relatively increased by the end of the period compared to the beginning.

**Figure2. *Evolution of real per capita GDP in CBM countries***



We can summarize that the observed conditional *β*-convergence also makes it probable that factor accumulation alone would not be enough to explain the growth differentials between countries in the CBM region. As a result, country-specific variables such as human capital accumulation, financial development, openness and foreign direct investment could drive growth and explain its dispersion across CBM countries.

***3.2.1.2. Alternative Empirical models for estimating growth and convergence***

In contrast with several studies in the literature reported on the growth and convergence, we use a dynamic panel data approach that makes possible to account for heterogeneity which cannot be feasible with cross-country and time series methods. Pesaran *et al.* (1997) argues that the estimator of the speed of convergence obtained by Barro (1991) is inconsistent because it accounts for homogeneity assumption across countries sample.

Furthermore, we adopt a recently developed dynamic panel heterogeneity analysis based on some techniques introduced by Pesaran *et al.* (1999, 2004). Specifically, we present an Autoregressive Distributed Lag model (ARDL). We can use three different estimators such as: the Mean Group (MG), the Pooled Mean Group (PMG) and the Dynamic Fixed Effect (DFE) estimators in order to explore (1) both the long-run and short-run effects of human capital accumulation and financial development in CBM countries growth[[7]](#footnote-7) and (2) to estimate the speed of convergence toward their steady-state level of real per capita GDP[[8]](#footnote-8).

1. ***Model specification:***

To address the drawbacks of the models presented in the neoclassical theory, we consider the following ARDL (p, q) model based on the specification of Pesaran et al. (1999):

 (1)

The dynamic heterogeneity in panel regression can be added into an error correction model using an ARDL (p, q) technique by subtracting the lagged dependent variable (GDP per capita) from both sides as follow:

(2)

Where the dependent variable *y* is the real per capita GDP, *X* stands for a list of independent variables including the human capital, financial development, openness and foreign direct investment indicators. Since that these factors are important in the sense that they affect resources mobilization and affectation to better uses. In other words, we explained in subsection 2.1.4 how they positively influence human capital productivity through technologies transfer and skilling so we seek to study importance of these variables in accelerating economic growth of countries. The parameters:

* *v* and *θ* represent the short-run coefficients of lagged dependent and independent variables, respectively.
* *β* and*ϕ* represent the long-run coefficients and speed adjustment to long-run steady state coefficient, respectively.
* *η* is a country-specific intercept.

The subscript *i* and *t* represent country and time, respectively.

We note that the term represents the long-run relationship between *ln(y)* and *ln(X)* (*Error Correction term*). According to Pesaran*et al.,* (1999) there exist two assumptions to this long-run regression:

* ***Assumption1***: the relationship between *ln(y)* and *ln(X)* defined by  exist if*ϕ < 0* (*ϕ speed of convergence*), for each *i = 1 to 8* and *μ* is a stationary process.
* ***Assumption2***: the long-run coefficients on *Xit*, defined by, are the same across countries, namely: *δi = δ* (*long-run homogeneity assumption*).

The equation (1) will give intuitions into the issue of *β*-convergence, since *ϕ* can be interpreted as the speed of convergence toward a common steady state. As noted above, alternative estimators have been proposed for the whole sample to estimate this equation including, the PMG estimator and the MG estimator and the DFE estimator. The only difference between PMG and MG estimators is that the first imposes a restriction on the coefficients of long-run coefficients to be homogenous across counties, while the second doesn’t require a restriction, it allows for all coefficients to vary and be heterogeneous in the short and long-run. However, according to Pesaran *et al.* (1999), the PMG estimator offers an increase in the efficiency estimates as compared to the MG estimator under the log-run homogeneity. To test this assumption of long-run slope homogeneity, we use a Hausman (1978) type test to test whether there is a significant difference between PMG and MG or PMG and DFE estimators. Under the null (slope homogeneity), the PMG estimator is consistent and efficient. If the null hypothesis is not rejected, the PMG estimator is recommended.

* 1. **Statistical Properties of the Variables**

The basic statistics of Human capital, financial development, openness, foreign direct investment and economic growth are given in table 2.

**Table 2. *Basic statistics***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Variable** | **Mean** | **Min** | **Max** | **St.Dev** |
| *RPCGDP* | 8.879303 | 7.164721 | 10.45237 | 0.8834986 |
| *HC* | 4.452391 | 3.810654 | 4.760241 | 0.2296525 |
| *PRIVY* | 3.920961 | 2.609209 | 5.370924 | 0.7044703 |
| *OPEN* | 3.927827 | 2.182675 | 4.751041 | 0.3632247 |
| *FDI* | -0.116524 | -5.744605 | 2.243313 | 1.263101 |

\*Where RPCGDP, HC, PRIVY, OPEN and FDI denote the per capita real GDP, the Human Capital, the Domestic credit to private sector in percent of GDP, the Openness trade and Foreign Direct Investment indicators relatively.

**4.2. Results and Discussions**

***4.2.1. Unit root test:***

Since the ARDL model is not applicable for series exceeded an order of integration equals 2, we apply a unit root test to make sure that series are *I(0)* or *I(1)* (Pesaran and Smith (1995), Pesaran *et al.* (1999)). Since our data are unbalanced, we first employ two different types of panel unit root tests: the *Im, Pesaran and Shin* (IPC) test and *ADF-Fisher* (ADF) test.

The table below reports both the IPC and ADF unit root tests.

**Table 3. *Panel unit root tests results***

|  |  |  |  |
| --- | --- | --- | --- |
|  | **IPC** | **ADF-Fisher** | **Level of Integration** |
| *Level* | *First Difference* | *Level* | *First Difference* |
| ***RPCGDP*** | 0.4833 | -6.1361\*\*\* | 0.4771 | -5.9081\*\*\* | ***I(1)*** |
| ***HC*** | 1.3547 | -9.0054\*\*\* | 1.4297 | -7.7424\*\*\* | ***I(1)*** |
| ***PRIVY*** | 1.9896 | -4.7927\*\*\* | 2.0663 | -4.6475\*\*\* | ***I(1)*** |
| ***OPEN*** | -2.1277\*\* | -8.0701\*\*\* | -2.2655\*\* | -7.3427\*\*\* | ***I(0)*** |
| ***FDI*** | -3.2687\*\*\* | -11.1489\*\*\* | -3.2706\*\*\* | -9.3062\*\*\* | ***I(0)*** |

Notes: \*\* and \*\*\* indicate significance at 5% and 1% level, respectively. Lag length selection is based on Schwartz Bayesian Criterion. ADF-Fisher test is based on Choi’s-Z statistic.

Our data includes period that is fairly long (38 years), we further applied a unit root test with constant and trend in level and first difference. Table 3 above of IPC and ADF test results show that the null hypothesis of unit root cannot be rejected for real per capita GDP, human capital and financial development in level. On the other hand, both the variables trade openness and foreign direct investment are stationary in level with constant and trend.

The existence of unit root in the real per capita GDP provides that deviations of this variable from its steady state-level are permanent rather than transitory [Wane (2004)].

In summary we notice that our data suffers from either *I(0)*or*(1)* which allows us the possibility to estimate both short-run and long-run relationship between economic growth and human capital using a Panel ARDL approach.

* + 1. ***Panel ARDL estimates:***

The estimation of the Augmented Solow-Swan *(ASS)* model for *CBM* zone is conducted using an Autoregressive Distributed Lag model *ARDL (1,1,1,1,1)*.

**Table 4. *PMG estimates and MG estimates for CBM region***

|  |  |  |
| --- | --- | --- |
| **Variables** | ***Pooled Mean Group Estimates*** | ***Mean Group Estimates*** |
| *Coef.* | *Std.Err* | *P.Value* | *Coef.* | *Std.Err* | *P.Value* |
| ***Dependent Variable: Log real per capita GDP*** |
| ***Long-Run Coefficients*** |
| **HC** | 0.6629\*\*\* | 0.3758 | 0.007 | 0.5483 | 0.5714 | 0.337 |
| **PRIVY** | 0.4257 | 0.1554 | 0.816 | -0.4256 | 0.3638 | 0.242 |
| **OPEN** | 0.9386\*\* | 0.2966 | 0.002 | 0.0413 | 0.2176 | 0.850 |
| **FDI** | -0.0204 | 0.0248 | 0.411 | 0.0937\*\*\* | 0.0319 | 0.003 |
| **Hausman Test** |  14.41 0.006 |
| **Err. Corr. Coef.** | -0.1213\*\*\* | 0.0460 | 0.008 | -0.2009\*\*\* | 0.0553 | 0.000 |
| ***Short-Run Coefficients*** |
| **ΔHC** | 0.6665\*\*\* | 0.2573 | 0.010 | 0.5579\*\* | 0.2394 | 0.020 |
| **ΔPRIVY** | 0.1257 | 0.0849 | 0.139 | 0.1642\* | 0.0845 | 0.052 |
| **ΔOPEN** | 0.1085\*\* | 0.0645 | 0.092 | -0.0830 | 0.0546 | 0.129 |
| **ΔFDI** | 0.0083\*\* | 0.0050 | 0.099 | 0.0020 | 0.0055 | 0.706 |
| **Linear Trend** |  0.0066\*\*\* | 0.0021 | 0.002 | 0.0119\*\*\* | 0.0036 | 0.001 |
| **Intercept** | -12.152\*\*\* | 3.9752 | 0.002 | -21.157\*\*\* | 6.4319 | 0.001 |

Note: \*, \*\* and \*\*\* indicate significance at 10%, 5% and 1% level respectively. Ander the long-run slope homogeneity, the Hausman statistic is asymptotically distributed as a Chi-squared with four degrees of freedom. The lag structure is ARDL(1,1,1,1,1), and the order of variables is Real per capita GDP, Human Capital, Financial Development, Openness and Foreign Direct Investment. All the variables expressed in natural logarithm form.

Table 4 above reports the results based on the Pooled Mean Group estimator. Equations for the long-run relationship between GDP growth and human capital accumulation were calculated for each country. From these results, the MG was estimated from the unrestricted country by country estimation[[9]](#footnote-9). Coefficients of MG estimator are the average of country-specific parameters and PMG coefficients are restricted to be the same across countries. Hence, the comparison between the PMG (*long-run slope homogeneity*) and MG (*long-run slope heterogeneity*) estimates results show how sensitive the empirical estimates of the growth model are to different estimation technique.

According to Hausman test[[10]](#footnote-10), we accept the PMG as a consistent and efficient estimator. In line with ASS model, the PMG estimator results indicate the existence of strong relationship between economic growth and human capital in *CBM* countries, in the short and long run. As one would not expect, we could notice that the long-run marginal effect of human capital on real per capita GDP growth is of same magnitude as in short term impact. Indeed, both the long-run and short-term human capital elasticity of real per capita is estimated at 66%[[11]](#footnote-11). Openness appeared to be a strong driving force of growth in line with endogenous growth models. The Openness elasticity of real per capita GDP is estimated at 92% in long term and 10% in short-run. Financial development does not have a significant impact on real per capita GDP while the FDI has only a short-run strong and positive impact on economic growth.

The error correction coefficient, which represents the speed of convergence, is negative and significant. This estimator provides an evidence of sufficient arguments for valid speed of convergence to long-run steady state path from the poorest countries to the richest ones in *CBM* region during the period. Our estimation using the PMG estimator indicates an average speed of convergence of 12% over 1975-2012, which is not consistent with Barro’s (1991) finding that estimates the speed of convergence at around 2% and 3% a year.

CBM countries converge to a common steady state path growth rate regardless of their specific economic and financial policies with a speed adjustment of 12%.

1. **Conclusions and Policy implications**

In this paper, we have examined the different aspects of the relationship between the so-called long-term structural policies and their influences on the growth and the economic convergence of the countries bordering the Mediterranean basin by using new estimation techniques based on the panel ARDL methods. These techniques allow us to estimate the long-term effects of different economic policies on economic growth, as advocated by endogenous growth theories.

Major results are as follows: Education and human capital improvement policy contributes directly to economic growth at both the short and long-term levels. The educational variable appears to be a key variable in accelerating the economic growth of our sample. At the same level, the variable of openness and economic integration is positive and statistically significant. Openness seems to be a beneficial economic development strategy influencing economic growth. It is seen as a catalyst for accelerating economic growth.

According to our perspective, the non-significance of the financial factor is linked to the lack of structural reforms aimed at modernizing and increasing the competitiveness of the banking sector, which remains dependent on the influence of central banks in terms of funding. It is also linked to the importance of the informal sector which reduces the circuit and the sources of funding especially in the South of the Mediterranean countries. Thus financial sector reforms should aim to abolish credit constraints and facilitate credit availability. Interest rate liberalization is one of the measures that promote financial development by eliminating financial repression.

The estimation results found by the PMG method show that FDI exerts a positive direct effect on per capita GDP growth over the short term rather than the long term. This outcome results from the fact that the foreign direct investments in the countries of our sample target activity sectors with low added value. FDIs that contain high technology are recommended investments for these countries. Thus, in terms of economic policy, it seems important that these countries try to promote the attractiveness of these types of investments that can bridge the technological gap and the lack of investments with high added value.

In all the specifications, the convergence parameter is significant and of negative sign, is of 12%, which indicates a process of economic convergence of all the countries in our sample. This outcome shows that the rate at which countries converge is higher than usual in growth regressions involving larger groups of countries. Thus, Southern Mediterranean countries, by defining an optimal growth strategy, can converge towards the countries of the Euro zone.

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**Appendix:**

**Table A.1. Variables deﬁnitions and descriptions**

|  |  |  |  |
| --- | --- | --- | --- |
| **Notation** | **Variables** | **Definitions** | **Sources** |
| RPCGDP | Real GDP per capita | GDP per capita based on purchasing power parity (PPP), constant 2000 US $. | WDI, World Bank 2015 |
| HC | Human Capital | Measured by total secondary school enrolment: The gross enrolment ratio for secondary education relates total enrolment regardless of age, to the population which, according to national regulations, should be enrolled at this level of education. | WDI, World Bank 2015 |
| PRIVY | Financial development indicators | Private Credit by Deposit Money Banks to GDP. | Beck and Levine Financial Structure Dataset, World Bank 2015 |
| OPEN | Trade openness | Trade openness: (exports +imports)/GDP. | International Monetary Fund (IFS-2015) |
| FDI | Foreign Direct Investment | Foreign direct investment net inflow in current US dollar.  | UNCTAD 2015 |

1. wajdibardi@gmail.com [↑](#footnote-ref-1)
2. saifayouni2000@yahoo.fr [↑](#footnote-ref-2)
3. mekkihamdaoui@yahoo.fr

a Higher Institute of Management, University of Gabes, Tunisia

b Faculty of Economic Sciences and Management of Sousse (FSEGS), Tunisia.

c Faculty of Economics Sciences and Management of Tunis (FSEGT), Tunisia [↑](#footnote-ref-3)
4. Foreign direct investment is used as a proxy for research and development (See, Borensztein, *et al.* (1998)). [↑](#footnote-ref-4)
5. Barros’s (1991) study ignored the countries heterogeneity in his estimation. [↑](#footnote-ref-5)
6. *β*-convergence tends to be generated by *σ*-convergence. [↑](#footnote-ref-6)
7. According Loayza and Ranciere (2006), static panel data estimators don’t take account to the long-run and short-run relationships. [↑](#footnote-ref-7)
8. Pesaran *et al.* (1997) argue that the proper way to take account of the different convergence speeds across countries is to consider an unrestricted model that allows for countries differences in steady-state levels. [↑](#footnote-ref-8)
9. Only the PMG and MG estimators will be discussed in this paper. [↑](#footnote-ref-9)
10. Gudelines: H0: PMG is preferred (MG and PMG are consistent, but MG is inefficient); Ha: PMG is inconsistent. In others words If p-value > 5%, we use PMG while when p-value < 5% MG method is more appropriate. [↑](#footnote-ref-10)
11. As the variables are used in their natural logarithm, coefficients can be treated as elasticity. [↑](#footnote-ref-11)