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Digital Divide in Mexico

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Abstract

Enthusiasm for the benefits of the information revolution is boundless; it promises to provide economic opportunity, growth and democratic communication. Yet, these promises are fulfilled only to those with access and competence to use these new technologies. Stark international and national contrasts exist between those who have access to the information technologies and those who have not. Despite the increasing attention digital divide issues have received in the public arena, in the academic literature, there is no consensus regarding the appropriate policy to implement. This paper draws on the different policy trajectories recommended by the literature of telecommunications development and uses them as an analytical lens to examine the case of a developing country like Mexico. It explores the underpinnings of the digital divide in Mexico and provides the data that substantiates the concept. The argument in this paper is that the Social Capital *concept is useful in the design and implementation of a universal access policy. From this standpoint, the focus of the debate moves beyond short term supply considerations to dynamic issues such as technological adoption in an asset-based community development.*

Resumen

Existe un entusiasmo ilimitado por los beneficios asociados a la revolución en información; promete proveer oportunidades económicas, crecimiento y comunicación democrática. Sin embargo, tales promesas son alcanzables únicamente por aquellos que tienen acceso y capacidades para emplear las nuevas tecnologías de la información. Existen dramáticas diferencias entre aquellos que tienen acceso a las tecnologías de la información y aquellos que no la tienen. A pesar de la creciente atención que los temas de brecha digital han capturado en la agenda pública, no existe un consenso en la literatura académica, respecto a que política pública debe diseñarse en este tema. Este documento analiza las diferentes sugerencias de políticas regulatorias que se desprenden de la literatura sobre brecha digital y las utiliza como lente analítico para examinar el caso de un país en desarrollo como es el de México. El argumento central, en este documento, es que el concepto de Capital Social resulta útil en el diseño e implementación de una política de acceso universal. Desde esta perspectiva, el foco del debate se traslada más allá de consideraciones de oferta de corto plazo hacia temas dinámicos tal como la adopción efectiva de la tecnología en el desarrollo comunitario basado en activos propios.

Introduction

Enthusiasm for the benefits of the information revolution is boundless. From this perspective the New Economy is driven by the innovation in communication technologies and it promises to provide economic opportunity, growth and democratic communication. The Internet is expected to do no less than virtually transform society. Yet, these promises are fulfilled only to those with access and competence to use these new technologies. Stark international and national contrasts exist between those who have access to the information technologies and those who have not. Telecommunications reforms in recent years have extended the scale and scope of services; however, in many countries even basic telecommunications services are still unavailable to significant segments of the population.

The widening gap between the information haves and information have-nots labeled as the digital divide is "the gap between individuals, households, business and geographic areas at different socio-economic levels with regard both to the their opportunities to access information and communication technologies (ICTs) and to their use of the Internet for a wide variety of activities" OECD (2001) This concept has gained significant attention as a public issue both at the national and the international level; it is frequently used as a lever in policy recommendations for telecommunications reform. International organisms are offering options and best practices to national governments who are implementing policies that seek to extend access to telecommunications services beyond what the market is providing.

Despite the increasing attention digital divide issues have received in the public arena, in the academic literature, there is no consensus regarding the appropriate policy to implement. The debate on the digital divide in the literature of telecommunications policies has taken place along a spectrum that argues, on one end, that the market alone will take care of any perceived disparities and, on the other end, that governments should implement policies that subsidize access in some fashion. Clearly, whether any of these views becomes prevalent has important economic and political consequences for countries seeking to address this policy issue. This literature, however, is based mostly on the experience of developed countries where the digital divide takes on quite a different dimension than that of developing countries.

This paper will examine the concept of the digital divide as it applies to Mexico; it will explore the underpinnings of this gap and provide the data that substantiates the concept. What is the reality that a developing country, such as Mexico faces in terms of telecommunications access? How does this reality relate to the literature on the subject?

The first round of reforms in Mexico was successful in transforming the path of telecommunications development in the country. Privatization and the

introduction of competition increased telephone penetration, technologically upgraded the network and reduced tariffs. Moreover, the main international players were attracted to the Mexican telecommunications industry.

Indeed, the obligations imposed to the incumbent firm Telmex in 1990, when it was privatized, were fulfilled. The network was expanded at a 12.5 percent during the next five years following privatization and telephone lines were installed in areas with 2,500 inhabitants. As competition was introduced, in 1996, the growth of the network was strengthened and tariffs were further diminished. These results are consistent with evidence from cross-country empirical research in both developed and developing countries that finds that competition and privatization of state-owned utilities increase service availability and reduce retail prices. (Petrazzini, 1996; Wallsten, 2001)

However, this paper examines perhaps the most significant shortcoming of the reform, i.e., the notably low telephone penetration rates that lead to a considerable digital divide. Telephone penetration in Mexico is lower than many Latin American countries and developing countries. The regional distribution of telephone services, mostly located in urban developed areas, imply that the benefits of technological innovation in telecommunications have not reached the majority of Mexicans.

The evidence presented in this paper corroborate findings in cross-country empirical studies that indicate that telecommunications deployment has increased inequality in terms of access (Forestier, Grace & Kenny, 2002). The policy suggestions that stem from the review of the literature and from the evidence presented are that the costs associated with not implementing a policy program to bridge the digital divide are high. A policy access program should include a broad rationale that integrate supply and demand factors in order to exploit in significant ways the opportunities offered by ICTs.

Historical Context

Questions concerning access to the telephone network are almost as old as the technology itself. We can trace the origin of the universal service policy back to the 1920s. During the early period of development of the telephone system in the United States, from 1894-1914, there was strong competition in the sector given the expiration of the patent rights that Bell had won in 1887. Under the leadership of Theodore Vail, the Bell system employed a number of aggressive practices to prevent entry including acquiring independent companies.

Vail argued this cumbersome form of competition for the users should be transformed into a regulated monopoly: a single entity could best provide telephone services. The concept of "Universal Service", which was to become a central component of U.S. telecommunications regulatory policy, was first

put forward in the slogan made by Vail: "one policy, one system, and universal service".

What Vail meant by universal service is currently under debate. The traditional view commends the Bell system with a public service spirit where universal service came to mean regulatory policies that kept rates low to promote availability of telephones to everybody who wanted one. However, according to a more recent view sustained Mueller (1977), universal service did not mean that everyone should have a telephone, but that everyone that did should have a Bell telephone! From this perspective, Vail only meant the consolidation of competing companies into local monopolies so that all telephone users could be interconnected. Mueller argues that the Bell's public relations machine was responsible for creating a historical myth around the concept of universal service. In its efforts to preclude antitrust claims during the early 1970s, Bell argued that low rates were a result of a regulated monopoly. Mueller claims it was AT&T's chairman John DeButts's speech in 1973 before the National Association of Regulatory Utility Commissioners that created the perception that Bell's regulated monopoly was the instrument to achieve low rates for all. Thus, from Mueller's perspective, universal service was a myth that resulted from AT&T re-writing telephone history in the 1970´s.

Horrigan (1998), however, finds evidence that elements of the universal service objective existed well before the 1970´s; Theodore Vail himself, wrote "with a large population with large potentialities, the experience of all industrial and utility enterprises has been that it adds to the permanency and undisturbed enjoyment of a business…if the prices are put at such a point as will create a maximum consumption at a small percentage of profits". The fact is that concerns about the importance of having a telephone were present in the early part of the century. In 1914, McClure's Magazine remarked on Bell's efforts to "democratize this instrument -to make it part of the daily life of every man, woman, and child[1]" And by 1931, a presidential commission stated: "to be without a phone or a telephone listing is to suffer a curious social isolation in a telephonic age" (Hadden, 1994).

Whether it was Vail who introduced the concept of universal service (low rates to promote subscribership) to the government agenda or not, the Bell System used this public concern to its advantage, and promoted the idea that the best way to advance universal service was through a regulated monopoly. At the same time, the notion of telephone services as a natural monopoly took hold in the public opinion. The theoretical literature on natural monopoly, prevailing since the late 1880s[2], supported the idea that utilities because of economies of scale and scope should be regulated as natural monopolies. In this context, the role of the government was to prevent the monopoly from

[1] Quoted by Horrigan (1998).

[2] Carter Adams examined the firm's costs in an attempt to define which industries should be regulated in a study of 1887. The natural monopoly label was coined by Richard T. Ely.

abusing its dominant power while protecting it from entrance and the monopoly in return would advance universal service.

Current Policy Debate

During the period of a seamless network monopoly, the central mechanism used to make telephone service more affordable for rural and residential users was cross subsidies of local residence telephone rates by long-distance and business rates. Today, as competition has become the main driving force of network expansion; cross-subsidies create inefficiencies and may be used as an unfair competitive practice by the incumbent. Thus, subsidies can no longer be implicit but need to become explicit transfers between providers and users. In the current context of a more competitive market structure more targeted mechanisms have developed that have now become the focus of a policy debate.

The debate on universal service led to what Lloyd Morrisett, the former president of Markle Foundation, labeled as the Digital Divide between the information "haves" and "have-nots" (Compaine, 2001). Some of the uncertainties under dispute are how the policy issue is to be defined, whether in fact it is a substantial policy issue and if it is how to achieve it. The debate on the digital divide has taken place along a spectrum that argues, on one end, that the market alone will take care of any perceived disparities and, on the other end, that governments should implement policies that subsidize access in some fashion. The basic question that surrounds the digital divide debate is why are Information Technologies of Communications (ICT) sufficiently special that society should support its consumption rather than other goods and services? The different answers given to this question reflect the state of the debate that this paper classifies into three perspectives that have distinctive policy implications and are shown in Table 1.

T A B L E 1

CURRENT DEBATE ON THE DIGITAL DIVIDE

THEORETICAL PERSPECTIVES	POLICY IMPLICATIONS
MARKET ECONOMY MARKET AS THE ENGINE OF GROWTH AND THUS EXPANSION OF TELECOMMUNICATIONS	POLICIES THAT PROMOTE COMPETITION AND DIRECT POVERTY REDUCTION POLICIES
KNOWLEDGE ECONOMY ICT AS THE ENGINE OF GROWTH	PRO-ACTIVE SUPPORT TO THE CONSUMPTION OF TELECOMMUNICATIONS SERVICES
SOCIAL CAPITAL COMMUNITY BASED ECONOMIC GROWTH	INTEGRAL POLICIES THAT PROMOTE ACCESS

Market Economy. From the market economy perspective, it is argued that if regulation rather than market forces drives the deployment of ICT, technological innovation will not be encouraged and prices will increase for many users. Moreover, subsidies can distort investment patterns and lead to inefficient resource allocation (Moshella and Atkinson, 1998). Mueller (1997) argues that public policies designed to promote universal telecommunications access are simply a form of wealth redistribution. Such a policy takes away money from those who can easily afford it, and gives it to those who cannot. And wealth redistribution is a political process that often times diverges from its original objective.

In this view, universal access policies should not try to substitute sound economic policies. The strong positive correlation between economic growth and telecommunications infrastructure is not considered a justification for government intervention. "Rich countries have the highest levels of telephone penetration because wealth causes penetration levels to reach universal levels and not the other way around." (Mueller, 2001). So, the most effective universal policies are simply to foster economic growth through an open competitive economy that can supply telecommunications services.

In this same vein, Robert Crandall (2001) argues that the current universal service policy in the U.S. is not an efficient mechanism for creating a more equitable distribution of income. If there is a concern about lack of affordability in some households then better options are some form of direct income distribution policy. In terms of income distribution, universal policies

can only have a marginal contribution to the distribution of telecommunication resources.

From a similar angle, Tsen and Ho (2001) argue that "Far from being an equalizer, the information technology might further degenerate the digital divide worldwide. The minimal effect of technological network unveils the myth of equalizer and universal better off hypotheses"[3]. The results of the regression study conducted in this paper suggest that even though the growth of the Internet may enhance economic productivity, it shows no direct impact on the distribution of income. They find GDP per capita is the most significant factor determining deployment and thus suggest the importance of improving economic performance and distribution to address the level of income inequality.

Knowledge Economy. From the knowledge economy perspective there is a clear need to bridge the digital divide by subsidizing access to telecommunication services because of its contribution to economic development. In developing countries, low income groups often do not have access to vital resources such as water or electricity. In these cases there are other important divides, there are economic, social and political divides, so why are ICT sufficiently special that society should support its consumption rather than other goods and services?

The answer from this perspective is that ICT has the potential of improving the living conditions of disadvantaged groups by helping them increase their income. Telecommunications is a key infrastructure that promotes development through the combination of three factors; externalities, knowledge creation and regional development.

Externalities. Externalities appear in cases where some important element of a market exchange is not considered in the payment received for the value delivered. A transaction generates un-priced benefits to outside parties. In telecommunications, network externalities imply that the private benefits that a new consumer receives from connecting are less than the total benefits to society because many people may benefit when an additional person is connected. In other words, the value of the network to each of its subscribers grows as the number increases. Thus, subsidizing telecommunications services creates positive externalities.

Knowledge Creation. Telecommunications services as a channel of information are considered a form of knowledge creation. From this perspective ICT is regarded as a merit good, a service that society believes everyone should have access to because of its direct impact on poverty reduction. A first impact ICT can have on poverty reduction is through education. The Internet provides a virtual classroom in which interactivity and the sharing of knowledge and

[3] Shu-Fen Tseng and Chin-Chang Ho (2001) The Global Digital Divide and Social Inequality: Universal or Polarizad? Paper submitted to the Annual Meeting of the American Sociological Association, August 18-21, 2001

resources takes place. In the U.S., the Telecommunications Act of 1996, states as one of its primary roles ubiquitous Internet access from all schools. The enthusiasm for the possibilities of transforming society through the Internet are clearly expressed in William Clinton's "Call to Action for American Education", the Information Superhighway "will harness the powerful forces of science and technology" (Clinton, 1997).

The impact ICT can have on education is supported by the knowledge building perspective, here it is believed that government support for access to advanced technology leads to economic growth. This argument is closely related to the endogenous growth theory as innovation and technology development is determined by learning. Paul Romer (1986) proposes a model where economic growth is driven by the accumulation of knowledge; knowledge is the basic form of capital. Because investment in knowledge has a natural externality, that is knowledge can not be perfectly patented, and ICT is a channel for learning, some form of support to access to the Internet would be justified.

Bar and Riis (1998) claim that the need to nurture learning mechanisms constitutes a powerful argument for broadening the universal service concept to promote access to advance networking technologies for schools, libraries and medium sized companies. These authors suggest that the success or failure of the learning process is given by the interaction between users and providers. With more and more varied ICT users that interact with producers in the innovation of goods and services, alternative paths will be explored, innovations will not only respond to the needs of traditional sophisticated users that have dominated the network. By promoting broader access to ICT universal service policies can thus help develop an information society that involves a broader range of citizens.

Following the nature of ICT as channels of information, a second important poverty reduction mechanism is through the support of health services. The ITU report on Internet for Development (ITU, 1999) observes that the most immediate impact that the Internet can have is on the volume and flow of medical information. A third area of impact is productivity and income generation. ICT give small enterprises access to market information, input prices and output markets and it may strengthen forward linkages to national and international markets. (Van Crowder, 1997)

Regional Development. Associated to the view of telecommunications as a key infrastructure to the economic development prospects of regions, cities, and rural areas are the benefits of telecommunications to community development. Experts agree that the relationship between investment in telecommunications infrastructure and economic development outcomes is indirect and complex, and thus difficult to measure (Saunders, *et. al.*, 1994; *Science and Engineering Indicators 2000*). Macroeconomic, or country-level, benefits include telecom infrastructure as a factor of production. Telephone

density correlates with the "wealth of nations" (Saunders, *et. al.*, 1994,). Youtie and Read (1996) focus on the benefits of telecommunications infrastructure to firm location decisions, increased firm productivity, and regional advantage. Cronin (1995) asserts that telecommunications is a "ubiquitous input to the production of every good and service in the economy" such that telecom investments affect economic outcomes as well as vice versa. Wilson (1999) views telecommunications as a facilitating component of community development. Hudson (1997) focuses on the development benefits of telecommunications as increasing efficiency, effectiveness, and equity. Access to information facilitated by telecommunications infrastructure has social benefits in the delivery of health care and education services to remote locations. The most concrete evidence of the telecommunications' and information technologies' benefits has been obtained through firm-level analysis *Science and Engineering Indicators 2000* (Calabrese & Jung, 1992; Hobbs & Blodgett, 1999; Wilson, 1999). A number of studies emphasize the advantages that new technologies could bring to rural or distressed areas by reducing the importance of market proximity and transportation costs in business location decisions.

Social Capital. Closely associated to the economic regional development point of view is the social capital perspective that stresses the social and political benefits of telecommunications access. Pool (1983) was one of the first to write on the importance of access to the telephone. In *Social Effects of the Telephone,* Pool described how the telephone has expanded human freedom. From the political science perspective, the concept of social capital attempts to incorporate factors that bind communities together. Robert Putman views social capital as a set of "horizontal associations" among people that have an effect on the productivity of the community. Moreover, Putman argues, there is growing evidence that social capital can have an impact on development outcomes, including growth, equity and poverty alleviation. Associations and institutions provide an informal framework for sharing information, coordinating activities and making collective decisions.

Horrigan (2002) links the notion of social capital as developed by Putman with the concept of institutions as reducing transactions costs (North, year). Horrigan argues that the Internet can play a role in reducing transactions costs and, thereby building social capital. Through this process, the Internet has the potential to serve as a catalyst to overcoming the friction that is part of any collective action. The Internet can clearly facilitate the network of information exchange that can aid cooperation.

While in this perpective there is a consensus that more effective and efficient use of ICT can stimulate economic growth and development, there is concern on how such benefits can be distributed among the minority of ICT users and the majority of those who have no access to telecom services. In developing countries where there is a wide gap between rich and poor, it is

possible that ICT may reinforce, or widen, existing social and economic inequalities in these countries. Failures in ICT implementation show that learning is a critical feature of technological change. Accumulated knowledge, learning by doing over time represents the most significant factor in the ability to implement new technologies. Some of the constraints that many developing countries face in distributing telecom services to the poor are human capabilities, urban and rural locations affordability and information content.

Hunter Wade (2002) argues that ICT is being oversold as the key to higher efficiency. ICT tools can help people learn how to absorb knowledge generated elsewhere and thus help raise income but it cannot leapfrog institutional obstacles as well as skill and resource deficiencies. Indeed, the ICT-for-development literature is biased toward the supply side and gives little attention to demand. The lesson from successful implementation of ICT in East Asian countries is that along with the supply of ICT, government promotes education in technical skills. ICT is in danger of being captured by the existing organizational inefficiencies. Moreover, developing countries are in danger of locking themselves into a new form of e-dependency on developed countries as they introduce software and hardware systems that they have no capacity to maintain for themselves.

In thinking about the digital divide in developing countries, it is worth taking Pinkett's (2000) notion of "shared constructive activity". Building from Kretzman and McKnights (1993) concept of asset-based community development, Pinkett argues that communities need to look inward to the assets and capabilities that may strengthen the possibilities of successfully implementing ICT.

In a study of how community institutions are responding to the various possibilities presented by the Internet, Horrigan (2002) shows that the Internet novelty resulted in numerous meetings of people to develop plans to integrate ICT into their missions. Some of his results show that the Internet serves as a catalyst to new types of cooperation. This catalytic effect means that the Internet facilitates a rich new network of information exchange that results in the development of Internet content as the output of cooperative activity between individuals and is a sign of the construction of social capital.

This literature is based mostly on the experience of developed nations. Within developed countries the differences in access that existed in the early stages of the Internet are rapidly fading away with its widespread diffusion. The digital divide in these countries refers to the quality of Internet access (Castells, 2002).

The situation in developing nations is quite different. As Lisa Servon (2002) puts forward, the digital divide is a symptom of a much larger divide –the problem of persistent poverty and inequality. The problem of poverty and inequality is much more acute and widespread in developing countries. How may these different perspectives apply to the reality of a developing country

such as Mexico? The following section will offer data that substantiates the concept of a digital divide in Mexico.

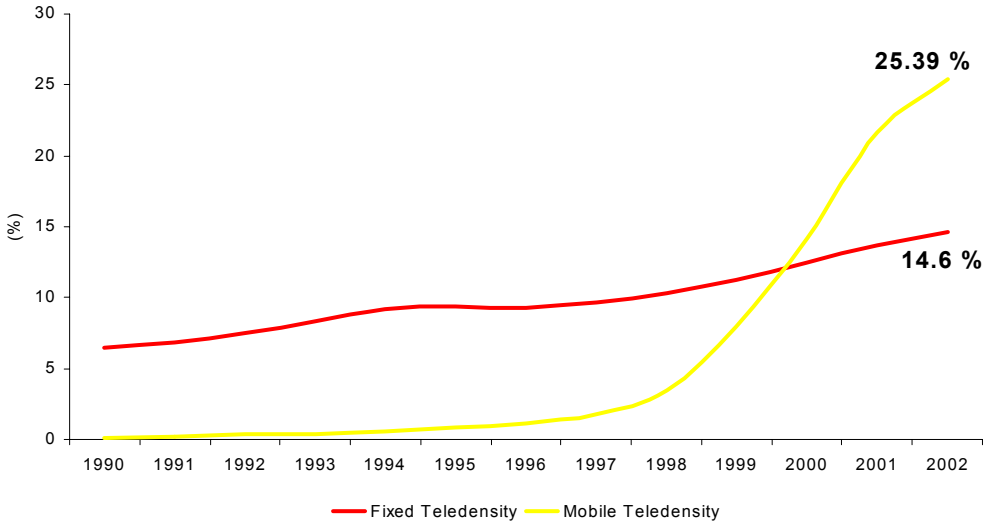
This section will reveal that while it is clear that there is a positive relationship between between ICT adoption and economic growth, i.e, the digital divide is an effect of the underlying social and economic divides, a comparison of countries with similar economic and social conditions show a divergent trend in ICT adoption. That is, there is a significant digital divide gap between countries that is not explained by economic growth.

Digital Divide in Mexico

The first round of reforms in Mexico led to a significant increase in network penetration. New telephone lines were installed in towns with a population of 500 or more; between 1990 and 2002, the number of lines increased from 5,352 to 14,941. As Graph 1 depicts, fixed telephone lines increased 14.6 percent during the period 1990 to 2002 while mobile telephony increased at a rate of 25.39 percent. These trends coroborate studies that find evidence indicating that countries that have introduced competition into their telecommunications market have achieved a higher level of penetration (Petrazzini and Clark, 1996; Wallsten, 1999; Noll, 2001; Melody, 2001). Petrazzini and Clark find that cellular teledensity is increasing for both competitive and non-competitive markets, but the rate of teledensity growth in competitive markets is significantly higher than that in non-competitive markets. Competition in cellular services, which has been introduced more widely and for a longer period of time than competition in wireline services in developing countries, clearly has led to much greater network penetration than monopolies. Graph 2 shows how cellular teledensity in Latin America has grown at a faster speed in competitive markets than in monopoly markets.

G R A P H 1

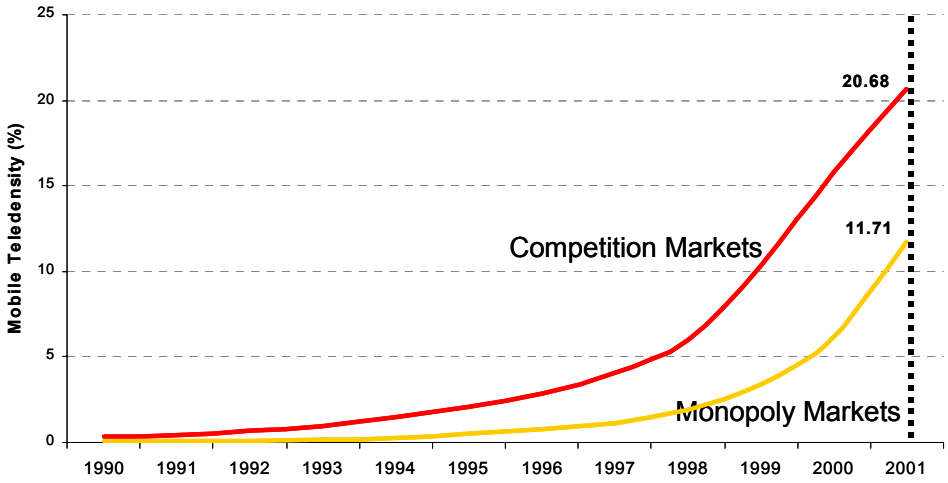
FIXED AND MOBILE TELEDENSITY



Source: TELECOM-DATA from: ITU & COFETEL

G R A P H 2

COMPETITION GENERATES INCREASED PENETRATION

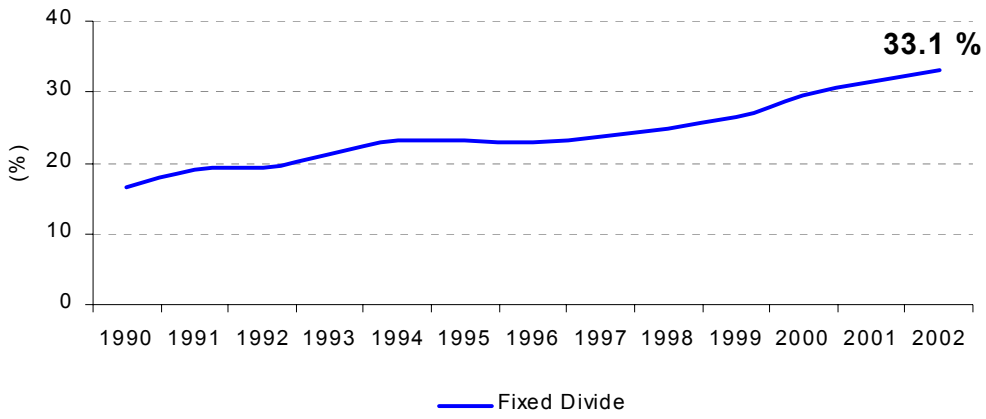


Source: TELECOM-DATA from: ITU

However, even though the absolute number of telephone lines has increased, the distribution of network penetration is very unequal; the digital divide within Mexico has increased significantly. Graph 3 shows, for the year 2001, the difference in the growth of fixed penetration between Mexico City and Chiapas while Graph 4 shows the difference in growth of mobile penetration between region 1 and region 7. The stark differences in connectivity between these areas are clearly the result of socio-economic factors that may be reinforced by the increased marginalization caused by the lack of access to ICTs. These results are compatible with empirical studies that suggest that, historically, telecommunications rollout has had the effect of increasing inequality as the new technologies have benefited the wealthier (Forestier, Grace & Kenny, 2002).

G R A P H 3

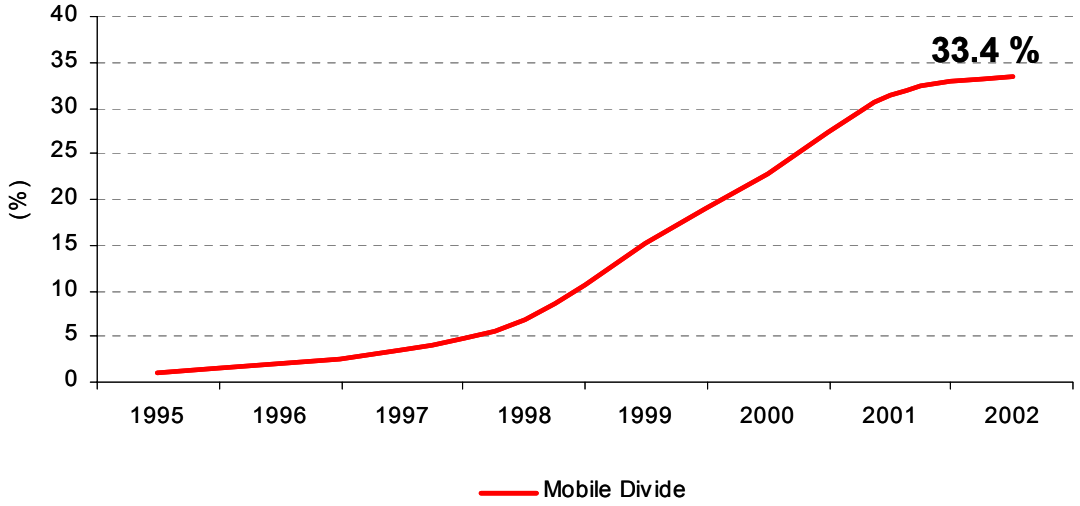
DIFFERENCE IN GROWTH BETWEEN MEXICO CITY AND CHIAPAS



Source: TELECOM-DATA from: COFETEL

G R A P H 4

DIFFERENCE IN GROWTH BETWEEN REGIONS IN MEXICO



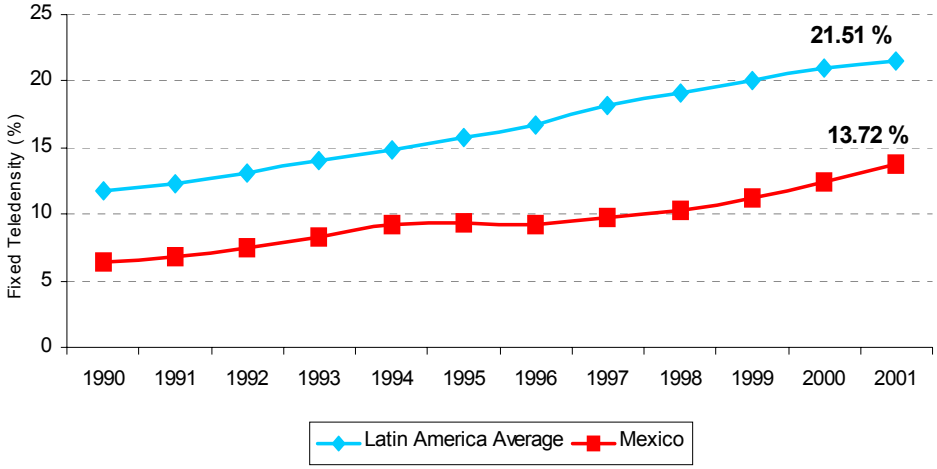
Mobile Divide between Region 1 (Baja California, Baja California Sur, Sonora) and Region 7 (Veracruz, Puebla, Oaxaca, Guerrero, Tlaxcala)
Source: TELECOM-DATA from: COFETEL

Addressing Muller's assertion that rich countries have the highest levels of telephone penetration because wealth causes allocation levels to reach universal levels and not the other way around, a comparison is made between countries with similar GDPs and the teledensity levels reached. Graph 5 shows the average performance of Latin American countries in terms of fixed teledensity compared to that of Mexico; countries with similar GDP have reached a higher fixed teledensity than Mexico. Moreover, countries with a similar or even lower GDP than Mexico have achieved a better distribution of telephone penetration. Graph 6 shows the comparative differences in regional growth rates in fixed teledensity among Chile, Brazil, Peru and Mexico. Graph 7 shows the difference in regional growth rates in mobile teledensity between Mexico and Brazil; while Mexico shows a 31.36 difference, Brazil has a significant smaller disparity of 12.6.[4]

[4] Brazil was the only national case of comparison available in regional mobile growth.

G R A P H 5

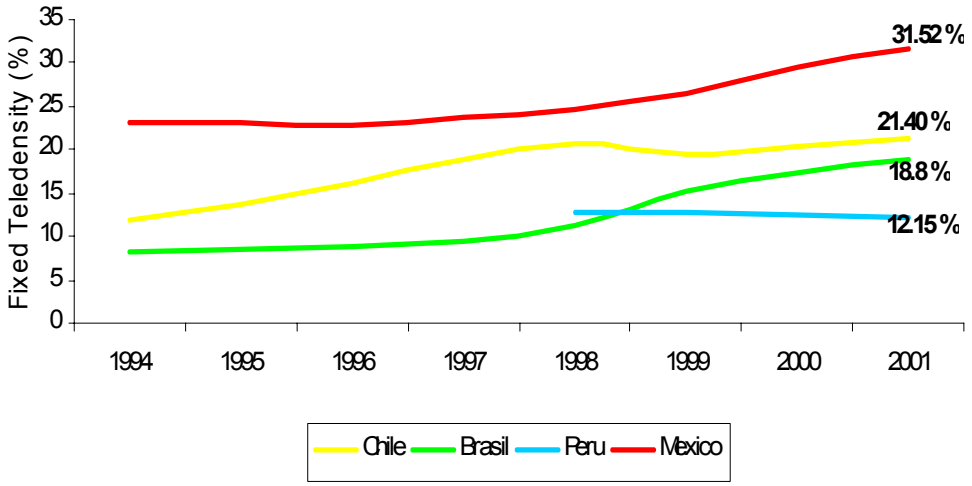
AVERAGE GROWTH RATES IN FIXED TELEDENSITY
MEXICO VERSUS LATIN AMERICA



Source: Telecom Data from: ITU, 2002.

G R A P H 6

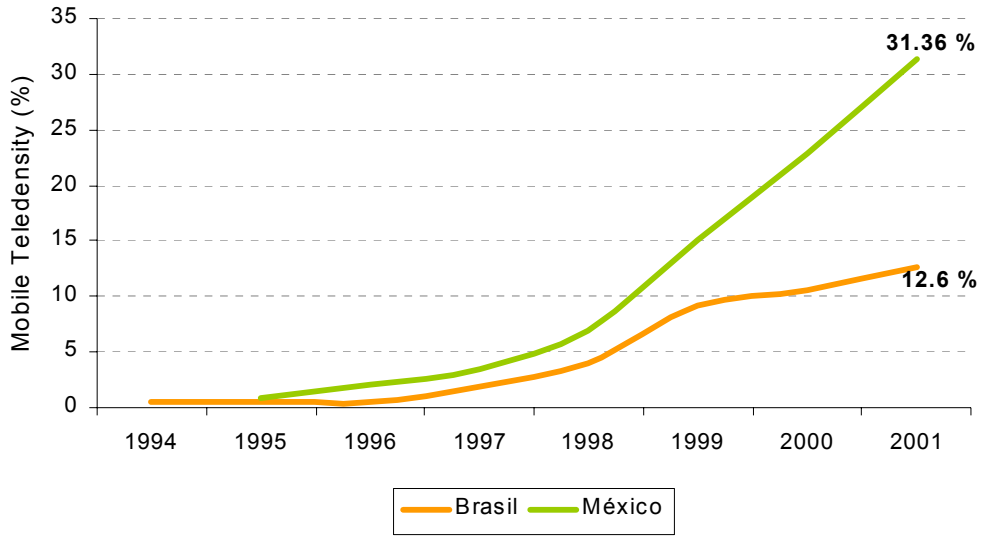
DIFFERENCES IN REGIONAL GROWTH RATES
SELECTED LATIN AMERICAN COUNTRIES



Sources: Brasil: Anatel, Chile: Subtel, México: Telecom Data from: ITU y COFETEL, Perú: Ministerio de Transportes y Comunicaciones. Note: Brazil: divide between Southeast Region (Minas Gerais, Espírito Santo, Rio de janeiro y São Paulo) and Northeast Region (Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe and Chile: divide between Metropolitan Region and Del Maule. México: divide between Distrito Federal y Chiapas. Perú: divide between Lima and Callao y Huancavelica.

G R A P H 7

DIGITAL DIVIDES IN BRAZIL VERSUS MÉXICO
(MOBILE TELEDENSITY)



Source: Brasil: Anatel, Mexico: Telecom Data from ITU y COFETEL. Source: Brasil: Anatel, México: Telecom Data from ITU y COFETEL. Note: **Brasil**: difference between Southeast Region (Minas Gerais, Espírito Santo, Rio de janeiro y São Paulo) and Northeast Region (Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe y Bahia). **Mexico**: difference between Distrito Federal and Chiapas.

However, the problem with using GDP as a source of comparison is that it is only a measure of the level of income. GDP levels do not say anything with regard to development levels; as to how the income is distributed. By including the Gini coefficient in our comparison we examine whether countries with a more even distribution of income have a higher rate of teledensity growth[5]. Table 2 reveals that, in these selected Latin American national cases, countries with a more unequal income distribution such as Chile, Brazil and Guatemala have a higher fixed and mobile teledensity growth.

And as Table 3 depicts, even though Internet levels shows a higher degree of penetration than fixed teledensity in Mexico, countries with similar GDPs have achieved a higher Internet penetration than Mexico. While Mueller's perspective may apply in the more general international comparison between developed and developing countries, there is a significant gap between some

[5] The Gini coefficient is a measure of income concentration; it takes on values between zero and one. When the value approximates one it indicates a higher concentration of income and when Gini is closer to zero the concentration of income is lower.

countries in terms of telecommunications access that is not explained by economic growth rates or income distribution.

T A B L E 2

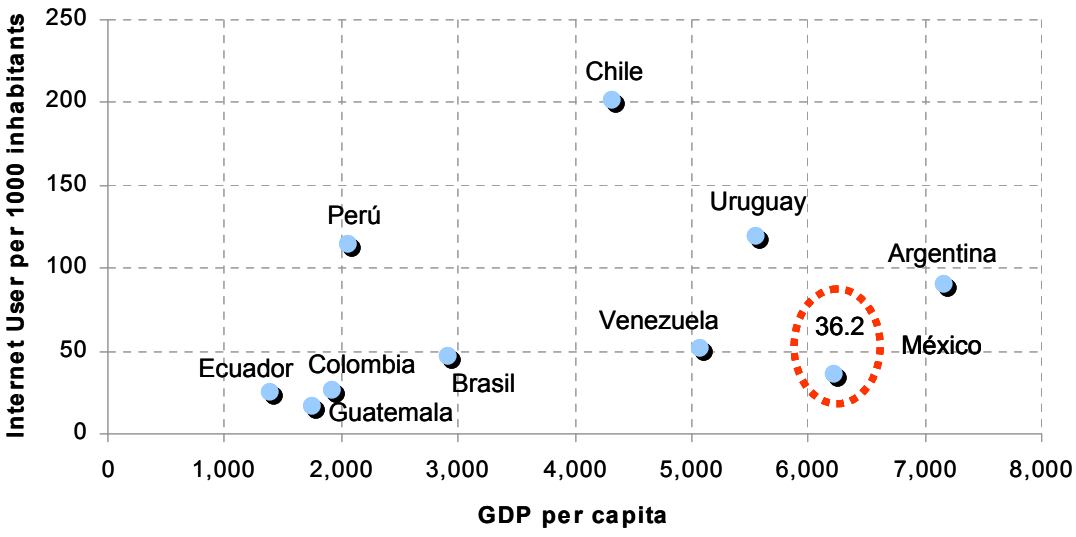
TELEDENSITY AND GINI COEFFICIENT IN LATIN AMERICA (2001)

PAÍS	PIB PER CÁPITA USD (2001)	TELEDENSIDAD FIJA CRECIMIENTO PROMEDIO ANUAL (%) (1990-2001)	TELEDENSIDAD MÓVIL CRECIMIENTO PROMEDIO ANUAL (%) (1990-2001)	GINI
URUGUAY	5,554	7.05	115.51	.423
MÉXICO	6,214	7.12	70.88	.531
VENEZUELA	5,073	3.50	95.38	.495
CHILE	4,314	12.38	73.95	.566
BRASIL	2,915	11.83	223.22	.607
PERÚ	2,051	11.18	98.24	.462
COLOMBIA	1,915	8.69	76.77	.571
GUATEMALA	1,754	10.82	123.83	.558
ECUADOR	1,396	7.42	76.85	.437

Sources: ITU & UNDP, World Development Report, 2002

G R A P H 8

INTERNET USERS VS. GDP PER CAPITA



Source: TELECOM-DATA from: ITU, 2002

In order to obtain a more accurate perspective of the relation between development and telecommunications penetration a panel data analysis is performed. Using indicators from the *United Nations Development Program,* in the "Human Development Report 2002" in 100 countries during the period 1990 and 2000, we measure the impact of development on teledensity. The model, as is shown in equation 1, considers fixed teledensity as a function of GDP, the Human Development Index and the urban population as a percentage of the total population. The Human Development Index provides a weighted average of levels of mortality and literacy among other indicators (see Annex for a full description). Urban population is believed to be a significant determinant of telecommunications roll out as delivering services to rural and dispersed populations represent a greater degree of difficulty.

1) Teledensity = F (GDP, HDI, %UrbanPop)
(teleit = cit + βitpcgdp + γit%poburb + λitdhi + ε)

Where: *i=1,2,.....,100* y *t=1,2,.....11*

tele is fixed teledensity**,** *pcgdp* is the pib per capita in constant dollars of 1995, *%poburb* is the urban population as a percentage of the total population and *hdi* is the Human Development Index.

T A B L E 3

MODEL

SOURCE	SS	DF	MS	NUMBER OF OBS =295
				F(3, 291) = 417.92
MODEL	98928.9802	3	32976.3267	PROB > F = 0.0000
RESIDUAL	22961.8478	291	78.9066934	R-SQUARED = 0.8116
				ADJ R-SQUARED = 0.8097
TOTAL	121890.828	294	414.594653	ROOT MSE = 8.8829

TELE	COEF.	STD. ERR.	T	P>|T|	[95% CONF. INTERVAL]	
PERGDP	.0009553	.0000583	16.39	0.000	.0008406	.0010701
PORURBPOP	.0849115	.0386593	2.20	0.029	.0088243	.1609987
HDI	42.63023	5.226086	8.16	0.000	32.34451	52.91595
_CONS	-23.59146	2.440489	-9.67	0.000	28.39471	-18.78821

The results are:

- GDP per capita was statistically significant with a confidence interval of 99%, and a positive estimated parameter, so, the higher the GDP per capita, the higher the penetration level.
- *Percentage of Urban Population was* statistically significant (0.97), and its estimated parameter was positive, so, the higher a society's urbanization is, the higher is the penetration level.
- Human Development Index was statistically significant too, at a level of 0.99, with a positive estimated parameter, so, the higher the human development in an specific country, the higher the penetration level.
- The coefficient of determination (R^2) is equal to 0.8116, that is, the model explains more than 80% of the variations in teledensity.

As Table 4 depicts, the predictions of this model when applied to the fixed teledensity in Mexico, are an estimated value equal to 20.3, significantly higher than the actual rate of 12.47 percent observed in the year 2000. This is a non conclusive exercise that gives a preliminary result that should be strengthen by testing different models that include a more complete determination of penetration rates. However, these first results suggest that Mexico has the human and economic capacity to reach higher penetration levels.

T A B L E 4

TELEDENSITY, GDP PER CAPITA & HUMAN DEVELOPMENT INDEX (HDI)

OBSERVED TELEDENSITY (2000)	12.47
ESTIMATED TELEDENSITY (2000)	20.30

Source: TELECOM-DATA based on UN

Conclusions

Fundamentally, poverty reduction is about bringing growth processes to poor areas. Poor areas can benefit from the dramatic level of technical innovations occurring today in the ICT industry, so it is possible to create growth faster and at a greater level than ever before. This paper has presented evidence that indicates that the gap between the information haves and the information have-nots is not narrowing with the deployment of telecommunications networks. Telecommunications penetration has increased substantially in Mexico during the past ten years. However, Mexico is still well behind international benchmarks. Furthermore, the internal digital divide has increased; this supports international evidence that telecommunications rollout tends to increase inequality.

The policy trajectory that is suggested by the *Market Economy Perspective* is that the most effective universal policies are simply to foster economic growth through an open competitive economy that can supply telecommunications services. While there is a close association between income and ICT penetration, this relationship is not a definite one. Countries with similar income levels as Mexico show a higher level of success in bridging the digital divide. The divergences may be explained by significant physical and social investments in ITC access.

The *Knowledge Economy Perspective* suggests that there is a clear need to bridge the digital divide by subsidizing access to telecommunication services because of its contribution to economic development. As this paper explored past justifications on universal service rested mainly on welfare concepts; making telephone affordable to all. This new rationale is based on the innovative potential of access to ICTs, knowledge building is considered an important resource to economic growth. This view, however, appears to be biased toward the supply side and gives little attention to demand. International evidence suggests that the lesson from successful implementation of ICT is that along with the supply of ICT, governments promote education in technical skills. Training systems appear to be a strong complement to ICT use as it upgrades the national capacity for adaptation of the skills of a country's work force and innovation. Thus, if a country aspires to exploit in significant ways the opportunities offered by ICT, it needs to emphasize training.

The argument in this paper is that the *Social Capital* concept is useful in the design and implementation of a universal access policy. From this standpoint, the focus of the debate moves beyond short term supply considerations to dynamic issues such as technological adoption in asset-based community development. Thus, the debate on universal access broadens to include demand side factors such as the role lay-users can play in the innovation process.

Access to ICT in developing countries may be in danger of being captured by the existing organizational and educational inefficiencies.
Moreover, developing countries are in danger of locking themselves into a new form of e-dependency on developed countries as they introduce software and hardware systems that they have no capacity to maintain for themselves. In order to prevent learning-based systems from locking into static, technological and institutional arrangements an asset-based community development may prove to be productive. Communities need to look inward to the assets and capabilities that may strengthen the possibilities of successfully implementing ICT. In the context of developing countries, Internet-driven projects may result in the creation of new Internet content that is devoted to addressing the needs of specific communities.
The first round of reforms in Mexico, the privatization and the introduction of competition, set the initial conditions for telecommunications development. However, there are critical unfinished businesses to attend, among the most salient is the implementation of a universal access program. Given the significant geographic divide Mexico faces, not implementing a universal access policy places communities in a serious handicap in achieving development. The status of access to ICT services of an economy is an indicator of its potential ability to exploit the economic opportunities afforded by the new technologies.

The issue of universal access in Mexico has only recently appeared as a significant concern both in the public debate and in the government agenda. The first public discussions of universal access took place in the year 2000 during the debate of the reform to the 1995 Federal Telecommunications Law. Since then, Mexican authorities have initiated a series of efforts to contend with this issue. This is a critical moment to design and implement an integrated policy that addresses what Carlos Braga of the World Bank identifies as the ABC's to bridge the digital divide, namely Access, Basic skills and Content.
The literature on universal access has produced numerous studies on best practices in terms of delivering access to unserved areas (Ovum, 2003; Laffont & Tirole, 2000; Milgrom 1996). The consensus here is that regulatory authorities need to provide incentives, and not obligations, for carriers to expand the network to non-profitable areas. This is best achieved through auctions that are won by firms that announce the least amount of subsidy to deliver services to unserved areas.

The other elements that comprise the ABC's of the digital divide, namely basic skills and content are less studied issues that need further empirical research. Future work should concentrate on designing integral universal access policies that go beyond providing physical access to include training in the use of ICTs in the context of developing countries.

Annex

T A B L E 1

ANALYSIS VARIABLES DESCRIPTION

ESP_INDEX	=	LIFE EXPECTANCY INDEX. SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
EDU_INDEX	=	EDUCATIONAL ATTAINMENT INDEX. SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
PIB_INDEX	=	PER CAPITA GDP INDEX. SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
IDH90	=	HUMAN DEVELOPMENT INDEX FOR 1990. SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
IDH95	=	HUMAN DEVELOPMENT INDEX FOR 1995. SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
IDH00	=	HUMAN DEVELOPMENT INDEX FOR 2000. SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
POB_URB00	=	URBAN POPULATION (%) EN 2000. SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
TEL_FIJA90	=	FIX TELEDENSITY IN 1990. SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
TEL_FIJA00	=	FIX TELEDENSITY IN 2000. SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
TEL_MOV90	=	MOBILE TELEDENSITY IN 1990. SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
TEL_MOV00	=	MOBILE TELEDENSITY IN 2000. SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
HOSTS90	=	INTERNET HOSTS IN 1990. SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
HOSTS00	=	INTERNET HOSTS IN 2000. SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
GINI02	=	GINI COEFFICIENT. SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
CONCY10_02	=	INCOME CONCENTRATION MEASUREMENT. IT'S REPRESENTED AS THE RATIO OF THE POPULATION'S RICHER 10% BETWEEN THE POORER 10%, FOR 2002. SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
CONCY20_02	=	INCOME CONCENTRATION MEASUREMENT. IT'S REPRESENTED AS THE RATIO OF THE POPULATION'S RICHER 20% BETWEEN THE POORER 20%, FOR 2002. SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
RLAW0001	=	RULE OF LAW FOR THE PERIOD 2000-2001. TAKES VALUES BETWEEN (-2.5 = TOTAL INFECTIVITY) A (2.5 = TOTAL EFFECTIVENESS). SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
GOVEFF0001	=	GOVERNMENT EFFECTIVENESS 2000-2001. TAKES VALUES BETWEEN (-2.5 = TOTAL INFECTIVITY) A (2.5 = TOTAL EFFECTIVENESS). SOURCE: "HUMAN DEVELOPMENT REPORT 2002" DEL UNDP.
PIBPER95_95	=	CONSTANT GDP PER CAPITA IN 1995 USD, FOR YEAR 1995.
PIBPER95_00	=	CONSTANT GDP PER CAPITA IN 1995 USD, FOR YEAR 2000.

T A B L E 2

VARIABLE ANALYSIS, THEIR MEDIUM VALUE, STANDARD DEVIATION AND MINIMUM AND MAXIMUM VALUES

VARIABLE	OBS	MEAN STD.	DEV.	MIN	MAX
ESP_INDEX	100	.6906	.1915952	.24	.93
EDU_INDEX	100	.7831	.1915735	.23	.99
PIB_INDEX	100	.661	.1897127	.28	1
IDH90	100	.68163	.1796849	.29	.926
IDH95	100	.69446	.1799773	.3	.932
IDH00	100	.71201	.1786431	.313	.942
POB_URB00	100	55.972	22.03915	6.2	97.3
TEL_FIJA90	100	145	181.6046	1	681
TEL_FIJA00	100	215.84	222.5953	2	750
TEL_MOV90	83	4.048193	10.64952	0	54
TEL_MOV00	100	200.9	255.1989	0	861
HOSTS90	68	3.244118	6.941534	0	41.7
HOSTS00	75	18.80533	41.37267	0	295.2
GINI02	100	39.599	10.36095	19.5	61.3
CONCY10_02	100	18.223	17.92445	3.6	91.1
CONCY20_02	100	9.491	6.883315	2.6	32.7
RLAW0001 |	99	.1237293	.9146011	1.503933	1.909447
GOVEFF0001 |	96	.1384503	.8956261	1.476909	1.926363
PIBPER95_95	100	7097.617	11106.65	146.07	44603
PIBPER95_00	100	8118.455	12750.73	140.7	56372

The 100 countries sample, ordered by the level of human development, ("Human Development Report 2002"), are:

HIGH HUMAN DEVELOPMENT	
1	NORWAY
2	SWEDEN
3	CANADA
4	BELGIUM
5	AUSTRALIA
6	UNITED STATES
7	NETHERLANDS
8	JAPAN
9	FINLAND
10	SWITZERLAND
11	FRANCE
12	UNITED KINGDOM

HIGH HUMAN DEVELOPMENT	
13	DENMARK
14	AUSTRIA
15	LUXEMBOURG
16	GERMANY
17	IRELAND
18	ITALY
19	SPAIN
20	ISRAEL
21	GREECE
22	KOREA, REP. OF
23	PORTUGAL
24	SLOVENIA
25	CZECH REPUBLIC
26	HUNGARY
27	SLOVAKIA
28	POLAND
29	CHILE
30	URUGUAY
31	COSTA RICA
32	CROATIA
33	LITHUANIA
34	TRINIDAD AND TOBAGO
35	LATVIA

MEDIUM HUMAN DEVELOPMENT	
36	MEXICO
37	BELARUS
38	PANAMA
39	MALAYSIA
40	RUSSIAN FEDERATION
41	BULGARIA
42	ROMANIA
43	COLOMBIA
44	VENEZUELA
45	THAILAND
46	BRAZIL
47	ARMENIA
48	PHILIPPINES
49	UKRAINE
50	PERU

MEDIUM HUMAN DEVELOPMENT	
51	TURKEY
52	JAMAICA
53	SRI LANKA
54	PARAGUAY
55	ECUADOR
56	DOMINICAN REPUBLIC
57	UZBEKISTAN
58	CHINA
59	TUNISIA
60	JORDAN
61	GUYANA
62	EL SALVADOR
63	MOLDOVA, REP. OF
64	ALGERIA
65	SOUTH AFRICA
66	VIET NAM
67	INDONESIA
68	MONGOLIA
69	BOLIVIA
70	EGYPT
71	HONDURAS
72	NICARAGUA
73	GUATEMALA
74	MOROCCO
75	INDIA
76	SWAZILAND
77	ZIMBABWE
78	GHANA
79	LESOTHO
80	PAPUA NEW GUINEA
81	KENYA
82	CAMEROON

LOW HUMAN DEVELOPMENT	
83	PAKISTAN
84	LAO PEOPLE'S DEM. REP.
85	YEMEN
86	BANGLADESH
87	MADAGASCAR
88	UGANDA
89	TANZANIA, U. REP. OF
90	MAURITANIA
91	ZAMBIA
92	SENEGAL
93	CÔTE D'IVOIRE
94	RWANDA
95	MALI
96	CENTRAL AFRICAN REPUBLIC
97	GUINEA-BISSAU
98	BURKINA FASO
99	MOZAMBIQUE
100	BURUNDI

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