

A Dynamic Panel Data Analysis for Relationship between Structural Policy and Economic Growth

Wajdi Bardi^{1,*}, Tarek Sadraoui², Anouar Bardi¹

¹Higher Institute of Management of Gabes, Tunisia

²MODELIS Laboratory, University of Sfax, HIAS University of Gafsa

*Corresponding author: wajdibardi@gmail.com

Abstract Governments around the world must formulate and implement policies for taxation and public spending. These policies can have major impacts on economic growth, income distribution, and poverty, and thus they tend to be at the center of economic and political debates. In this study, we estimate the dynamic relationship between structural policy and economic growth. We will try to bring some theoretical literature on the relations of structural policy emergence as a new approach of economic coordination. Our empirical study recently bases on various estimation methods developed within dynamic panel framework for a sample of 6 countries over 1975-2012. We used Generalized Moment Method, causality tests and unit root applied to panel data. Results suggest a positive and significant relation between structural policy and economic growth for all countries sample.

Keywords: structural policy, economic growth, dynamic panel data, technological externality, cointegration, unit root test

Cite This Article: Wajdi Bardi, Tarek Sadraoui, and Anouar Bardi, "A Dynamic Panel Data Analysis for Relationship between Structural Policy and Economic Growth." *International Journal of Econometrics and Financial Management*, vol. 4, no. 1 (2016): 1-10. doi: 10.12691/ijefm-4-1-1.

1. Introduction

The theoretical literature on the economic role of the state has stopped giving new-old ideas about the position that the public authority wishes to carry on economic activity. The oscillatory evolution of this position with more interventionism or economic liberalism, has gained new momentum with the emergence of endogenous growth theories. These theories, which are likely to be neoclassical, rehabilitate the role of the state in economic activity and provide a theoretical justification of an appropriate macroeconomic policy to influence economic growth and explain the difference in Development and growth rates between countries.

Although the question of relations between the state and economic growth is a subject that attracts the attention of economists now for almost two decades, we have tried to shed light on a topic that is the subject of many questions as at the scientific level and at the level of society as a whole. Since the revival of growth theories and empirical investigations of D. Aschauer, the effects of public policy on growth economists challenge both methodologically and in terms of causalities and interpretations to give empirical relationships. Of course, this last idea is not new, it dates back to the work of Kuznets [77,78] to explain the vision of modern growth by mentioning the growing importance of the state "... the spread of modern growth emphasized the importance and the need of the organization in sovereign unity ...

The sovereign state is crucial for the formulation of the rules governing economic activity; as arbitrator ... and as

infrastructure provider..". Kuznets emphasizes the rapid rate of structural change and also the increasing role of general education. Likewise the importance of public intervention has been proven by King and Rebelo [76] show that differences in national public policies are the sources of large differences in growth rates between countries. And even Barro [54], author of "liberal" (re) discovered the role of the state in his study of public finance and endogenous growth.

While this vision of a positive role of the state is no longer repulsive, the question that arises at this point is that the priority intermediate objectives to conduct and the conduct of economic policies. Indeed in the first place, this article analyzes the role of the State through its efforts to increase the productive capacity of the economy (capacity building), ie the supply of the global economy. The main objective in this context is to support activity and private initiative and ensure a strong and sustained growth. Second, the paper provides a brief assessment on economic support policies (indirect action of the state in the economy) that can perform tricks with their remarkably positive effects on the economies of growth. In this sense, the financial factor seems to be crucial to the extent that it facilitates the mobilization of scarce resources into productive jobs. Also the policies of openness and economic integration become, according to the theories of endogenous growth, potential factors that promote economic growth. The paper then presents an empirical analysis based on the methodology of non-stationary panel data estimates. We sought to test the validity of assumptions that different economic policies (or measure of economic policies) affect economic growth for a number of coastal countries of the Mediterranean.

2. Direct Structuring Role of the State

According to endogenous growth theories, public intervention takes several forms. Indeed, the new role, initiated by these theories is to give the State the opportunity to act on the growth path and the accumulation of capital in general. These new theories give the state a role in both normative and positive much more important in driving growth promotion policies that do usually did neoclassical theories to Solow. The main idea is that economic growth is maximized when the incentives for investment in physical and human capital as well as technological developments are determined by free market forces. Governments must support these efforts by promoting regeneration of the business community and the establishment of an environment of macroeconomic stability, a competitive climate that encourages entrepreneurship and strong human resources, and adequate public infrastructure. So these are not public expenditure as a whole that have an effect on growth, but rather the structure of these expenditures is crucial. We must distinguish, within public spending between current consumer spending and future spending; which amounts to differentiate expenses immediately respond to a request for information which must lead in the future, and in return a revenue stream. The structuring role of the state must be seen from these different mechanisms through which the public body can enhance its action on long-term growth mainly because of its action on the offer or commitment of public spending productive.

2.1. The role of Human Capital

Improving the level of education appears to be crucial for all countries. While human capital is considered one of the main sources of economic growth. This idea is certainly nothing very original and it has long inspired the works of economists of education or development [Mincer (1985), Schultz (1961) and Becker (1964)]. The model proposed by Lucas [81] is the first of many endogenous growth models incorporating the dimension of human capital that incorporates the decision of individuals to acquire knowledge. For human capital, he hears the characteristics of economic agents which contribute to improve the productivity of their work and / or their ability to innovate and develop production techniques. This human capital is defined as a training stock directly affects the productivity of labor by improving its quality, which education is one of the main factors that makes the acquisition of knowledge and implementation. The central idea is that human capital can be accumulated as physical capital, but unlike the latter, it is produced by a process of increasing returns over himself because he is his own production factor.

Thus human capital would be the same type of phenomenon capable of generating endogenous growth, highlighting the increased efficiency of the factors result in decisions concerning and that which is to introduce a principle of human capital accumulation.

The existence of externalities justifies government put in place economic policies, which have intended to guide private agents towards growth-generating activities. Based on the model of Lucas, who asserts the existence of a gap between the decentralized growth and the optimal growth

rate, it is legitimate that there is indeed a public intervention in the field of education. The public authorities obviously heavily involved in educational choice. The reasons for this procedure are twofold. In the presence of externalities the state can supply the market and individual choice to improve the efficiency of resource allocation and typically increase the growth rate. It may also intervene in the interests of social justice and reducing inequalities. Certainly the positive link between education and human capital and economic growth is confirmed by several empirical studies [Diamond (1989, Otani and Villanueva (1990), Villanueva (1994), Barro (1994), Mankiw, Romer and Weil (1992)]. Some studies show that the insufficient level of human capital acquired at risk of falling behind in some countries in this field, in traps of underdevelopment. That is a sufficient level of human capital must be acquired before a late economy takes off. Thus, the initial condition is paramount. Differences in initial conditions can lead to weak growth paths to push agents to acquire the training and skills to accumulate, economy converge to a low-income equilibrium path without training, which explains the persistence of per capita income differences between countries [Azariadis and Drazen (1990) and Berthélemy and Varoukakis (1996)].

The different empirical research undertaken can detect other mechanisms through which skills training has an indirect effect on growth. Indeed, the only human capital accumulation was not a sufficient guarantee of economic takeoff, which requires the study of their interaction with other economic policies. These studies suggest that the significance of human capital indicators in the regressions on growth was robust when incorporates other explanatory variables. Empirical studies find that it stimulates investment, it is in close liaison with the opening exchange or education is related to the research and development activities [56]. They confirm that the interaction between education and technology gap appears as a predictor of economic performance of countries. Similarly, Gould and Ruffin which link the impact of human capital on the rate of trade openness. Their argument is that human capital was to be considered a classic input, but also as an engine of growth, due to its importance in the imitation / innovation process.

2.2. Technological Capital Role

The consideration of the multiplicity of roles that can play human capital and more precisely the connection that was made between human capital and technology transfer expresses the importance of such capital, said technological capital, in promoting Economic Growth. In the first endogenous growth models that have developed this type of growth factor, there are models of Romer [89] and Aghion and Howitt [44]. Both are multi-sector models that consider that capital is not a homogeneous good, but a set of inputs from different production.

The Romer model use innovations emergence that enable use of a wider variety of intermediate goods used in the final good production process. Indeed, the model of Romer considering knowledge as a non-rival public good that can be used by all economic agents and generates externality. Romer [89] shows the importance of technological capital in growth economic. Expenditures

for research and development are considered an investment in knowledge, likely to result in new technologies and by more efficient use of existing resources in human and physical capital. To the extent that these public expenditures on research and development are effective, it can be said that an increase in these costs will result, as shown in the model, a permanently higher growth rates. In recent years, the intensity of spending on research and development has increased in developed OECD countries. Although most of this class of expenditure is financed by private companies, Guellec and Van Pottelsberghe the Potterie [74] show that public spending on research and development may be a stimulus for research and business development. The importance of investment in research and development comes from the will of the state of each industrialized country to help its company's better product. Developed countries place a high expenditure on research and development in their budgets; they represent about 2% of GDP. However, in the case of developing countries lack sufficient financial resources and the ability of these countries to innovate, the share of this expenditure is of the order of 0.65% of gross domestic product (GDP) for all developing countries.

The empirical literature agrees that the positive role of research and development on economic growth [Nadiri and Kim (1996), Lichtenberg (1993), Birdsall and Rhee (1993), Wolf (2000) etc ..]. In this sense, Coe and Helpman [60] show, by studying a sample of 22 developed OECD countries for the period 1971 to 1990 by means of a production function to estimate the effect of domestic expenditure on research and development is significant and positive in the order of 24% in the countries making up the G7 and 8% for the rest. International externalities of R & D make the social rate of return on R & D from the G7 and within the 22 countries of the sample of around 155%. They recommend in their analysis, for developing countries to implement policies promoting domestic competitiveness by importing new technologies and policy rather than capital equipment for R & D grants to scale National.

As for Coe, Helpman and Hoffmaister [60], studying a sample of 22 countries of the North (developed countries) and 77 countries of the South (developing countries), found that the effect of spending on research and development is of foreign about 7% of the GDP growth rate for the southern countries and show that the United States and Japan are major emitters of externalities from research to the South. Gittlman and Walf show, by studying a sample of 80 countries at different levels of development, the effort of R & D appears to be related to the level of development of these countries.

2.3. Public Capital Role

Besides taking into account the external effects, the state obviously has a direct influence on the efficiency of the private sector: public investment intuitively combine to private productivity. Thus, Barro [54] developed a model that highlights the dual effects of taxation. It shows that government activities are also a source of self-sustaining growth. And government spending, such as the provision of public infrastructure, act positively on levels and on the growth rate of the economy and are considered complementary to private capital. In his model, Barro not

consider the stock of public infrastructure but the flow of total public spending represented by the term "G". It is assumed that these purchases (G) consist of goods in their characteristics of being non-rival and non-exclusive: in fact using these assets, any firm does not reduce the amount available to others; in addition, each firm can use all of these assets. In other words, the supplier cannot prevent free use by an agent, and whose use by one agent does not preclude the use by another.

Glomm and Ravikumar [71] propose a version of the model of capital accumulation at the Diamond. They have a dynamic general equilibrium model taking into account public spending. In this model, the authors try to study the effect of public spending on infrastructure and education on long-term growth. These expenses are considered as inputs in the production function. The dynamics of the model is comparable with that of Diamond; However, as shown by the authors "the economy does not converge to a steady state level but sustained growth path." Thus the model predicts the same as those of the major lessons final endogène. En growth models, both models are seeing the positive effects of public investment in infrastructure (productive investments) on the long term growth rate of the economy. They also show the dual effect of taxation on the growth rate, which is used to define a certain size called "optimal" state. We have a wide range of empirical studies that try to verify the positive relationship that may exist between public spending on public capital and their contribution to the growth of total factor productivity and long-term economic growth. Indeed, the literature proposes essentially two approaches to deal with this economic problem. A first category is based on relationships which require the estimation of the "economic production function". The second category, based on the estimation of a cost function, emerged in recent years and has been proposed to settle many problems that limited the utility of estimating the production function. These various studies, using the estimates in cross-section or panel data, agreed on the positive role of infrastructure spending on economic growth [Fay (1993), Cannin and Fay (1993), Evans and Karras (1994) HoltzEakin (1994), Garcia-Mila, McGuire and Porter (1996) Knight, Loayaza and Villanueva (1993), Devarajan, Swaroop and Zou (1996) Milbourne, Otto and Voss (2003), Aschauer and Lacher (1998) , Demetriades and Mamuneas (2000) Demetriades and Mamuneas (2000), Naqvi (2003), Shioji (2001), Ramirez and Nazmi (2003) Miller and Tsoukis (2001), Easterly and Rebelo (1993), Turnovsky and Fisher (1995) etc ..].

Several studies used a test "Granger" to examine the direction of causality between production and infrastructure. In this sense, Duffy-Demo and Eberts, working on regional data, found that the causality runs in both directions. However, Holtz and Eakin found a somewhat ambiguous relationship regarding the direction of causality. Tatom, working on the case of the United States, shows that causality could go more in the direction of production to the infrastructure capital. Eberts and Forgaty show, in turn, that there is a double causality between public investment and economic growth; A similar result was found by Dessus and Herrera (1996), studying the case of 28 developing countries for a public capital aggregate. We can add the work Christodoulakis (1993), which studies the influence of investment in electrical

equipment, transport and communications in the Greek manufacturing. It shows that the finer level of aggregate considered infrastructure makes the most satisfactory results.

3. Indirect Role of the State in the Context of Liberalization Policies

The state has an important role to play in improving economic growth and act on the aspect of "offers" of the economy. The last point addressed the direct role of the state on growth through public spending say productive, which mainly affect human capital, technological capital and public capital. Theoretical approaches of the respective roles of the financial system and trade liberalization have been developed in economic theory. Other empirical studies show a positive link between these two variables and economic growth in a large sample of countries, whether developed or developing. The theories of endogenous growth resumed these two variables. These are considered the engines and the determinants of long-run economic growth. Indeed, the government action is not limited to a direct intervention in the economy. There are accompanying interventions that are essential for economic growth and for the success of the productive public expenditure policies.

3.1. The Financial Factor and Financial Development Policy

Financial systems ensure the functioning of an efficient payment system, mobilize savings and improve its allocation to productive investment. In performing these functions, financial systems can contribute to growth as noted by the IMF (1996): "the growth rate attainable in the long term depends on the economic policies implemented, including the ability of countries to mobilize domestic and foreign savings to replace and increase the stock of capital." As also emphasized Brana [58]: "The analysis of successful development trajectories in the twentieth century shows that it is important to reach a high domestic savings to finance growth, and the need to focus on efficiency investment rather than its level. " Indeed, one of the determinants of economic growth highlighted by the theories of endogenous growth is the financial factor.

In reality, the idea that financial development stimulates growth is not new; it dates back at least to the work of Schumpeter (1911). The role of the financial system is seen as a long-term economic growth engine and as a source of disparity between nations in their economic performance. The model of Pagano [82] highlighted the role of financial factor. In this model, one can identify the different channels through which the financial system can affect economic growth. These channels are three in number: (i) increasing diameter, the proportion of savings channeled to investment; (ii) A by increasing the marginal productivity of capital; (iii) influence (s) that is the rate of pergenes. According to this model, we can generate economic policies favorable for economic growth. Indeed, the policy that fosters financial development as the involvement of the State, through subsidies, to the upgrading of financial intermediation and the establishment

of branches of state banks in more distant regions as the sole framework big cities, can improve the process of collecting savings and move towards investment. In this sense, an interest rate policy that promotes saving, especially for small investors, can affect economic growth.

Many studies both theoretical and empirical developed from the theories of endogenous growth, have shown the existence of a positive correlation between financial development and economic growth [Greenwood and Jovanovic (1990), Blackburn and Hung (1993) Guillard and Rajhi (1993), De la Fuente and Marin (1995), De Gregorio and Guidotti (1995), Demirguc-Kunt and Levine (1996), Levine and Zervos (1998), Arestis and Demetriades (1997), Levine , Loayza and Beck (2000) etc ..]. Thus, a financial development policy appears to be important for better channeling and efficient allocation of scarce resources into productive jobs.

3.2. Opening Factor and Economic Integration

A large and lively debate on the nature of the role of trade openness and economic integration in economic growth has been engaged for several years. Proponents of a model in which an intelligent government intervention is observed, show that this is the main reason for the efficient allocation of factors. Building on the positive example of the countries of East Asia and the failure of countries in sub-Saharan Africa, which had quickly turned to foreign markets, we had a demonstration of merits of liberalization policies and promotion of exportations. In this sense, endogenous growth models, highlighting the role of international trade suggest that openness to trade allows countries to benefit from discoveries feedback effects technology, through, for example, the stock of knowledge contained in the equipment and intermediate goods. And openness to international trade can also increase the variety of goods available for domestic workers and increases productivity by providing intermediate goods cheaper or higher quality, thereby increasing long-term growth rates.

The "market size" is also in the endogenous growth theory a key variable [50,84]. Indeed, it allows generating self-sustaining growth through the division of labor, specialization, and returns to scale. This is the idea of Adam Smith that the extent of the market allows further division of labor, a source of economies of scale. This idea based economic policy of openness and integration of economies. Baldwin [50] shows that European integration, increasing the size of markets, increased the growth rate in Europe. Rivera-Batiz and Romer [84] identified three major effects of the opening: an effect of resource allocation, an integration effect -accroissement the size of market- and finally a redundancy effect, in other words, free -trade avoids duplication of costs. Fontagné and Guérin [69] hold two paradigms that make free trade a generally better economic policy.

The literature is rich empirical studies that emphasize the positive link between the variable "proxy" of openness and economic growth; include for example the following works [65,68]. Indeed, a policy of liberalization and free trade and economic integration even has a positive effect on economic growth of a country. This policy, however, must be complemented by a range of other means of

economic policies which ensure an environment conducive to growth based on the integration, including the quality of education (human capital), macroeconomic stability, infrastructure quality (public capital), etc. It is a set of favorable economic policies conducive to a macroeconomic environment that governments must implement to increase the growth rate of the economy and the convergence of the latter to that of the most developed countries.

In the following section, we will try to verify empirically the effects of these policies on economic growth for a sample of Mediterranean countries with a method of estimating non-stationary panel data. We will try to identify the policies that seem most effective to act favorably on their growth rates.

4. An Empirical Analysis by Dynamic Panel Data Models

The goal of this analysis is to examine in a structure of dynamic panel data the role of structural policy in economic growth. Initially, the analysis is focused on the impact of structural policy in accordance with others factors - on production. Economics can get out of whack for a variety of reasons. Policymakers, in turn, have a number of ways to try to fix them, depending on what is wrong.

For example, when prices are rising too fast and consumers and businesses are buying at a rate that exceeds an economy's underlying ability to produce goods and services-that is, overall demand is growing too fast-policymakers can take steps to reduce demand. Similarly, during economic downturns, when businesses and consumers close their wallets-aggregate demand is shrinking-governments can take steps to encourage them to open their pocketbooks or substitute government spending for diminished private spending. Such government actions are called demand management or stabilization policies.

Sometimes an economy's problems are deeper and longer lasting than excessive or inadequate demand, usually as a result of government policies or private practices that impede efficient and fair production of goods and services-that is, supply. Fixing such problems can require changes to the fabric of the economy, called structural policies.

Stabilization policies are important in the short run, because it is easier to alter the various components of overall demand for a short time than it is to make a country's resources more productive. Stabilization policies include taxing and spending actions (see "What Is Fiscal Policy?" F&D, June 2009) and changes to interest rates and the money supply (see "What Is Monetary Policy?" F&D, September 2009). When longer-term, structural changes are required to improve aggregate supply, governments must address specific impediments. This may involve the core structure of the economy, such as how prices are set, how public finance is conducted, government-owned enterprises, financial sector regulation, labor market rules and regulations, the social safety net, and institutions.

4.1. Empirical Literature Reviews

Raising an economy's growth potential requires stabilization and structural policies that complement one

another. Stabilization policies lay the foundation for economic growth by helping lower inflation, smooth out consumption and investment, and reduce government deficits. Successful implementation of structural policies is possible only after such macroeconomic imbalances have been resolved.

Similarly, though, structural policies enhance the effectiveness of many stabilization measures: promoting competition (a structural policy), for example, can lead to lower prices and, hence, lower inflation

Economic Surveys involves the monitoring of long-term economic performance and structural-policy settings, in addition to policy recommendations to improve performance. While cross-country comparisons of performance and policies are used extensively in this work, policy recommendations are often arrived at without international benchmarking, and are instead based on in-depth knowledge of country circumstances and policy objectives. By contrast, the present report makes much more systematic use of benchmarking in deriving policy priorities.

The structural surveillance work in the OECD that focuses on more specific issues is organized along the following lines:

- Labour market performance and social conditions are monitored on a regular basis, and this often involves a review of policies on the basis of internationally-comparable indicators (e.g. benefit replacement rates, the intensity of employment protection legislation and various aspects of active labour market policies). The results of this surveillance are reported in the OECD Employment Outlook and Benefits and Wages, and in country reports on the public employment service, work and family life, and ageing and employment policies.

- The extent and the quality of education of the young and of the population at large, and related policies, are reviewed on a regular basis. The reviews are published in Education at a Glance, reports from the Programme for International Student Assessment (PISA), and country reviews on national policies for education.

- Developments in taxation of labour income are examined on a yearly basis, and this includes the construction of standardized indicators of average and marginal tax rates for all member countries. The indicators are published in Taxing Wages.

- Support to agriculture and the different forms of such assistance is monitored on an annual basis and published in Agricultural Policies.

- Performance and policies with respect to science, technology and industry is reviewed regularly and published in Science, Technology and Industry:

- Policies that have an impact on high quality regulation, competition and market openness in product markets.

In some cases, the monitoring of performance and policies is accompanied by country-specific recommendations. This has been the case in e.g. reviews of public employment services, work and family life, ageing and employment policies, national education systems, and regulatory reforms.

The policy recommendations that emerge from the surveillance of these various fields may sometimes give emphasis to objectives that go beyond growth or income maximization and relate to wider dimensions of welfare.

Thus, for example, the surveillance processes for labour and social affairs emphasize the need to find a balance between equity and efficiency in their policy recommendations, and the surveillance processes for education tend to stress the importance of equitable access to education in addition to the goal of increasing human capital.

In this paper we study implications of productivity of participation in cooperative research. Moreover, we use a sample of various countries over 1975-2012. We try to use generalized moments method developed by Arellano and Bond, we control possible endogeneity of independent variable, and while adopting recent econometrics literature of panel data relating to unit roots tests, causality and cointegration⁶. Finally we estimate our model by Full Modified Ordinary Least Square method "FMOLS" and we try to interpret results.

4.2. Model Presentation

A growing strand of the empirical growth literature focuses on the explanatory power of structural policies or institutions to account for differences in living standards across countries. In general, structural policies evolve slowly, and empirical studies focus on their long term influences on income levels (e.g., Hall and Jones 1999 and Acemoglu et al. 2001).

Instead of examining long term effects of structural policies that are captured in cross sections, we investigate their contemporary short term effects on economic growth in a panel of countries.

Two issues have prevented researchers from identifying the growth effects of structural policies. A panel approach requires sufficiently large variation not only in structural policies, but also in the relevant instruments that are necessary to control for endogeneity.

Within framework of our study we consider a log-linear Cobb-Douglas product function transformed:

$$G_{it} = \delta_1 G_{it-1} + \delta_2 yd_{it} + \delta_3 te_{it} + \delta_4 tac_{it} + \delta_5 hlth_{it} + \delta_6 def_{it} + \delta_7 ouv_{it} + \delta_8 inf_{it} + \delta_9 fin_{it} + \delta_{10} edu_{it} + \delta_{11} inv_{it} + \delta_{12} pop_{it} + \gamma_t + \eta_i + \xi_{it} \quad (1)$$

The equation has retained the one hand, the dependent variable is the real GDP growth rate per capita, and on the other hand, the explanatory variables are:

G (-1), which means the real GDP per capita lagged one period. This variable represents the convergence of variable;

Ouv, the open rate measured by the share of exports and imports in GDP;

Dev: this is the variable of financial development measured by the ratio of credit to the private sector as a percentage of GDP.

Inv, the investment ratio to GDP;

Inf, the inflation rate;

TE / GDP: the share of total government spending relative to GDP for country *i* at time *t*;

DEF / TE ratio of defense spending over the whole of total expenditure;

Hlth / TE: the ratio of health spending across the total expenditure;

Ed / TE: the ratio of education spending across the total expenditure;

Tac / TE: the ratio of spending on transport and communications all of total spending.

We try to take account of temporal structure of expenditure and of GDP variables. With this intention, we must test the presence of unit root test and if all the series are non stationary I(1). The recent approaches adopted by Im, Pesaran and Shin [29] IPS and by Kao are respectively used for unit root and cointegration test. The first consists in carrying out unit root tests on each series by using Augmented Dickey-Fuller, method [21]. We obtain then statistics serving to make unit root test for panel by calculating individual statistics ADF average. This value is compared with simulated breaking values provided by IPS. When it is higher than the value given threshold of significance, null assumption of unit root is rejected.

As for used approach by Kao for Cointegration, it consists in making individual regressions of ordinary least squares (OLS) of *G* on *edu* and carrying out ADF tests on estimated residues of these series. The statistics being used to test null assumption of non-Cointegration are obtained by calculating the average of ADF statistics previously obtained. It is compared with breaking values provided by Kao and makes it possible to reject null assumption if it is higher. This leads us to analyze series for each country.

4.3. Unit Root and Cointegration Studies

The unit root tests became a current step for analysis of time series stationnarity. However, practical application of these tests on panel data is recent. The tests most frequently used are those of Levin and Lin [34] (LL) and of Im, Pesaran and Shin [29] (IPS). Recently, several procedures of unit root tests and Cointegration were developed for panel data models. The addition of individual dimension to temporal dimension offers an advantage, in practical application of unit root and Cointegration tests.

In this paragraph we seek to study non-stationary properties and Cointegration and to study stationnarity we try to use Levin Lin and IPS tests.

$$\Delta y_{it} = \alpha_i + \theta t + \beta y_{it-1} + \sum_{j=1}^p \gamma_j \Delta y_{it-j} + e_{it} \quad (2)$$

The regressions being used to the stationnarity test of variables in level can include a constant and a linear trend. The rejection of null assumption unit root indicates that series is characterized by a random walk representation.

To check stationnarity of the group and to mitigate the low power of tests LL in small sample, we called upon the method of IPS which proposed a test of unit root in the context of panel data model by using the average of individual statistics ADF of the regressions (2). Our data out of longitudinal transverse section must ideally respect assumptions necessary to application of statistics alternative T-bar making it possible to test the null assumption of unit root ($\beta_i = 0$):

$$\bar{t}_{NT}(p_i) = \frac{1}{N} \sum_{i=1}^N t_{iT}(p_i) \quad (3)$$

Where $t_{iT}(p_i)$ represents ADF tests estimated with *p* lags differences;

N is the number of groups n = 1, 2,, 23.

T the total number of observations t = 1, 2,, 13.

IPS proposes to use the following standardized statistics:

$$Z_i = \frac{\sqrt{N}(\bar{t}_{NT} - E(\bar{t}_{NT}))}{\sqrt{\text{var}(\bar{t}_{NT})}} \quad (4)$$

Where $E(\bar{t}_{NT})$ and $\text{Var}(\bar{t}_{NT})$ are respectively arithmetic mean and variances of individual statistics ADF, since $\beta_i = 0$. The IPS study shows that these standardized

statistics converge slightly towards reduced normal centred distribution, which makes it possible to compare it with breaking values distribution $N(0, 1)$.

The application of unit root tests of LL and IPS shows that the whole of statistical series is affected of a unit root (see Table 1). It should be noted that the number of maximum lag is fixed at 3, the selection of the numbers of lag is programmed by Pedroni for these two tests.

Table 1. Unit Root Tests

Statistics	G	YD	TE	INF	FIN	OUV	POP	INV	DEF	TAC	HLTH	EDU
Levin-Lin ADF-stat	3.838	-1.405	-0.105	-1.522	-1.270	-1.405	-0.105	1.342	3.540	-0.105	1.342	1.231
IPS ADF-stat	2.617	-0.284	-1.088	-0.178	-0.190	-0.284	-1.088	2.342	1.231	-1.088	2.342	2.342

The checking of non-stationary properties for all panel variables leads us to study the existence of a long run relation between these variables. The Cointegration study by applying Pedroni Cointegration tests based on unit root tests on residues estimated. Cointegration tests on panel data consist in testing the presence of unit root in the estimated residues. However, the problem of fallacious regressions, of the time series, also arises in the case of panel data.

Pedroni developed seven tests of Cointegration on homogeneous and heterogeneous panel data, these tests take into account heterogeneity on the level of Cointegration relation i.e. for each individual there are one or more Cointegration relations not necessarily identical for each individual of panel.

The implementation of Pedroni tests requires in a first stage estimate of long run relation for each individual described by:

$$y_{it} = \alpha_i + \delta_i t + \beta_{1i} x_{1it} + \dots + \beta_{Mi} x_{Mit} + \varepsilon_{it} \quad (5)$$

With $i = 1 \dots N$, $t = 1 \dots T$ and $m = 1 \dots M$.

In the 7 Pedroni tests, four are based on within dimension and three are based on between dimensions. These two categories rest on null assumption of absence of Cointegration, the distinction between the two categories is done on the alternative level assumption:

$$H_1 = \begin{cases} \rho_i = \rho < 1 \forall i : \text{within} \\ \rho_i < 1 \forall i : \text{between} \end{cases} \quad (6)$$

Pedroni showed that under the suitable standardizations based on Brownian functions of movement, each of 7 statistics follows a normal law centered reduced for N and T sufficiently significant:

$$\frac{z_{NT} - \mu\sqrt{N}}{\sqrt{v}} \rightarrow N(0,1) \quad (7)$$

Where z_{NT} indicates one of the 7 statistics, Pedroni the values of the moments μ and v necessary to such a standardization according to the number of explanatory and presence or not of a constant and a trend in the relations of Cointegration. Results are indicated in table 2:

Table 2. Tests of Cointegration of Pedroni

	v-stat	Rho-stat	pp-stat	ADF-Stat	Rho_stat ¹	Pp_stat ¹	Adf_stat ¹
g, yd, inf, inv, fin, te, tac, pop, ouv, hlth, edu, inv, def	2.17288	-2.8919	-6.7528	-3.79753	-4.92532	-9.66474	-4.95903

¹ it acts of the tests based on dimension BETWEEN.

From results of Pedroni Cointegration tests we can notice that the whole of statistics are lower than breaking value of normal law for a threshold of 5% (-1,64). So the whole of these tests requires the existence of a Cointegration relation. With an aim of carrying out Cointegration tests on panel data and to obtain an estimation of Cointegration vectors it is necessary to apply an effective method of estimation. Within this framework we can distinguish several techniques with FMOLS method (Full Modified Least Square) used by Pedroni, DOLS method (Dynamic Least Square), GMM method.

$$\beta' = \begin{pmatrix} 1 & 5.76 & 4.34 & 4.27 & -1.41 & 2.34 & 3.23 & 2.12 & 3.45 & 1.45 & 2.65 \\ - & (1.00) & (2.49) & (6.73) & (-1.70) & (1.67) & (1.27) & (1.37) & (2.67) & (1.23) & (3.23) \end{pmatrix}. \quad (8)$$

4.4. Estimation by Using DPD98 Method

While following the step followed by Anderson and Hsiao and one uses G_{it-2} like instrument of $(G_{it-1} - G_{it-2})$, the equation of difference first becomes:

Phillips and Moon showed that within framework of panel data, FMOLS and DOLS techniques leads to estimators asymptotically distributed according to a reduced centred normal law. All the same, Pedroni (1996) affirms that estimators OLS his super-convergent, whereas their asymptotic distributions is skewed and depends on the parameters effects. According to Pedroni, these problems can be marked in heterogeneity presence. For our model estimated cointegrant vectors by FMOLS method is given by (t-student between brackets):

$$\Delta G_{it} = \delta_1 \Delta G_{it-1} + \delta_2 \Delta YD_{it} + \delta_3 \Delta TE_{it} + \delta_4 \Delta INF_{it} + \delta_5 \Delta FIN_{it} + \delta_6 \Delta OUV_{it} + \delta_7 \Delta POP_{it} + \delta_8 \Delta INV_{it} + \delta_9 \Delta DEF_{it} + \delta_{10} \Delta POP_{it} + \delta_{11} \Delta INV_{it} + \delta_{12} \Delta DEF_{it} + \delta_{13} \Delta TAC_{it} + \delta_{14} \Delta HLTH_{it} + \delta_{15} \Delta EDU_{it} + g_{it} \quad (9)$$

Estimation of this equation gives us the following results:

	<i>Coefficient</i>	<i>T-Stat</i>	<i>Significance</i>
G(-2)	1.043741733	2.61851	0.01862671
yd	0.034631350	2.11157	0.01255140
inf	0.117410800	3.10834	0.00507352
fin	0.261604184	1.09045	0.02905193
cat	0.068683520	2.10772	0.01555534
ouv	0.043741733	3.61351	0.01862671
pop	0.134631250	1.91157	0.01255140
hlth	0.105410800	3.10834	0.00507352
inv	0.263424184	1.09045	0.02905193
edu	0.043283520	4.10772	0.00555534

The uses of the variable $(G_{it-2} - G_{it-3})$ as instrument of $(G_{it-1} - G_{it-2})$ results of the estimation are given below:

	<i>Coefficient</i>	<i>T-Stat</i>	<i>Significance</i>
G(2) -G(-3)	4.02020750	2.11480	0.0226709
yd	0.91820030	1.90250	0.03925921
inf	1.86404603	2.34064	0.01364196
fin	1.25706985	2.84950	0.02590034
cat	0.55898626	1.99396	0.02520837
ouv	0.02720750	3.11480	0.02267098
pop	1.21825030	2.90250	0.03925921
hlth	0.66474603	4.34064	0.01364196
inv	1.67706985	1.84950	0.02590034
edu	0.55898626	2.09396	0.02520837

After having estimate model by Anderson and Hsiao [2] method and to obtain more efficient results, we try to apply Arellano and Bond [4] approach which makes it possible to obtain an estimator more efficient moments generalized.

• Arellano and Bond [5] Method in first difference

Estimation that we present here corresponds to Arellano and Bond [4] GMM of. We limit ourselves to these results because it makes it possible to eliminate in a rigorous way any skew related to individual heterogeneity not observed and offers consequently a better effectiveness results of estimation.

	<i>Coeff</i>	<i>T-Stat</i>	<i>Signif</i>
G(-1)	0.52001865	0.46582	0.64180074
yd	0.20891059	2.90728	0.03425802
inf	0.36345220	2.33785	0.01333684
fin	2.15210478	1.99675	0.36944694
pop	0.54085022	2.15794	0.02465192
cat	0.58571865	2.46582	0.64180074
inv	0.25831059	2.90728	0.03425802
edu	0.38355220	2.36785	0.01333684
hlth	1.39210478	1.99346	0.36944694
Edu	0.17685022	2.15794	0.02465192

The empirical estimation confirms the positive effect of structured policy on growth of expenditure on productivity of countries.

4.4. Discussion and Conclusion

Raising an economy's growth potential requires stabilization and structural policies that complement one another. Stabilization policies lay the foundation for economic growth by helping lower inflation, smooth out consumption and investment, and reduce government deficits. Successful implementation of structural policies

is possible only after such macroeconomic imbalances have been resolved. Similarly, though, structural policies enhance the effectiveness of many stabilization measures: promoting competition (a structural policy), for example, can lead to lower prices and, hence, lower inflation

Over the past decade, the gap in GDP per capita relative to the United States has widened in a number of countries, including the large continental European economies and Japan. The gap is linked to lower hours worked per capita, lower output levels per hour worked, or both. This chapter describes broad trends in economic performance since the mid-1990s and summarises structural policy priorities for all member countries to enhance GDP per capita. The policy priorities are identified on the basis of cross-country comparisons of performance and policy settings.

Countries are concerned not only with average living standards but also with their distribution across populations. Trade-offs may exist between levels and distribution of income and, in these cases, policies may be set so as to sacrifice some gains in average living standards in return for greater equity. However, the trade-offs may frequently be less stark than perceived, particularly in a longer term perspective. Some countries (e.g. Denmark, the Netherlands and Sweden) have indeed managed to achieve high levels of employment and living standards while maintaining a relatively low degree of income inequality.

The panel econometrics model makes it possible to control observations heterogeneity in their individual dimensions either by taking account of a specific effect or by taking account of non observable specific effect "random effects". Temporal dimension is taken account by introduction of dummy variables.

The application of LL and IPS unit root tests shows that the whole of statistical series is affected of a unit root. It should be noted that the number of maximum lags is fixed at three. Selection of the numbers of lags is programmed by Pedroni. The checking of non stationary properties for all variables of panel leads us to study the existence of a long run relation between these variables. From results of Cointegration tests of Pedroni we can notice that the whole of statistics are lower than the breaking value of normal law for a threshold of 5% (-1.64). So the whole of these tests requires the existence of a Cointegration relation.

References

- [1] Anderson, T.W. and Hsiao, C. (1981). 'Estimation of Dynamic Models with Error Components', *Journal of American Statistical Association*, Vol. 76, pp. 598-606.
- [2] Anderson, T.W. and Hsiao, C. (1982). 'Formulation and Estimation of Dynamic Models Using Panel Data', *Journal of Econometrics*, Vol. 18, pp. 47-82.
- [3] Antonelli, M. (1994). 'Technological districts localized spillovers and productivity growth. The Italian evidence on technological externalities in the core regions', *International Review of Applied Economics*, pp. 18-30.
- [4] Arellano, M. and Bond, S. (1991). 'Some test of specification for panel data: Monte Carlo evidence and application to employment equations', *Review of Economic Studies*, Vol. 58, pp. 277-297.
- [5] Arellano, M. and Bond, S. (1998) 'Dynamic panel data Estimating using DPD98-A Guide for users', institute for *Fiscal Studies*, mimeo.
- [6] Autant, B.C and Massard, N. (1999) 'Econométrie des Externalités Technologiques et Géographie de l'Innovation : une analyse critique', *Economie Appliquée*, Vol. 52, N. 4, pp. 35-68.

- [7] Autant, B.C. (2000) 'Géographie de l'innovation et externalités locales de connaissances. Une étude sur données françaises', Thèse pour le doctorat en sciences économiques, Université Jean Monnet St-Etienne.
- [8] Bach, L. and Lhillery, S. (1999) 'Recherche et externalité: tradition économique et renouveau', in Foray, D, Mairesse, J, eds, innovations et performances: approches interdisciplinaires', Paris, Editions de L'EHRESS : pp, 339-367.
- [9] Baumol, W. J. (1992) 'Horizontal collusion and innovation', *Economic Journal*, Vol.102, pp, 129-137.
- [10] Baumol, W. J. (1997) 'Pareto optimal sizes of innovation spillovers', *Research Report*, pp. 97-42, The C.V. Starr Centre for Applied Economics, Department of Economics, New York University.
- [11] Baumol, W. J. (1993) 'The Mechanisms of Technology Transfer, II: Technology Consortia in Complementary Innovations' In Entrepreneurship, Management, and the Structure of Payoffs. MIT Press: Cambridge MA, pp, 193-222.
- [12] Beath, J., Theotoky, J.P. and Ulph, D. (1998) 'Organization, Design, and Information Sharing in a Research Joint Venture with Spillovers', *Bulletin of Economic Research*, Vol. 50, pp. 47-59.
- [13] Branstetter, L. and Sakakibara, M. (1998) 'Japanese Research Consortia: A micro-econometric analysis of industrial policy', *Journal of Industrial Economics*, Vol. 46, N. 2, pp. 207-233.
- [14] Cassiman, B. and Veugelers, R. (2002) 'R&D cooperation and spillovers: some empirical evidence from Belgium', *American Economic Review*, Vol. 92, N. 4, pp. 1169-1184.
- [15] Combe, E. (1998) 'Pour quoi les firmes s'allient-elles? Un Etat de l'art', *Revue d'économie Politique*, Vol. 4 N. 108, pp. 433-475.
- [16] Cozzi, G. (1999) 'R&D cooperation and growth', *Journal of Economic Theory*, Vol. 86, pp. 17-49.
- [17] Crampes, C. and Encaoua, D. (2001) 'Microéconomie de l'innovation', Série verte, Bargaining over monetary policy and the desirability of central bank independence, V01067.
- [18] Crépon, B., Kramarz, F. and Trogon, A. (1996) 'Parameters of Interest, Nuisance Parameter and Orthogonality Conditions: An Application to Error Component Models', Discussion Paper n° 9335, Institut National de la Statistique et des Etudes Economiques.
- [19] D'aspremont, C. and Jacquemin, A. (1988) 'Cooperative and non cooperative R&D in duopoly with spillovers', *American Economic Review*, Vol. 5, N. 78. pp. 1133-1137.
- [20] D'aspremont, C. and Jacquemin, A. (1990) 'Cooperative and Non-cooperative R&D in Duopoly with Spillovers: Erratum', *American Economic Review*, Vol. 78, pp. 1133-1137.
- [21] Davidson, R. and MacKinnon, J.G. (1992) 'Regression-Based Methods for Using Control and Antithetic Variates in Monte Carlo Experiments', *Journal of Econometrics*, Vol. 54, pp. 203-222.
- [22] Debresson, C. and Amesse, F. (1991) 'Networks of innovators: a review and introduction to the issue, Networks of innovators, Montreal workshop', *Research Policy*, Vol. 20, N. 5, pp. 363-379.
- [23] Dogson, M. (1993) 'Organizational learning: A review of some literature', *Organizational studies*, Vol. 14, N. 3, pp. 375-394.
- [24] Gallie, E.P. (2003) 'La coopération, vecteur d'externalités de connaissances', Colloque "Economie de la firme: quelles nouveautés? Ancecy, 17-18 avril.
- [25] Geroski, P.A. (1992). Vertical relations between firms and industrial policy', *Economic Journal*, Vol. 102, N. 410, pp. 138-147.
- [26] Green, W.H. (1997) 'Economic Analysis', 3rd edition, New York: Prentice Hall.
- [27] Hagedoorn, J. Schakenraad, J. (1992) 'Leading companies and networks of strategic alliances in information technologies', *Research Policy*, 21, pp. 163-190.
- [28] Hippel, Erik. (1987) 'Cooperation between rivals: informal know how trading', *Research Policy*, 16, pp. 291-302.
- [29] Im, K., Pesaran, H. and Shin, Y. (2003) 'Testing for unit roots in heterogeneous panels', *Journal of Econometrics*, Vol. 115, pp. 53-74.
- [30] Irwin, D. and Klenow, P. (1996) 'High-Tech R&D Subsidies: Estimating the effects of SEMATECH', *Journal of International Economics*, Vol. 40, pp. 323-344.
- [31] Kamien, M., Muller, I.E. and Zang, I. (1992) 'Research Joint Ventures and R&D Cartels', *American Economic Review*, Vol. 82, N. 5, pp. 1293-1306.
- [32] Katz, M.L. and Ordover, J.A. (1990) 'R&D Cooperation and competition', in: Brookings Papers on Economic Activity: Microeconomics, pp. 137-203.
- [33] Katz, M.L. (1986) 'An analysis of cooperative research and development', *RAND Journal of Economics*, Vol. 17, N. 4, pp. 527-543.
- [34] Levin, A., Lin, C. and Chu, C.J. (2002). 'Unit root tests in panel data: Asymptotic and finite-sample properties', *Journal of Econometrics*, Vol. 108, pp. 1-24.
- [35] Levin, R., Cohen, W. and Mowery, D. (1985). 'R&D appropriability, opportunity and market structure: New evidence on some Schumpeterian hypotheses', *American Economic Review*, Vol. 75, pp. 20-24.
- [36] Levin, R., Klevorick, N.R. and Winter, S. (1987). 'Appropriating returns from industrial research and development in Baily, M. and Winston, C. redactors 'Brooking papers on Economic activity', Wachington, the brooking institution.
- [37] Mowery, D. and Rosenberg, N. (1989). 'Technology and the pursuit of economic growth', *Cambridge University Press*.
- [38] Mowery, D., Oxley, C. and Silverman, B. (1996). 'Strategic Alliances and Inter-firm Knowledge Transfer', *Strategic Management Journal*, Vol. 7, pp. 77-91.
- [39] Nootboom, B. (1999) 'Inter-firm alliances-analysis and design', London, Routledge.
- [40] Pedroni, P. (1999) 'Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors' *Oxford Bulletin of Economics and Statistics*, Vol. 61, pp. 653-670.
- [41] Pedroni, P. (2004) 'Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis', *Econometric Theory*, Vol. 3, pp. 579-625.
- [42] Teece, D. (1992) 'Competition, cooperation and innovation: organisational arrangements for regimes of rapid technological progress', *Journal of Economic Behaviour and Organisation*, Vol. 18, N. 1, pp. 1-25.
- [43] Agenor (2000). "The Economics of ajustment and Growth", Academic Press, San Diego.
- [44] Aghion Ph et Howitt P. (2000). 'Théorie de la croissance endogène', Dunod.
- [45] Amable B et Chatelain (2001). « Can financial infrastructures fostereconomic development? », *Journal of Development Economics*, Vol 64, pp 481-498.
- [46] Amable et Guellec (1992) « Les théories de la croissance endogène », *Revue d'Economie Politique*, Vol 102, n°3, Mai-Juin, pp 313-377.
- [47] Aschauer D.A. (1989 a) 'Does public capital crowd out private capital?' *The Journal of Monetary Economics*, 24, Septembre.
- [48] Aschauer D.A. (1989 b) 'Is public expenditure productive?', *The Journal of Monetary Economics*, 23, mars.
- [49] Azariadis C et Drazen A. (1990) 'Thresholds Externalities in Economic Development', *The Quarterly Journal of Economics*, 105(2), Mai, p 501-526.
- [50] Baldwin R.E (1992) "Measurable Dynamic Gains from Trade", *Journal of Political Economy*, 100, p162-174.
- [51] Barro J.R. (1997) « Les facteurs de la croissance économique : une analyse transversale par pays », *Economica*.
- [52] Barro R. J. et Sala-i-Martin X. (1995) 'La Croissance Economique', New York, McGraw-Hill.
- [53] Barro R.J. (1989) « The Ricardian Approach to Budget Deficits », *Journal of Economic Perspective*, Volume 3, n°2, Spring, p 37-54.
- [54] Barro R.J. (1990) 'Government Spending in a Simple Model of Endogenous Growth', *Journal of Political Economy*, vol 98, n° 5, partie 2, p S103-S125.
- [55] Ben-David (1996), « Trade and Convergence among countries », *the Journal of International Economics*, 40, pp 279-298.
- [56] Benhabib Spiegel (1994) « The Role of Human Capital in Economic Development: Evidence from aggregate Cross-Country Data », *Journal of Monetary Economics*, n°34, pp 143-173.
- [57] Berthélemy J.C et Varoudakis A. (1995) « Clubs de convergence et Croissance : le rôle du développement financier et du capital humain », *Revue Economique*, 46, pp 217-235.
- [58] Brana S. (1998), « Les sources financières de la croissance : une analyse comparative », *Communication au colloque international sur l'Euro et le financement de la croissance en Méditerranée*, Marseille 22-23 janvier, 28 pages.
- [59] Bresson (2002) "Nonstationary Panels: panel unit root tests and panel cointegration", Document de travail présenté aux EuroLabSources, CEPEA-CEMAFI.
- [60] Coe et Helpman (1995), « International R&D Spillovers », *European Economic Review*, Vol 39, pp 859-887.

- [61] D'Autume et Michel (1994) « Education et croissance », *Revue d'Economie Politique*, 104 (4), Juillet-août. P457-499.
- [62] Darreau Ph (2003) « Croissance et politique économique », *Collection ouvertures économiques*, édition De Boeck.
- [63] Diamond J. (1990) « Les dépenses publiques et la croissance », *Revue Finances et Développement*, Décembre, p 34-36.
- [64] Dinopoulos E et Thompson P. (1996) "A Contribution to the Empirics of Endogenous Growth", *Eastern Economic Journal*, vol 22, n°4, fall, p 389-400.
- [65] Dollar D (1992) "Outward Oriented Developing Economies Really Do Grow More Rapidly: Evidence from 95 LDCs, 1976-1985", *Economic Development and Cultural Change*, 41, p 523-544.
- [66] Durlauf et Quah (1998) « The New Empirics Of Economic Growth », Center for Economic Performance, Discussion Paper n° 384, University of Wisconsin, Madison and LES.
- [67] Edwards (1998) « Openness, productivity and growth : what do we really know? », *Economic Journal*, 108, pp 383-398.
- [68] Edwards S (1993) "Openness, Trade Liberalization, and Growth in Developing Countries", *Journal of Economic Literature*, Septembre, vol XXXI, p 1358-1393.
- [69] Fontagné et Guérin (1997) « L'ouverture, Catalyseur de la croissance », *Economie Internationale*, n°71, troisième trimestre, pp 135-163.
- [70] Frankel et Romer (1999) « Does Trade Cause Growth? », *American Economic Review*, 89 (3), pp 379-399.
- [71] Glomme G et Ravikumar B. (1997) "Productive government expenditures and long-run growth", *Journal of Economics Dynamics and Control*, vol 21, p 183-204.
- [72] Guellec D et De la Potterie B.V.P. (1997) "Le soutien des pouvoirs publics stimule-t-il la R&D privée?", *Revue économique de l'OCDE*, n° 29, vol 2, p 103-131.
- [73] Guellec D. (1996). 'Croissance mondiale : les nouvelles perspectives', *Problèmes économiques*, n°2.467, 10 Avril, p 1-3.
- [74] Guellec et Van pottelsberghe de la Potterie (1997) « Le soutien des pouvoirs publics stimule-t-il la R&D privée? » ; *Revue économique de l'OCDE*, Vol II, n°29, pp 103-131.
- [75] Islam (1995) «Growth Empirics: A Panel Data Approach », *The Quarterly Journal of Economics*, Novembre, pp 1127-1170.
- [76] King et Rebelo (1990) « Public Policy and Economic Growth: Developing Neoclassical Implication », *Journal of Economic Review*, 83, S126-S150.
- [77] Kuznets S (1973) "Modern Economic Growth: Findings and Reflections", *American Economic Review*, 63, 3, juin, p 247-258.
- [78] Kuznets S (1981) "Modern Economic Growth and the Less Developed Countries", *Conference on Experiences and Lessons of Economic Development in Taiwan, Taipei, The Institute of Economics*.
- [79] Levine et Renelt (1992), « A Sensitivity Analysis of Cross-Country Growth Regressions », *the American Economic Review*, Vol 82, N 4, septembre.
- [80] Levine, Loayza et Beck (2000) « Financial Intermediation and Growth: Causality and Causes », *Journal of Monetary Economics*, Vo 46, n°1, Aout, pp 31-77.
- [81] Lucas R. (1988) "On the Mechanisms of Economic Development", *Journal of Monetary Economics*, Vol 22, N 1, Juillet.
- [82] Pagano (1993) « Financial Markets and Growth : An Overview », *European Economic Review*, n 37, p 613-622.
- [83] Pedroni P (1995) "Panel cointegration, asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis", *Working Paper in Economics*, 92-013, Indiana University.
- [84] Rivera-Batiz et Romer (1991a), « Economic Integration and Endogenous Growth », *Quarterly Journal of Economic*, Vol 106, Issue 2, pp 531-555.
- [85] Rivera-Batiz et Romer (1991b), « International trade with endogenous technological change », *European Economic Review*, 35 Mai, pp 97-1001.
- [86] Rodriguez et Rodrick (2000) « Trade Policy and Economic Growth : A Skeptic's Guide to the Cross-National Evidence », *Working Paper*, Harvard University.
- [87] Rodrik D (2001), « L'intégration dans l'économie mondiale peut-elle se substituer à une stratégie de développement? », *Revue d'économie du développement*, 1-2, pp 233-243.
- [88] Rodrik D. (1998) "Why Do More Open Economies Have Bigger Governments?", *Journal of Political Economy*, vol 106, n° 5, p 997-1031.
- [89] Romer (1990) « Endogenous Technological Change », *Journal of Political Economy*, Vol 98, n°2, pp 337-367.
- [90] Romer P.M. (1994) 'The Origins of Endogenous Growth', *Journal of Economic Perspectives*, vol 8, n°1, Hiver, p 3-22.
- [91] Temple J. (1999) 'The New Growth Evidence', *Journal of Economic Literature*, vol XXXVII, mars, p 112-156.