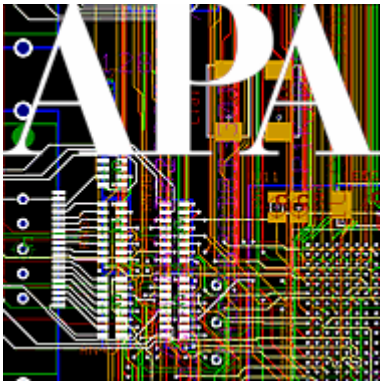

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The Internet Diffusion in Middle-Income Countries

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The Internet Diffusion in Middle Income Countries

I. Introduction

The Internet, the fastest diffusing technology within all the information and telecommunication innovations[i], has not showed a similar diffusion pattern throughout the world. Although, during the last 10 years, the overall number of people worldwide with access to and use of the Internet has increased from 40 million to almost 795 million[ii], the access to the Internet is highly skewed globally. 56.2 % of the Internet users live in North America and Europe, while only 2.1% and 1.5 % of them live in Middle East and Africa respectively[iii]. This discrepancy becomes much worse when we look at the penetration rates within the regions[iv]. In Asia, which accounts for more than half of the world's population, only 6.9 % of people can enjoy the benefits of the Internet, whereas in Europe this number goes up to 30.5 % and in North America it reaches to 68.5%[v].

The unequal spread of the Internet has increased the attention of many scholars because the level of diffusion is believed to significantly influence socio-economic, political and cultural positions of countries. Economically, a well-developed telecommunication infrastructure and hence the Internet may create new jobs and economic activities. Available to all, low-cost information may decrease the level of inequality within the societies. Politically, it may generate a participatorier democratic environment where multiple users can disseminate and share their ideas. Socially and culturally, the Internet may offer better "alternative choices" such as health and educational services and leisure activities. Since these effects of the Internet are likely to grow with its spread and influence the futures of the countries, understanding the determinants of diffusion is vital especially for developing countries. However, most of the previous studies (Hargittai 1999, Bauer, Berne and Maitland 2002) analyzed the issue from the perspective of OECD countries. Data limitations and low Internet penetration levels were the major hindrances for similar studies on developing countries. Throughout the years as the data become more available, comprehensive studies including low and middle-income countries have been conducted. (Guillen and Suarez 2001, Beilock and Dimitrova 2003). These studies presented per capita income, level of competition in telecommunication sector, infrastructure development, democracy and predictable conditions for entrepreneurship as the major factors of differences in the Internet development. However, almost no study tried to measure the impacts of these major determinants on the Internet diffusion in developing countries[vi]. Segregating developing countries may help to reassess the importance of some factors that have been widely valued due to their impact in advanced countries.

In this paper, I try to differentiate the factors influencing the Internet adoption in low and high middle-income developing countries. The main questions here are: which particular factors in these

similar countries explain the different diffusion rates?[vii] and in what aspects, the determinants of diffusion in developing countries differ from the advanced countries?. Considering information technology mediums' increasing role in the national competitiveness of developing countries, identifying determinants of diffusion is highly important for their future plans and policies. I will also discuss the effects of telecommunication policies and plans on the Internet diffusion in cases of Turkey, Malaysia and South Korea. In combining statistical research with case analysis, I hope to understand the general trends and factors of diffusion in low and high middle-income countries.

II. Literature Review

The recent Internet diffusion studies widely use Roger's (1983) diffusion of innovation approach as their theoretical base. (Hargittai 1999 and Maitland 1999). The theory identifies 5 factors to explain the rate of adoption of technological innovations. First, to diffuse faster, a technology should have a relative advantage over the ones it supersedes. Second, it should satisfy and convince the adopters by making an impact on their economic or social status. Third, the new technology should also be "compatible" with the existing social values, norms and needs of the society. Fourth, for higher rates of adoption, the new technology should have low degree of "complexity" but high degree of "trialability" and "visibility" for the potential users. Roger's framework brings an improved understanding that it is not only the innovation itself but also the social system as a whole, in which adoption processes develop, is important for a successful diffusion. Regardless of whether a system is a complex one or not, it is the communication within the system that facilitates or hinders the diffusion of innovations. As this communication network becomes more interpersonal and informal, its influence on individuals becomes stronger. Moreover, this interpersonal communication turns out to be more effective, if it takes among people with similar beliefs and socioeconomic conditions. Any improvement on economic wealth, social status or education level makes diffusion of innovation within the society more successful as well.

Hargittai (1999) in his analysis of the factors influencing different Internet diffusion rates among the OECD countries focuses on the economic wealth of nations. Overall economic strength of countries makes it easy to acquire necessary resources and capital for the diffusion of the new medium. He indicates human capital as an important factor influencing the diffusion process. The relevancy of human capital in terms of connectivity to the Internet comes with population's level of education and English proficiency. Similar to Rogers, he argues that better educated people are more likely to show higher Internet adoption rates. At the aggregate level, this proposition is true for countries as well; meaning nations with higher education levels are expected to show higher Internet diffusion rates. Similarly, English proficiency is expected to have a significant impact since the content of the Web is

widely dominated by materials written in English. For non-English speaking people, it is hardly possible to exploit all the benefits of the Internet and contribute to its development with their own experiences. Interestingly, Hargittai's results indicate that neither education, nor English proficiency has a statistically significant impact on the diffusion of the Internet within the OECD countries. Intuitively, for developing countries, the propositions still hold their strengths. The other important factors for diffusion are the existing telecommunication facilities and the institutional legal environment in a country. However, Hargittai finds that the institutional legal environment defined by policies on privatization, free competition and regulation exhibits more impact on the Internet connectivity than does the existing telecommunication infrastructure. Long-term telecommunication policy of a nation appears comparatively more important than its existing phone density level.

These socio-economic variables have strong explanatory power on the dependent variable; however, there is always a section that even the most powerful regression models cannot explain. This unexplained issue may be the culture of the countries, which is highly difficult to find proxies for and quantitatively measure its impact. Maitland (1999) [viii], by using Roger's communication and value compatibility approaches, analyzes the impact of culture on the diffusion of interactive networks. He suggests that the diffusion rate will be higher in "weak uncertainty avoidance cultures", where new ideas are welcomed with greater tolerance than in cultures with high uncertainty avoidance. It is pretty intuitive that eagerness of people to appropriate different things in a culture stimulates new innovative activities and their diffusion. Other than being open to different things, "social status" has an important value on the diffusion process. If a culture has a high acceptance level of "status symbols", then it is very likely that, apart from their economic benefits, telecommunication technologies will be adopted easily since they improve over short periods of time. Gender equality is another indicator for assessing network diffusion. Obviously, the cultures with higher gender equality will be more innovative since they will be using a larger share of their human capital than the nations where women are secluded from the social and working life. Moreover, investing firms may be less hesitant to innovate newer products since the market halves due to high gender inequality. The culture that comes with the centralized or decentralized structures of the countries also affects the diffusion of interactive networks. Maitland argues that as nations become more centralized, the resources need to be distributed from a single point and this increases the need for better communication and hence diffusion of interactive networks. However, this may be challenged from another perspective that as centralization increases, a more power intense or authoritarian culture may prevail affecting frequency and aims of using communication technologies. Considering the merits of the Internet, the diffusion process may then counteract in a centralized culture. Although Maitland's paper does not

quantitatively measure the impact of culture, it is highly important in terms of introducing culture as a vital explanatory factor and setting the relations between the culture and network diffusion.

Other than Roger's diffusion of innovation theory, another line of thought that has been influential in diffusion literature is the new institutional economics, which interprets the economic models with a coherent analysis of existing institutions within the society. In this theory, the overall institutional environment of a society and the embedded power relations and administrative rules and regulations shape individuals and organizations. In institutional economics, technology is not an external factor of production affecting the functioning of capital as in neo-classical economics, yet it is internal and has an intrinsic value as a factor of production within the production process. For instance, Bauer et al. (2002)[ix] argue that in neo-classical economics, utility derived from access to the Internet is external to the system. However, in their model, individual Internet access is dependant upon the utility derived from access, which is shaped by the existing network, values and norms in a society, price of access and the disposable income. On the other hand, for institutions and organizations, utility is measured by the contribution of Internet access to the productivity. This internal interpretation of utility may be applied to individuals as well. Demand for the Internet access may increase if individuals believe that their efficiency increase with the alternative choices offered by the Internet. As more "choices" turn out to be "needs" for people in a system, then demand for access increases. Obviously, the adaptability of institutional environment to new changes either through new laws or regulating policies stimulates this process. Moreover, a trustable environment encourages more people to try available alternatives in meeting their frequently changing needs.

Similar to other studies, Bauer et. al. in their research find that economic wealth and communications infrastructure of a country are important in explaining cross-national Internet diffusion rates. Lower access prices also have a statistically significant impact on the Internet penetration rates. Other than structural variables, they are particularly interested in the role of some telecommunication policy variables such as local competition and local loop unbundling policies. Both of these variables significantly explain the differences in Internet penetration rates between the US and the European Union countries, yet their significance still remains questionable for developing countries.

Another different conceptual framework, National Systems of Innovation (NSI) is used by Wolcott et. al. (2001) to explain different diffusion patterns. NSI, which is actually a spin off concept of the institutional economics, basically emphasizes the importance of national institutions and the relations among them for the diffusion of innovations within the countries. Niosi, one of the first scholars using the concept, defines it as "… the system of interacting private and public firms (either

large or small), universities and government agencies aiming at the production of science and technology within national borders. Interaction among these units may be technical, commercial, legal, social and financial, in as much as the goal of the interaction is the development, protection, financing or regulation of new science and technology"[x] Incorporating the concept of NSI to the Internet diffusion discussions in developing countries is especially important since governments in these countries have strong influence on some services, which in advanced countries are handled by the competitive markets. However, the major shortcoming of these comprehensive studies is their incomparability with other country analyses since common metrics are not defined in assessing different national innovation systems. On this issue, regarding the Internet diffusion, Press et.al. (1998) developed a framework which includes six different categories of Internet adoption: pervasiveness, geographic dispersion within the country, sectoral absorption, connectivity infrastructure, organizational infrastructure and sophistication of the Internet use. The Internet penetration levels of countries are ranked within each category. The authors argue that comprehensive evaluation of these six characteristics provides a better understanding of the Internet adoption within the countries and also offers a medium to make comparisons among the countries. Though this type of framework is criticized since it requires expert knowledge of evaluation and subjective decision-making ranking for each country [xi], it is still highly important for making comparisons especially among developing countries, on which finding data is extremely limited.

III. Data and Methods

This study includes 35 low and high middle-income countries throughout the world[xii]. It measures the Internet adoption levels across the countries in two ways: the number of Internet users per 10,000 population (IU) and the number of hosts, individual computers connected to the Internet, per 10,000 population (IH).[xiii] Since the number of regular Internet users is calculated by using the number of hosts, models using these two dependant variables demonstrate similar results. Therefore, only the results of the models of the Internet users will be presented in this section. Moreover, the measure of IU is logged to normalize its distribution.

The study assumes that Internet diffusion is a function of four sets of variables.

IU = *f (Economic Factors, Social Factors, Infrastructural Factors, Policy Factors)*

Cultural factors are not included due to the difficulty of finding proxies to measure their impact, as discussed in the literature review section. Economic development levels are controlled with factors of GDP per capita, GINI inequality index and foreign direct investment (FDI). Previous studies found a strong positive correlation between GDP per capita and IU. This is pretty intuitive that as the economic wealth of people increases, the affordability of personal computers and the software needed to access

the Internet raises as well. Furthermore, economic well-being is highly correlated with higher education levels. Highly educated people are more likely to have the skills needed to utilize the benefits of the Internet[xiv]. GINI inequality index is employed since wide income gap between the richest and the poorest sections of the population is a major problem for developing countries. Hargittai (1999) used this index for the 18 advanced countries of the world but could not find a statistically significant impact on the Internet adoption rates. The last economic variable, FDI is incorporated into the models since it is a major economic development strategy pursued by most of the middle-income countries inline with the comments of multinational monetary organizations such as IMF and World Bank. That higher FDI induces higher IU in middle-income countries seems reasonable in two ways. First, influx of FDI is expected to increase the total GDP in a country. Second, it requires a certain level of established telecommunications infrastructure and human capital, which are likely to have a positive impact on the Internet penetration rates. Unfortunately, FDI is dropped from the models since it caused a severe multicollinearity problem.

To control social development levels, education, English language competency, democracy and population density variables are used. Education variable is a composite index based on adult literacy rate and combined gross enrolment ratio for primary, secondary and tertiary schools. Similar to advanced countries, the numbers of Internet users are expected to increase with increasing education levels in middle-income countries. Penetration of English language is coded as dummy variables. Countries, where English is the native language or one of the dominant languages, are coded as 1 and 0 otherwise. The major shortcoming here is that data does not compromise the sections of the population who know English as a second language. Democracy index is employed with the intent to capture the degree of openness in a society. As the society becomes more open, the more people in the society are encouraged to access to various information resources[xv]. Moreover, there is an established link between the democratic form of government and policy predictability. Policy predictability in democratic societies encourages new entrepreneurial activity and investments in telecommunications sector which increases access to and use of the Internet as well[xvi]. Similar to Beilock and Dimitrova (2003), Freedom House's civil liberty and political rights indexes are used to calculate the democracy index. Freedom House assigns a score to each country ranging from 1 to 7. 1 denotes the most "free" countries whereas 7 refers to "not-free" countries. Democracy index compromises the mean values of civil liberty and political rights measures for each country. Population density is used as a variable to control for urban and rural differences.

Infrastructural factors are measured by the number of personal computers, secure servers, phone density, Internet pricing, broadband availability index, and the local ICT services availability

index. The number of personal computers indicates the availability of hardware needed to access to the Internet. Similar data is looked for software and piracy rates but could not be found for most of the countries. Phone density is a composite variable consisting of main telephone lines and cellular subscribers per 100 people. Better telephone infrastructure is expected to increase the Internet adoption rates. Pricing data is a composite variable consisting 30-hour off-peak monthly telephone and access charges. A negative relationship is expected between the Internet pricing and the number of Internet users. The two other broadband and local IT services availability indexes are included since their existence are assumed to encourage the Internet adoption rates.

For advanced countries, many studies, especially OECD documents, indicate that free competition and private ownership decreases prices and improves the quality of infrastructure making better service available to more people. Among the 35 countries in this study, 10 countries fully privatized and 17 countries partially privatized their telecommunication sector. Only 8 countries have state monopolies. On the other hand, 21 countries have full competition, 4 countries have partial competition and 1 country has duopoly in their local telephone services. 9 countries have no competitive local service environment. These numbers indicate that not only the ownership, either state or private, but also the level of competition in local services is important, since most of the people in middle-income countries still access to the Internet through a dial-up connection[xvii]. To measure the impact of privatization, three dummy control variables are used. The variables state monopoly, partial privatization and full privatization identify the countries in which the telecommunication incumbent is owned by the state or partially owned by the state or fully owned by the private sector. For the level of competition in local services, 4 dummy variables are created: monopoly in local services, duopoly in local services, partial competition in local services and full competition in local services. The existence of competition among the Internet service providers is measured with an ISP competition index developed by the World Bank. Similarly, government priority index, online government index and ICT law availability indexes are used to measure the roles of governments and institutional environments in the Internet diffusion. Since, well-developed government policies, laws and regulations in middle-income countries might be as influential as free competitive markets in advanced countries, their impact necessitates detailed analysis.

IV. Empirical Findings and Discussion

Table 1 presents the results of regression models. Except model H, all models show the explanatory power of four different sets of variables. Model A measures the impact of economic wealth among the middle-income countries and indicates that, economic variables, by themselves alone, explain most of the variance on the Internet adoption rates in middle income-countries. In model

A, GDP per capita, which is logged to normalize its distribution, has a statistically significant impact on the level of Internet diffusion, whereas inequality does not have such a significant impact. Previous studies, on the other hand, show that in advanced countries, economic variables are not good enough to explain the existing variance[xviii]. These results show that, the Internet in low and high middle-income countries is still widely used by the wealthier sections of the population and has not diffused to wider sections of the population. In this respect, middle-income countries, resembles more to low-income developing countries then to advanced nations to which they are trying to converge to.

Table 1: OLS Regression Results for Internet Users

Dependent Variable: Internet Users (logged)								
	Model A	**Model B**	**Model C**	**Model D**	**Model E**	**Model F**	**Model G**	**Model H**
Independent Variables								
GDP	1.553***							
	9.60							
Gini Coefficient Index	-0.002							
	-0.37							
Education Index		6.918***						3.00***
		5.74						3.08
Democracy Index		-0.104*						
		-1.72						
English		0.370*						0.345*
		1.79						1.80
Population Density		0.270***						
		3.45						
Number of PCs				0.788***				
				7.98				
Pricing			-0.378	-0.006				-0.022
			-0.23	-1.08				-0.14
Phone Density			0.806***					0.019***
			5.40					2.78
Broadband Avail. Index			0.367***	0.102				0.317**
			2.54	0.83				2.09
Local ICT Services Index			0.016	0.001				
			0.10	0.01				
Secure Servers Index			0.040					
			0.46					
ISP Comp. Index					-0.056	-0.087	-0.077	
					-0.27	-0.44	-0.39	
Online Govt. Index					0.235	0.215	0.256	
					1.40	1.31	1.56	
ICT Law Avail. Index					0.719**	0.616*	0.672**	
					2.28	1.83	1.96	
Government Priority Index					-0.232	-0.107	-0.167	
					-0.97	-0.42	-0.72	
State Owned Monopoly							0.116	
							0.24	
Partial Privatization						0.099		
						0.33		
Full Privatization					-0.278			-0.256
					-0.83			-1.26
Monopoly in LTS							0.325	
							0.69	

Partial Competition in LTS						-0.497 -1.01		
Full Competition in LTS					0.118 0.36			0.140 0.71
R-square	0.762	0.676	0.755	0.855	0.417	0.426	0.420	0.823
F-test significance	48.14	15.71	14.22	33.94	2.62	2.72	2.66	14.62
Number of observations	32	34	28	27	28	28	28	29
*** p<0.01; **p<0.05, *p<0.1								

Model B presents the impacts of social factors. While education and population density have high statistically significant impacts, the two other variables, English competency and democracy index are significant only at 90 % level. ($p<0.10$). The significance of these variables depends on the interpreter's evaluation. The results indicate that, similar to high-income countries, as education levels increase, the Internet adoption rates increase in middle-income countries as well. Higher education brings better computer skills and economic wealth, which have simultaneous positive impact on the diffusion rates. Positive and significant, though not very high, English proficiency is inline with the expectations that it would encourage the Internet spread. However, this low significance may be due to 3 reasons as well. First, native-English speaking measure may not be inclusive enough and need to be replaced with a better competency measure including English education as a second language. Second, Internet users may be restraining themselves with the websites available in their mother languages. Third, they may be using the Internet not as a source of knowledge but just as a new medium of communication where they don't need English to communicate[xix]. Therefore, if 90% significance level is not convincing, the impact of English proficiency may be evaluated inline with these arguments. Improved political rights and civil liberties in a country also have positive impact on the Internet diffusion[xx]. The results actually show evidence in support of a simultaneous relationship between the Internet diffusion and the existence of democracy. On the one hand, the Internet may improve political rights and civil liberties by generating a free environment where multiple users can exchange their ideas; on the other hand, in a democratic environment more people may be willing to use the Internet. Though not as significant as in advanced countries, democratic environments have positive significant impact on the Internet adoption rates in middle-income countries. Social factors, compared to economic factors explain less of the variance in the dependent variable[xxi]. This indicates that economic factors are still more important than social factors in these countries. If we construct a new model, including both economic and social variables, the fitness of the model does not significantly improve and a high multicollinearity appears among the variables, making most of the social factors insignificant. Economic factors dominate the social factors within this diffusion process.

Model C analyzes the impact of the infrastructural factors. It has been widely argued that a well-developed telecommunication infrastructure, significantly affects the number of people using the Internet. The high correlation between the mainline telephone subscribers and the Internet users is pretty clear since most people access to the Internet through a dial-up connection. A similar correlation between the number of cellular subscribers and the Internet subscribers might be, on the other hand, either due to the existence of a well-built mobile phone infrastructure system in the country or to the openness of people adopting new technology. The results present strong significant impacts of phone density and broadband availability on the Internet diffusion. It is also fair to assume that Internet price increases decrease the number of people using the Internet, since economic factors are overriding in explaining the variance in the Internet users. Interestingly, access pricing does not have a statistically significant impact on the Internet connectivity. This is probably due to the fact that price mechanisms in middle-income countries are not as decisive as structural institutional factors to influence the decisions of potential Internet users. The two other insignificant infrastructural variables, the number of secure servers and the local ICT services index are also contrary to the expectations since it was hypothesized that a sustainable local ICT environment would encourage the spread of the Internet in middle-income countries. However, it seems that having local ICT services and secure servers does not make a significant impact on the Internet connectivity. Similar to model C, model D analyzes the impact of infrastructural factors as well. This model is constructed only to provide evidence for the importance of hardware availability in middle-income countries. Since phone density variable is highly correlated with the number of PCs, it is omitted from the model and the latter is added instead. The results provide strong evidence for the significant impact of the number of computers. Broadband availability index loses its significance and the two other variables remain insignificant as well. The fitness of the infrastructural models improves compared to model B but remains similar to model A, see Table 1 in Appendix C.

Models E, F and G provide strong evidence that, unlike advanced countries; privatization and competition in middle-income countries do not exert statistically significant impact. This is not surprising that although most of the countries have privatized or deregulated telecommunications, they do not have high levels of Internet connectivity. In each model, similar privatization and competition variables are paired and they are controlled with other policy variables. The only policy variable that has significant impact on the Internet diffusion is the ICT law availability index. This proves strong evidence for the comparative importance of institutional context in middle-income countries than telecommunication privatization or deregulation, though these policies are strongly enforced on them by international organizations. Privatization and competition in telecommunication sector may or may

not have significant impacts on various fields that different studies analyze, but for the Internet development, institutional environment, laws and regulations that are constructing the system, seem to be more important in developing countries. Another interesting point is the low explanatory power of these policy models compared to economic and infrastructural models. Though a system perspective, laws, regulations and institutions increasingly appear to be important for middle-income countries, still structural models dominate the Internet diffusion patterns.

Model H aims to understand the impact of full privatization and full competition by controlling for the factors of education, English competency, phone density, broadband availability and pricing. Full privatization and full competition do not have significant impact in this model as well. Other than price of access, all variables are significant indicators of the Internet connectivity. Economic factors are omitted from the model due to high multicollinearity problem. However, explanatory power of the model is still pretty high and significant with an R^2 value of 0.82. This model supports the assumption that structural and social factors but not the privatization and competition in middle-income countries, have an impact on the Internet diffusion rates.

In the next section, development of the Internet connectivity in Turkey will be analyzed and compared with some other successful middle-income Asian countries such as South Korea and Malaysia.

V. Telecommunications and the Internet Development in Turkey, Malaysia and South Korea

Privatization discussions of the telecommunication sector in Turkey started in the very beginning of the 1990s due to similar development patterns in the international arena. During the first half of the decade, most of the advanced countries privatized or partially privatized their telecommunication incumbents. This process had largely been shaped by a series of decisions accepted in Uruguay Rounds back in 1985. Liberalization of telecommunication services was hoped to bring better services, lower prices and competition. It would also help to create "information societies" in which adoption of technology would be the major determinant of development in almost all sectors. Major multinational corporations and regional unions such as World Bank, International Telecommunications Union and European Union supported the ideal of creation of "information society" and exerted their pressure on especially peripheral countries in this regard[xxii]. Turkey was one of these countries whose privatization and deregulation efforts in 1990s were structured by international forces.

Turkey's objective of becoming a part of the European community has started as early as 1950s. However, this has always been a unilateral wish of Turkey, which had not been accepted or even considered by the European countries until the 1990s. The first positive sign occurred in 1994,

with Turkey's accession to European Customs Union. Especially after that date, Turkey started to reform its institutional regulatory environment to make it compatible with European Union laws and regulations. Privatization and liberalization of telecommunication sector was just one minor part of this process. Therefore, it was structurally different from the privatization efforts in the European Union countries, which were strategically adopted to increase the competitive power of their telecommunication industries against Japan and the USA[xxiii].

World Bank's and IMF's enforcement policies have become more influential especially after the economic crisis in 1994. Since the financial aids coming from these organizations were vital for government spending, they were suspending the aids and then putting some pre-conditions for their release, such as privatization of the big state enterprises[xxiv]. Though there were some internal conflicts within the weak and uncertain government coalitions of the 1990s, almost all of them supported the privatization process to continue to get aid from the multinational monetary organizations and to pay the national debts with the money coming from the privatization of the state's telecommunication company. Thus, privatization efforts have never had an internal vision such as the development of the infrastructure as in the 80s or creation of a more competitive telecommunication environment for the private investors, which is free from the bureaucratic impediments prevailing in Turkey.

The first privatization attempt started in June 1994 with the enactment of Law 4000. Turk Telecom was established as a joint stock company, wholly owned by the state, in account for the telecommunication services. The same law also made it possible to privatize 49 % of the company. This first privatization attempt, increased lots of controversy in the country that were coming basically from the military due to national security issues and the nationalist coalition partner of the government. The law had been challenged at the constitutional level and the share to be privatized contracted down to 39 %[xxv].

The lack of consensus among the key actors and institutions within the country and the non-internalization of the "information society" approach made government not to withstand with its proclamations and slowed down the process of privatization. Conflicting approaches especially among main military and government actors resulted in an unpredictable policy making environment that diminished the interests of private investors. There were only very few international telecommunication companies interested in the privatization of the Turk Telecom, since the stake to be sold was so small and they wanted to continue to hold the monopolistic power of the company[xxvi]. The attractiveness of the fixed telephony market was shrinking due to the expansion of the cellular phone technology[xxvii]. This very last problem actually influenced the introduction of two new laws in 2000 and 2001 regarding the privatization of telecommunication sector in Turkey.

The law 4502[xxviii], enacted in 2000, first assured the commercial independence of the Turk Telekom and then set a final date, December 31 2003, to end its monopolistic position in fixed voice telephony. It also established the regulatory framework of the Telecommunications Authority, in accordance with the European Union standards, to separate policymaking and regulatory functions of the government. Later, based on this law, Council of ministers issued a decree on 20 % block sale strategy. The goal here was to benefit from the expertise and experience of a global telecommunications operator. A number of domestic companies showed interest in tender but there was no bid from an international investor until the closing date. To increase interest, Telecommunications Authority designed a new tender, which offered 33.5% of the shares with enlarged managerial rights to foreign investors. However, this second tender was also challenged on several legal grounds and cancelled by an administrative court in Ankara[xxix]. This unpredictable policy making environment added to the lacking interest of foreign investors for the following tenders.

The second law, law 4673[xxx], first increased the responsibilities of Telecommunications Authority especially regarding issuing and revoking of licenses. The transfer of responsibility from the government to an autonomous institution was a positive step since dissidences within the government was hampering the process of privatization. It also allowed for 100% privatization of the company except for the one "golden share" reserved for the State due to national security and public interest concerns. However, direct or indirect foreign ownership was limited to 45 %[xxxi]. The amendments introduced with this law were not enough to attract the interests of the foreign investors as well.

The government could not achieve the privatization of the Turk Telecom before the proposed date in the law. As a final attempt, Council of ministers issued another decree just 1,5 months before the due date of ending monopoly. This decree ensured a block sale of minimum 51% of the shares[xxxii]. However, as of today, privatization of the Turk Telecom could not be achieved yet. Domestic companies strongly criticize the government's insistence on foreign investment and block share sale requirements. They argue that this will eventually lead to privatization of the incumbent less than its target value. As an alternative, by presenting Malaysia as a success story, they propose public offerings to bring more dynamism to the telecommunications market. [xxxiii]

Malaysia represents a successful country example in the development of the telecommunication sector. As in most of the countries, the push towards privatization began in the early 1980s and accelerated during the end of the decade especially within the electronics industry[xxxiv]. The partial privatization of the dominant carrier Telekom Malaysia started in 1990 with the sale of 25 % of the stocks, which increased to 34 % by the year 2000. Foreign investment was limited to 30 % in total.[xxxv]

If we look at the similarities and dissimilarities between Malaysia and Turkey, we see that both of them have very strong, in some respects authoritative, state structures. Besides, both of the countries are impacted by financial crises. Though Asian Financial Crisis was a global one, it had pretty significant impact on Malaysia similar to the 2000 and 2001 economic crises of Turkey. Malaysia and Turkey also show quite similarity in terms of their phone densities. The number of main telephone line subscribers per 100 people is 19 in Malaysia whereas it is 28 in Turkey. Similarly, while the number of cellular phone subscribers per 100 people is 38 in Malaysia, it is 35 in Turkey.

Unlike Turkey, Malaysia's privatization efforts are structured by her domestic socio-economic cleavages but not by international institutions and regional unions. The multi-ethnic structure of the society was the major source of the opposition during the privatization process since power holders were biased in favor of their own interest groups. However, a liberalized market structure satisfying the demands of various groups during the 1990s diminished the resistance to the privatization idea of the incumbent provider.[xxxvi] The most significant dissimilarity yet comes from Malaysia's clear vision of the development and spread of the ICT technologies in the country. The phone densities of the two countries indicate that Turkey is in a better position in terms of mainline telephone infrastructure. This is important since the empirical analysis in the first section presented a strong correlation between phone density and the Internet connectivity. From these results one would expect Turkey to have better or at least similar Internet diffusion rates with Malaysia. However, when we compare the number of Internet users, we see that Malaysian users are 4 times more than the Internet users in Turkey[xxxvii]. This is actually bad news for policy makers in Turkey who believe the enhancement in ICT technologies would come with the privatization of Turk Telecom. Malaysian case shows that though service improvement is important, it is not the privatization of the incumbent but the government backing and visualization that lead to advancement in information technologies.

Another country example that showed similar development patterns (until 1990s) with Turkey is the South Korea. Similar to Turkey, Korea has always had a centralized and authoritarian state structure throughout her history. The transformation of the agricultural structure of the society started during 1960s with the President Park Chung Hee (1967-79) who was assassinated as a result of the dissatisfaction with the elite domination in the country[xxxviii]. To control the civil unrest during the post assassination period, Korean government prioritized universal service to meet the demands of its middle-income citizens and domestic businesses[xxxix]. An incredible service enhancement was achieved during the 1980s. In 1980, the number of telephone mainlines per 100 people was 7.34. However, this number increased to 30.97 in 1990. This infrastructure improvement process attributable to universal service provision of the government continued to increase during the 1990s due to the privatization

demands of top domestic corporations, especially in electronics industry, and foreign equipment manufacturers and multinational corporations[xl]. Although Korea, similar to Turkey, had international pressures, the main demand was coming from her domestic industry. The privatization of the incumbent operator Korea Telecom began in 1991 and ended in 2002, ahead of the schedule[xli]. First 20 % of the stocks were sold. However, this amount increased to 41% by 2000. Foreign ownership limit was also increased to 49 % from 33 %. Till the end of the decade, due to privatization, social uprisings, especially among the workers, prevailed. Ironically, the financial crisis in 1997 helped the government to settle down the social unrest since the international organizations started to exert more power[xlii]. Now, South Korea has 48.86 main telephone lines and 67.5 cellular subscribers per 100 people. Though, these numbers indicate amazing infrastructure advancement levels, especially the percentage of increase in main telephone lines is less than the 1980s. This indicates that though the success attributable to privatization was huge, the consequences of the universal access policies of the governments in 1980s were not less than it. Similarly, in terms of high Internet penetration rates, a universal access telecommunications culture of the state and following policies were as influential as well-developed telecommunication infrastructure of the country. South Korea has the highest Internet diffusion rates among all high-middle income countries. The number of Internet users is 7,5 time more than the Internet users in Turkey[xliii]. Unlike Turkey, the vision of universal "information society" of the government and comprehensive policies have eased privatization and hence the Internet connectivity in South Korea.

Though the Internet policy of Turkey was embedded in the privatization process of the Turk Telekom, Turk Telekom had almost no role in the introduction of the Internet in Turkey. Similar to most of the countries, research institutes and university networks prepared the basis of the connectivity in the country. In 1991, the Middle East Technical University (METU) and Turkish Scientific and Technical Research Council, (TUBITAK) initiated a project and then established the first Internet connection with NSF in 1993[xliv]. Turk Telekom's lack of interest on the Internet until 1995, first of all, was a repercussion of the unavailability of a comprehensive Internet policy of the state, and second, was due to Turk Telekom's unawareness of the significance of the Internet[xlv]. With METU's and TUBITAK's suggestions, Turk Telekom announced a tender for the creation of an Internet backbone, which was later called TURNET, in Turkey. Within 3 years time after TURNET went online, ISP market flourished in the country. The most affirmative action of the government regarding the development of the Internet was eliminating the barriers, or not creating new ones such as licensing agreements, for ISPs to enter the market. Some ISPs, which were supported by the biggest corporations

in Turkey, leased international lines, developed their infrastructure and increased their speed of connectivity[xlvi]. The competition in ISP market, hence, became very fierce and dynamic.

The increased activity necessitated the improvement of TURNET typology. The new network, TTNet, is started to operate during the second half of the 1999. It was a huge improvement over TURNET since it increased the existing domestic capacity by 2 times and the international capacity by approximately 9 times.[xlvii] With this new backbone, geographic scope of the Internet moved beyond the Ankara, Istanbul and Izmir triangle with 143 points of presence throughout the country[xlviii]. Provision of various technologies such as ADSL and Cable, especially during the latter half of the 2001 also increased the capacity and efficiency of the TTNet. By banning ISPs providing these enhanced capacity services, Turk Telekom became a "monopoly" in broadband services. Despite its supporting policies at the end of the 90s, Turk Telekom, with TTNet, embraced a severe competition policy with other service providers in dial-up connection. Telekom's prices were so low that Telecommunication Authority made it to increase the charges since existing prices were causing unfair competition. Still, this low prices and enhanced capacity was enough to increase the number of TTNet subscribers from 9,000 to 162,000 between the years 2000 and 2001.[xlix] This increase becomes more interesting when we assess it together with the 30% decrease in all Internet dial-up subscribers due to the economic crisis in 2000. Thus, with TTNet backbone, Turk Telekom became dominant ISP itself, unlike to its position in TURNET.

Turkey is a 70 million-population country with approximately 5 million Internet users. Although, the future market to be involved in looks pretty big, there are some structural factors limiting the size of the market. If we take Turkey as a case and interpret the empirical results of the first section, we see that similar to all middle-income countries, economic wealth of the people in Turkey affects the Internet connectivity level. The huge decrease in the number of Internet users during the crisis in 2000 supports this argument. However, this fact can be used as an input for more comprehensive Internet policies. Generating policies that would ease access for people, such as public libraries, schools and cafes with Internet connections, may decrease the impacts of bad economic conditions on diffusion. Internet cafes are now the only available options in Turkey with an access rate of 27 %.[l] Though the models do not indicate significant results for income inequality, the growing gap is a big problem in Turkey. While only 16 % of low and middle income people have connection to the Internet, this number goes up to 78.2 % for higher middle and high income groups[li]. For a country as highly populated as Turkey, the absolute number of 84 % of low and middle-income people means lots of people without connection to the Internet. Other significant factors limiting the Internet market are the number of personal computers, the number of websites and broadband access by the country. The

number of PCs per 100 people in Turkey is 4.46 and that is way below the average number of 12 in middle-income countries. The gap becomes more striking if we compare it with the numbers in South Korea (49.7) and Malaysia (14.7). A similar disparity exists in the number of websites per 10,000 people. While Turkey has only 9 websites, Korea has 110 and European Union countries have 379 websites on average[lii]. If we look at the broadband access per 100 inhabitants, including both DSL and cable, we see that only 0.02 people in Turkey have access to broadband services whereas the average number of people in OECD and European Union countries is 3.8 and 2.3 respectively. South Korea again has an overwhelming dominance with 19.1 people per 100 people[liii]. Interestingly, the empirical results indicate the insignificant impact of pricing on the Internet diffusion. Turkey can be used as a perfect evidence for this argument since it has both the lowest Internet access pricing with a value of 9.13 $ and the lowest penetration rate among all OECD and EU countries[liv]. The two other insignificant policy variables that need to be assessed for Turkey are the ISP competition and Online Government policies. The policies supporting the competition among ISPs are not enough to increase the number of Internet users since the Internet market is shaped by more structural factors, as explained above, than just the level of competition. The severe competition among ISPs and low Internet connectivity in Turkey presents the importance of structural factors in this process. The government online services availability does not have a significant impact on the Internet diffusion in middle-income countries as well. In Turkey, these online government services do not increase demand among people because they do not offer options for people that would ease their life despite going with traditional means. Lack of coordination and hence chaos among the providers of similar services affects the adaptability of people who have already low computer literacy skills. Although, cooperation and coordination among different governmental bodies and online government services aimed to be increased by participating to the E-Europe Project, e-government policies still miss the vitality of basic components, such as software development, in service provision[lv]. This lack of awareness and ignorance continue to persist at different levels of the hierarchy.

VI. Conclusion

The factors affecting the Internet diffusion in middle-income countries present differences compared to advanced countries. Although the economic and infrastructural factors have similar significant impacts, the influence of policy variables varies widely. The high significant factors of privatization and competition in advanced countries leave their place to the institutional environment shaped by ICT laws and regulations in middle-income countries. This result is very important since most of the developing countries appraise the liberalization of basic telecommunications services as a necessary condition for the development of the Internet, though liberalization may not generate similar

conditions of competition and property rights as in developed countries. Privatization might foster the Internet development if developing countries have "information society" ideals supported by comprehensive Internet policies as exemplified by South Korea and Malaysia cases. This is exactly what Turkey is lacking. Turkey without having comprehensive Internet policies, expects improvement in the Internet market, as a natural consequence of the privatization process of the Turk Telekom. It seems that by being unaware of the importance of information societies supported by learning, adaptive and participatory systems, Turkey will continue to loose time and its competitive edge in the following years.

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Appendix A

Description of Variables and Data Sources

Variables	Description	Measurement	Year	Source
Internet Hosts	Individual computers connected to the Internet	per 10,000	2002	ITU (2002) http://www.itu.int/ITU-D/ict/statistics/
Internet Users	Number of regular Internet users calculated based on # of Internet hosts	per 10,000	2002	ITU (2002) http://www.itu.int/ITU-D/ict/statistics/
GDP	Gross domestic Product	per capita	2002	ITU (2002) http://www.itu.int/ITU-D/ict/statistics/
Gini Coefficient Index	Gini Coefficient for income inequality	score	2003	UNDP(2003) http://hdr.undp.org/statistics/data/ index_alpha_indicators.cfm
Education Index	Composite Index including adult literacy rate and the combined gross enrolment ratio for primary, secondary and tertiary schools.	score	2003	UNDP(2003) http://hdr.undp.org/statistics/data/ index_alpha_indicators.cfm
Democracy Index	Composite Index including Civil Liberty and Political Rights	ranking from 1 to 7; 7 is lowest/worst	2003	Freedom House (2003) http://www.freedomhouse.org/ research/freeworld/2003/table.pdf
English	English among the most commonly used languages in the country	Y/N dichotomy	2004	CIA (2004) http://www.cia.gov/cia/publications/ factbook/index.html
Pricing	The cost of a 30-hour off-peak Internet access basket	USD	2002	World Bank (2002) http://www.worldbank.org/data/ countrydata/countrydata.html
PC	Number of personal computers	per 100 people	2002	ITU (2002) http://www.itu.int/ITU-D/ict/statistics/
Phone Density	Composite variable consisting of: Main telephone lines cellular phone subscribers	per 100 people	2002	ITU (2002) http://www.itu.int/ITU-D/ict/statistics/
Population Density	Number of people per km2	number of people	2002	ITU (2002) http://www.itu.int/ITU-D/ict/statistics/

Variables	Description	Measurement	Year	Source
Broadband Availability Index	Broadband Internet access availability	ranking from 1 to 7; 7 is highest/best	2002	World Bank (2002) http://www.worldbank.org/data/ countrydata/countrydata.html
Local ICT Services Index	Local specialized ICT services availability	ranking from 1 to 7;7 is highest/best	2002	World Bank (2002) http://www.worldbank.org/data/ Countrydata/countrydata.html
Secure Services Index	Number of secure services	ranking from 1 to 7; 7 is highest/best	2002	World Bank (2002) http://www.worldbank.org/data/ countrydata/countrydata.html
ISP Competition Index	Competition in ISPs	ranking from 1 to 7; 7 is highest/best	2002	World Bank (2002) http://www.worldbank.org/data/ countrydata/countrydata.html
Online Government Index	Government online services availability	ranking from 1 to 7; 7 is highest/best	2002	World Bank (2002) http://www.worldbank.org/data/ countrydata/countrydata.html
ICT Law Availability Index	Laws relating to ICT use	ranking from 1 to 7; 7 is highest/best	2002	World Bank (2002) http://www.worldbank.org/data/ countrydata/countrydata.html
Government Priority Index	Government prioritization of ICT	ranking from 1 to 7; 7 is highest/best	2002	World Bank (2002) http://www.worldbank.org/data/ countrydata/countrydata.html
Telecommunication Policy	State owned monopoly, partial competition or full competition	Y/N dichotomy	2002	ITU (2002-2003) http://www.itu.int/ITU-D/treg/profiles/ guide.asp?lang=en
Competition in Local Service	Monopoly, duopoly, partial competition or full competition in local phone services	Y/N dichotomy	2002	ITU (2002-2003) http://www.itu.int/ITU-D/treg/profiles/ guide.asp?lang=en

Appendix B

Descriptive Statistics and Pearson's Correlation Coefficients

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	**IU**	1																						
2	**GDP**	0.85	1																					
3	**GINI**	-0.2	-0.2	1																				
4	**EDU**	0.49	0.57	-0.2	1																			
5	**DEM**	-0.3	-0.3	0.1	-0.38	1																		
6	**ENG**	0.21	0.18	0.3	-0.27	0.17	1																	
7	**POPD**	0.49	0.55	0	0.05	0.14	0.26	1																
8	**PC**	0.91	0.87	-0.2	0.44	-0.19	0.19	0.7	1															
9	**PRC**	-0	0.06	0.1	0.27	-0.49	-0.2	-0.15	0	1														
10	**PHND**	-0.8	0.9	-0.4	0.6	-0.47	-0.1	0.34	0.74	0.1	1													
11	**BROAD**	0.67	0.59	-0.1	0.37	-0.31	0.1	0.47	0.72	0.07	0.49	1												
12	**ICTSER**	0.16	0.31	0	0.06	-0.37	0.14	0.15	0.22	0.17	0.22	0.24	1											
13	**SECSER**	0.21	0.32	0.4	0.13	-0.05	0.45	0.3	0.24	0.05	0.17	0.21	0.36	1										
14	**ISP**	0.38	0.37	0.1	-0.01	0.09	0.35	0.22	0.31	-0.2	0.38	0.36	0.22	0.33	1									
15	**OGOV**	0.55	0.56	0.1	0.33	-0.22	0.16	0.46	0.5	-0	0.47	0.47	0.69	0.51	0.48	1								
16	**ICTL**	0.74	0.68	-0.2	0.19	-0.16	0.25	0.43	0.65	-0.1	0.66	0.43	0.37	0.23	0.49	0.56	1							
17	**GOVP**	0.5	0.42	-0.2	-0.13	0.14	0.35	0.39	0.44	-0.2	0.43	0.16	0.19	0.18	0.46	0.47	0.75	1						
18	**SOMON**	-0.3	-0.3	-0.2	-0.16	0.3	0.04	-0.11	-0.2	0.05	-0.24	-0.2	-0.1	-0.29	-0.3	-0.3	-0.34	-0.22	1					
19	**PPRIV**	0.25	0.29	-0.3	0.04	-0.04	-0.1	0.18	0.22	-0.1	0.31	-0.1	0.1	0.06	-0	0.1	0.33	0.36	-0.53	1				
20	**FPRIV**	-0	-0.1	0.5	0.1	-0.23	0.08	-0.1	-0.1	0.04	-0.12	0.29	0.01	0.19	0.26	0.15	-0.08	-0.22	-0.34	-0.61	1			
21	**MONLS**	-0.1	0.03	-0.2	-0.29	0.29	0.13	-0.11	-0	-0.1	-0.06	-0.1	-0.2	-0.16	-0.1	-0.2	0.05	-0.01	0.458	-0.05	-0.37	1		
22	**PLS**	-0.2	-0.2	0.2	-0.04	0.25	0.12	-0.06	-0.2	-0.1	-0.24	-0.2	-0.1	0.04	-0	-0.1	-0.1	0.18	0.018	0.01	-0.03	-0.21	1	
23	**FLS**	0.3	0.15	0	0.23	-0.49	-0.1	0.15	0.19	0.2	0.24	0.39	0.25	0.07	0.11	0.32	0.11	-0.05	-0.39	-0.02	0.39	-0.72	-0.4	1