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Can Internet Promote Democracy?

A cross-country study based on dynamic panel data models

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Abstract

In the age of information revolution, information and communication technologies are penetrating all levels of societies and also influencing the political aspect of each country by providing some facilities such as Internet and web technologies. Democracy, as a universal value and a political system, is also well-known and has an important role in the sublimation of the human societies. This study attempts to examine the effect of Internet extension on democracy promotion by using a panel consisting of 122 countries covering the period from the year 2000 to 2014. In order to estimate the effect, and also to deal with the endogeneity and autocorrelation problems, the dynamic panel data models are employed in the study. The results of estimation models indicate that Internet extension has a significantly positive effect on democracy promotion during the period. In the end, some ideas for further research are presented.

Keywords: Democracy, Internet, Dynamic Panel Data Models.

1. Introduction

All human nations have been trying to have an ideal society and attempting to sublimate the society in several ways. Democracy, as a long-standing human desire, is a well-known mechanism to achieve this, and it has long been the central focus of political and social science and has many supporters especially in the current age. Despite of the many attempts at democracy by different nations, there are only 20 countries in the world that have full

democracy, and other countries have flawed democracy, hybrid or authoritarian regimes (EIU, 2015). In the age of Information and Communication Technology (ICT), the attempts have been accelerated and many non-democratic nations have taken steps forward to having democratic countries. Because the nations have indeed perceived, as Nixon (1999) said, “only people can solve problems people create” and have tried to promote democracy in their society, which would lead to an increase in the citizens’ participation in the decision-making processes that can affect their communities, environments, and societies (Coleman and Blumler, 2009; James, 2011; Polat, 2005; Rethemeyer, 2007; Tolbert and McNeal, 2003; White, 1997).

In the age of information revolution, web technologies – in particular the Internet and its deployment to a broader public since the early 1990s – are penetrating all levels of societies and are also affecting the political aspects of each society (Chadwick, 2006; Guillén and Suárez, 2005; Pirannejad, 2011). In the new era, some studies focused on the contribution of Internet extension on some factors, which related to the political systems and citizens participation, and also explained that the wide diffusion of Internet in societies facilitates political communication (Coombs and Cutbirth, 1998; Norris, 2000; Ricci, 1998), improves the process of the gathering and dissemination of information (Baybeck and Huckfeldt, 2002; Kaye and Johnson, 2004), provides greater networking capacity to citizens through means such as online forums and discussion (Papacharissi, 2004; Woo-Young, 2005), brings about political awareness among citizens (Pirannejad, 2011), and reduces the transaction costs for citizen participation (Desanctis et al., 2003; Kaye and Johnson, 2004; Lee and Jang, 2010).

Undoubtedly the Internet extension has an important role on the development of societies and has attracted the attention of many researches to explore this critical role. Most scholars, as mentioned previously, focused on the effect of Internet and its diffusion on the variables which

relate to political systems and democracy, and very few studies attempted to explore how the Internet extension can affect democracy as a general concept. This research aims to empirically examine whether the Internet can lead to democracy promotion, by using a cross-country database of 122 countries which covers the period from the year 2000 to 2014. This study has two important features: First, in order to estimate the effect of Internet on the democracy promotion, the study employs the pooled Ordinary Least Squares (OLS) regression. Because the pooled OLS may yield biased and inconsistent estimates – such as endogeneity and autocorrelation problems – the study also uses the Dynamic Panel Data (DPD) models. Second, in order to have a more accurate estimation, the levels of GDP and education – which were emphasized in the theoretical literature to have important roles on the process of democracy promotion – are used as control variables.

The study continues as follows. The next section reviews the theoretical relationship between Internet and democracy. Section 3 explains the methodological choices and describes the approaches that were used in the study. Data sources and variable definitions are also presented in this section. In Section 4, the empirical findings are reported and discussed. Section 5 contains the limitation of the study and presents some ideas for further research. The last section summarizes the results of the study.

2. Literature Review

2.1. Disentangling The Effects of Internet on Democracy

Democracy as a kind of valuable political system, and also the process of democratization as an acceptable political paradigm shift, are conducted the growing amount of literature in social and political science for several decades. Although this concept was mostly accepted among scholars

and politicians at the international level, but there is little consensus globally on how to establish and strengthen it (Inoguchi et al., 1998; Wynia, 1974).

In the age of information and communication technologies (ICTs), several scholars believe ICTs, especially Internet, by providing some technological facilities such as various channels for participation, including weblogs, and online social networks have positive potentials to affect the process of democratization in all over the world (Bimber, 2003; Gimmmler, 2001; Lee, 2016; Margolis and Moreno-Riaño, 2013; Stoycheff et al., 2016; Weare, 2002). There is a broader story behind the direct or indirect possibility of Internet on democracy promotion. During the last two decades, a growing amount of literature has begun to explore the effects of Internet extension on different aspects of democracy promotion. Several scholars argued that Internet facilitates the process of gathering and dispatching information, and increases the scale and speed of information provision with a low cost. They emphasize that access to information is an important factor of the process of democratization in every nation and can lead to democracy promotion (Bimber, 2003; Chan and Rubin, 1987; Freyburg et al., 2011; Schimmelfennig, 2014). Magnani and Bardone (2006) concluded that the Internet, by providing the different sources of information, allows people to verify and test the information delivered by traditional media such as press, radio, television etc. Weare (2002) argued that Internet has facilitated access to information and citizen input to the policy making process. Gimmmler (2001) pointed out that Internet, by increasing the access to information and also by providing the free and open discourse within a vital public sphere can affect the quality of political debates and has an important role in the political process. Similarly, Bailard (2014) claimed that Internet opens a large window for citizens to access huge amount of information about the social and political issues in domestic and global scale. Moreover, She stated that the Internet increases diversity of

information sources, prepares the facilities for citizens to transmit a higher volume of information, and more exposures to political information regarding the performance of government.

In the meanwhile, some other scholars emphasized on the indirect effects of Internet on democracy promotion and explored the Internet's impact on civil society as a specific catalyst for democratization (Diamond, 2008; Edwards, 2009; Muskhelishvili and Jorjoliani 2009). In other words, some scholarly works conclude that the Internet indirectly, by affecting civil society as one of the most fundamental pieces of democracy, has been correlated with the development of democracy (Freedman 2009; Friedman et al., 2005; Guillén & Suárez 2005). For example Toyoma (2010) argued that ICTs are not the main driver of development or social change in societies. Civil society's progress depends on human changing and their uses and interactions with technologies. Hence, Sommerfeldt (2013) emphasized on the key role of social capital in the process of democratization and stated that the Internet technologies, such as websites and social media platforms, can affect public relations and social capital. He argued when the public relations and social capital developed in a society, it can leads to civil society and public spheres, because people trust one another. And finally, when people trust one another, they are likely to be more active and participate in their society, as a key component of democratization process.

Some other scholars attempted to examine the effect of Internet on the other critical factors of the process of democratization such as public consultation, political participation, political empowerment, and political engagement of citizens. Fishkin (2009) argued that Internet has an important role in democracy promotion, because it affects the possibility and feasibility of different methods of public consultation. He also emphasized that democracy has two critical values that Internet extension can affect positively. The first value is deliberation which refers to

the development of preferences that facilitates access to good information. And the second value is political equality which refers to how those preferences weigh in the decision process. Mossberger *et al.* (2008) explained that Internet can lead to citizens' political participation. They implied that "the results clearly demonstrate that the Internet contributes to the development of civic engagement among individuals and fosters political participation" (p. 144). They also argued that the Internet access is an increasingly important tool for political activities of citizens, and emphasized that the high rate of Internet diffusion introduced a new version of citizenships, the so-called "digital citizenship". According to Amichai-Hamburger *et al.* (2008) using ICTs – especially Internet – could lead to the political empowerment of the citizens, which in turn increases effective political participation and also helps to supervise and influence government decisions. They implied that ICT facilitates the process of sharing information and knowledge, and also it empowers citizens "through engendering the creation of a fruitful debate regarding civil and government issues among political activists and critics via online watchdog groups" (p. 1785).

In addition, some other scholars emphasized that the Internet leads to the emergence of the new version of citizens' participation, the so-called "e-participation" which in turn creates a new version of democracy, the so-called "e-democracy" (Astrom, 2001; Macintosh, 2004; Saebo *et al.*, 2008). It is regarded as an approach for enhancing the public sphere, and as decentralized communications within cyberspace, which reduce the transaction costs for citizen participation and facilitate political participation and rational-critical discourse, and hence develop public opinion and also increase the quality of citizen participation in the democratic processes (Chadwick, 2003; Mahrer and Krimmer, 2005; Moreno-Jiménez and Polasek, 2003).

Despite the positive side of the Internet effects on the process of democratization which has attracted a lot of studies over the last decade, some other scholars focused on the dark sides of the Internet and its effects on the social and political issues (Lonkila, 2008; Lord, 2006; Thornton, 2002). For example, Rheingold (1993) stressed the positive potentials of the Internet regarding to the issues, while worrying about whether the Internet would be able to realize that potential in the real world. He stated that “virtual communities could help citizens revitalize democracy, or they could be luring us into an attractively packaged substitute for democratic discourse” (p. 276). Fish (2009) argued that "the possibility of government control over the Internet cuts out the very heart of its democratic ambitions. It is thus especially disturbing that while the governments that maintain Internet censorship operations are mostly authoritarian in form, at least one democracy has gotten in on the game" (p. 48). Similarly, Tsai (2016) stated that in non-democratic countries such as china, the governments try to develop their ability to effectively control network technology and cyberspace, in order to effectively control public opinion and finally to strength their ability to govern.

In addition to the last two categories of the research –which focused on the positive or negative effects of Internet on democracy promotion – some few researches look at the Internet as a neutral technology. According to this viewpoint, have a positive or negative effects of the technology is highly related to the social, cultural, and political contexts and backgrounds of the any society and also dependent on the actors that decide to use them (Bowers, 1998; Cho, 2014; Feenberg, 2017; Mulligan, 2013; Ray, 2007). For example, Cho (2014) analyzed public opinion data for the 45 societies and found the significant differentiation in the effect of Internet on democracy promotion among the democratic and authoritarian countries. He clarified that controlling the online content in non-democratic countries is the main factor which could

introduce the different face of the Internet in different setting. Similarly, Mulligan (2013) by comparing the views of Internet addiction in several countries, found the Internet as a neutral technology and stated that the purpose and value of this technology is politically and socially constructed. She emphasized that citizens' understanding of Internet and related technologies are influenced by two main competing discourses among nation-states.

2.2. Related Research

There are several camps projecting different kinds of results on the effect of the Internet on the process of democratization. Some have projected that there is little evidence that the Internet has had any immediate effect on democratization, while others find the Internet to be the next logical step toward democratization in a globalizing world context (Lonkila 2008; Lord 2006).

A number of previous empirical studies have been conducted to examine the impact of Internet extension on democracy promotion, but the results are mixed. Thornton (2001) concluded that direct participatory democracy is highly unlikely to eventuate merely as a result of the Internet's existence. She states that because Internet-usage is restricted to relatively privileged groups of citizens and does not expand more profoundly into the middle- and lower-income groups of citizens, the democracy promotion will not happen. Best and Wade (2009) examined the global effect of the Internet on democracy over the period of 1992 to 2002. They found that Internet prevalence significantly affects the level of democratization and has played a positive role in the increase of democracy during the period. Scheufele and Nisbet (2002) provided empirical evidences, which indicate that the Internet does not increase democracy. They concluded that mass media broadcasting, such as television and newspapers, plays a far more effective role than the Internet in promoting democracy. Hence, Rhue and Sundararajan (2014) conducted a research to investigate the effect of digital technologies on democracy promotion across 189

countries between 2000 and 2010. The study was conducted based on a publicly available data and uses state-of-the-art dynamic econometric and network analysis methods. They founded three key mechanisms linking information technology with democratic change in the sample countries. The first one is *Information flows and transparency* which refers to the important role of new technologies, such as smart mobile phones, on creating and accessing increasingly novel information sources for citizens. The second mechanisms is *coordination and communication*, related to Internet facilities which provided the low-cost, immediate, and interactive connections among geographical disparate citizens. The last one is *external visibility*, refers to the international pressure toward freedom through foreign media coverage and international sanctions.

3. Methodology and Data

3.1 Estimating The Effect of The Internet on Democracy

In order to examine the effect of the Internet extension on the democracy promotion, the study uses the following panel data model which includes the lagged dependent variable as an explanatory variable:

$$DI_{it} = \beta_0 + \beta_1 DI_{i,t-1} + \beta_2 Internet_{it} + \beta_3 GDP_{it} + \beta_4 Edu_{it} + \theta_i + \varepsilon_{it} \quad (1)$$

where *DI* is the democracy status; *Internet* is the level of Internet extension; *GDP* is GDP per capita; *Edu* is the level of education; θ_i refers to the country-specific effects; and the ε_{it} are disturbances assumed to be distributed across countries with a zero mean. In Eq. (1) both *GDP* and *Edu* are used as control variables. *GDP* is included as many studies find that countries with higher levels of economic development in general have higher levels of democracy (Hadenius

and Teorell, 2005; Lopez-Cordova and Meisner, 2008; Wickrama and Mulford, 1996). *Edu* is included, as previous studies suggest that countries with a better-educated population usually have high democracy (Acemoglu et al., 2005; Carr, 2008; Dewey, 1916; Glaeser et al., 2007; Rindermann, 2008).

In order to estimate the effect of Internet extension on democracy promotion, the study employs the dynamic panel data model specified in Eq. (1) for the following reasons. First, in order to estimate the democracy promotion accurately the study needs to work with a dynamic, lagged dependent econometric model as shown in Eq. (1). Because as Groshek (2009) argued, a change in the value of the democracy index is predicted based on its past values and therefore the study employs the values of the democracy index one year earlier as a lagged variable.

Second, the possibility of an endogeneity problem – when there is a correlation between the parameter or variable and the error term – may arise from estimating Eq. (1), and so the failure to correct this problem may lead to inconsistent coefficients. In order to solve the endogeneity problem, the study employs an instrumental variable procedure applied to the dynamic panel data model.

Third, using the pooled OLS regression to estimate the effect of Internet extension on democracy promotion as shown in Eq. (1) may yield biased and inconsistent estimates. In order to solve the problem, the study employs the Generalized Method of Moments (GMM) estimator proposed by Holtz-Eakin *et al.* (1988) and developed by Arellano and Bond (1991). The *Stata* program v. 14 is employed in this study.

3.2 Data sources and variable definitions

In order to present the national levels of democratization, the study uses the Democracy Index (*DI*) as a dependent variable which provided by Freedom House (2016). The scale ranges from 0-7 where 0 is least democratic and 7 most democratic. As independent variable, the study employs the country's Internet extension (*Internet*) which is measured by Internet users per 100 inhabitants. The scale is taken from the World Telecommunication/ICT Indicators Database provided by ITU (2016).

As mentioned in section 2, some factors – such as economic development and level of education – traditionally are associated with levels of democratization. In other words, these variables are affecting the process of democratization in each country. Therefore, in order to examine the effect of Internet implementation on democracy, this study uses these two factors as the control variables. To present the economic development, the study employs the GDP per capita in thousands of constant current international dollars, and to present the level of education the study uses the gross enrolment ratio in secondary education. The data for the control variables – economic development and level of education – are obtained from the World Development Indicators provided by the World Bank (2016). The definitions and sources of variables are given in Table 1. The summary statistics of the variables are given in Table 2.

Table 1: Definitions and sources of variables

| Variables | Definitions | Sources |
|------------------|---|---------------------------|
| <i>Internet</i> | Internet users per 100 inhabitants | ITU (2008) |
| <i>Democracy</i> | Democracy Index ranges from 0-10 where 0 is least democratic and 10 most democratic | Freedom House (2000-2008) |
| <i>GDP</i> | GDP per capita, in thousands of constant current international dollars | World Bank (2008) |
| <i>Education</i> | Gross enrolment ratio in secondary education (%) | World Bank (2008) |

Note. The missing value for *Democracy* in the years 2006 and 2007 for Myanmar are replaced by the average of the 2005 and 2008 values.

Table 2: Summary statistics of main variables

| Variables | N | Mean | Min | Max | Std. Dev. | Number of observations |
|------------------|----|-------|------|-------|-----------|------------------------|
| <i>Internet</i> | 71 | 27.92 | 0.35 | 76.02 | 24.44 | 639 |
| <i>Democracy</i> | 71 | 5.76 | 0.25 | 10 | 3.37 | 639 |
| <i>GDP</i> | 71 | 12.50 | 0.11 | 59.98 | 13.07 | 639 |
| <i>Education</i> | 71 | 0.77 | 0.25 | 0.98 | 0.19 | 639 |

3.3 Panel Data

The study uses the data of 122 countries¹ which covered the years from 2000 to 2014. Table 3 provides the list of countries, which are grouped by levels of Internet users and democracy. In this list, Iceland has the highest level of Internet implementation (*Internet*=98.16), and Eritrea has the lowest level of Internet implementation (*Internet*=0.99) in the year 2014. Therefore, the study divides the 122 countries into three groups based on their values of Internet implementation in the year 2014. The first group contains the countries with higher levels of Internet users (*Internet*≥50), and the second group includes the countries with medium levels of Internet users ($25 \leq \textit{Internet} < 50$), and the last group encompasses the countries with lower levels of Internet users (*Internet*<25).

¹ According to the four variables (Internet users, Democracy level, Education level, and GDP) which used in the current research, the study needs a data set which contains completely all data of the variables for every country during the time period from 2000 to 2014. Base on this circumstance, some countries - who had not complete data for any of the variables during the period - were excluded from the study. Hence, the data of 122 countries -who had the complete range of data for the variables- were used in the study. In other words, based on the statistical concern, the data of all countries who had complete range of data for all the four variable were used and there was no any selection process in order to prepare the panel data in the study.

Table 3: List of 71 sample countries, grouped by different levels of Internet and Democracy

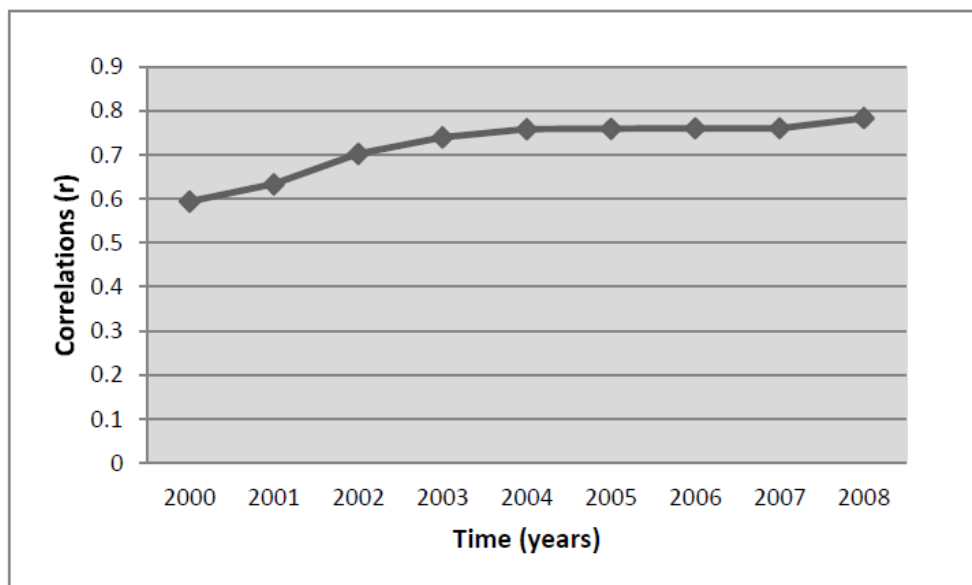
| <i>Internet</i> ₂₀₀₈ <25 | | 25≤ <i>Internet</i> ₂₀₀₈ <50 | | <i>Internet</i> ₂₀₀₈ ≥50 | |
|-------------------------------------|---------------------------|---|---------------------------|-------------------------------------|---------------------------|
| Country | <i>DI</i> ₂₀₀₈ | Country | <i>DI</i> ₂₀₀₈ | Country | <i>DI</i> ₂₀₀₈ |
| Uzbekistan | 0.25 | Russia | 4.75 | Malaysia | 6.5 |
| Saudi Arabia | 0.42 | Bosnia and Herzegovina | 6.07 | Jamaica | 8.5 |
| Myanmar | 0.5 | Ecuador | 7.08 | Antigua and Barbuda | 8.56 |
| Swaziland | 1.08 | Colombia | 7.17 | Sao Tome and Principe | 8.56 |
| Eritrea | 1.17 | Mozambique | 7.33 | Croatia | 8.92 |
| Syria | 1.17 | Guyana | 7.75 | Korea, South | 9.08 |
| Equatorial Guinea | 1.25 | Macedonia | 8.08 | Belgium | 9.5 |
| Sudan | 1.5 | Brazil | 8.67 | Czech Republic | 9.5 |
| Vietnam | 1.58 | Argentina | 8.67 | Estonia | 9.75 |
| Oman | 1.75 | Bulgaria | 8.92 | France | 9.75 |
| Iraq | 1.91 | Romania | 8.92 | Germany | 10 |
| Zimbabwe | 1.92 | Greece | 9.58 | Hungary | 10 |
| Kazakhstan | 2.25 | Italy | 9.58 | Lithuania | 10 |
| Cameroon | 2.33 | Chile | 10 | Slovakia | 10 |
| Chad | 2.42 | Costa Rica | 10 | Slovenia | 10 |
| Mauritania | 2.5 | Poland | 10 | Spain | 10 |
| Somalia | 2.5 | St Kitts and Nevis | 10 | St Lucia | 10 |
| Afghanistan | 2.74 | | | United Kingdom | 10 |
| Egypt | 3 | | | | |
| Tajikistan | 3 | | | | |
| Fiji | 3.17 | | | | |
| Gabon | 3.17 | | | | |
| Togo | 3.17 | | | | |
| Angola | 3.25 | | | | |
| Gambia | 3.33 | | | | |
| Bangladesh | 3.5 | | | | |
| Yemen | 3.67 | | | | |
| Cote d'Ivoire | 3.75 | | | | |
| Central African Rep | 3.92 | | | | |
| Algeria | 4.25 | | | | |
| Cambodia | 4.25 | | | | |
| Uganda | 4.33 | | | | |
| Congo, Dem Rep | 4.58 | | | | |
| Djibouti | 4.67 | | | | |
| Burkina Faso | 5 | | | | |
| Tanzania | 5.17 | | | | |

Note. *Internet*₂₀₀₈ is the value of internet users per 100 inhabitants in 2008. *DI*₂₀₀₈ is the value of Democracy Index in 2008.

For the 61 countries with higher levels of Internet implementation, all have higher levels of democracy ($DI \geq 3.5$). For the 27 countries with medium levels of Internet extension, all have higher levels of democracy ($DI \geq 3.5$). For the 34 countries with lower levels of internet extension, 30 countries have lower levels of democracy ($DI < 3.5$), and only four countries in this group - Mali, Burkina Faso, Pakistan, and Cote d'Ivoire - have middle levels of democracy.

As the Figure 1 shows, there is a clear correlation between levels of Internet extension and democracy during the years 2000-2014. The estimation correlation shows that, for the year 2014, the correlation between the Internet implementation and democracy is 0.856. This study attempts to clarify whether there is a casual relationship underling this high correlation. Furthermore, as Table 3 shows, the fact that most of the countries with lower levels of democracy have lower levels of Internet users implies that, if causality from Internet extension to democracy promotion can be established, the promotion of democracy in the countries with lower level of democracy may be significantly benefited by greatly increasing the Internet user in these countries.

Figure 1: Correlation of Internet users and Democracy, $P < 0.01$ for all points on the graph



4. Estimation Results

In order to estimate the effect of Internet extension on the democracy promotion specified in Eq. (1), the study runs three models. In all of them the dependent variable is *DI*. In Model (1), the pooled OLS was employed to estimate Eq. (1). The effective sample size for model (1) is 1814. In order to compare the estimation results of the frequently-used OLS method – employed in

model (1) – with the results obtained from the GMM estimator, the study uses the dynamic panel data model in models (2) and (3). The effective sample size for these models is 1692.

The results of pooled OLS in model (1) are shown in the first column of Table 4. The adjusted R^2 is 0.566 and indicates that three explanatory variables – *Internet*, *GDP*, and *Education* – can explain a substantial level of cross-country variation in democracy. As model (1) shows, both the coefficients of *GDP* and *Edu* are positive and significant. The finding shows – as emphasized in theoretical literature – that the levels of GDP and education have significantly positive effects on democracy promotion in the sample countries. It means that countries with higher levels of economic development and higher levels of education in general have higher levels of democracy. The coefficient of Internet is 0.103 and is also significant. It indicates that Internet extension has a significantly positive effect on democracy and an increase in Internet extension can promote democracy in the sample countries.

In model (2) and (3), the Internet, as an explanatory variable, is assumed to be endogenous and also the value of democracy index one year earlier is considered as a lagged dependent variable. In order to deal with the endogeneity and autocorrelation problems, the GMM estimator is used in the model (2) and (3). The GMM allows the use of additional instrumental variables in estimation. In these models, second lags of democracy and Internet are used as additional instruments and also the first and second lags of GDP and education are employed as additional instruments. The numbers of additional instruments for model (2) and (3) are 83 and 89, respectively. According to Arellano and Bond (1991), because the numbers of instruments are not higher than the number of groups (122), having too many instruments does not make a serious problem in the estimation models.

Table 4: Estimation results of the models

| | Model (1) | Model (2) | Model (3) |
|--------------------------|---------------------|------------------------|------------------------|
| | OLS | DPD | DPD |
| <i>Lagged DI (lag=1)</i> | - | 0.831*** (0.009) | 0.820*** (0.004) |
| <i>Internet</i> | 0.104** (0.007) | 0.087** (0.004) | 0.090** (0.003) |
| <i>GDP</i> | 0.011** (0.009) | 0.013* (0.005) | 0.150** (0.006) |
| <i>Edu</i> | 0.010* (0.002) | 0.008 (0.001) | 0.014* (0.013) |
| <i>Year dummy 2001</i> | - | - | 1.760 (0.057) |
| <i>Year dummy 2002</i> | - | - | 1.800 (0.057) |
| <i>Year dummy 2003</i> | - | - | 1.359 (0.057) |
| <i>Year dummy 2004</i> | - | - | 1.553 (0.057) |
| <i>Year dummy 2005</i> | - | - | 1.600 (0.057) |
| <i>Year dummy 2006</i> | - | - | 1.966 (0.057) |
| <i>Year dummy 2007</i> | - | - | 1.566 (0.057) |
| Constant | 2.567*** (0.138) | - | 0.415 (0.098) |
| Adj. R ² | 0.601 | - | - |
| Hansen test | - | $\chi^2(61)=$ 66.09 | $\chi^2(62)=$ 65.45 |
| AR(2) test | - | Z=1.76 | Z=1.81 |
| N of countries | 71 | 71 | 71 |
| N of observations | 586 | 534 | 534 |

Note: standard errors are in parentheses under coefficient values. Those coefficients followed by * are significant at the 10% level, those followed by ** are significant at the 5% level, and those followed by *** are significant at the 1% level.

As the table 4 shows, in order to address the endogeneity problem, the Hansen test is employed in the model (2) and (3). All the results of Hansen test are insignificant and it indicates that there is no serious problem of invalid instruments in these models. In addition, in order to solve the autocorrelation problem, the standard Arellano-Bond test is used in the model (2) and (3). As mentioned in Table 4, the results of AR(2) test indicate that there is no serious problem of second-order serial correlation in these models and the null hypothesis of no autocorrelation cannot be rejected.

In confirmation of the conducted research on democracy promotion, the results of this study, as mentioned in model (2) and (3), indicate that the *GDP* and *Edu* variables have positive and significant effects on democracy promotion among the sample countries. In other words, the countries that have high levels of economic development and also have better-educated people have high level of democracy. As model (2) and (3) indicate, the coefficient of Lagged Democracy (Lag=1) is significant and has high value 0.885 in model (2) and 0.879 in model (3). It means that the past value of democracy index is an important predictor of the current value of the democracy index. In other words, the current status of democracy is highly affected by the past process of democracy promotion among the sample countries.

The empirical results of the models (2) and (3) explore that the Internet can lead to democracy promotion. The estimation results of these models indicate that the coefficient of *Internet* is positive and significant at the 5% level in both the models. According to the pooled OLS used in model (1), if the Internet users per 100 inhabitants increase by 10 persons, the Democracy Index will on average increase by 1.03. Also as the results of the dynamic panel data in models (2) and (3) estimate, if the Internet users per 100 inhabitants increase by 10 persons, the Democracy Index will on average increase by 0.07. These findings indicate that the pooled OLS and dynamic panel data model can estimate the effects of Internet on democracy promotion, but the estimation of dynamic panel data models is more accurate because it solves the problems of estimation, such as endogeneity and autocorrelation, and then explores the effect.

5. Limitation and Future Research

In order to examine the effect of Internet extension on the democracy promotion, the study uses panel data consisting of 122 countries which are grouped by levels of Internet implementation and democracy. As mentioned in the literature review (section 2), the concept of democracy and

the process of democratization are multi-dimensional concepts. The study attempts to explore the effect of Internet extension on the democracy promotion in macro level. It means, the study did not aim to recognize the effect in economic, political, and social level. In order to reach the micro level analysis of the effect, the author suggests that researchers can categorize countries based on the different regions, different levels of economic, political, and social development, and the different kind of political systems, and then examine the effect of Internet extension on the democracy promotion. It may include important information about how the process of democracy promotion through Internet diffusion can be affected by the regional effect, the level of development, and the political regimes.

As the last limitation, the study used the data bases of the ITU, Freedom House, World Bank etc. as international organizations which provide the several indicators to scan the current situation of the democracy index in all over the world. In order to examine the index accurately, they improve and develop the indicators and also may be some changes will happen during the next versions. The author was inevitable to use the data bases because there are not any international data resources which monitor the index and also helpful to use for exploring the effect.

6. Conclusions

This study attempts to examine the effect of Internet extension on democracy promotion by utilizing a dynamic panel data model which consists of 122 countries from the year 2000 to 2014. In order to investigate the effect, the study runs three models. In the first model, the pooled OLS was used to estimate the effect but, because using pooled OLS may yield biased and inconsistent estimates – such as endogeneity and autocorrelation problems – the study also employed the dynamic panel data and GMM estimator in the model (2) and (3). Additionally, in order to estimate the effect of Internet extension on democracy promotion accurately, as argued

in theoretical literature, the study uses the levels of GDP and education as control variables in all models. The empirical results of the study explain that Internet extension has a significantly positive effect on democracy promotion. However, the findings indicate that on average an increase of 10 in the number of Internet users per 100 inhabitants raised the Democracy Index by about 0.07 points, which is a substantial amount for a 7-point scale. A possible explanation of this result is related to this fact that ICTs are penetrating all aspects of each society and also affecting the process of economic, social and political development, which are critical factors of democracy promotion in each country (Chadwick, 2006; Lipset, 1959). In other words, Internet extension directly – by affecting the political aspect of the society such as improving the political participation, empowerment, consultation of citizens (Fishkin, 2009; Gimmmler, 2001; Mossberger et al., 2008; Norris, 2001) – or indirectly – by affecting the social and economic aspect of each society such as reducing the poverty and illiteracy (Acemoglu et al., 2005; Carr, 2008; Dewey, 1916; Glaeser et al., 2007; Rindermann, 2008) – can lead to democracy promotion.

In addition, the empirical results also indicate that the levels of GDP and education have significantly positive effect, on democracy promotion among the sample countries. This finding is consistent to conducted researches, which emphasize the important role of economic development and education in the process of democratization. The results of the study also show that the current status of democracy is highly affected by the past process of democracy promotion. It means that the past value of democracy index is an important predictor of the current value of the democracy index.

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