Potential Productivity of ICT in a Democratic Environment: Investigation Panel Data

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Abstract

 The interest of this paper is to identify the impact of ICT diffusion and the nature of the political regime on growth and the contribution of the synergy between digital technology and a democratic environment and the effectiveness of legal an economy. At this level, we are dealing with an empirical study using panel data for a group of 32 countries organized in two sub-samples, democratic and non-democratic during the period 1994-2011. The analysis need to include in the model of Solow founder, economic variables, institutional and interaction. The results suggest that efficiency in ICT adoption can be explained by a simultaneous game of three categories of factors: long time like a major technological change, such as a medium-term investment boom and quotas as a number of favorable circumstances. The quality of political and governmental institutions may enroll in fact in part contingent factors are favorable paving the way for ICT to generate its economic benefits.

INTRODUCTION

The 18th century, commonly known Enlightenment, focused on the theme of progress characteristic of the human mind and could spill over its organizational arrangements companies. This idea of progress associated with the consecration of the democratic regime as legitimately claimed formed the basis for a wide area of research founder of the sociology of development of human societies. In this context, the great thinkers of the 18th and 19th centuries, Tocqueville, Marx, Durkheim, Weber ... associèrent forms of work organization and technological levels with models of social and political management and establish strong links and forms significant correlation between the economic, social and political nature of the regime.

Such a question emerges today for political scientists and economists who have taken evidence to develop a political economy of growth, especially after the wave of protest movements against authoritarian regimes that happen to upset some of them (the MENA region Egypt, Tunisia, Libya, Yemen ..) and the role played by ICT and especially the Internet and social networking sites. Note also the pace and tone of these exceptional events, essential characteristics of ICT. Empirical evidence that would support the hypothesis of a technological and economic revolution was rapidly evolved. We will try, in fact examine

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the impact of the synergy between the digital revolution and a democratic and lawful economic growth. Democracy is she fertile ground for ICTs generate their stimulating effects of growth?

I- LITERATURE REVIEW

Most studies seeking to measure the contribution of ICT to growth are based on the neoclassical growth model, which states that the growth rate of total output is the weighted sum of the growth rates of inputs used in production (labor lumber, ICT capital and non-ICT capital) plus a residue equal to the growth rate of TFP. This represents the overall effectiveness of the use of productive factors. It seems natural, therefore, to expect that ICT manifest their effects on productivity growth by affecting the overall economic efficiency and they appear in the Solow residual (I. Tuomi (2006)).

After 1996, TFP has increased rapidly in the ICT-producing economies and some other large consumers of these technologies. This increase has been attributed to a relatively unanimous ICT. Therefore, in the model, TFP is not attributed to improvements involving cost and increase remains unexplained.

I- 1   ICT and Growth
- **ICT in the context of the theory of endogenous growth**

The first generation of endogenous growth models have shown that sustainable growth can be fostered through the dissemination of knowledge generated by the labor factor and linked to a phenomenon of "learning by doing", therefore, the practical experience by workers (Arrow (1962)). The know-how generated by the experiment allows, therefore, improve the productivity of the workforce. Indeed, it is the conditions of acquisition of knowledge that are important and not the acquisition of new equipment, so that ICT would have no particular virtues compared to other innovations. The increase in the stock of knowledge is, therefore, an essential factor for growth.

Empirical validation of the model of *Romer (1986)* shows that the process of accumulation of knowledge and know-how is positively influenced by the accumulation of physical capital. However, the majority of studies on the accumulation of intangible capital (Internet, software, ...) cannot detect this favorable effect. *H. Baudchon and O. Brossard (2001)* explain this inefficiency by the rapid obsolescence of ICT products and, more specifically, software and multimedia tools. They suggest, therefore, that obsolescence "is certainly not a factor accelerating the process of learning by experience, even if it requires much adaptability of employees" (H. and O. Brossard Baudchon (2001)).

In subsequent generations models, technical progress is assumed as a result of a deterministic process and is explained by economic behavior. The analysis of factors explaining the increase in TFP attributes it to a qualitative improvement of conventional inputs, labor and capital. This theory diversified, and the sources of growth by integrating explicitly modeling.

Several studies have applied the model of growth accounting decomposition to measure the contribution of ICT to growth. In fact, growth can be decomposed as follows:

$$dLogY = \Sigma \, \Sigma = \lambda K \; YK \; dlog \; dlog \; K + \Sigma \, \alpha i \; \beta j + \Sigma \; dLogLj \; \lambda K \; DLOG \; PGFK$$

with: $\Sigma \alpha i \; \Sigma \beta j + = 1$ and $= 1 \; \Sigma \lambda K$

αi and βj are the respective shares of the remuneration of Lj qualifications and forms of capital Ki and λK share of industry k in total output. This form of the production function allows the introduction of structural and cyclical factors.

The productivity growth of real GDP per capita can also be decomposed as follows:

$$dLogY \, / \, L = dlog \; \Sigma \alpha i \; Ki \, / \, L + \Sigma \beta j \; dLogLj \, / \, L + dlog \; \Sigma \lambda_K \; PGF_K$$

It focuses specifically on the capital contribution of ICT products and equipment:

$\beta_{TIC} \; dLog \; k_{TIC} \, / \, L$: is the effect of a change in ICT capital per capita (intensification technology) on the growth of labor productivity.

The overall contribution of ICT to growth is determined by summing these two components, weighted by the share of the two groups of sectors in total value added, namely:

$$\sigma_u \; (dlog \; \alpha u TIC \; Kuti\acute{c}) + \sigma_p \; (\alpha p TIC \; dlog \; d + KpTIC \; Log \; pGFP)$$

σ_u and σ_p are the respective sectors, users and producers of ICT in total value added: $\sigma_u + \sigma_p = 1$

In addition, producers and users distinguish sectors does not change the contribution of ICT to growth compared to developments in the overall economy.

- **ICT and the social dimension in evolutionary theory**

The hypothesis of an amorphous and malleable technological change has been challenged by many economists. Innovation is thus a structured, cumulative technological change, in which each development opens the door to new opportunities or to potential changes also with additional constraints. In fact, it is this dialectic between these potentials and constraints that evolutionary economists propose to clarify the process for intelligibility.

The innovation process is largely tree, that is to say, the novelty comes from pre-existing elements. Moreover, the genesis of new traces not only a posteriori, there is always, therefore, a degree of uncertainty and indeterminacy that results from the process of social innovation that economic factors play a role.

Some new technologies become generic in that they open the door to a wide range of innovation in many sectors of the economy *(Nelson and Winter (1992))*. Thus, to understand the development and depletion of technologies taking into account the economic constraints, the concept of "economic trajectory" developed by Nelson and Winter seems quite relevant for this task, since it allows to report a hand, the cumulative nature of innovation, on the other hand, the fact that it may proceed by breaks. In fact, the process of innovation and obeyed at all stages of a logic which entangle economic arguments.

Other economic historians, who emphasized the importance of innovation for improvement, expressed similar ideas about systems, trajectories and paradigms *(De Bandt, Dosi, Perez, Freeman, Mensch ...)*. Economists conceptualize today advances in technology as an interaction between the demand for new products or processes and technology push, that is to say, the scientific and technical progress under which the creation of new products and processes becomes technically feasible and affordable *(Dosi. G and Winter. Sidney. G (2003))*.

Sahal (1985) argues that technology is changing the socio-economic environment and is modified by it. *Perez (2006)*, for his part, spoke of the interplay between institutional change and technical change in the concept of "techno-economic paradigm." The benefits and potential productivity gains of a new techno-economic paradigm first appear in one or a few high-tech sectors. The diffusion of new technology begins to affect the whole economy that has clearly demonstrated when the effects. Generation potential productivity gains inevitably a long period of structural adjustment and adoption since is grappling with a new infrastructure, many institutional changes, new skills and equipment of a new kind.

In this context, *Freeman (1992)* argues that the new paradigm of ICT productivity paradox explains the prevailing since 1970. In fact, until the early 90s, the massive and growing ICT has not resulted in a significant increase in productivity gains. Instead, the real growth rates of the average productivity of labor are below the levels reached in the years 50 and 60. Freeman attributed the slowdown in labor productivity observed during the decades of the 70s and 80s compared to the rate of two decades earlier, a structural crisis of adjustment or modification of the techno-economic crisis, exacerbated by the uneven development of certain sectors of the economy.

In trying to explain the famous Solow paradox, *Paul David (1991)* makes a comparison of the revolution (ICT) in the last two decades and is generated by the invention of the dynamo and electricity at the end century last. He highlighted significant differences between the two cases, the main one being that information together no electricity as an economic good. It is very difficult to quantify directly the production and distribution of information. The use of conventional processes market problematic. A practical consequence of this is that one can question the usefulness of conventional statistics on productivity to measure the change in productivity due to ICT.

- ▪ **The transitional dynamic in evolutionary theory and analysis of the impact of ICT on growth**

Work on long cycles considered a fairly unanimous that economic history is a history of alternating break, transition and renewal. Their analysis focuses on explaining the disconnect between the onset of innovations and rising growth rates. *Models of General Purpose Technologies (GPT)* illustrate the process of diffusion of innovations and their transitional dynamics. The notion of *"General Purpose Technology" (GPT)* common in North American academic literature encompasses both aspects. It emphasizes the universal nature of ICT and their generic nature. Indeed approaches and face skeptics who argue that the productivity gains from ICT are localized exclusively in producing sectors and thereby producing countries, models of "General Purpose Technologies" We offer a more optimistic view. In these models, the ICT-producing sector is represented by the firms producing intermediate goods using ICTs (new generation) while the user sector is constituted by those producing final goods using the components of new generation.

These models emphasize the importance of research activity in the course of the economic cycle. These initial studies show a slowdown of productivity growth is an inevitable stage in the growth process and may be evidence of the depth of technological change because it reflects the emergence of a generic innovation. Innovation is generic if it "gives rise to a general upheaval ways to produce and consume and if this shift occurs through a succession of secondary innovations designed to exploit the opportunities offered by the original innovation*" (H Baudchon. and Brossard. O (2001))*. Indeed, *H. Baudchon and O. Brossard* suggest that if one accepts that the first signs of rupture growth trend starting to be from 1995 to the United States, then it is in the presence of a generic innovation.

I- 2 Democracy and growth

Historically, the dominant idea is that stating that political stability is guaranteed by authoritarian regimes, is beneficial for the development of non-democratic countries at least temporarily. It assumes that the third world is still unable to start the experience "delicate" and any attempt to democratize finished with a back drop for several reasons.

Moreover, proponents of the approach stating that democracy can be beneficial to growth based on three arguments more or less significant. The first suggests that democracies are better able to manage conflict than authoritarian regimes. Indeed, some studies have shown that changes in government, changes in ruling majority and the political and social unrest are more common in democracies than in dictatorships, however, they do not disrupt the process and economic development (A . Diemer (2003)). Despite these events, the economic growth was "healthy" which is not the case of authoritarian regimes.

Second, democracies are better able to manage the inherent and serious situations made the existence of institution, against-power and opposition parties encourage and require leaders to act effectively. Finally, democracies promote the dissemination of knowledge through open dialogue and public debate that can

disseminate information disseminate relevant categories and, consequently, affect the behavior and quality of life.

This optimistic view has been confirmed by some recent statistical analyzes, such as that developed by Barro (1997) who emphasized the positive correlations between economic growth and democracy approximated by the protection of civil rights and civil liberties. In fact, the existence of a general correlation involving the growth and development of democracy is considered a unanimous manner as evidence even though the debate continued to be highly controversial work and conflicting results from the work of founder Seymour Lipset (1959). The author supports the idea stating that improving the living conditions of populations is expected to increase by economic growth which should result democratization of political regimes, which would in turn, from a threshold, a development accelerator. Despite this consensus two schools of thought can be considered:

- The développentalistes (Lipset, Deutsh, Dahl ...): this is the approach of radical optimism. It adheres to the idea of determinism democracy to growth and development. This school conducive to the capitalist system and intense internationalization of trade, established positive correlations between certain socio-economic indicators related to the notion of economic growth trends and companies to integrate into the sphere of democratic countries. The democratization process through the adoption of forms of political organizations that are similar to those of the great democracies of the world

- The dependentistas (Peixoto ...): this is the approach of the radical pessimists who denounce all positive links between economic development and democracy. Proponents of this theory state that the economic domination and dependence which underdeveloped countries are locked vis-à-vis the capitalist core, not only engendered the economic under-development but also induced "forms of social alliances and bourgeoisie deviant who forbade any attempt to democratize societies "(Peixoto (1977)).

Barro (1997), one of the developmentalist radicals, provides an illustration of the interaction between democracy and growth. His approach differs from the neoclassical models and endogenous growth perspective methodology, including the definition of the endogenous variable. The author asks the debate at the difference in growth between countries. These differences give the possibility to integrate in the field of analysis of phenomena as diverse as the level of the degree of political freedom, the education of men and women religious affiliation.

Barro's analysis is based on the principle of conditional convergence, assuming that the growth rate depends on the relationship between the initial level of output y and y * desired position. This relationship is itself dependent on other factors that may a powerful country to another, influence the target y * as the fertility rate and the rate of flow from y to y * as improving literacy rate *((R. Barro 1997), A. Diemer (2003))*. In attempting to identify the impact of certain determinants such as government policies on long-term growth, the analysis of R. Barro happens to detect three highly correlated results:

- The principle of conditional convergence is empirically confirmed and enriched other specifications. The growth rate is thus stimulated by high levels of schooling and moderate fertility.

- The effect of increased real civil liberties is a determinant of growth

- Economic freedoms, focusing on maintaining property rights are supposed encouraged economic growth.

Some authors such as *Friedman (1962)* pointed out that these two freedoms, economic and public, are mutually reinforcing and expansion of any one helps the other and tends to stimulate economic growth. *Gastil (1982)* identifies two significant indicators to measure democracy. The first is the political rights "are the rights to participate meaningfully in the political process. In a democracy, it means the right to vote to all adults and present in public office, and for elected representatives to have a decisive vote on public policies. "The second is that public policies that are "rights to free expression, to organize or protest, and the right to a certain degree of autonomy (religion, education, travel and other personal rights."

  Denouncing this deterministic relationship, *Dominique Darbon (2002)* suggests that the democratic system and economic growth appear in a situation of complex interaction that excludes any form of conditionality by one another. He concludes that the economic and political history of the great democracies of the OECD and other countries shows that democracy is not linked to a level of GDP or economic growth, but is the product of a set of social dynamics predictable "development and democracy are bound by the action of a multitude of variables and sets of actors including the dissemination of ideas and institutions, external influence on the issues and the configuration of forces, local arenas and forums , available resources, the ability of elites to manage the process of social control ... " *(Dominique Darbon (2002)).*

   ▪ **Institutional change: a social technology, a contingency factor favorable to growth**

It is properly perceived, therefore, that the accumulation of physical capital and technological change are not the only factors that can explain the differences and shifts in economic performance between countries and the political and governmental institutions have a role decisive and powerful growth.

Nelson and Sampat (2001) treat political institutions as social technologies in the operation of economic activities, which involve human interaction rather than the hardware technology. Proponents of this approach state that when corruption is not controlled and enforcement is difficult or when property rights are not defined, then there is a problem with the quality of institutions. This could then act on the growth rate of the country.

Easterly and Levine (1997) find that the traditional factors of growth can not fully explain the experience of some countries and are guided towards institutional explanations. Other authors such as *Knack and Keefer (1996)* and *Acemoglu et al (2001)* emphasized the strong position of institutions entant a powerful factor for growth through their ability to support property rights, rights Economic and prevent violence.

All these studies emphasize the importance of political factors. However, they do offer us a theoretical hypothesis lacks any empirical validation. However, other studies such as those carried out by *Easterly and Levine (2003)* and *Acemoglu, Johnson and Robinson (2001)* and tried to empirically test the hypothesis of a positive impact and stimulating political and governmental institutions on growth economy. They arrive to detect a significant contribution of these factors to growth.

North (1990), one of the radical proponents of this approach suggests that effective institutional environment is one that guarantees economic transactions and minimizes uncertainty. Such an environment is only likely to face corruption, government instability, weak rule of law, political violence, denial of contracts, lack of civil liberties and economic ...

The majority of studies have highlighted the high heterogeneity of the results of empirical studies dealing with the impact of democracy on economic growth. Some studies have found that democracy has attractive properties for growth and could increase the efficiency of the economy *(Acemoglu and Verdier (1998))*. Others have stated that democracy can not be a factor deteriorating growth *Mauro (2001))*.

Through. J and Wacziarg (2000) suggest to them about the effect of democracy on growth is an aggregate effect of direct and indirect effects elementary. They show that democracy, establishing a political stability, generates a strong accumulation of human capital. It improves the support of a part of the educational system for the benefit of the poor by the state, by increasing thereby spending. This leads to changes in taxes. The accumulation of private capital is thus limited by a greater distribution to employees, which will negatively affect the profit of capital and the investment rate. It turned out as well as the aggregate effect of all these factors drift of democracy is quite destructive to economic growth. However, other authors adhere to the idea stating that democracy can influence growth through human capital accumulation and through schooling *(Saint Paul and Verdier (1993)* and *Mankiw, Romer and Weil (1992))*. Democracy positively affects enrollment by adopting policies to encourage education, too, by promoting the development of the initiative, democracy may influence growth

II- Estimated effects of increased ICT capital and democracy on real PGF per capita and analysis of results in both democratic and non-democratic groups

The present work is devoted to determining the effect of ICT diffusion and a democratic and legal environment on growth. The theoretical framework used to decompose growth based on the equation of the Solow model whose endogenous variable is an indicator of economic performance such as productivity of labor. The objective of our empirical study is to add to this equation the variables representing the political revolution and the digital revolution. The growth rate of real GDP per capita is expressed as follows:

$$yit = dlog\ dlog\ \alpha 0i\ \alpha 1 + k\ (h\text{-}ICT)\ it + \alpha 2\ dlog\ k\ (ICT)\ it + \alpha 3 + \alpha 4\ dlog\ dlog\ RDIT\ CORRit\ \alpha 5 + dlog\ (KTIC * RD)\ it + \alpha 6\ dlog\ (KTIC * CORR)\ it$$

α_{0i} is individual specific effect and a_j (j = 1, 2, 3, 4, 5, 6) are the model parameters to be estimated. i and t respectively denote the country and time.

II-1   Database and presentation variables

The data are collected by the database of the World Bank and involve a series of macro-economic and institutional indicators calculated in recent years. The sample of countries used is divided into two sub-samples according to the degree of democratization. The first includes the democratic countries, the second is devoted to non-democratic.

- *The macroeconomic variables*

The macroeconomic indicators are represented by *(y)* the level of real *GDP* per capita *($K_{h\text{-}ICT}$)* and physical capital *(K_{TIC})* technological capital. To construct these two stocks we hold the so-called perpetual inventory used in the calculation of physical capital stocks. This method consists of cumulating past investment by applying a depreciation rate. ICTs are characterized in part by their rapid obsolescence resulting in a depreciation rate very high (about 30% for computers), on the other hand, the sharp drop in prices, which adds a nominal depreciation of the same order of magnitude as the obsolescence (of the order of 20%). Therefore, the depreciation rate that applies to computers is, in general, about 50% and about 20% for communications equipment and an average of about 40% for all ICT goods *(P. A Mute (2006)).* However, it is of the order of 6% for a many usual equipment. A considerable part of falling computer prices is, in fact, generated by rapid depreciation. As sometimes say those working in the ICT sector, this activity is fishing, the products feel bad quickly if left on the shelves *(I. Tuomi (2006)).*

- *Institutional variables:*

In attempting to measure the effects of a legal and democratic economic growth we used three indicators of corruption (CORR) and the rules of rights (RD) and the indicator democracy. Notes indicative of the latter range from 0 to 10. More political environment of a country is democratic, the indicator value is close to 10. We used this indicator to distinguish between democratic and non-democratic countries.

- *The interaction variables:*

Analysis of the effects of the interaction and synergy between digital technology and a legal and democratic requires the integration of these two variables articulating dimensions (KTIC * CORR * RD and KTIC). In fact, the increase in the stock of ICT capital raises the efficiency of the economy through technical progress incorporated institutional factors. These two variables will allow us to detect problems, if any, related to the control of social and institutional factors of production.

II -2   Estimation Results

We conducted tests of stationarity for all series. They are all, stationary in first differences. Thereafter and to see if our model is identical for all individuals in the sample or if there specificities of each country, we will proceed to test for homogeneity of data. Fisher's exact test can reject the hypothesis of overall homogeneity and proves the existence of specific individual for each country. The most appropriate method will be the method of panel data that takes into account specific effects of individual countries. The results of the two regressions are presented in the table below

Variables	*Democratic countries*		*Non-democratic countries*	
	Fixed effects model	*Random effects model*	*Fixed effects model*	*Random effects model*
C	2,34 (12,38)	2,51 (14,37)	0,61 (0,26)	2,46 (1,32)
dLog k $_{h\text{-}TIC}$	$0,14*10^{-3}$ (0,77)	$0,18*10^{-3}$ (0,98)	$0,123*10^{-2}$ (-2,67)	$0,13*10^{-2}$ (0,08)
dLog k_{TIC}	$0,15*10^{-1}$ (1,63)	$0,53*10^{-2}$ (1,50)	-0,20 (1,96)	$0,65*10^{-2}$ (1,38)
dLog RD	$-0,20*10^{-3}$ (-1,09)	$-0,43*10^{-3}$ (-1,24)	1,57 (0,84)	1,11 (0,84)
dLog CORR	$0,20*10^{-3}$ (0,037)	$0,5*10^{-2}$ (0,22)	-0,56 (-0,84)	-0,145 (-0,29)
*dLog (K_{TIC}*CORR)*	$-0,257*10^{-3}$ (-0,21)	$-0,1*10^{-2}$ (-0,06)	-0,115 (1,61)	$0,53*10^{-1}$ (0,89)
*dLog (K_{TIC}*RD)*	$-0,76*10^{-2}$ (0,14)	$-0,23*10^{-2}$ (-0,71)	$0,5*10^{-2}$ (0,53)	$015*10^{-1}$ (1,89)

The *Hausman specification test* can accept the alternative hypothesis to a risk of 8% for democratic countries and 1% for non-democratic. The model is fixed effects.

- ▪ *Impact of ICT on growth in real GDP per capita*

When estimating the model on data for the democratic group, some estimated coefficients appeared insignificant. However, the coefficient on technological intensification is rather significant and, in addition, positive reflecting a significant contribution of this component in the productivity of labor.

These estimates confirm the hypothesis of a positive effect of ICT equipment productivity. In fact, the contribution of new technology to growth in major technological revolutions, first comes the deepening of capital and, therefore, technological intensification resulting from the rapid collapse of the prices of products incorporating this technology.

This acceleration reflects and partly accelerating the pace of accumulation of ICT capital, but more progressive consequences rapid accumulation decades. The differences between countries are due mainly to the importance of ICT capital stock accumulated *(P. A Mute (2006))*.

Many authors have applied this growth decomposition to changes observed during the last ten years and the results are relatively consistent. Our analysis of the democratic group confirms their results even if the value of the coefficient found in our study is relatively small and weakly significant because the sample also includes PED and simple buyers of ICT. The coefficient on technological intensification at the undemocratic group is, however, significant but negative sign reflecting a deterioration in the growth of real GDP per capita.

David. P (1990) explains this situation slowing productivity gains by the "transitional dynamics" corresponding to a transition between two technological paradigms. The slowdown in growth is an inevitable step in the diffusion of new technology which will be followed by an expansion phase. A period of adaptation and assimilation was therefore necessary between the onset of technology and restarting the long-term growth. ICTs are, therefore, an exception to the rule. In this context, P. David shows that it took more than thirty years for electricity translates into significant productivity gains at the macroeconomic level. The same phenomenon occurs for ICT so after a qualified social learning technology.

H. Baudchon and O. Brossard (2001) suggest, in turn, another explanation is also reasonable. Weak productivity growth reflects in their transitional costs of the reallocation of factors of production between the "old economy" and the "new economy". *Muet. P. A (2006)* proposes, also, an explanation that is more or less significant to our estimates. He suggests that the accumulation of ICT capital does not lead to a significant effect on the productivity growth of labor when the rapid growth of ICT capital is combined with a stock accumulated which begins to be be negligible compared with other components of capital.

- *Effects of institutions and their interaction with ICT capital on the growth of real GDP per capita*

The coefficients for the dummy variables for democracy appeared all insignificant. Democracy considered in isolation has no effect on the growth of real GDP per capita. This result confirms empirical many lessons. The relationship between growth and democracy is still ambiguous despite its inclusion in theoretical analyzes *(Sirowy and Inkeles (1990), Przeworski and Limongi (1993))*. Our analysis also confirms the finding of *Cheung (1990)* for corruption and *Dominique Darbon (2002)* which states that the democratic system and economic growth occur in a situation of complex interaction that excludes any form of conditionality one by the other.

The analysis of the interaction between ICT and democracy and their effect on growth does not, however, an exception to the rule, only the coefficient on the variable $(K_{TIC}*CORR)$ became significant (13%) for non-democratic country. Its negative sign reflects a deterioration in productivity. In addition, the origin of this adverse effect may be attributed to this interaction as it can also be the result of capital deepening in ICT products. The effect of political and governmental institutions is in fact ambiguous.

The absence of direct effects of democracy and joint ICT / democracy on growth does not denounce the possibility of existence of indirect effects as stimulants stress *Travers. J and Wacziarg (2000),* who suggest that the effect of democracy on growth is an aggregate effect of direct and indirect effects elementary.

The failure of such a procedure returns, in fact, has a capacity of assimilation and absorption is not sufficient. The capital deepening in technological products triggers the first wave of economic benefits brought about by digital technology in the democratic group, a step that has not yet achieved the level of non-democratic countries.

Abramovitz (1991) defined two variables that establish the extent to which an economy that derives from behind technologically manage to catch up. These two variables are *"social capacity"* and *"opportunity"*. Technological capacity takes many forms not exclusively oriented towards the only control equipment but also to better control of social production.

In fact, several definitions can be considered to identify the concept of absorptive capacity. These definitions refer to two fundamental ideas. The first is that it relies on the ability to learn. The second states that mastering a new technology presupposes a predisposition of human capital to assimilate. Capacity building own learning would be for countries to buy (especially developing countries), a phase prior to the realization of the objective of the acquisition of the new technology that is other than the performance of companies. Human capital is in fact an essential component of absorptive capacity and support knowledge.

In this context, several arguments have shown that democracy can positively affect economic growth through human capital positively affect enrollment *(Mankiw, Romer and Weil (1992)).* It guarantees a membership indispensable to the development of individual initiative, itself a condition of economic development. Governments, under pressure from the government, and against the consciousness of individuals, adopt policies favorable to education *(Saint Paul and Verdier (1993)).* Democracy is also across the road, positively stimulate the development of social capacity may translate technological advances in economic efficiencies.

- **Conclusion**

The failure of all observed at the undemocratic group can be explained by the lack of social capacity available, and therefore means of absorption and assimilation of new technology (ICT). Thus, to establish

the digital economy, many measures should be recommended and tend to provide a more conducive environment for the emergence of this economy. This is consistent with the idea stating that the increased use of ICT must go hand in hand with a significant reorganization of productive structures, accompanied by structural reforms. They require a legal environment and better institutions cannot be guaranteed by democracy.

Efficiency in ICT adoption observed at group level can be explained democratic game simultaneous factors long period, medium period as stipulated quota and *B. Paulre (2001)*: *"We have seen an investment boom amid technological change and supported by a number of favorable circumstances"*. The quality of political and governmental institutions may enroll in fact in part contingent factors favorable ICT can pave the way to generate its economic benefits.

- ▪ **References**

Abramovitz (1991): "The postwar productivity spurt and slowdown factors of potential and realisation"; in OECD / Technology and productivity / The Callenge for Economic Policy / Paris / OECD.

Acemoglu. D et Verdier. T (1998): «Property rights, corruption and the allocation of talent: a general equilibrium approch», Economic Journal, vol 108, pp 1381-1403;

Acemoglu. D, Johnson. S et Robinson. J .A (2001): «Reversal of fortune: Geography and institutions in the making of the modern world income distribution», NBER Working Paper, n°8460/ April;

Baudchon. H et Brossard. O (2001): "Croissance et technologies de l'information en France et aux Etats-Unis" ; Revue de l'OFCE/ 2001/ 1(n°76).

Barro. R. J (1997): «Determinants of economic growth », A Cross-Country Empirical Study, Mit Press;

Cette. G, Mairesse. J et Kocoglu. Y (2005): "ICT and potential output growth" ; Economics Letters/ Vol 87/ n°2 ; p 231-234 ;

Cheung. S(1998): "The curse of democracy as an instrument of reform in collapsed communist economies", Contemporary Economic Policy, vol 41, pp 247-249;

Chkir. A et Allaoui. Z (2007): "Corruption, démocratisation et croissance économique des pays en développement (PED) : Investigation en données de panel" ; ali.chkir@fsegs.rnu.tn ;

Colecchia. A et Sshreyer (2001): " The impact of information and communication technologies to out put Growth: issues and preliminary findings "; OCDE, Draft Dsti/ EAS / IND / SWP/ 2001/11.

Darbon. D(2002) : «Les conditions politiques et sociales du développement : Démocratie et Développement », Cahier Français n°310, pp70-76

David. P. A (1999): "Digital technology and productivity paradox: after ten years, what has been learned?" Paper presented to the conference understanding the digital economy: Data, tools and research; Held at the US department of commerce; Washington; D.C 25-26 May.

De Bandt. J (2001) : "L'émergence du nouveau système technique" ; Colloque :" nouvelle économie", Sceaux. Mai 2001.

Dosi. G et Winter. Sidney. G (2003): "Interprétation évolutionniste du changement économique: une étude comparative"; Revue Economique/ Vol 54/ n°2/ Mars 2003.

Estavao (2004): "Why is productivity growth in the euro area so sluggish ?" ; IMF Working Paper/ WP/04/ 200 ;

Easterly. W et Ross. L (2003): "Tropics, germs and crops: how endowments influence economic development", Journal of Monetary Economics, Elsevier, vol 50/ n°1/ January/ pp3-39

Freeman. Ch (1992): "The nature of evolution and the productive system"; in OECD/ Technology and productivity / The Challenge for Economic Policy / Paris / OECD ;

Friedman. M (1962) : « Front matter, the interpolation of time series by related series», NBER Chapters, in The interpolation series by related series, pp4, NB

Gastil(1982): « Freedom in the world », Westport, Greenwood Press ;

Knack S. et Keefer P., (1995): « Institutions and Economic Performance: Cross country Tests Using Alternative Institutional Measures », *Economics and Politics*, n° 7, vol 3, pp 207-227.
Keefer P. et Knack S., (1997): «Why Don't Poor Countries Catch Up? A Cross-National Test of Institutional Explanation », *Economic Inquiry*, Oxford University Press, vol 35(3), pp 590-602, July. *Review*, vol 45, n° 8, août, pp 1341-1378

Lipset. S. M (1959): «Some social requisites of democraty : economic development and political legitimacy», American Political Science Review, 53, pp 155-175 ;

Mankiw. N. G, Romer. D et Weil. D (1992): «Acontribution to the empirics of economic growth», The Quarterly Journal of Economics, Mit Press, vol 107, n°2 ;

Nelson et Winter (1982): "An Evolutionary theory of technological change"; Harvard University Press"

Nelson. R. R et Sampat Bhaven. N (2001): « Making sense of institutions as a factor shaping economic performance »Journal of Economic Behavior and Organisation ; vol 44, pp 31-54 ;

Niosi. J et Hanel. P (1998) : "La technologie et la croissance économique : survol de la littérature" ;Avril 1998/ extrait d'Internet.

North. D. C (1990) : "Institutions, institutional change and economic performance" New York: Cambridge University Press;

Mauro. P. H (2001): "Corruption and growth" ; Journal of Comparative Economics, vol 29/ n°1, pp 66-79;

Muet. P. A (2006) : "Impacts économiques de la révolution numérique" ; Revue Economique, vol 57/ n°3, pp 347-375;

Paulre. B (2001) : "La new economy : un simple boom d'investissement ?" ; Matisse, UMR ; Université Paris I ; n°8595 (Laboratoire Matisse-S. Y. S, Université Paris I, Panthéon Sorbonne Paulre@univ-Paris.Fr.

Peixoto. A. C (1977) : « «La théorie de la dépendance : analyse critique», Revue Française de Science Politique, vol 27 ; n°(4 et 5), pp601-629 ;

Perez. C (2006): «Technological revolution and financial capital : the dynamics of Bubbles and Golden Ages »/ Ed Amazon)/ (amazon.fr).

Przeworski. A et Limongi. F (1993) : «Political regimes and economic growth », Journal of Economic Perspectives, vol 7, n°3. Pp51-69 ;

Oliner. S. D et D. E. Sichel (2002): "Information technology and productivity : where are we going" ; FRB Bank of Atlanta/ 3ème trimestre/ p 15-44 ;

Romer. P. M (1986): "Increasing returns and long-run growth" ; Journal of Political Economy / vol 94/ n°5.

Sahal. D (1985): "Technological guideposts and innovation avenues" ; Research Policy/ vol14/ n°2.

Saint Paul. G and Verdier. T (1993): « Education, democracy and growth », Journal of Development Economcs

Sirowy. L et Inkeles. A (1990): « The effects of democracy on economy growth and inequality : a review »Studies in Comparative International Development/ 25(1)/ pp126-157 ;

Tavares J. et Wacziarg R., (2001): « How Democracy Affects Growth », *European Economic*

Tuomi. I (2006) : "Exploitation du potentiel de productivité des TIC " (The ITPS Report)/ Document de travail de l'ITPS/ www.cordis.lu/ist.about/socio-eco.htm.