A Data Co-Integration Analysis for Evolvement Cooperation

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Abstract: In this article, we consider evolvement cooperation and direct foreign investment as a channel of international economics by a practical literature on innovation and growth. Economics are limited to the country where evolvement is conducted; the growth rate in each country will be determined by the country's own efforts and by evolvement cooperation ignored a long time in growth literature. Economics take place across borders, and growth rates will tend to converge across countries. Two potential channels for evolvement economics are examined: localization of evolvement cooperation.
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1. Introduction

A country's productivity depends on its own evolvement efforts as well as evolvement efforts of its trading partners. So, we can consider that evolvement cooperation is a most important factor of economic growth and transmission of technological externality. Using data from Middle East countries during 1980-2010, we find that evolvement cooperation and foreign direct investment have important effects on total factor productivity. [1, 2]

Exchange is a form of communication which stimulates the training methods of production and organization. Domestic resources are allocated in a more efficient way. Then, international contacts facilitate transfer of foreign technologies. In addition, it is possible to increase productivity of a country by the evolvement of new technologies or foreign imitation of techniques production indirectly affecting level productivity.

Under these conditions, the international exchange is presented as a strategy of evolvement and knowledge acquisition, it is significant to note that these objects are concentrated on developed countries and a generalization of results is risky. However, today, majorities of developing countries go through processes of regionalization and hope to capture externalities from evolvement stocks of advanced countries. Middle East countries do not make exception and technology transfer, key of success of Euro-Middle east project, is the principal contribution of North-South free exchange area. Euro-Middle east activates partnership is the channels of technology transfer via exchanges of goods and services. Technological transfer should increase total productivity of factors. We try to find the explanatory factors of evolvement efforts of Middle East countries1. We suppose that externalities of evolvement are not limited to the most advanced countries, but also diffuse towards of developing countries. [5]

In traditional theory of international exchange, exchange is perceived like a means of rationalizing of productive structures economy. Exchange allows evolvement of industries where country is relatively more effective. Under these conditions, developing countries which are specialized in intensive labor of industries see their productivity increasing. New international exchange theory associate an analytical framework of endogenous growth, the mechanism by which exchange contributes to productivity growth is double3. It affects country growth rate directly by increasing the quantities of inputs available on the market, maybe by evolvement of intermediate goods quality. In addition, international exchange is also a mechanism by which technological knowledge is transmitted internationally.

International exchange returns are the consequence of several factors. Initially, the widening of the market allows economies of scale. In addition, repetition effects of evolvement activity are wholly eliminated. Finally, technological difference can quickly be filled as soon as imitation costs are lower than innovation costs. The logic with this type of reasoning rests on the ideas characteristics and technological knowledge: they have the property to be goods "non-rivals" and "non-exclusive". In other words, the simultaneous use of the same idea does not destruct any of users. Thus, international exchange can be a vector of knowledge diffusion. These last are imported product which incorporates technological information. Countries must exploit imports like source of knowledge accumulation. [3, 4].

2. Practical Analysis

The goal of this analysis is to examine in a structure of data the role of evolvement cooperation in innovation process. Initially, analysis is focused on evolvement cooperation impact in accordance with others factors on production innovation. Our objective is to show if evolvement cooperation are complementary to innovation process, by increasing innovation and production of companies measured by the intensity of internal evolvement, respectively by innovations realization product. The intensity of internal evolvement stimulates also probability of evolvement cooperation between various countries. The majority of innovation activities imply multiple actors. The evolvement of new products requires an active research process implying several companies and establishments to discover new knowledge sources and technology. In a more or less durable multitude of agreements between two or several associates, credits and activities are linked and combined. Thus, technological capacities are necessary to develop process innovations. The importance of increased evolvement cooperation regularly thanks to increasing complexity, risks and innovation costs5. Within the framework of our analysis we primarily try to specify many objectives: The role played by technological cooperation in justification of investment effort in research and evolvement; in which measurements technological cooperation is perceived like a privileged vector of innovation and incentive to innovate and technological cooperation impact on countries growth.

Evolvement cooperation belongs to new strategies developed by countries in more globalize and competitive economic environment. The advantages evolvement cooperation for participating countries is well-known. Indeed, the participant's evolvement cooperation can profit from and economies scale complementarities of their know-how and can avoid the repetitions of their results. Another advantage of evolvement cooperation is economics internalization, owing to the fact that patents do not reflect a perfect protection against imitations. The cooperative importance of research is recognized through the government's policies. A vast deal of practical evidence shows that a country's production structure and productivity growth depend on its own evolvement capital formation. US find that production processes become less labor intensive as international evolvement economics grow. In the short-run, evolvement intensity is complementary to the international spillover. This relationship persists in the long-run for the U.S., but the Japanese decrease their evolvement intensity. In addition, U.S. evolvement capital directly contributes to Japanese total factor productivity growth by three and a half times more than Japanese evolvement capital directly contributes to U.S. productivity gains. International economics cause social rates of return to be around ten times the private returns.

In the same way research of joint projects is formed starting from antitrust laws because they are considered to promote productivity. Also, to analyze participation research effects of joint project on productivity is an interesting question. Estimation of total cooperative research advantages is very difficult because cooperation can have an impact on evolvement expenditure. Evolvement can have a positive impact on productivity.

In this article we study implications of productivity of participation in cooperative research. Moreover, we use a sample of various countries where information is available on evolvement expenditure. We try to separate total investment evolvement effect and cooperative research participation on productivity. We try to take account of independent variable endogenously, and while adopting recent econometrics literature of data relating to unit roots tests and cointegration7.

3. Purposed Method

The models which are interested in cooperative research influence on productivity take account of economics effects. These economics would be mainly proposed for private research. Public research would not profit from overflow resulting effects from other public institutions. Nevertheless, public economics diffusion was sometimes tested upstream in innovation process by introducing external public evolvement into function which determines public evolvement. Association of economics terms and cooperation is a little usual. We consider that cooperation can be used as an economics vector because of non-rival character of knowledge and uncertainty of knowledge process. Indeed, knowledge is not subject to the same rules of appropriation as in private sector. In fact, the objective of researchers is not to adapt their discovery to illustrate financial profits but to establish a principle priority, generally thanks to publications. In this case, there exists, established priority, no limit with knowledge diffusion. Cooperation within public networks should support considerably knowledge diffusion published.

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

$$\log Y_{it} = \eta_i + \beta_1 COP_{it} + \beta_2 \log RD_{it} + \beta_3 FDI_{it} + \\ + \beta_4 \log K_{it} + \beta_5 \log L_{it} + \gamma_t + U_{it} \quad (1)$$

Where Y is final output, L is the available labor force, K is the capital accumulation. FDI_{it} is

Foreign Direct Investment for country i in the year t, $Log\ RD_{it}$ is the logarithm of expenditure of research and evolvement ratio to the GDP for country i in the year t, COP is evolvement cooperation expenditure calculated as an economics effect, U, Indicate a stochastic term, and η_i and γ_i are individual and temporal effects.

We try to take account of temporal structure of variables with this intention, we must test the presence of unit root and if all series are non stationary. it consists in making individual regressions of ordinary least squares of evolvement on COP and carrying out ADF tests on estimated residues of these series Engle and Granger, The statistics being used to test null assumption of non-Co integration are obtained by calculating the average of ADF statistics previously obtained. This leads us to analyze series for each country. For our data base, it has been determined from many sources9 for the period 1980 to 2010.

The unit root tests became a current step for analysis of time series stationary. However, practical application of these tests on data is recent. Recently, several procedures of unit root tests and Co integration were developed for data models. The addition of individual dimension to temporal dimension offers an advantage, in practical application of unit root and Co integration tests.

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

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

The regressions being used to the stationary 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 stationary 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 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 tit p_i represents ADF tests estimated with p lags differences; N is the number of groups $n = 1, 2, 6$; T the total number of observations $t = 1, 2, 3, 4$.

IPS proposes to use the following standardized statistics:

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

Where $E\left(\bar{t}_{NT}\right)$ and $\mathrm{var}\left(\bar{t}_{NT}\right)$ 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 centered 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 only LY, LK and LFDI are I (1) (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.

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

Pedroni developed seven tests of Co integration on homogeneous and heterogeneous data; these tests take into account heterogeneity on the level of Co integration relation i.e. for each individual there are one or more Co integration relations not necessarily identical for each individual of. [8]

Table 1. Unit root tests results

Statistics	LY	*COP*	LK	LL	RD	LFDI
Levin-Lin ADF-stat	2.67	-1.84	-1.7	1.7	1.35	0.67
IPS ADF-stat	1.77	-2.14	-2.47	1.11	1.3	0.46

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

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

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

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 Co integration, the distinction between the two categories is done on the alternative level assumption:

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

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 Co integration. Results are indicated in Table 2:

From results of Pedroni Co integration tests we can notice that the whole of statistics are lower than breaking value of normal law for a threshold of 4%. So the whole of these tests requires the existence of a Co integration relation. With an aim of carrying out Co integration tests on data and to obtain an estimation of Co integration vectors it is necessary to apply an effective method of estimation. Within this framework we can distinguish several techniques with Full Modified Least Square method used by Pedroni, Dynamic Least Square method. For estimators for each country determined by full modified ordinary least square method we indicate in Table 3 most of results for our sample countries.

Table 2. Co integration tests of Pedroni

Variables	v-stat	Rho-stat	pp-stat	ADF-Stat
LY, LK, L L, RD, *COP*, LFDI	-0.364	-0.6531	-2.917	-1.676
Variables	Rho-stat 1	Pp-stat 1	Adf-stat 1	
LY, LK, L L, RD, *COP*, LFDI	-2.870	2.233	1.773	

Table 3. Estimation Results for each countries

Country	Variables	Coefficients	t-statistics
PAKISTAN	LL	3.46	(17.07)
	LK	0.34	(3.43)
	RD	-0.88	(-4.53)
	COP	-0.18	(-4.42)
	LFDI	-0.22	(-1.67)
IRAQ	LL	0.56	(4.92)
	LK	0.28	(2.79)
	RD	-0.13	(-1.74)
	COP	-0.31	(-1.45)
	LFDI	-0.11	(-1.58)
SYRIA	LL	-0.14	(-1.93)
	LK	0.17	(9.45)
	RD	0.23	(3.49)
	COP	-0.09	(-1.99)
	LFDI	-0.08	(-1.29)
JORDON	LL	0.98	(4.57)
	LK	0.17	(6.34)
	RD	-0.26	(-0.21)
	COP	-0.03	(-0.77)

4. Conclusion

In this paper the objective of our study is to confront theoretical and practical results the scholarly work of evolvement cooperation impact on economic growth. Although a model including a whole of variables is tested with generally admitted estimators, emphasize is related to data analysis. This approach makes it possible to study a model with theoretical lesson on evolvement cooperation. Econometric specification of this model combines the use of Co integration and unit root tests. In this work, we examine the relation between evolvement cooperation and growth in four Middle East countries during the period 1970-2008, results obtained show that impact evolvement cooperation on growth varies according to indicator of internal expenditure of research and evolvement of each country taken in the sample. On the basis of this last indicator, it appears from the estimates that the increase in percentage of this indicator led to 0, 665 point of additional growth.

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