Local Universities as Engines for Innovation and Regional Development in Southern Economies with Reference to MOROCCO

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Abstract:

The objective of this paper is to show that universities can be engines for local development in Southern economies. Previous contributions to the literature on this subject have already shown the positive effects of regional sources of tacit knowledge on local development. Using data on developed, developing and emerging countries, regression analysis is pursued with the available data. The attained results show that developing economies do have room for local development as this can be further provided by regional universities and schools. These potential gains have been expressed to be higher for developing and emerging countries. These results imply that developing and emerging countries can enhance their local and overall development through the promotion of local universities and schools but these sources of skills and knowledge need to be tied with the local needs of the population as in developed countries. The case of Morocco illustrates the potential and positive effects of regional universities on local development. The transmission channel includes encouragement of skills, access to patents and intellectual property rights protection besides enterprise creation and implementation. These trends are likely to be accelerated within the regionalization process and the role of regional knowledge centers.

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Introduction

A series of studies and publications are still referring to the increasing quantitative and qualitative diversities of needs of the population in developing economies and mainly in Africa (De Pee et al., 2010; McTavish et al., 2010; Quisumbing, 2010; Kebede et al., 2010; Anderson et al., 2010 and Beneria, 2010). According to these studies, these needs concern almost every component related to health, education, employment, income and infrastructure. Furthermore, as these needs are expressed locally by households in both rural and urban areas, their satisfaction cannot be only from local supplies. But, responses and supplies can sometimes be locally provided with possibilities of the development of further trade and exchange with other localities in the same country or outside. But potential suppliers may need further knowledge and also inputs from research and innovations ensuring thus, the competitiveness of the new products and services. Several authors have looked at different dimensions of the links between R&D and local supplies. These include Rothwell (1977), Pavitt (1984), Reinert (2006), Bengt-Åke Lundvall (2007), Amsden (1989), Freeman (2004), Mazzoleni and Nelson (2005), Peres (2006), Stiglitz (2001) and Reinert (2007).

The major objective of this paper is to show that local and regional universities can play an important role in the process of providing the knowledge to contribute to the supply of the desired and growing needs of local populations. This is shown to be related to the generation and development of integrated technological and socio-economic platforms related to the valuation of new and specific local and regional niches and opportunities.

This paper will focus on the impact of new localized universities on the territorial and general economic growth and development. It attempts to answer question such as “Can these universities along with tertiary education be engines for local development? If this is tested to be relevant, then what promises and prospects exist for most developing economies?

The paper provides a literature review in the following section about the role played by universities in local development in different countries and regions. The overall assumption

and hypotheses to be tested is that there are three groups of countries and that these groups perform differently given the way they combine new and old sources of growth and development. This is tested in the second part of the paper that shows that developed countries have a better pattern of local economic development than developing countries. Besides that, transition economies have an improved pattern compared to developing countries. Empirical methods are pursued to test the hypotheses and practical implications of the results are then provided and discussed. The case of Morocco is used as a reference to demonstrate that universities can play an important role in local development through enterprise creation, patent registration, university deposits and others.

I. Literature Review

Local development in different countries and mainly in developing economies has been traditionally based on the valuation of traditional business ideas and projects with preservation and control of the gained positions. These businesses have been generally benefiting from autarkic means of preservation and protection, including familial transmission of tacit knowledge within the traditional structures that monitor the process. These types of models are becoming progressively obsolete and local economic development can now be driven by new ways of thinking where advanced knowledge occupies a dominant position. These new models have been already experienced in developed economies where most of time, current knowledge has been replacing traditional ways of doing business. The new drivers for developing economies are to be based on specific engines that are primarily related to the contributions of education and the training offered by the local universities. It has been observed that university activities in regions play an important role in promoting local development. This is a new approach where knowledge is the key factor for future economic competitiveness and progress. Therefore, universities and tertiary education systems explicitly play the major role.

Shaffer and Wright (2010) explain that universities and higher education systems can act as drivers of economic development and community improvement through using their research force and developing innovative ideas to reinforce the competitiveness of the economy and use innovations commercially and socially. They can also provide knowledge-based services to businesses and employers, educational, social and cultural revival of local communities and education for the success of people as individuals and groups.

Hill (2006) offers some incentives as to the extent to which university research, especially faculty innovative output, supports local economic development. The author also points to the contributions made to the local economy through research universities and their graduate programs. The reason of this success is related to the obstacles surrounding the transfer of tacit knowledge while knowledge derived from research efforts can be codified and can reach everyone not only the closest population. Universities also influence local economic development through retaining graduates in the vicinity of their schools especially if the university is located in a large urban area. The skills and field of study of those graduates are, for example, dependent on labs and qualified science and engineering training (Hill, 2006). University research is also found to influence local economy development through promoting corporate research and development (R&D) activity. Besides that, results from a number of econometric studies showed, through the use of variables measuring economic activity and others for the research university, a positive statistically significant relationship in many cases but the strength of the relationship usually seems weak (Hill, 2006).

Ji et al. (2010) found that local colleges play an important effect on Chinese regional scientific and technological innovation. They are considered a major node in Chinese regional innovation system through thinking and understanding activities, production and research cooperation and joint scientific and technological research among others. Frenette (2008) found that the creation of new universities, in cities where there were none, did indeed increase university attendance among the local youth at the expense of colleges in most cities. However, the short run effect of new university establishment is the considerable rise of the probability of moving out of a given city for both men and women. Men experience increased employment and women get an increase in business services and public sector employment (Frenette, 2008).

Westnes et al. (2009) worked on a comparative study of the role played by local universities and public research organizations in the promotion of local capabilities for innovation. This latter study was performed on two gateways to the North Sea oil and gas province which are the Stavanger region on the southwest coast of Norway and the Aberdeen region in northeast Scotland. The authors found that the contribution of education and research organizations to regional development of both oil regions was made differently but there is no proof affirming that one is better than the other in developing competitive and powerful regions. In the Stavanger region (Norway), universities developed relevant technological capabilities based on coordination and collaboration. The Aberdeen universities (Scotland) developed ties to

industry through the achievements of individual academics in various disciplines (Westnes et al., 2009).

Hart et al. (2009) used the model of the University of Brighton's Community-University Partnership Program (CUPP) Helpdesk as an 'enabling platform' for commitment possibilities between the community and the university. The authors affirm that such models can help overcome the barriers holding back assistance to the community-university engagement work.

Guodong and Huosong (2010) explain the role of knowledge as an important factor for the sustainable development of the university. Since the knowledge value is proven to slightly affect the knowledge dissemination, it is necessary to define the expectations behind the construction of local universities such as teacher quality, knowledge value, society effects, school conditions, the knowledge body and diffusion path.

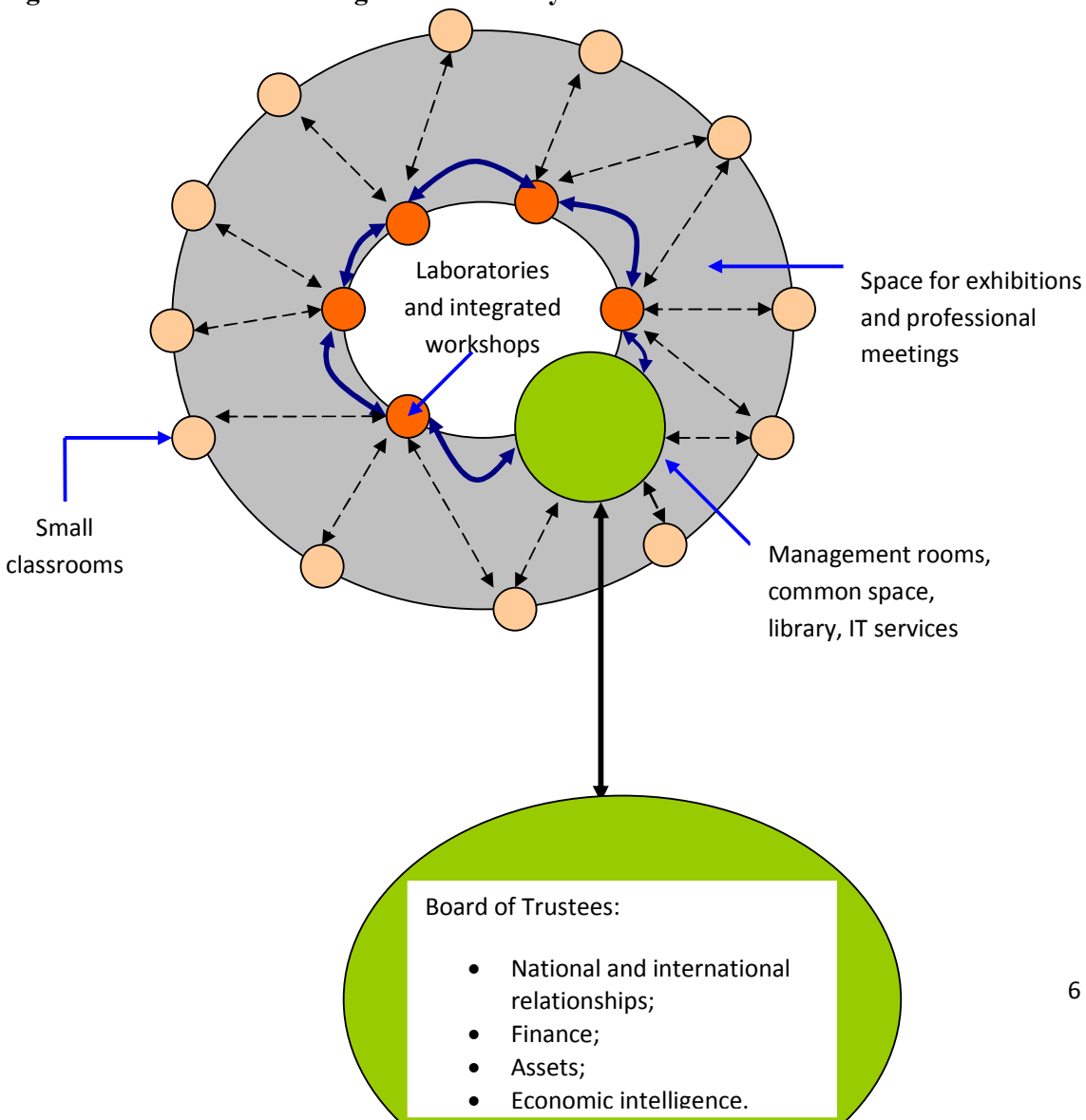
Driouchi et al. (2006) describe the modern modes of information and knowledge diffusion to support regional decision-making processes in regions of Morocco. These modes can carry on innovation and local systems development that will assist in improving the competitiveness of a region. One of the mechanisms suggested is the establishment of local universities that would help the transfer of tacit knowledge into formal one and assist in the dissemination of that knowledge. The suggested solution is derived from previous contributions of Driouchi and Djeflat (2004) and Driouchi et al. (2006). The new forms of regional universities result from the fact that local authorities and regions are not always involved in local educational systems despite their importance. Consequently, local populations are not involved enough in the knowledge production and diffusion processes. The regional dynamics are relevant to developing skillful and qualified human resources required to enhance local productivity and competitiveness. Therefore, the university has a fundamental role in local and regional development that might encompass the "second chance" education programs, which are open, flexible, and which create the conditions for excellence such as in France, the Netherlands, etc., polytechnic complexes such as in the US, India, China, etc., the "Land-Grant" programs in different parts of the US and the education schools managed by non-governmental institutions.

According to Driouchi and Zouag (2006), the local university in the regions of Morocco should be based on specific principles. These latter include the establishment of an open system, which recruits its students from different educational disciplines. No distinction exists between educational disciplines when recruiting students (i.e. technical, scientific, or literary streams, etc.) or among different types of educational systems (i.e. private, public, executive education, etc.). The local university provides a multi-disciplinary system including different

domains of interest and education. It encourages the development of bridges and micro-bridges to allow students to change their specialty at different moments of the curriculum. The students receive training in different disciplines but can also pursue other studies according to their choices and interests. In the local university, education offerings and areas of specialty are adjusted to the trends expressed at the regional level. Another principle concerns the university complex that should educate students and their partners to develop a culture of tolerance, social work, and diversity of ideas and interests.

Concerning the structure of these local universities, direct management of the university complex should involve three major poles that are the financial, the admissions and the academic poles. The central entities of this system should include laboratories, integrated workshops and simulation centers. These entities will form the nodes around which several small classrooms will be designed. The common space is used for exhibitions and professional meetings as described in the following figure.

Figure: the Structure of a Regional University



Source: Driouchi and Zouag, 2006.

The financial resources of the local university include revenues from its own assets (tangible and intangible assets developed and transferred to sustain the education and research system), donations given by the public administration, the private sector, and associations, income generated by products and services developed at the university, consulting revenues, tuition fees paid by the students, companies, and other institutions and revenues from the executive and continuing education programs and specific actions for the benefit of other institutions. The local university financial resources also include supplies from regional government or the state, revenues equivalent to fiscal exonerations, revenues related to general costs engaged as part of research and development projects and international donations.

Belenzon and Schankerman (2007) studied the effect of private ownership, motivation pay and local development objectives on university licensing performance. They found that using incentive pay, impacts university licensing performance especially in the case of privately owned universities and schools. This is explained by the additional 30% to 40% income brought by license. They also found that around 30% less income by license is generated from universities that have strong local development objectives.

II. Empirical Analysis

This section introduces the discussion about the methods and the data used, before the introduction of the results attained. The reference to the Moroccan case is added based on the trends taking place in this economy in relation to local development and to the role of regional knowledge centers.

A. Methods and Data

To test for the relationship between knowledge and local development measures, panels of regionalized data per country are needed. In the absence of such data, two major implicit assumptions are set prior to the implementation of the empirical analysis using available information. The first assumption relates to considering that more universities in a given country would mean more regions covered by these sources of knowledge. The second assumption is related to the meaning of the overall development measures as the Human Development Index (HDI) and the Knowledge Economy Index (KEI). These dependent variables are considered to be capturing larger regional and localized performances.

In practice and for the empirical assessment of the role of universities on local development, three groups of countries are considered to exhibit different patterns. These are developed countries with an important contribution of advanced knowledge, emerging economies with new roles of advanced knowledge while tacit knowledge is not absent, and developing countries where traditional knowledge is the most dominant. The distinction between countries in terms of development is based on their income level. Each of the three sets of countries is listed in the appendix under developed, developing and emerging countries (see appendix).

The data used to test the above hypotheses include the number of universities per country, the number of regions per country, the total population of a specific country and the total population of age 18 years old. The data for universities is retrieved from the Ranking Web of World Universities (2011)[1]. The data for regions is obtained from Wikipedia[2]. The population data is from the World Bank (2008) and exceptionally from Wikipedia for some countries. To measure the local development, related variables are included such as the Human Development Index (HDI), the Knowledge Economy Index (KEI) and other development indices. For the purposes of this study, the Human Development Index (HDI) is retrieved from the United Nations Development Program global report of 2010. Besides, the Knowledge Economy Index (KEI) is retrieved from the World Bank website from the knowledge for Development section. The data is divided into three sections that are the developed, developing and emerging countries.

Other variables are discussed for the case of Morocco. They account for the annually newly created enterprises, patents and other intellectual property registration besides university patent deposits. These latter are extracted from 'Office Marocain de la Propriété Industrielle

[1] http://www.webometrics.info/university_by_country_select.asp
[2] http://en.wikipedia.org/wiki/Category:Regions_by_country

et Commerciale' (OMPIC) annual reports and the "Doing Business" report of the World Bank Group (WB).

B. Results of the empirical Analysis

After establishing the countries included in each of the three sets, regression analyses are performed. The dependent variable is the Human Development Index (HDI) and the independent variable is the number of universities per region. Another independent variable can be the number of universities per population of age 18. The results of these analyses are summarized in tables 1 and 2. The results of the regressions show that the human development of economies is slightly explained by the number of universities in the given countries where all the data is in a logarithmic form.

Table 1: Regression analyses results

Countries	Equation	R^2	Obs.
Developed	$\ln(HDI2010) = \underset{(-13.226)}{-0.2407} + \underset{(4.0121)}{0.0174} * \ln(NumOfUniversities)$	0.2678	46
Developing	$\ln(HDI2010) = \underset{(-14.335)}{-0.858} + \underset{(3.9468)}{0.082} * \ln(NumOfUniversities)$	0.1462	93
Emerging	$\ln(HDI2010) = \underset{(-2.134)}{-0.2917} - \underset{(-0.6665)}{0.0166} * \ln(NumOfUniversities)$	0.0255	19

The portion explained by the number of universities demonstrates that an increase in that number for developed countries leads to the slow increase of the human development factor by approximately 0.02%. At the same time, an increase in the number of universities leads to a slow increase in the human development effect on developing countries. Emerging economies have statistically insignificant results related to the effect of the number of universities on the human development effect of the country.

Table 2: Regression analyses results (continued)

Countries	Equation	R^2	Obs.
Developed	$\ln(HDI2010) = \underset{(-14.74)}{-0.161} + \underset{(1.803)}{0.023} * \ln(UnivPerPop18)$	0.069	46
Developing	$\ln(HDI2010) = \underset{(-2.796)}{-0.124} + \underset{(13.49)}{0.203} * \ln(UnivPerPop18)$	0.667	93
Emerging	$\ln(HDI2010) = \underset{(-4.769)}{-0.203} + \underset{(4.705)}{0.1} * \ln(UnivPerPop18)$	0.566	19

From table 2, another factor can explain the level of human development. It is the number of universities per population aged 18 that can significantly affects the 2010 human development

index in developing and emerging markets. This means that an increase in the number of universities per population of 18 years old leads to slightly increasing rise (0.203%) in HDI while it contributes to a 0.1 % increase of HDI for emerging economies. The relationship for developed countries is found to be statistically insignificant.

Table 3: Regression analyses with KEI data

Countries	Equation	R^2	Obs.
Developed	$\ln(KEI2009) = \underset{(36.48)}{1.99} + \underset{(2.823)}{0.033} * \ln(NumOfUniv) + \underset{(2.925)}{0.085} * \ln(UnivPerPop18)$	0.3244	44
Developing	$\ln(KEI2009) = \underset{(17.49)}{2.11} - \underset{(-1.214)}{0.029} * \ln(NumOfUniv) + \underset{(13.642)}{0.362} * \ln(UnivPerPop18)$	0.7633	76
Emerging	$\ln(KEI2009) = \underset{(7.04)}{2.02} - \underset{(-1.353)}{0.071} * \ln(NumOfUniv)$	0.0972	19
Emerging	$\ln(KEI2009) = \underset{(18.15)}{1.97} + \underset{(3.426)}{0.186} * \ln(UnivPerPop18)$	0.4084	19

When using the KEI as an independent variable and the number of universities as well as the number of universities per population aged 18 as dependent variables, the following tables and analyses result (table 3).

The results listed in table 3 show that for developed countries, both the number of universities and the number of universities per population aged 18 significantly impact the level of KEI in a positive way. In their logarithmic form, an increase in the number of universities by 1% can lead to the increase of KEI level by 0.033% and an increase in the number of universities per population aged 18 by 1% can lead to the increase in the KEI level by 0.085%. For developing countries, the increase in the number of universities does not significantly impact the KEI level. However, the number of universities per population aged 18 does positively influence the level of KEI. An increase in the number of universities per population of age 18 leads to the increase of the KEI level by 0.362%. In the case of emerging economies, the analyses show that an increase in the number of universities per population of age 18 of 1% can lead to the increase in the KEI level by 0.186%. However, the increase in the number of universities does not have a significant impact on the KEI level (table 3).

C. Reference to Morocco

Morocco has been engaged for large investment projects that have impacts on regional development. Such projects concern besides Casablanca and Rabat, the regions of Tangiers,

Meknès, Fès, Oujda and Marrakesh among others. While some projects focus on port and industrial development, others are centered on food industries, information technologies and tourism (A.Driouchi & M.Kadiri, 2010). The Green agricultural plan has also a pillar with very high regional and local development where the promotion of territorial labels is clearly well initiated (A.Driouchi & M.Kadiri, 2010).

Besides that, Morocco has adopted a new charter for communal development since 2009 (Mokhliss, 2010). Besides that, a clearer engagement towards regionally centered development is in process.

These two frameworks are likely to be driving local development with an important role to be devoted to regional universities. Currently, Morocco has 16 public universities located in Casablanca, Rabat, Fès, Meknès, Oujda, Beni-Mellal, Settat, Tetouan, Tangiers, Ifrane and others. Morocco has also public and private schools that focus on engineering, telecommunication and commerce. Some of these schools are being expanding over series of regions. But the regional effects of these knowledge centers on local development are not often observable as universities are only recognized for their education functions. Regional and local universities are rarely mobilized as sources of knowledge and expertise for local development. Most of the time, tacit knowledge sustains local traditional development implying the emigration of newly trained skills with outward looking universities and schools. Contribution to local development may appear to be inferior relative to national and international orientations. These trends are partially confirmed by data related to registration of patents and related intellectual property rights for the period 2004-2010. These data show that out of at least 16 universities, only 11 (most of them are in regions) have deposited 40 patents in 2010 while only 11 patents concerned 4 universities in 2009 and only 1 patent by 1 university in 2008. At the same time, the total of patents has known small annual increase during the period 2004-2010. The same pattern is expressed at the levels of trademarks and design and models. The data about enterprise creation from table 4 suggest that as the number of universities increases, the number of university deposits are likely to rise.

Table 4: OMPIC intellectual property rights protection data 2004-2010

Patent registrations	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
National	151	135	178	150	178	140	104
Foreign	856	794	833	782	732	520	457
Total	1007	929	1011	932	910	660	561
Trademark Registration	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
National	5521	5678	4630	5020	5642	4966	4163

Foreign	1572	1269	1558	1502	1703	1429	1239
Total	7093	6947	6188	6522	7345	6395	5402
Design and models	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
National	990	864	759	696	723	646	448
Foreign	97	61	70	69	77	51	4
Total	1087	925	829	765	800	697	486
Moral person	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
Intention of Creation (Enterprise)	46120	45181	45590	43663	33139	23492	20375
Creation of Enterprises	24560	23810	23552	25833	18703	13480	11360
	2010	**2009**	**2008**				
University Deposits	40	11	1				
Number of universities	11	4	1				

Source: Annual reports, OMPIC, Morocco

Besides the availability of universities in series of regions in Morocco, there are also Investment Centers (CRI) located in each region. Furthermore, Morocco has also developed agencies for the promotion of small and medium businesses besides the promotion of employment. But, these institutions besides the schools and the universities have not all the time focused on local needs and regional development. They are still often nationally and outward operated. Two major links seem to be missing. They include the lack of incentives for universities and schools to focus on local development and the absence of mechanisms that can help transform research ideas into development projects and enterprises. These links might be related to the limited demand for specific local development. The current trend of regionalization might be an important source for the enhancement of demand for specific local projects, for the valuation of local economic and social niches besides the provision of further inspiration for patent development and enterprise creation.

The Moroccan experience in terms of enterprise creation mainly goes through regional institutions aiming at developing new niches. Enterprise creators can submit their requests either to the regional investment centers (RIC) or directly to other institutions to initiate the creation of enterprises. There is a RIC for each of the 16 regions of Morocco. Each RIC gathers all the processes and administration that is needed for the authorization of the enterprise. But, even under this high level of integration, the number of enterprises created within the RIC and outside is still limited.

Table 5 introduces data on enterprise creation in different regions of Morocco before and after the creation of the Regional Investment Centers in 2002. The computed t-test shows that the number of enterprises initiated after 2002 is slightly higher. This implies that RICs have been capturing the flows of created enterprises but even with further integration of the operations for starting a new business, possibilities of fragmentation are still prevailing.

Table 5: Average number of yearly creation of enterprises before and after RIC

Regions	Average number of Enterprises created before RIC	Average number of enterprises created After RIC
Grand-Casablanca	4695	5255
Marrakech-Tensift-Al haouz	2226	3101
Meknès-Tafilalt	3034	2610
Rabat-Salé-Zemmour	2834	2836
Doukala-Abda	1542	2264
Tanger-Tétouan	2684	4025
Guelmim-Es Smara	1163	1173
Région de l'Oriental	2764	3134
Souss-Massa-Drâa	3067	4078
Fès-Boulmane	2061	1825
Lâayoune-Boujdour	1552	1337
Gharb-Chrarda Beni Hssen	1279	1755
Chaouia-Ouardigha	1378	1607
Taza-Al Houceïma-Taounate	779	823
Tadla-Azilal	991	1357
Oued Eddahab-Lagouira	655	641
Average	2044	2363.8125
Standard Deviation	1082.506597	1305.094797
Count	16	16

t-stat (comparing average number before and after)	3.02	

Source: Rajae Berjal (2005), MBA Qualifying Exam, SBA, Al Akhawayn University, Ifrane.

From the data on "doing business", it appears that the costs of creation are still high. This shows that fragmentation is still operating and anti-commons prevailing. Table 6 lists the total number of enterprises created per region between 2006 and 2010 in Morocco.

Table 6: Total yearly number of enterprises created 2006-2010

Regions	2010	2009	2008	2007	2006
Grand Casablanca	8408	7958	7941	8573	6607
Tanger-Tétouan	2416	2603	2937	3240	2236
Marrakech-Tensift-Elhouz	2149	2140	2336	2929	2173
Rabat-Salé-Zemmour	2871	2506	2407	2873	1929
Meknes- Tafilalet	1307	1356	1147	1201	729
Sous Massa Draa	1370	1463	1400	1627	1163
Fes-Boulmane	1065	1074	954	1049	726
Oriental	1030	1007	1035	990	680
Other Regions	3944	3703	3395	2991	2460
Total	**24560**	**23810**	**23552**	**25833**	**18703**

Source: OMPIC, Annual Reports 2006, 2007, 2009 and 2010

Data for the period 2006-2010 show that enterprise creation in Morocco has known a general increasing trend over these years (table 6). As these data include enterprises created through RIC and through other sources, they are higher than those shown only through RIC. But, this increase, with or without RIC help, is limited by the bureaucratic process of starting a business in terms of number of procedures and time. This is confirmed also through the larger costs of enterprise creation in Morocco relative to other countries. As of Doing Business Report 2010, the cost of creating an enterprise in Morocco is 15.8% of the income per capita while in neighboring countries such as Algeria, Egypt and Tunisia, the costs are 12.9%, 6.3% and 5% of the income per capita, respectively. Those costs are even lower in developed countries such as France, Finland and United States with only around 1% of income per capita needed to start a business. These higher costs are mainly related to the series of steps and procedures that need to be pursued by applicants for enterprise creation.

The preceding description shows that there is room for more local development and enterprise creation as long as there are schools and universities focusing on the knowledge needs for their immediate neighborhoods.

III.Discussion

Following the empirical analysis above, the results show that the development in the number of universities in the developed countries depicts a thorough local growth driven by the increase in the expansion of tertiary education. This growth shows the level of country development in terms of knowledge economy and human development. It is proven that the knowledge economy index of developed economies is high as well as their level of human development index. Concerning developing countries, two trends are observed. The first concerns the traditional ways that impact on local development while the second witnesses the emergence of new sources of local growth such as the establishment of additional universities. In developing countries, development indices show declining performances and the move from old to new sources of local growth is not straightforward. Economies in transition, such as Brazil, India, China, South Africa and Turkey, have improved development indices (KEI and HDI) and their levels of response to knowledge measure is lower than those of developing economies but higher than those of developed countries. This might confirm the shift in regimes from old to new sources of local development is likely to be the major driver of better local and global economic growth. This is clearly the trend that is initiated in Morocco and that needs to be accelerated under the new status of regions and localities. Under lack of data, the above available information shows that the number of universities increases (probably regional universities), the rate of local development also increases. This process leads to additional university deposits and the transformation of research ideas and innovations into development projects and enterprises.

Conclusion

The needs of different population groups may lead to major reforms in many sectors such as education, health, finances and employment. To satisfy the majority of needs, local growth is a key factor that results specifically from the establishment of local universities in different countries thus involving both rural and urban circles in the development process. This paper has shown the role played by universities in offering knowledge in order to generalize local growth and provide population needs. The regressions analyses pursued have concluded that

the establishment of universities is the reason behind high development indices of developed countries. These regressions have shown also that developing countries have declining development indices because of the low number of universities while emerging countries have exhibited some improvement relative to the case of developing countries. Furthermore, the attained results have indicated that developing countries have more rooms for new regional universities because of the higher sensitivity of their development indices to knowledge measures. The dependence of local development on local university establishment and impact is based on the identification of each university region-specific niches and economic opportunities. This latter idea can be studied and demonstrated in future studies. The case of Morocco already points to some evidence about the role of regional universities in the local development of that specific area. The above analysis has been conclusive about the role of tertiary local education as a sure engine for local development. But, further data are needed to refine the outcomes of this paper.

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APPENDIX

Table A.1: Developed Countries

Developed	Num. Univ.	Regions	Pop18	Univ/Pop18 (000)	HDI	KEI
Australia	91	9	289624	0.31	0.937	8.97
Austria	77		100240	0.77	0.851	8.91
Bahrain	14		12280	1.14	0.801	6.04
Barbados	1		4208	0.24	0.788	7.16
Belgium	100	4	126862	0.79	0.867	8.80
Canada	204	11	450917	0.45	0.888	9.17

Croatia	26	6	55049	0.47	0.767	7.28
Cyprus	15		13366	1.12	0.810	7.50
Czech Republic	57	16	130932	0.44	0.841	7.97
Denmark	95	7	66978	1.42	0.866	9.52
Estonia	35		19175	1.83	0.812	8.42
Finland	51	22	66371	0.77	0.871	9.37
France	581	30	761763	0.76	0.872	8.40
Germany	411	13	935663	0.44	0.885	8.96
Greece	64	10	116095	0.55	0.855	7.39
Hong Kong	26		87084	0.30	0.862	8.32
Hungary	75	11	127100	0.59	0.805	8.00
Iceland	9		4529	1.99	0.869	8.95
Ireland	50		58262	0.86	0.895	9.05
Israel	33	3	110145	0.30	0.872	8.01
Italy	203	24	575897	0.35	0.854	7.79
Japan	716	9	1244995	0.58	0.884	8.42
Korea, Rep.	398		663394	0.60	0.877	7.82
Kuwait	10		40021	0.25	0.771	5.85
Latvia	63		33946	1.86	0.769	7.65
Luxembourg	4		5749	0.70	0.852	8.64
Malta	3		5608	0.53	0.815	7.58
Netherlands	160	3	201427	0.79	0.890	9.35
New Zealand	45	23	63601	0.71	0.907	8.92
Norway	67	1	62518	1.07	0.938	9.31
Poland	433	9	546668	0.79	0.795	7.41
Portugal	111	4	116911	0.95	0.795	7.61
Qatar	4		10185	0.39	0.803	6.73
Saudi Arabia	43		485787	0.09	0.752	5.31
Singapore	18	5	66174	0.27	0.846	8.44
Slovakia	33	9	78424	0.42	0.818	7.47
Slovenia	32		23185	1.38	0.828	8.15
Spain	236		453738	0.52	0.863	8.28
Sweden	50		128089	0.39	0.885	9.51
Switzerland	107	7	94647	1.13	0.874	9.01
Trinidad and Tobago	5		25029	0.20	0.736	5.59
United Arab Emirates	36		57378	0.63	0.815	6.73
United Kingdom	233	3	806680	0.29	0.849	9.10
United States	3274	28	4514594	0.73	0.902	9.02

Table A.2: Developing Countries

Developing	Num. Univ.	Regions	Pop18	Univ/Pop18 (000)	HDI	KEI
Albania	24		63603	0.38	0.719	3.96
Algeria	46		753091	0.06	0.677	3.22
Angola	8		379066	0.02	0.403	2.00
Argentina	106		684822	0.15	0.775	5.57
Armenia	19	1	61315	0.31	0.695	5.65
Azerbaijan	36		189365	0.19	0.713	3.83
Bangladesh	96		3373443	0.03	0.469	1.48
Belarus	48	7	146132	0.33	0.732	4.93

Benin	10		196395	0.05	0.435	2.05
Bolivia	46		202613	0.23	0.643	3.46
Bosnia and Herzegovina	37	3	51450	0.72	0.710	4.58
Botswana	3		44108	0.07	0.633	3.88
Bulgaria	60		93802	0.64	0.743	6.99
Burkina Faso	2	13	323167	0.01	0.305	1.71
Cambodia	34		362275	0.09	0.494	1.56
Cameroon	12	11	418946	0.03	0.460	1.71
Cape Verde	3		12623	0.24	0.534	3.35
Costa Rica	58		89194	0.65	0.725	6.03
Cote d'Ivoire	4	19	446357	0.01	0.397	1.65
Djibouti	1	3	19311	0.05	0.402	1.47
Dominican Republic	33		186288	0.18	0.663	3.85
Ecuador	70		261550	0.27	0.695	3.90
El Salvador	28		133145	0.21	0.659	4.06
Ethiopia	34	11	1834106	0.02	0.328	1.30
Fiji	4		16530	0.24	0.669	4.20
Georgia	17	11	74864	0.23	0.698	5.21
Ghana	28	12	521663	0.05	0.467	2.46
Guatemala	22		290970	0.08	0.560	2.89
Guinea	1	8	197600	0.01	0.340	1.07
Guyana	1	10	11621	0.09	0.611	4.57
Honduras	13		162495	0.08	0.604	3.21
Iran	533		1777261	0.30	0.702	3.75
Jamaica	10		55482	0.18	0.688	4.90
Jordan	37		122997	0.30	0.681	5.54
Kazakhstan	116		308677	0.38	0.714	5.05
Kenya	44		833810	0.05	0.470	2.77
Kyrgyzstan	11		119132	0.09	0.598	4.29
Lao PDR	3		146135	0.02	0.497	1.94
Lesotho	1		49363	0.02	0.427	2.05
Lithuania	48		52911	0.91	0.783	7.77
Macedonia	11		31928	0.34	0.701	5.58
Madagascar	10	24	419530	0.02	0.435	2.21
Malawi	5		301417	0.02	0.385	1.69
Mauritania	2	14	65167	0.03	0.433	2.36
Mauritius	3		20567	0.15	0.701	5.48
Moldova	20		73617	0.27	0.623	5.07
Mongolia	16		61943	0.26	0.622	4.72
Mozambique	7		457049	0.02	0.284	1.58
Myanmar	4		936540	0.00	0.451	1.34
Namibia	4	15	52934	0.08	0.606	4.28
Nepal	20		620385	0.03	0.428	1.74
Nicaragua	31		128238	0.24	0.565	2.81
Nigeria	85		3275446	0.03	0.423	1.84
Pakistan	270	1	3949225	0.07	0.490	2.34
Panama	23		60305	0.38	0.755	5.16
Paraguay	43		131340	0.33	0.640	4.00
Romania	111		292561	0.38	0.767	6.43
Rwanda	5		245946	0.02	0.385	1.14
Senegal	7	15	273491	0.03	0.411	2.57
Sierra Leone	2		118263	0.02	0.317	0.96
Sri Lanka	30		337308	0.09	0.658	4.17

Sudan	35	6	826528	0.04	0.379	1.78
Swaziland	1		30350	0.03	0.498	2.78
Syria	20		446389	0.04	0.589	3.09
Tajikistan	6		169459	0.04	0.580	3.22
Tanzania	32	27	872082	0.04	0.398	2.17
Tunisia	44		211737	0.21	0.683	4.42
Uganda	17		695336	0.02	0.422	2.36
Ukraine	330	2	664120	0.50	0.710	6.00
Uruguay	14		52397	0.27	0.765	6.49
Uzbekistan	36		654852	0.05	0.617	3.25
Venezuela	58	1	544602	0.11	0.696	4.18
Vietnam	86		1919088	0.04	0.572	3.51
Yemen	12		536434	0.02	0.439	2.20
Zambia	8		269983	0.03	0.395	2.12
Zimbabwe	8		344314	0.02	0.140	2.25

Table A.3: Emerging Countries

Emerging Countries	Num. Univ.	Regions	Pop18	Univ/Pop18 (000)	HDI	KEI
Brazil	1379	1	3356043	0.41	0.699	5.66
Chile	82	20	302144	0.27	0.783	7.09
China	1156	4	22349307	0.05	0.663	4.47
Colombia	282		887875	0.32	0.689	4.84
Czech Republic	57	16	130932	0.44	0.841	7.97
Egypt	52		1556129	0.03	0.62	4.08
Hungary	75	11	127100	0.59	0.805	8.00
India	1555	22	23624450	0.07	0.519	3.09
Indonesia	342		4242607	0.08	0.6	3.29
Malaysia	77		521077	0.15	0.744	6.07
Mexico	906	9	2024917	0.45	0.75	5.33
Morocco	95	16	650413	0.15	0.567	3.54
Peru	93	25	572907	0.16	0.723	4.79
Philippines	289	18	1845449	0.16	0.638	4.12
Poland	433	9	546668	0.79	0.795	7.41
Russia	671		2099258	0.32	0.719	5.55
South Africa	26		983380	0.03	0.597	5.38
Thailand	150	1	977756	0.15	0.654	5.52
Turkey	162	7	1357648	0.12	0.679	5.55

Table A.4: Developed Countries (Logarithm form)

Developed	Num. Univ.	Univ/Pop18 (000)	HDI	KEI
Australia	4.51086	-1.16	-0.07	2.19
Austria	4.34381	-0.26	-0.16	2.19
Bahrain	2.63906	0.13	-0.22	1.80
Barbados	0	-1.44	-0.24	1.97
Belgium	4.60517	-0.24	-0.14	2.17
Canada	5.31812	-0.79	-0.12	2.22
Croatia	3.2581	-0.75	-0.27	1.99
Cyprus	2.70805	0.12	-0.21	2.01

Czech Republic	4.04305	-0.83	-0.17	2.08
Denmark	4.55388	0.35	-0.14	2.25
Estonia	3.55535	0.60	-0.21	2.13
Finland	3.93183	-0.26	-0.14	2.24
France	6.36475	-0.27	-0.14	2.13
Germany	6.01859	-0.82	-0.12	2.19
Greece	4.15888	-0.60	-0.16	2.00
Hong Kong	3.2581	-1.21	-0.15	2.12
Hungary	4.31749	-0.53	-0.22	2.08
Iceland	2.19722	0.69	-0.14	2.19
Ireland	3.91202	-0.15	-0.11	2.20
Israel	3.49651	-1.21	-0.14	2.08
Italy	5.31321	-1.04	-0.16	2.05
Japan	6.57368	-0.55	-0.12	2.13
Korea, Rep.	5.98645	-0.51	-0.13	2.06
Kuwait	2.30259	-1.39	-0.26	1.77
Latvia	4.14313	0.62	-0.26	2.03
Luxembourg	1.38629	-0.36	-0.16	2.16
Malta	1.09861	-0.63	-0.20	2.03
Netherlands	5.07517	-0.23	-0.12	2.24
New Zealand	3.80666	-0.35	-0.10	2.19
Norway	4.20469	0.07	-0.06	2.23
Poland	6.07074	-0.23	-0.23	2.00
Portugal	4.70953	-0.05	-0.23	2.03
Qatar	1.38629	-0.93	-0.22	1.91
Saudi Arabia	3.7612	-2.42	-0.29	1.67
Singapore	2.89037	-1.30	-0.17	2.13
Slovakia	3.49651	-0.87	-0.20	2.01
Slovenia	3.46574	0.32	-0.19	2.10
Spain	5.46383	-0.65	-0.15	2.11
Sweden	3.91202	-0.94	-0.12	2.25
Switzerland	4.67283	0.12	-0.13	2.20
Trinidad and Tobago	1.60944	-1.61	-0.31	1.72
United Arab Emirates	3.58352	-0.47	-0.20	1.91
United Kingdom	5.45104	-1.24	-0.16	2.21
United States	8.09377	-0.32	-0.10	2.20

Table A.5: Developing Countries (Logarithm form)

Developing	Num. Univ.	Univ/Pop18 (000)	HDI	KEI
Albania	3.17805	-0.97	-0.33	1.38
Algeria	3.82864	-2.80	-0.39	1.17
Angola	2.07944	-3.86	-0.91	0.69
Argentina	4.66344	-1.87	-0.25	1.72
Armenia	2.94444	-1.17	-0.36	1.73
Azerbaijan	3.58352	-1.66	-0.34	1.34
Bangladesh	4.56435	-3.56	-0.76	0.39
Belarus	3.8712	-1.11	-0.31	1.60

Benin	2.30259	-2.98	-0.83	0.72
Bolivia	3.82864	-1.48	-0.44	1.24
Bosnia and Herzegovina	3.61092	-0.33	-0.34	1.52
Botswana	1.09861	-2.69	-0.46	1.36
Bulgaria	4.09434	-0.45	-0.30	1.94
Burkina Faso	0.69315	-5.09	-1.19	0.54
Cambodia	3.52636	-2.37	-0.71	0.44
Cameroon	2.48491	-3.55	-0.78	0.54
Cape Verde	1.09861	-1.44	-0.63	1.21
Costa Rica	4.06044	-0.43	-0.32	1.80
Cote d'Ivoire	1.38629	-4.71	-0.92	0.50
Djibouti	0	-2.96	-0.91	0.39
Dominican Republic	3.49651	-1.73	-0.41	1.35
Ecuador	4.2485	-1.32	-0.36	1.36
El Salvador	3.3322	-1.56	-0.42	1.40
Ethiopia	3.52636	-3.99	-1.11	0.26
Fiji	1.38629	-1.42	-0.40	1.44
Georgia	2.83321	-1.48	-0.36	1.65
Ghana	3.3322	-2.92	-0.76	0.90
Guatemala	3.09104	-2.58	-0.58	1.06
Guinea	0	-5.29	-1.08	0.07
Guyana	0	-2.45	-0.49	1.52
Honduras	2.56495	-2.53	-0.50	1.17
Iran	6.27852	-1.20	-0.35	1.32
Jamaica	2.30259	-1.71	-0.37	1.59
Jordan	3.61092	-1.20	-0.38	1.71
Kazakhstan	4.75359	-0.98	-0.34	1.62
Kenya	3.78419	-2.94	-0.76	1.02
Kyrgyzstan	2.3979	-2.38	-0.51	1.46
Lao PDR	1.09861	-3.89	-0.70	0.66
Lesotho	0	-3.90	-0.85	0.72
Lithuania	3.8712	-0.10	-0.24	2.05
Macedonia	2.3979	-1.07	-0.36	1.72
Madagascar	2.30259	-3.74	-0.83	0.79
Malawi	1.60944	-4.10	-0.95	0.52
Mauritania	0.69315	-3.48	-0.84	0.86
Mauritius	1.09861	-1.93	-0.36	1.70
Moldova	2.99573	-1.30	-0.47	1.62
Mongolia	2.77259	-1.35	-0.47	1.55
Mozambique	1.94591	-4.18	-1.26	0.46
Myanmar	1.38629	-5.46	-0.80	0.29
Namibia	1.38629	-2.58	-0.50	1.45
Nepal	2.99573	-3.43	-0.85	0.55
Nicaragua	3.43399	-1.42	-0.57	1.03
Nigeria	4.44265	-3.65	-0.86	0.61
Pakistan	5.59842	-2.68	-0.71	0.85
Panama	3.13549	-0.96	-0.28	1.64
Paraguay	3.7612	-1.12	-0.45	1.39
Romania	4.70953	-0.97	-0.27	1.86
Rwanda	1.60944	-3.90	-0.95	0.13
Senegal	1.94591	-3.67	-0.89	0.94
Sierra Leone	0.69315	-4.08	-1.15	-0.04
Sri Lanka	3.4012	-2.42	-0.42	1.43
Sudan	3.55535	-3.16	-0.97	0.58
Swaziland	0	-3.41	-0.70	1.02

Syria	2.99573	-3.11	-0.53	1.13
Tajikistan	1.79176	-3.34	-0.54	1.17
Tanzania	3.46574	-3.31	-0.92	0.77
Tunisia	3.78419	-1.57	-0.38	1.49
Uganda	2.83321	-3.71	-0.86	0.86
Ukraine	5.79909	-0.70	-0.34	1.79
Uruguay	2.63906	-1.32	-0.27	1.87
Uzbekistan	3.58352	-2.90	-0.48	1.18
Venezuela	4.06044	-2.24	-0.36	1.43
Vietnam	4.45435	-3.11	-0.56	1.26
Yemen	2.48491	-3.80	-0.82	0.79
Zambia	2.07944	-3.52	-0.93	0.75
Zimbabwe	2.07944	-3.76	-1.97	0.81

Table A.6: Emerging Countries (Logarithm form)

Emerging Countries	Num. Univ.	Univ/Pop18 (000)	HDI	KEI
Brazil	7.22911	-0.89	-0.36	1.73
Chile	4.40672	-1.30	-0.24	1.96
China	7.05272	-2.96	-0.41	1.50
Colombia	5.64191	-1.15	-0.37	1.58
Czech Republic	4.04305	-0.83	-0.17	2.08
Egypt	3.95124	-3.40	-0.48	1.41
Hungary	4.31749	-0.53	-0.22	2.08
India	7.34923	-2.72	-0.66	1.13
Indonesia	5.83481	-2.52	-0.51	1.19
Malaysia	4.34381	-1.91	-0.30	1.80
Mexico	6.80904	-0.80	-0.29	1.67
Morocco	4.55388	-1.92	-0.57	1.26
Peru	4.5326	-1.82	-0.32	1.57
Philippines	5.66643	-1.85	-0.45	1.42
Poland	6.07074	-0.23	-0.23	2.00
Russia	6.50877	-1.14	-0.33	1.71
South Africa	3.2581	-3.63	-0.52	1.68
Thailand	5.01064	-1.87	-0.42	1.71
Turkey	5.0876	-2.13	-0.39	1.71