Democratic Influences of Internet Expansion

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Abstract

Most studies of internet diffusion show positive correlations with democracy. While some research argues that democracies facilitate diffusion; democracy is a broadly defined concept. Which aspects of democracy correspond with growth? Disaggregating the component variables of Freedom House and Polity IV indexes of democracy, I test whether characteristics of civil liberties, political rights, and autocracy correlate with national level growth of internet users. When looking at the differences between countries over time, countries with higher levels of democracy are associated with higher numbers of internet users overall, and relative to autocracy. Autocracy is associated with reduced numbers of internet users overall, but I do not find evidence that autocracy itself restrains internet expansion when also accounting for democracy. This research confirms that democracy matters, especially civil liberties. The observed growth pattern has implications for understanding the role of political structures on the growth of new forms of global communication and participation.

Working Paper – Please do not cite[1]

Introduction

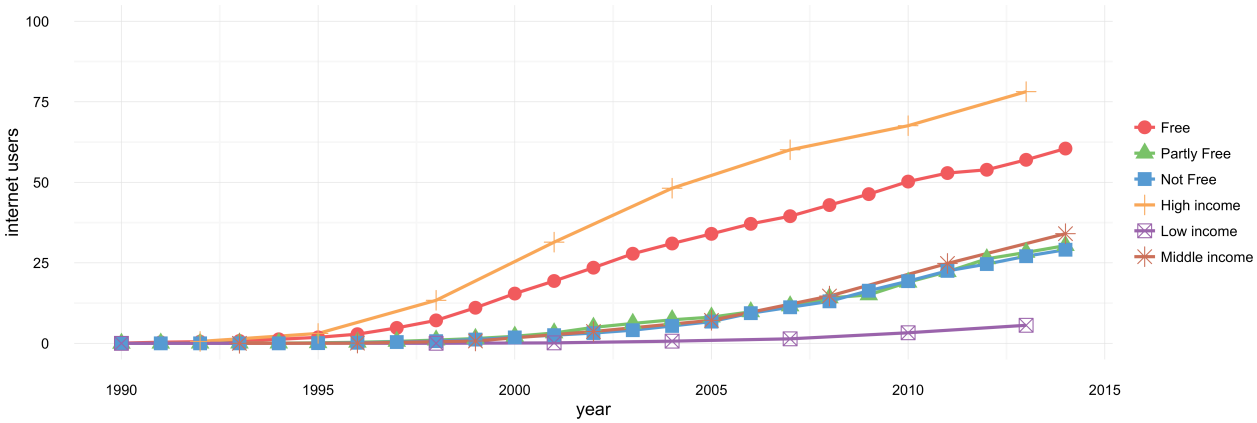
Almost every study of internet diffusion analyzing political causes cites democracy as a driver of internet adoption. However, the characteristics of democracies which increase internet users within a country are not well understood.

Globally, the internet is expanding very rapidly. Within the 24 years between 1990 and 2014, worldwide participation grew from essentially zero to 40.7% of the world's population (The World Bank 2015). With its current ubiquity, it is easy to forget how recently it was developed and how rapidly it has grown. Although global participation is increasing rapidly in almost every country, there is wide variation. Throughout that time, only North Korea has kept itself free of internet participation. Other nations such as East Timor and Somalia have less than 2% of their population connected. Only small number of countries have less than 10% of their population using the internet. These countries tend to be lower income and less democratic than the countries at higher levels of participation. Among the nations with higher levels of participation, the United Arab Emerites, Bahrain, most of the nordic nations, Qatar, Japan and the United Kingdom all outpace the United States with 87% of its population using the internet in 2014 (The World Bank 2015). The variety of ways in which democratic practices are institutionalized in the political structures varies greatly even among these countries with high levels of internet use.

What explains the rapid global expansion of internet participation? Broadly researchers have studied this as the global digital divide (Castells 2009; Corrocher and Ordanini 2002; Norris 2001; Pick and Sarkar 2015). Economic and political theories of diffusion privilege the role of development, democratization and network effects (Andrés et al. 2010; Milner 2006). Unsurprisingly, the income within a country as measured by the GDP per capita is one of the strongest predictors of internet participation within a country (Hargittai 1999). Large literatures look at the digital divide in access among communities (DiMaggio et al. 2001) as well as nations (Norris 2001).

Also consistent across the literature is the correlation between democracy and internet growth. Democracy has been theorized as a cause of its diffusion. Authoritarian regimes have a history of repressing media which they do not control. Milner (2006) and others argue that national leaders who see the internet as a threat use policies to restrict the spread of the internet. Her analysis leads her to conclude that "democratic governments facilitate the spread of the internet relative to autocratic ones" (p 176).

[1] An early draft of this was presented at the 2015 American Sociological Association conference in Chicago. Special thanks to Evan Schofer for creative diagnostic solutions. Replication data and code are available from the author.



Those conclusions are also supported by looking at where internet expansion occurs. Plotting growth over time using World Bank income categories and Freedom House democracy categories (Freedom House 2015)(free, partially free, not free), it is easy to see the distinctions. The internet is expanding in richer countries and in democracies. The divide between country income levels is highly stratified with countries categorized by the UN as "least developed" having 8.6% of their population using the internet, compared to 80.6% of the population in high income countries (The World Bank 2015).

However, when categorized by democratic status, there is only a small distinction between the countries classified as "partially free" and "not free". Over sixty percent of the population in democratic nations are using the internet, whereas it is half of that in other nations. Within this representation it is easy to see why democracy might be seen as cause of internet growth.

Democracy itself is a broad concept. It is not clear which aspects of democracy actually produce internet growth. Democracy in practice contains at least two primary components: personal freedoms and regulated authority of governance (Lijphart 2012). Previous studies have treated democracy as a unitary variable associated with internet adoption. In most studies of internet adoption, the notion of democracy has been quantitatively characterized as a combination of different factors, but then indexed and modeled as a singular variable. With the broad nature of democracy and its diverse implementation, this leaves us to question what exactly is responsible for the growth that we see. And whether growth is associated narrowly with specific aspects of democracy.

It is likely that there is a complex relationship between democracy, political institutions, cultural practices and economic causes of internet diffusion. Using previous research as a guide, isolating characteristics of democracy in cross national analysis should get us closer to understanding these relationships.

Previous studies have used variations of two measures, and characterize democracy along two aspects: civil liberties, and political rights.

Table 1: Previous studies with democracy

Paper	Democracy Measure	Outcome	Method
Norris (2001)	FH - Civil Liberties (1:7)	+	OLS, not sig with development
Beilock and Dimitrova (2003)	FH - Civil Liberties: High	+	Tobit / OLS
	FH - Civil Liberties: Low	-	
Guillén and Suárez (2005)	Polity IV - DEMOC (1: 10)	+	OLS / GLS, significant at .05 in 1 of 3 models
Milner (2006)	Polity IV - POLITY (-10:10)	+	CSTS NB Reg
	FH - Political Rights (1:7 reverse)	+	

Paper	Democracy Measure	Outcome	Method
	Przeworski et al (2000) (dummy)	+	

Studies of political culture note that the structures that maintain personal freedoms require the widespread adoption of liberalized cultural values (Almond and Verba 1989). Among these values are interpersonal trust, belief in the essential equality of people, and the belief that minorities deserve protection (Coleman 1990; Putnam 1993). In previous internet diffusion research the effects of civil liberties are mixed. Norris (2001) uses civil liberties cross sectionally in 2000 and doesn't find significance once economic development is accounted for. Beilocka and Dimitrova (2003) find significant positive effects with a category created from a measure of civil liberties.

Whereas assessment of civil liberties may be more subjective and dynamic, political rights are procedural and bureaucratic. The process of voting, the establishment of institutions and the structure of governments are easier to measure than the more abstract freedoms of expression and religion. Within the diffusion literature Guillen and Suarez (2005) and Milner (2006) both test measurements that account for political rights of citizens.

This research can improve current literature in three ways. First, there is simply more data available now. We have the opportunity to run analysis on 24 years of available data that measures internet growth. Secondly, this research isolates specific aspects of democracy rather than treating it as a unified concept. Thirdly, with improved data we can use model validation techniques to isolate the components that may be varying and causing an effect.

Addressing the causal claims and strong consistent findings of previous research (Milner 2006), this study starts with that understanding — that democracy leads to internet expansion. Norris (2001) argues that democracy is causal due to its sequential precedence and positive association. Both popular and academic accounts of the internet attribute the participatory nature as an inherent defining characteristic of this technological innovation (Lessig 2004; Rheingold 2000; Shirky 2008). Likewise, democracy's innovation and defining characteristic is also participation and collective action (Anderson 1991). Understanding how democracy impacts the internet we can test the theoretical assertions of globalization scholars, including DiMaggio et al. who call for more research on how the internet and large institutional structures interact (2001).

With these studies in mind, I am expecting to be able to replicate their findings using time series methods with the larger sample of countries and years available. Secondly, if there is a distinction between civil liberties and political rights associated with internet users in a country, I will be modeling so that we can see those distinctions. Third, I want to compare the effect of democracy versus autocracy. Do democracies boost, while autocracies restrain simultaneously? Or instead, is the positive effect we see the result of either restraint or boost from one political structure?

Data and Methods

To investigate the effects of substantively different aspects of democracy, I model internet growth within countries using the index and component variables from the primary measures of democracy used in previous research. Independent variables come from two datasets: the Freedom House Freedom in the World report (Freedom House 2015), the Polity IV Project (Marshall, Gurr, and Jaggers 2015). The dependent variable in each model is the percentage of internet users within a country (*Internet Users* per 100 people) collected by the International Telecommunications Union (ITU). The ITU is the division of the United Nations responsible for coordinating telecom policy. This variable measures individuals who have access to the internet at home on any device (The World Bank 2015). Although it doesn't measure the quality of access, or consistency of access, it is the measurement that is used most often in the previous research.

These models use yearly observations of country level data between 1990 and 2014. Complete data is available for 189 countries using Freedom House data and 159 countries in the Polity data with each country having an average of 20.46 yearly observations. Tables in the appendices show descriptive statistics and correlations for the variables used.

Analysis is conducted using panel regression with country fixed effects in order to address correlated error due to pooling yearly observations of the same country (Baltagi 2013). Fixed effects focus on the variation within a country, rather than expect shared variation between countries. Panel models with random effects showed similar results. Diagnostic Hauseman testing showed estimation inconsistencies between some of the models with fixed and random effects. In these cases, the more conservative fixed effects are preferred. Because democracy is fairly stable within countries across yearly observations, the variation present needs to be especially large in order for it to be reflected in models with fixed effects.

Freedom House

The first measure of democracy is also one of the most widely used within the current diffusion literature. Freedom House uses a panel of analysts to score each country based on the events and conditions within its border each year using a checklist of indicators. From this questionnaire and the consensus of the analysts it creates a *political rights* and *civil liberties* rating for each country. The political rights rating is based on questions related to the electoral process, political pluralism and participation, and functioning of government. The civil liberties rating is based on indicators of freedom of expression and belief, associational and organizational rights, rule of law, and personal autonomy and individual rights.

The distinctions between the political rights and civil liberties scores and how they have been used has been analyzed and reviewed by Armstrong (2011). There is a high correlation between political rights and civil liberties. The measure is widely used as a combined sum, mean of the two scores, or each used independently. Milner (2006) uses the political rights score. Norris (2001) uses the civil liberties score. Beilocka and Dimitrova (2003) use the civil liberties score to create categories. Freedom House itself uses the combined mean score to also create categories of Free (1 - 2.5), Partially Free (3 - 5), and Not Free (5.5 - 7).

For this analysis I have reverse coded political rights and civil liberties so that increasing measures of each correspond to increased rights and liberties (1 - 7). Because of the high correlation between the two (.93), collinearity might impede our ability to see independent effects of each. To account for this, I use the mean of the two scores that accounts for the overall level of democracy (*score*), and created a variable that takes the *difference* between political rights and civil liberties. Countries with higher political rights than civil liberties will have positive values. If a nation has more civil liberties than political rights, the value of this difference will be negative.

Table 2: Variations in country level freedom

country	pr	cl	diff	polity
Swaziland	1.43	3.05	-1.62	-9.05
Tonga	3.67	5.14	-1.48	–
Brunei	1.67	3	-1.33	–
Israel	**6.88**	**5.56**	**1.32**	**9.62**
Fiji	3.26	4.57	-1.3	1.91
Burkina Faso	3.15	4.45	-1.3	-1.42
Greece	**6.84**	**5.64**	**1.2**	**10**
Gabon	2.55	3.7	-1.15	-2.26
Lebanon	2.48	3.57	-1.1	6
Congo	2.2	3.25	-1.05	-4.21
Eritrea	1.33	2.33	-1	-6.53
Chad	1.53	2.53	-1	-2.28
Kazakhstan	2	3	-1	-5.15

country	pr	cl	diff	polity
Monaco	6	7	-1	–
Grenada	**6.96**	**6**	**0.96**	–
India	**5.71**	**4.75**	**0.96**	**8.83**
Ivory Coast	2.05	3	-0.95	-0.86
Tunisia	2.29	3.24	-0.95	-3.61
El Salvador	**5.9**	**4.95**	**0.95**	**7.21**
Azerbaijan	2	2.95	-0.95	-6.61

To see examples of the variation within democracies, Table 2 lists the 20 countries with the largest absolute value of the mean *difference*, and their corresponding mean *political rights*, *civil liberties* and *polity2* score. Both high and low democratic countries have large differences between political rights and civil liberties. Countries with more political rights than civil liberties, such as Israel and Greece, are emphasized in bold. Within the top differences countries with more political rights tend to have higher overall levels of democracy. Other countries such as Tonga and Swaziland with higher levels of civil liberties tend to have lower levels of democracy overall.

Polity IV

Polity IV is the measure of democracy used by Guillen and Suarez (2005). Milner (2006) also uses it in addition to the political rights rating from Freedom House. Polity IV measures focuses on political rights, rather than civil liberties. As such it measures governance structures and conceptualizes democracy and autocracy separately, providing a distinct score for each. Democracies are conceptualized with three component elements: 1) procedures for citizens to express preferences for policies and leaders, 2) institutionalized constraints on executive power, and 3) a guarantee of civil liberties in acts of political participation. This last point on civil liberties, unlike Freedom House, is not directly coded as part of the component variables. Specifically, the codebook highlights its exclusion of "coded data on civil liberties," considering civil liberties as resulting from the other aspects of democratic governance (Marshall et al. 2015 Dataset Users' Manual p14).

Although autocracy is perhaps conceptualized by most social scientists as the inverse of a democracy, it is measured separately in Polity IV so that each country has both a *democracy* and *autocracy* score. Autocracies have the characteristic of restricting competitive political participation. The two are highly negatively correlated (-.85) but not perfectly inverse; indicating that there still are democratic aspects of autocracies and autocratic aspects of some democracies. Similar to the difference measure that I created for the Freedom House dataset, the *polity2* measure also reflects the difference of the two: the autocracy score subtracted from the democracy score. It ranges from 10 for highly democratic, to -10 for highly autocratic governments.

In addition, I use the concept variables relating mostly to political rights in the openness of *executive recruitment*, checks and balances of *executive constraint* on power, and *political competition*. Political competition captures both the level of organization and lack of interference in elections.

Controls

Multiple previous studies show income as the largest predictor of internet users within a country (Beilock and Dimitrova 2003). I control for this consistent with those studies by using the natural log of *GDP per capita* in current US dollars (The World Bank 2015). Because the effect is nonlinear, I also use the squared term of this measure. This measurement alone captures a large amount of the variation within nations.

To control for the effect of very small countries in the dataset, I use a dummy variable if the country's population is less than 1 million. I also present additional analysis using a lagged dependent variable for some models. By doing this the model is showing us the effect of yearly variation (in all cases, growth). Andres et al. (2010) use this technique in their modeling to show that a strong predictor of internet growth is the number of users in the previous year. They attribute this to network effects.

Although logically it makes sense that education and literacy is a prerequisite for internet use within a country, I do not use these controls. Previous research has either excluded them (Milner 2006), or found them similarly unhelpful for a number of reasons. First, due to high numbers of missing observations, introducing literacy would reduce the sample of usable cases considerably. Second, Guillen and Suarez (2005) test these variables and note that "the reason for the lack of significance is that literacy – or any education measure, for that matter — is highly correlated with" GDP per capita. And thirdly, the fixed effects models that I present which show within country variation. In countries where education measures are high, they tend to stay high.

Cases were dropped when they had fewer than two years of complete data. For cases where there was missing data on the dependent variable, the value was carried forward from the previous observation only when the previous observation and the following complete observation were identical. In most cases this meant that cases where internet usage was zero (or very low) in the initial years were still represented within the analysis, instead of dropping and potentially biasing toward nations where growth was strong and consistently reported.

Results

Testing each measure of democracy with the base model supports the findings of previous research: every measure of democracy has a significant and positive association with the number of internet users within a country. Higher levels of autocracy are associated with lower levels of internet use. Milner and others proposed that autocracies likely restrict internet expansion, and that is supported here.

Table 3: Panel Linear Models with Country Fixed Effects

	Dependent variable:						
	Internet Users						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP	-94.206^{***}	-94.428^{***}	-94.376^{***}	-94.299^{***}	-96.180^{***}	-96.848^{***}	-96.469^{***}
	(2.270)	(2.266)	(2.269)	(2.262)	(2.464)	(2.497)	(2.497)
GDP * GDP	7.613^{***}	7.607^{***}	7.618^{***}	7.582^{***}	7.650^{***}	7.688^{***}	7.671^{***}
	(0.142)	(0.142)	(0.142)	(0.141)	(0.154)	(0.155)	(0.156)
Over 1M	1.274	1.645	1.432	1.806	0.536	0.509	0.380
	(2.337)	(2.333)	(2.336)	(2.330)	(2.331)	(2.398)	(2.400)
FH Score		1.380^{***}					
		(0.338)					
FH Political Rights			0.624^{**}				
			(0.258)				
FH Civil Liberties				1.869^{***}			
				(0.356)			
Polity Polity2					0.291^{***}		
					(0.088)		
Polity Democ						0.535^{***}	
						(0.154)	
Polity Autoc							-0.467^{***}
							(0.181)
Countries	189	189	189	189	159	159	159
Observations	3,866	3,866	3,866	3,866	3,134	3,099	3,099
R^2	0.690	0.691	0.690	0.692	0.690	0.690	0.690
Adjusted R^2	0.655	0.657	0.656	0.657	0.654	0.654	0.653
Note:							*p<0.1; **p<0.05; ***p<0.01
							Standard errors in parenthesis.

The first model of Table 3 is the base model showing significant effects of both logged GDP and the squared

term, and the high level of variation that is explained by accounting for wealth. The statistical significance of the GDP-squared indicates that the effect is curvilinear.

Since all of the Freedom House measures are using the same scale (1-7) we can compare the coefficients and observe that while each measure of democracy is associated with a higher number of internet users within a country, the strongest effect is with civil liberties and the combined score. Political rights has a smaller coefficient, which also makes it significant at the .05 level instead of at the .01 level

Likewise, all of the Polity variables have significant associations with internet use. The combined polity2 measure as well as the democracy measure both have positive associations. The descriptive statistics show a positive mean for polity2; which indicates that overall countries lean democratic than autocratic. This model shows that in addition to that overall tendency, the countries which have more democratic features (and a higher, positive polity2 score) are associated with higher levels of internet use.

Autocracy is also significant and negatively associated. One question posed in the literature is whether there is a boosting effect of democracy, or restraining effect of autocracy. These base models show evidence of both happening simultaneously. If autocracy were neutral, we would likely see non-significant results or maybe even a mild but positive association that corresponds to the overwhelmingly positive trend of internet use increasing in all nations. Instead, both the significant positive relationship between higher levels of democracy alone, and higher levels of democracy gradationally moderated by the autocratic features of a country represented in polity2, indicate that democracy itself increases internet use. This isolation of democracy also supports the independence of the negative autocracy results - that autocracy restricts.

Table 4: Freedom House - Panel Linear Models

	Dependent variable:					
	Internet Users					
	(1)	(2)	(3)	(4)	(5)	(6)
GDP	−94.428***	−94.097***	−94.258***	−94.258***	1.819**	1.822**
	(2.266)	(2.270)	(2.263)	(2.263)	(0.734)	(0.733)
GDP * GDP	7.607***	7.600***	7.578***	7.578***	0.012	0.009
	(0.142)	(0.142)	(0.142)	(0.142)	(0.050)	(0.050)
Over 1M	1.645	1.289	1.800	1.800	2.219***	2.254***
	(2.333)	(2.336)	(2.331)	(2.331)	(0.621)	(0.621)
FH Score	1.380***		1.827***		0.255***	0.354***
	(0.338)		(0.363)		(0.090)	(0.097)
FH PR - CL		−0.490	−1.091***			−0.239***
		(0.303)	(0.325)			(0.086)
FH Political Rights				−0.177		
				(0.309)		
FH Civil Liberties				2.004***		
				(0.427)		
Lagged Internet Users					0.985***	0.984***
					(0.004)	(0.004)
Countries	189	189	189	189	189	189
Observations	3,866	3,866	3,866	3,866	3,692	3,692
R^2	0.691	0.690	0.692	0.692	0.980	0.980
Adjusted R^2	0.657	0.655	0.657	0.657	0.928	0.928

Note: *p<0.1; **p<0.05; ***p<0.01
Country fixed effects. Standard errors in parenthesis.

Table 4 analyses the Freedom House measures of democracy. It starts with the same positive association of the overall score from the previous table. When the difference between political rights and civil liberties is

introduced, the coefficient from the overall score increases slightly. The coefficient for the difference variable shows a significant and negative association with the number of internet users within a country. As the difference between political rights and civil liberties increases, there is a negative association with high levels of internet users. What this means is that after accounting for an overall level of democracy, there is a negative association with internet users when a country has more political rights than civil liberties. Likewise, when nations have more civil liberties than political rights, there is a positive association with internet users.

Despite the issues of collinearity that we control for by using the difference, we can see this again in with the next model where the variation in civil liberties shows a significant and positive association with internet users, whereas political rights is not statistically significant.

Table 5: Polity - Panel Linear Models

	Dependent variable:			
	Internet Users			
	(1)	(2)	(3)	(4)
GDP	-96.180^{***}	-96.850^{***}	-96.850^{***}	-96.850^{***}
	(2.464)	(2.500)	(2.500)	(2.500)
GDP * GDP	7.650^{***}	7.688^{***}	7.688^{***}	7.688^{***}
	(0.154)	(0.156)	(0.156)	(0.156)
Over 1M	0.536	0.508	0.508	0.508
	(2.331)	(2.398)	(2.398)	(2.398)
Polity Polity2	0.291^{***}	0.005	0.531^{**}	
	(0.088)	(0.268)	(0.228)	
Polity Democ		0.526		0.531^{**}
		(0.463)		(0.228)
Polity Autoc			0.526	-0.005
			(0.463)	(0.268)
Countries	159	159	159	159
Observations	3,134	3,099	3,099	3,099
R^2	0.690	0.690	0.690	0.690
Adjusted R^2	0.654	0.654	0.654	0.654
Note:				*p<0.1; **p<0.05; ***p<0.01
	Country fixed effects. Standard errors in parenthesis.			

Table 5 shows similar results with the polity dataset. Using a similar method to the last table of comparing the difference between two component measurements in order to see which is influencing the relationship while controlling for collinearity, we can compare polity's autocracy and democracy scores with the polity2 measure. Although polity2 is significant in the base models, when we include this variable with democracy, neither results in a predictor with significant p-values. Combined with autocracy, polity2 maintains a significant and positive relationship.

Since one hypothesis we were testing is whether democracy increases internet use, one indicator of support for that is in this model where, controlling for the level of autocracy in the world, the level of democratic characteristics in a country are positively associated with an increase in internet users. Similarly, the next model shows that relationship with the democracy variable and autocracy variables independently. Using Polity's measurement of autocracy, we are not seeing an indication that autocracy is reducing internet use after accounting for democracy.

Comparing the component indexes of the Polity measure in Table 6, countries with more democratic practices of executive recruitment, constraint on the executive, and higher levels of political competition all independently show positive and significant associations with internet use. Compared together, only politi-

Table 6: Polity Components - Panel Linear Models

	Dependent variable:			
	Internet Users			
	(1)	(2)	(3)	(4)
poly(log(gdp), 2, raw = T)1	−96.375***	−96.403***	−97.012***	−97.056***
	(2.489)	(2.500)	(2.506)	(2.511)
poly(log(gdp), 2, raw = T)2	7.664***	7.666***	7.700***	7.701***
	(0.155)	(0.156)	(0.156)	(0.156)
over1M	0.491	0.384	0.385	0.447
	(2.400)	(2.400)	(2.397)	(2.399)
polity_exrec	0.635***			0.315
	(0.229)			(0.320)
polity_exconst		0.592**		−0.082
		(0.259)		(0.371)
polity_polcomp			0.609***	0.504**
			(0.178)	(0.232)
Countries	159	159	159	159
Observations	3,099	3,099	3,099	3,099
R^2	0.690	0.689	0.690	0.690
Adjusted R^2	0.653	0.653	0.654	0.653
Note:				*p<0.1; **p<0.05; ***p<0.01
				Country fixed effects. Standard errors in parenthesis.

cal competition shows a significant and positive association. Although not presented here, additional models comparing these measures to each other in combination all still indicate significance only with political competition.

Finally, Table 7 combines the Freedom House and Polity measures. Despite high correlation between the variables, we don't see the model inconsistencies that are usual associated with multiple collinearity. The strength of association seen in the coefficients remain fairly consistent with the previous models which isolated individual effects, nor do the coefficients change direction in unexpected ways. Checking the generalized variance inflation factors with a pooled model does not indicate violations of collinearity assumptions (Fox and Monette 1992).

With these checks in mind, combining these measures show distinct characteristics of democracy consistently associate with higher levels of internet users within a country. The overall level of democracy represented by the Freedom House score and democratic aspects balanced by and autocratic characteristics represented by polity2 show positive associations with internet use. The association with civil liberties represented by the freedom house difference also remains strong. This is emphasized in the second model which still shows a strong significant association with democracy, rather than autocracy.

Conclusions

Democracy is as much a cultural institution as a political institution. There are cultural aspects to it as well as organizational structures and processes which keep it in place. People within democracies need to think of themselves as empowered to provide input, and representatives need to adopt a recognition that they are representing people other than themselves. Writing those symbolic roles and values into law does not make them automatically practiced. Likewise, the internet also maintains cultural institutional characteristics. We can create the technology and run the wires, but the way people participate in practices on the internet

Table 7: Combined - Panel Linear Models

	Dependent variable:	
	Internet Users	
	(1)	(2)
poly(log(gdp), 2, raw = T)1	-96.665^{***}	-96.733^{***}
	(2.503)	(2.503)
poly(log(gdp), 2, raw = T)2	7.642^{***}	7.643^{***}
	(0.156)	(0.156)
over1M	0.919	0.989
	(2.393)	(2.393)
fh_total	1.025^{**}	0.939^{**}
	(0.472)	(0.476)
fh_diff	-1.541^{***}	-1.614^{***}
	(0.363)	(0.366)
polity_polity2	0.307^{***}	
	(0.116)	
polity_democ		0.650^{**}
		(0.255)
polity_autoc		0.060
		(0.269)
Countries	159	159
Observations	3,099	3,099
R^2	0.692	0.692
Adjusted R^2	0.655	0.655

Note: *p<0.1; **p<0.05; ***p<0.01
Country fixed effects. Standard errors in parenthesis.

are constantly socially negotiated and identifying as an internet user is a symbolic role that individuals are increasingly incorporating into their identity.

To understand why a cultural and political institution such as democracy would have a causal effect on the growth of internet users, this research started with an attempt to replicate the democracy finding of others. After successfully finding each measure of democracy still holding up in expected ways using rigorous models, the next goal was to pull these measure apart and see if we could identify common traits of what might be occurring. In doing so, I look at the aspects of the measure that correspond with civil liberties and the aspects that correspond with political rights. Within the Freedom House dataset we see strong support that civil liberties more than political rights correspond with increases in the number of internet users within a country. In some exploratory models which were less definitively validated, political rights showed a negative association after taking into account civil liberties. Instead of answering questions, this raises the question on why the political structure that corresponds with the practice of democracy might have such an unexpected outcome.

Additionally, I wanted to answer open questions in the literature about whether democracies actually increase internet use or whether autocracies restrict it. Global internet expansion is occurring exceptionally fast: even in war zones, and even in areas where governments are not supportive of its expansion. Communication scholars have long shown that as governments which have more centralized authority will try to restrict media and journalism. Does the internet follow this pattern and can we characterize it as media?

When we look at the characteristics of autocracies represented in the Polity dataset, we see mixed results. The measure of autocracy on its own show expected results of negative association. However, combined with a measure that looks at the difference between democracy and autocracy within the same nation, democracy still shows a positive association, while autocracy doesn't indicate an association in multiple models. We don't have evidence that shows restraint of internet expansion overall, or any association after accounting for levels of democracy.

Where we see unequivocal results are that democracies themselves increase internet use. That finding has been suspected and tested in prior research - but even in relationship to autocracies, and even using extremely rigorous modeling with lagged dependent variables showing change from year to year, that finding is still present. So what is it that creates internet expansion within democracies? My suspicion is that coinciding cultural similarities are mutually supportive. Freedom of expression and involvement is fostered on the net, as well as in healthy democracies.

My hope in decomposing Polity into concept variable was to get a better understanding of this question of why civil liberties matter. The analysis may provide some insight. More important than where who is allowed to run, or whether there are checks and balances on leaders, is the quality of elections. If there is widespread participation in free, fair and well organized elections — it may be an indication of how widespread the cultural adoption of democracy is among citizens who are not directly part of the government. This cultural adoption might also be an indicator of the kind of civil liberties that would reinforce increasing levels of internet use.

Within countries there is debate on whether the internet facilitates the distribution of crafted messages from political elites or whether it has allowed new audiences to engage in political speech (Hindman 2009). With revolutions using the internet as a media platform and for organization, there is room for debate about the internet's impact on politics. What's clearly reinforced by this research is that the political structure, and perhaps the cultural structure of nations impact internet growth. The way democracy is implemented makes a difference.

Appendices

Table 8: Descriptive statistics

	n	sd	mean	min	max
Countries	189	–	–	–	–
Years/Country	–	4.03	20.46	2	25
Year	3866	6.63	2004	1990	2014
Internet Users	3866	24.79	18.34	0	98.16
GDP (log)	3866	1.62	8.12	4.61	12.17
Over 1 Million	3866	0.39	0.81	0	1
FH Political Rights	3866	2.12	4.7	1	7
FH Civil Liberties	3866	1.78	4.71	1	7
FH Score	3866	1.92	4.71	1	7
FH PR - CL	3866	0.81	-0.01	-3	2
Polity Polity2	3134	6.41	3.83	-10	10
Polity Democ	3099	3.86	5.7	0	10
Polity Autoc	3099	2.82	1.84	0	10
Polity Exec Recruitment	3099	2.17	6.38	1	8
Polity Exec Constraint	3099	2.05	5.01	1	7
Polity Competition	3099	3.04	7.02	1	10

Table 9: Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Year	–	–	–	–	–	–	–	–	–	–	–	–	–
2. Internet Users	0.55	–	–	–	–	–	–	–	–	–	–	–	–
3. GDP (log)	0.17	0.69	–	–	–	–	–	–	–	–	–	–	–
4. Over 1 Million	-0.01	-0.04	-0.16	–	–	–	–	–	–	–	–	–	–
5. FH Political Rights	-0.02	0.37	0.5	-0.18	–	–	–	–	–	–	–	–	–
6. FH Civil Liberties	0.04	0.44	0.56	-0.24	0.93	–	–	–	–	–	–	–	–
7. FH Score	0.01	0.41	0.54	-0.21	0.99	0.98	–	–	–	–	–	–	–
8. FH PR - CL	-0.12	-0.01	0.08	0.05	0.57	0.23	0.42	–	–	–	–	–	–
9. Polity Polity2	0.04	0.3	0.38	0.05	0.9	0.84	0.89	0.52	–	–	–	–	–
10. Polity Democ	0.02	0.36	0.48	0.04	0.92	0.86	0.91	0.53	0.97	–	–	–	–
11. Polity Autoc	-0.06	-0.19	-0.19	-0.06	-0.79	-0.74	-0.78	-0.47	-0.95	-0.85	–	–	–
12. Polity Exec Recruitment	0.03	0.23	0.28	0.05	0.82	0.75	0.8	0.52	0.94	0.89	-0.92	–	–
13. Polity Exec Constraint	0.03	0.33	0.43	0.06	0.88	0.83	0.88	0.5	0.95	0.96	-0.86	0.85	–
14. Polity Competition	0.05	0.28	0.36	0.06	0.85	0.81	0.84	0.45	0.93	0.9	-0.89	0.81	0.85

Table 10: Freedom House and Polity Democracy Measures

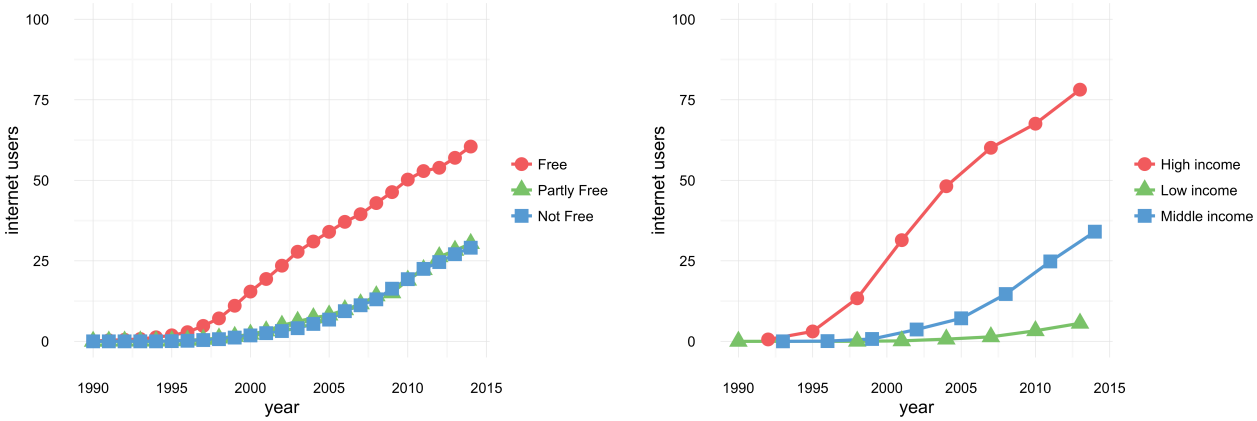
	Democracy		Autocracy
	Civil Liberties	Political Rights	
Freedom House	X	X	
Polity		X	X

Diagnostic Appendices

Not included in paper submission.

```
update(models.list[['blended']][[1]], model = "pooling") %>% vif()
```

```
##                                GVIF Df GVIF^(1/(2*Df))
## poly(log(gdp), 2, raw = T) 1.652780  2        1.133845
## over1M                     1.012956  1        1.006457
## fh_total                   6.772068  1        2.602320
## fh_diff                    1.397428  1        1.182129
## polity_polity2             5.837580  1        2.416108
```



% Default Table

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