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Internet diffusion and regime type: Temporal patterns in technology adoption

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ABSTRACT

It is often assumed that the Internet would threaten the survival of authoritarian regimes. Accordingly, most country-comparative studies have identified a democracy advantage in Internet diffusion. This paper revisits these technology-centric assumptions by conceptualizing the adoption of the Internet as a dynamic phenomenon with multiple phases that unfold differently depending on the political system. It is argued theoretically, that initially, the Internet diffuses faster in democracies because of inherent innovation advantages. However, authoritarian regimes adopt the Internet at comparable rates when the economic benefits of the technology outweigh the democratization risks. Yearly cross-sectional regressions for the years 1996–2013 show that the relationship between regime type and Internet diffusion varies temporally as authoritarian regimes have caught up considerably. Since 2013, there are no significant differences between democracies and authoritarian regimes anymore and monarchies even outperform democracies.

1. Introduction

The Internet has been regarded as a "liberation technology" (Diamond, 2010) which facilitates the exchange of political information and the organization of collective action, thereby reducing asymmetries between citizens and states in political communication.[1] From this perspective, digital technologies threaten the survival of authoritarian regimes, which typically rely on centralized information control.[2] In line with this reasoning, the empirical literature on the adoption of the Internet mostly identified democracy advantages (Corrales & Westhoff, 2006; Guillén & Suárez, 2005; Milner, 2006). Yet phenomena like the booming Internet economy in China and the use of the web by approximately 30% of citizens in non-democratic countries (World Bank, 2015) contradict simplistic assumptions. While these phenomena have been recognized by conceptual works and case studies, the empirical literature on the adoption of the Internet by different political regimes has not taken recent developments into account.

This paper extends this research conceptually, methodologically and empirically. It argues that the relationship between regime type and Internet diffusion needs to be understood as a dynamic process. The superior innovative capacity of democracies leads to a faster adoption of digital technologies, however, when the economic value of digital technologies rises with economies of scale, it is rational for autocratic rulers to encourage their use in economy and society in order to enhance the output performance of the regime. Meanwhile, the democratization risks are countered by a mix of political, economic and technical means to control information flows on the web.

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[1] This paper is a revised chapter of a dissertation submitted to Heidelberg University (Stier, 2016).

[2] The terms authoritarian and autocratic are used synonymously in this article. The same applies to the terms Internet diffusion and Internet adoption.

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To identify temporal variations in the relationship between regime type and Internet diffusion, this study implements cross-sectional regressions for the years from 1996 to 2013 taking relevant control variables into account. It is also the first paper to test the effects of authoritarian regime subtypes. A growing literature in comparative politics has demonstrated that different types of authoritarian rule influence outcomes in a wide range of policy fields (Croissant & Wurster, 2013). The empirical results show a temporal democracy advantage in Internet diffusion and a catching up by autocracies lead by monarchies which even outperform democracies in 2013.

The article first reviews the empirical literature on Internet adoption in Section 2. Section 3 develops the theoretical framework that concentrates on regime type as the most important explanatory variable, while Section 4 explains the research design of the paper. The empirical results are presented and discussed in Section 5, before Section 6 concludes.

2. Literature review

The adoption of Information and communication technologies (ICT) is a complex process at the intersections of governments, citizens and economic actors. The overarching political system determines the fundamental shape of these interexchanges and of economic activities in general. In the case of telecommunications policy, Internet service providers are dependent upon reliable regulation, state funding as well as the provision of public goods like public safety and the preservation of property rights in order to pursue their business models (Evans, 1995; Goldsmith & Wu, 2006; Milner, 2006). Internet diffusion is high when governments and economic stakeholders provide sufficient infrastructure and citizens are capable and willing to use these services.

There are multiple reasons why governments chose to encourage Internet use. Widespread use of digital technologies stimulates the economic performance of a country directly through applications like online banking and online commerce, but also indirectly by reducing transactions costs of myriad economic and communication processes. The emerging Internet economy itself stimulates new innovations and creates positive feedback loops. Thanks to economies of scale, the value of digital investments rises with an increasing number of users.[3] Independent of regime type, national development in the 21st century is not feasible without embracing digital technologies.

The determinants of Internet diffusion have been the subject of country-comparative studies in a variety of disciplines.[4] In terms of regime types, most studies applied a technology-centered approach, i.e. inherent properties of the Internet were related to the characteristics of different regime types. According to this perspective, the pluralism of democratic societies and economies is beneficial to the adoption of the web, while many facets of the decentralized medium run contrary to authoritarian strategies of information control and censorship (Corrales & Westhoff, 2006; Diamond, 2010; Guillén & Suárez, 2005; Norris, 2001). In an empirical test of this argument, Corrales and Westhoff (2006) found in panel regressions that democracies had a significantly higher Internet diffusion than autocracies. In contrast, the broadcasting medium television was used at equal rates in both regimes, which the authors credit to its value for authoritarian propaganda. Milner concurs in empirical analyses and relates the higher Internet use in democracies to the preferences of authoritarian elites: “Groups that believe they will lose from the Internet use political institutions to enact policies that block the spread of the Internet” (Milner, 2006, p. 176). Several other studies also identified a democracy advantage in ICT use (Beilock & Dimitrova, 2003, Crenshaw & Robison, 2006; Fuchs, 2008; Guillén & Suárez, 2005; Gulati & Yates, 2012).[5] Taken together, the democracy advantage is robust across a variety of research designs including cross-sectional and panel regressions as well as diverging observation periods.

Yet to the best knowledge of the author, no comparative study of Internet diffusion in different political regimes has incorporated data from the late 2000s and early 2010s. It is possible that this research topic is perceived as settled after the consolidation of previous results in the literature.[6] While none of these works claims that the democracy advantage should last forever, discussions of the potential benefits of digital technologies for authoritarian rulers are rare. Notably, Corrales and Westhoff (2006) demonstrate that market-oriented, richer autocracies have a higher Internet diffusion. An inter-autocratic comparison recently showed that regimes with a stricter information control in the offline world have the highest Internet use while the level of democratization does not reach statistical significance (Rød & Weidmann, 2015). Furthermore, a growing number of conceptual works and case studies recognizes that autocracies incorporate ICT in the very functioning of their regimes (e.g. Kalathil & Boas, 2003; Morozov, 2011). In light of this reorientation, the previously discussed empirical literature on telecomunications policy seems outdated. Theoretical and empirical models of Internet diffusion should be open to temporal changes in causal mechanisms. The present study argues that differences between political regimes can be explained to a large extent by temporal patterns of technological innovation and technology modification.

3. Theoretical framework

In order to elaborate on the relationship between regime type and Internet adoption, one has to first define the boundaries between regimes. Following Magaloni et al. (2013), the presence of the following conditions defines a polity as democratic:

“(1) A civilian government (as opposed to military or royal court) provides the main source of policy making; (2) Political leaders

[3] In the Internet economy, economies of scale are called network effects.

[4] The literature review only captures studies that included political variables.

[5] Hargittai (1999) and Norris (2001) report diverging results. In their cross-sectional models explaining Internet diffusion in the years 1998 and 2000, respectively, economic variables dominate political factors.

[6] Corrales and Westhoff (2006), Guillén and Suárez (2005) and Milner (2006) have accumulated more than 500 citations on Google Scholar (as of April 2016).

form multiple and competitive parties, and the parties interact and run the government through a legislature; (3) The executive is institutionally constrained or checked by other parts of the government; (4) Elections are used to select the political leadership, and they are largely open, competitive, and free and fair" (Magaloni et al., 2013, p. 6).

Political systems that violate one of these requirements are defined as authoritarian. These regimes are characterized by varying political institutions and governance which are the manifestation of survival strategies deployed by authoritarian leaders (Bueno de Mesquita, Smith, Siverson, & Morrow, 2003; Wintrobe, 1998). This may be a monarch, a military junta, elected authoritarian governments or one party regimes (Bueno de Mesquita et al., 2003; Magaloni et al., 2013). ICT potentially distort these equilibria, since they can be regarded as "coordination goods" used for the strategic coordination of collective action by oppositional actors (Bueno de Mesquita & Downs, 2005). Acemoglu and Robinson (2000, pp. 126–127) argue that "it is therefore agents who have political power and fear losing it who will have incentives to block *technological progress*" (emphasized insertion by the author). But if these static assumptions are true, why is an increasing number of citizens in non-democratic regimes, even in closed societies like Cuba and North Korea, granted access to the Internet? The theoretical framework explores the relationship between regime type and Internet adoption from a dynamic perspective incorporating the functional logic of web use that varies between political regimes.

3.1. Regime type and innovation capacity

To improve the conceptualization and empirical analysis of Internet adoption in different political regimes, we have to consider the temporal development of this relationship. According to diffusion of innovations theory, we can distinguish several phases of technology diffusion, which is defined as "the process by which (1) an *innovation* (2) is *communicated* through certain *channels* (3) over *time* (4) among the members of a *social system*" (Rogers, 2003, p. 11, emphasis in original). The following declination of these conditions shows that not only the authoritarian "anti-internet preferences" (Corrales & Westhoff, 2006, p. 930), but also a democratic innovation advantage help explain the patterns in Internet diffusion. Yet the subsequent chapter argues that autocracies do not entirely block technological change, but adopt politically sensitive technologies slower and in modified form.

One robust finding in comparative politics is the superior *innovative capacity* of democratic regimes (Acemoglu & Robinson, 2012; Halperin, Siegle, & Weinstein, 2010; Knutsen, 2012; Schmidt, 2012). The conceptualization of innovation applied here goes beyond the act of inventing a technology, encompassing the continuous efforts necessary to establish the infrastructural and organizational preconditions for widespread Internet use. Governments and economic actors have to find innovative solutions during all stages of technological adoption, but in particular during the early stages in order to initiate positive path dependencies. A political and economic environment rich in feedback loops enables stakeholders to constantly evaluate and refine policies and investments. The allocation of resources is much more efficient when governments are held accountable by the demos and businesses in a free market economy. The institutional structure of democracies guarantees these conditions constitutionally and politically (Halperin et al., 2010; Knutsen, 2012; Schmidt, 2012). The separation of powers keeps illegitimate state intervention in telecommunication markets to a minimum and guarantees that developers and industries can pursue their ideas and business models profitably. The political marketplace of ideas, manifested in party competition, improves policy making and results in a steady production of public goods like Internet access.

The openness of democratic regimes thus enhances the *communication* of technological ideas and solutions in policy (sub) systems as well as in society and economy, since knowledge and usage conventions diffuse *over time* through public and interpersonal communication (Halperin et al., 2010; Knutsen, 2012; Rogers, 2003). In contrast, authoritarian information control not only blocks the circulation of societal and political interexchanges, but also economic and technological ideas from outside a country (Knutsen, 2012). Authoritarian rulers govern in a political environment characterized by sparse and imprecise information and are cut off from societal feedback loops because of the suspicions and mistrust of citizens (Wintrobe, 1998).

Technology diffusion at the individual level is also guided by normative ideologies of the *social system* (Rogers, 2003). Political and social opinion leaders stigmatize technologies and their use if these contradict the predominant *Weltanschauung*. Twitter use, for instance, has been publicly condemned by the likes of Erdogan, Putin and the Grand Mufti of Saudi Arabia. Normative ideologies also affect public investments, since market processes, especially in the telecommunications field, are inherently related to their political and social context (Evans, 1995).

3.2. Technology-centered assumptions revisited: Authoritarian regimes and the Internet

The four stages in the diffusion of innovations support the notion of a democracy advantage in Internet adoption. Yet technology-centered assumptions of a fundamental incompatibility of ICT and authoritarianism need to be revisited in light of phenomena like the thriving Internet economy in countries like China, Kazakhstan or Singapore. As a reaction to the remarkable economic growth of many non-democratic regimes, comparative politics increasingly focuses on policy performance or "output performance" and the legitimizing effects it creates for authoritarian governments (Croissant & Wurster, 2013; Menaldo, 2012; Schmidt, 2012). In light of their enormous economic potential, it can be rational for autocratic rulers to promote the diffusion of digital technologies – in spite of the destabilizing potential of such policies.

ICT can foster the legitimacy of authoritarian regimes through several mechanisms (Göbel, 2013; Kalathil & Boas, 2003). Economic performance broadens the tax base of an authoritarian government which enables it to co-opt elites (Bueno de Mesquita et al., 2003), to distribute rents to specific groups or to produce public goods available to all citizens. Digital technologies translate into direct improvements of citizens' living standards and offer novel consumption and entertainment services. The provision of public services on e-government platforms improves the quality of governance and tightens the central government's control over its

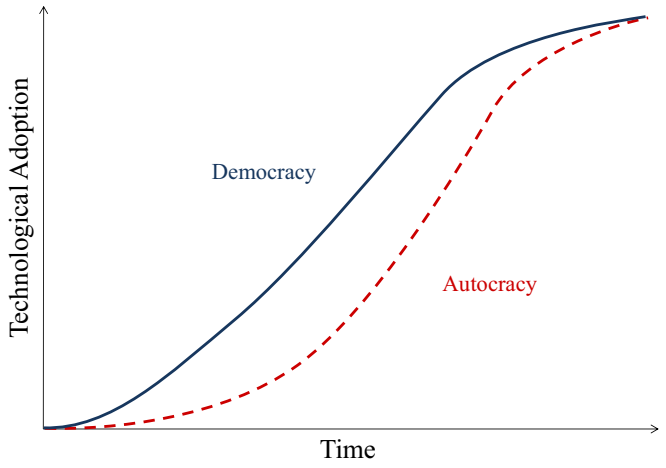

Fig. 1. Technological adoption and regime type.

bureaucratic agents (Stier, 2015). In summary, the Internet can generate support for an authoritarian government within the two most critical groups for authoritarian survival: regime elites and the masses.

Still, oppositional Internet use remains a serious threat to authoritarian survival, as the considerable role of digital technologies in the mobilization during the Arab Spring demonstrates. Two arguments, a temporal and a functional one, are developed in the following paragraph indicating that democracies should have a temporary advantage due to their superiority in innovation capacity, but that Internet diffusion in autocracies catches up when the cost benefit analysis of ruling elites regarding the technology changes.

First, it needs to be taken into account that the Internet is a dynamic technology continuously generating economies of scale with increasing connectivity of economic sectors, service providers and consumers. The higher individuals and organizations perceive the economic value of a technology, the faster its adoption rate will be (Rogers, 2003). Yet technology adoption is conditional on the output of the political system that obtains primacy over economy and society. In the early days of the Internet, its dynamic technological development and subsequent impulses for economic growth were far from predetermined. Instead, the Internet was regarded as a libertarian communication sphere independent from the sovereignty and governing capacity of nation states. Considering this, it was rational for authoritarian governments to impede or at least not to promote the use of the Internet by its citizens.

Since the start of the 2000s, at the very latest, the role of ICT in economic development became apparent, which changed the rationales of authoritarian rulers who set more favorable conditions for technology diffusion when the potential gains are large:

"If the global technology frontier's growth rate is high, relaxing restrictions on civil liberties will yield a higher consumption gain for the dictator in exchange for a given decrease in survival probability" (Knutsen, 2012, p. 19).

The lack of innovation capacities can therefore be substituted by importing knowledge. In light of the potential economic gains and modernization pressures, it would be irrational for autocratic rulers to keep blocking the use of digital technologies.

A second, functional argument refers to the actual use of the technology by citizens which is not situated in a political vacuum but is rather shaped by Internet policies of nation states (Rød & Weidmann, 2015). The "dual strategy" of authoritarian governments promotes the "hardware" of Internet use while simultaneously interfering with its "software", i.e. web applications and contents.[7] Targeted web services are blocked or censored, Internet service and content providers are stifled by strict telecommunication laws and regulations, users are subject to mass surveillance and activists are persecuted in publicly visible acts of repression (Deibert & Rohozinski, 2010; Greitens, 2013; Morozov, 2011). These Internet policies are designed to filter out politically sensitive contents and induce self censorship while doing minimal harm to economic exchanges (Knutsen, 2012; Morozov, 2011).

The capacity to control information flows on the web can serve as a catalyst for the adoption of the web in authoritarian societies since the "reprogramming" of the software makes it compatible with the predominant value system (Rogers, 2003). When authoritarian governments decided to promote Internet use, they also profited from "catch-up effects". Studies showed that innovations diffused faster in developing countries, because at the time of adoption, technologies were more developed and their costs lower (Andrés, Cuberes, Diouf, & Serebrisky, 2010; Chong & Micco, 2003). In addition, decision-making in authoritarian regimes is centralized and governments can implement infrastructure projects and telecommunication policies without any judicial or political restrictions.

Fig. 1 outlines a model of technological adoption in democracies and autocracies. Thanks to their superior innovative capacity, democracies should have a temporary advantage. Yet when its benefits outweigh the democratization risks in the preferences of elites, authoritarian regimes can strategically expedite Internet use in economy and society by incorporating the know-how of leading nations while simultaneously suppressing the political use of digital media. Therefore, the authoritarian adoption gap should diminish over time. A catch-up process is to be expected irrespective of the open question whether the diffusion could actually be

[7] Stier (2016) demonstrates empirically that democracies permit higher levels of Internet freedom than autocracies.

more efficient and faster in authoritarian regimes, since Internet adoption reaches a saturation limit in the leading democratic nations. Previous works have overlooked these temporal patterns in the relationship between regime type and Internet adoption.

4. Research design

The theoretical expectations are tested empirically in cross-sectional, country comparative multivariate regression models. This section presents the data and methodology of the article.

4.1. Data

Internet diffusion is the variable predominantly used in the empirical literature and also taken as the dependent variable in this study. It is operationalized as the number of Internet users in a given country, as defined by the (World Bank, 2015).

The independent variable of interest, regime type, is taken from the dataset of Magaloni et al. (2013) and coded according to the following criteria:

"To code regime type, we primarily focus on three aspects of the political regime: source of policy making, institutions or rules that structure intra-elite interaction and competition, and composition and selection of the executive and political leaders" Magaloni et al. (2013, p. 6).

Regimes with a civilian government elected in competitive, free and fair multiparty elections and constrained by institutional checks and balances are coded as democratic. Political systems in which these democratic principles are violated are coded as autocracies. The indicator depicts a binary democracy conception, which suits the theoretical framework that emphasizes qualitatively different regime rationales towards Internet adoption better than a continuous indicator like the Polity dataset. This approach also allows us to distinguish different forms of authoritarian rule, which have implications in policy performance (Croissant & Wurster, 2013). The dataset differentiates between one party regimes, multi party regimes, monarchies and military regimes. It covers countries with a population size greater than 500,000 and all relevant country-years including 2012.

The relationship between regime type and Internet adoption is conditioned by several other factors. The capabilities of actors on the supply side (governments and private enterprises) and on the demand side (citizens) clearly depend upon the economic development of a country (Hargittai, 1999; Milner, 2006; Norris, 2001). Thus, GDP per capita (logged) is included as the first control variable (World Bank, 2015). Citizens' media consumption and a country's regime type are also related to the human capital in a country. I include an indicator measuring the average years of schooling (United Nations, 2015). Expectations with regard to population size are ambivalent: On the one hand, the provision of Internet infrastructure is administratively and financially challenging in countries with a large population. On the other hand, a high potential number of users increases the value of a technology with increasing economies of scale (Rogers, 2003). Similarly, urbanization should facilitate the buildup of Internet infrastructure and ensure its use by a large number of users. Data on population size (logged) and the percentage of people living in urban centers is taken from World Bank (2015). Globalization might also stimulate Internet adoption, because many forms of international trade require a robust ICT infrastructure. International exchanges also facilitate the import and imitation of technological know-how. Thus, an indicator measuring the sum of exports and imports of trade and goods in percent of GDP is included (World Bank, 2015). Finally, resource abundance is an important variable in comparative regime research, since authoritarian countries are blessed or cursed, depending on the policy field, by the availability of natural resources. While, for instance, resource abundance impedes democracy and increases political violence (Ross, 2001), the oil rich monarchies in the Middle East have reinvested their resource rents in several economic branches including the telecommunication sector. To control for the effects of natural resources, I include a variable measuring the aggregated oil and gas exports, standardized per capita (Ross & Mahdavi, 2015).

4.2. Methodology

I chose a methodological design deviating from the two predominant empirical approaches in the field in order to unveil temporal patterns in the relationship between regime type and Internet diffusion. On the one hand, panel analyses estimate regression coefficients averaged over the entire pooled dataset of country-years, which implies that causal effects remain stable over time. On the other hand, isolated cross-sectional analyses, from which some studies have inferred generalizations (e.g. Fuchs, 2008), cover only one isolated measurement period. To address these limitations and investigate whether causal effects actually change over time, I use cross-sectional regressions for each year from 1996 to 2013.[8]

The dependent variable is left censored, since especially in the early years, Internet adoption stood at or close to zero percent in many countries. Since coefficients calculated from such a data structure violate normality assumptions of Ordinary Least Squares (OLS) regressions, I employ Tobit regressions (Tobin, 1958) which are suited for censored dependent variables (Wooldridge, 2009). The coefficients are, however, not interpretable linearly, since they display both, the probability of a data point to be above zero and its positive value (Wooldridge, 2009). Therefore, the results section will concentrate on the comparison of coefficients from different time periods and less on the proportion of variation explained by single models.

[8] 1996 is chosen as the first year under investigation because in the preceding years, the dependent variable has blatant gaps in coverage, in particular for authoritarian regimes.

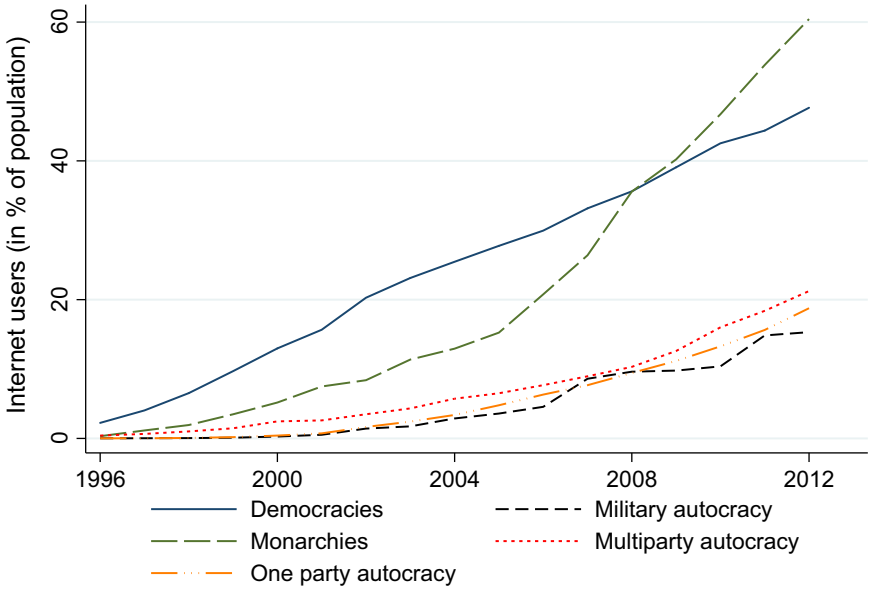

Fig. 2. Internet diffusion and regime type (Magaloni et al., 2013; World Bank, 2015).

5. Results and discussion

The theoretical framework of the paper indicates that the relationship between regime type and technological adoption is temporally variant. To get a first impression of the development over time, Fig. 2 displays the bivariate relationship between the variables of interest.

Fig. 2 demonstrates the leading role of democracies in Internet adoption. The leading countries in digital innovation almost exclusively had democratic governments. Yet authoritarian regimes reduced the gap during the 2000s and strikingly, since 2008, monarchies even outperform democracies. Internet diffusion in the other authoritarian subtypes also increases, yet with a much larger gap as compared to democracies.[9]

Yet bivariate analyses cannot account for structural differences between different regimes, especially with regard to economic development. To unveil temporally evolving causal effects in multivariate constellations, I calculate Tobit regressions for the years 1996–2013 including all control variables.[10] The remainder of this section discusses the results presented in tabular form in Appendix A.

Fig. 3, Panel A plots the democracy coefficient with confidence intervals. Differences between democracies and non-democracies (dummy variable 1/0) were insignificant during the years in which confidence intervals cross the red baseline 0. According to the stricter 95% significance level, democracies had an advantage during four years; according to the 90% significance level they had a significantly higher Internet adoption than autocracies from 2007 to 2012. Since 2012 and 2013 respectively, there are no statistically significant differences between democracies and autocracies anymore. The disagreement between studies reporting insignificant effects regarding regime types from the beginning of the 2000s (Norris, 2001) and the subsequent positive findings (e.g. Corrales & Westhoff, 2006; Guillén & Suárez, 2005; Milner, 2006) can be explained by taking such a temporal perspective. In contrast, the limited methodological designs and investigation periods of earlier studies have not been able to identify the changing causal effects, in particular the catching-up of autocracies.

The findings show that, all things being equal, democracies had a temporary superiority in Internet diffusion, even when taking their advantageous structural conditions into account in multivariate models. Yet somewhat surprisingly, regime differences are not statistically significant until the second half of the 2000s, while the theoretical framework expected the democratic innovation advantage to materialize in the earlier years of technology adoption. The delay can be explained on methodological and theoretical grounds. First, it might partly be a statistical artifact, since the variation in the dependent variable is less pronounced in the early years. An analogous growth in coefficients over time can also be observed in the significant control variables GDP/capita, education and the Pseudo R^2 (Appendix A). Second, diffusion of innovations theory distinguishes different stages of adoption. After the invention of a technology, the "early innovators" need some time to develop and implement sustainable technical solutions ("implementation stage"; Rogers, 2003) and diffusion within societies needs to reach certain thresholds to gain traction ("critical mass"; Rogers, 2003). Accordingly, it takes some time before regime effects manifest themselves in telecommunications policy.

The article enters uncharted territory when taking the effects of autocratic subtypes into account, since virtually no related discussion can be found in the literature on telecommunications policy. Some explanations can be derived from an expanding branch

[9] Bivariate correlations also reflect an evolving relationship. In 2003, the correlation between democracy and Internet diffusion was r=0.45, in 2012 r=0.36.
[10] Independent and control variables are lagged by one year in order to ensure that they temporally precede the dependent variable.

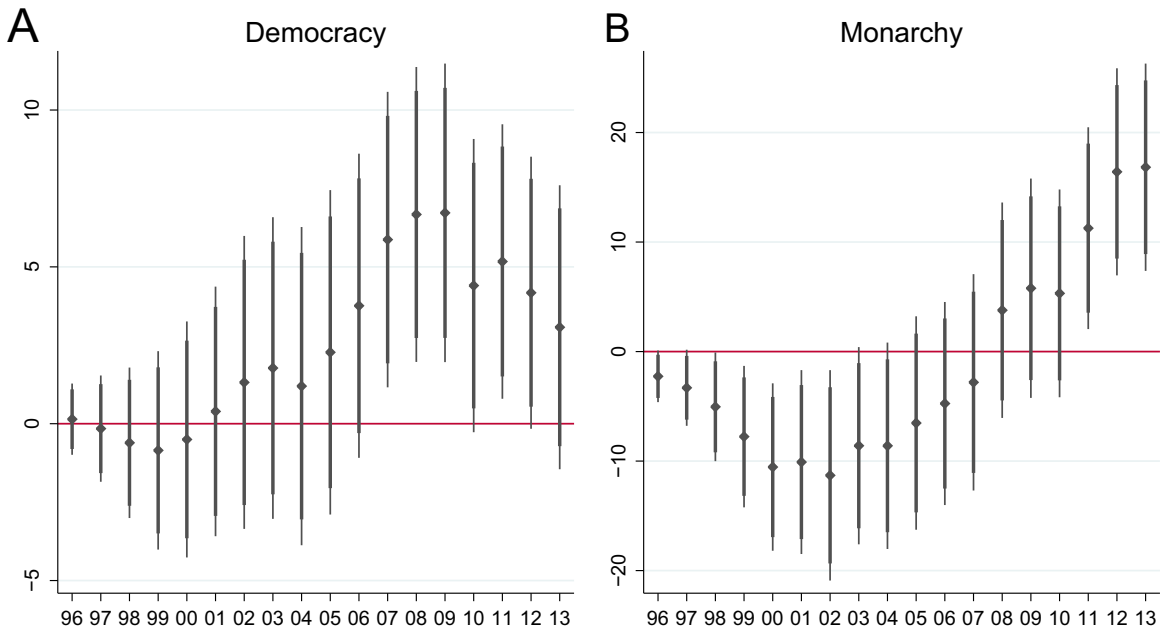

Fig. 3. Regime coefficients from Appendix A. 90% (thick line) and 95% confidence intervals (thin line). All control variables are included.

of research in comparative politics showing that the type of autocratic rule makes a great difference in policy outcomes (e.g. Croissant & Wurster, 2013; Menaldo, 2012). Whether the government is elected in (unfree) multiparty elections, a monarch is ruling with absolutist power, the leaders are chosen by an omnipotent closed party hierarchy or the rulers are members of the military might also be of relevance in patterns of Internet adoption. In light of sparse theoretical guidance, this step of analysis necessarily has to be of an exploratory nature.

I reran the models in Appendix A with all possible combinations of regime variables.[11] In these analyses, monarchy was consistently identified as the autocratic regime subtype with the highest explanatory power. Therefore, the models including the democracy and monarchy dummies were chosen as the main specification in the analysis. Fig. 3, Panel B plots the regime coefficients for monarchy showing that at first, monarchies were lagging behind all other regimes in Internet adoption, but have made considerable progress since the middle of the 2000s. In the year 2013, monarchies not only outperformed their autocratic peers in Internet diffusion, but even democratic regimes, with other variables being equal.

One might suspect that the rent incomes of monarchies in the Middle East drive these results. Yet the models statistically control for oil and gas income and in fact, resource abundance is even negatively correlated with Internet adoption (Appendix A).

How can we explain these profound changes in causal effects over time? Menaldo (2012) argues that monarchies have a special "political culture" binding the monarch in long-term institutional equilibria. He shows that monarchies are more politically stable, respect the rule of law and property rights more and have higher economic growth than other autocracies. In addition to these favorable institutional configurations, the monarchs of the Middle East have instated a considerable diversification of their resource wealth investing in branches like tourism, commercial aviation or the telecommunications sector. Qatar, for example, reinvests approximately 50% of its oil income (Menaldo, 2012). The rapid catch-up process was to a large extent based on the acquisition of foreign expertise and technological solutions. The Gulf monarchies redirected their rents to innovative technologies like the Internet and thus avoided the "resource curse" (Ross, 2001). Yet the non-oil monarchies in Jordan and Morocco also had above average levels of Internet diffusion in 2013, with 41% and 56% respectively. At the same time, monarchies are among the worst offenders of Internet freedom (Stier, 2016). This dual strategy reaps the economic and legitimizing benefits of the Internet, while stifling political dissent. These empirical findings notwithstanding, the extraordinary and rapid changes in the ICT strategies of monarchies during the 2000s remain a puzzle that further research can only solve by conducting qualitative case studies.

The control variables show differing patterns and degrees of stability (Appendix A). Economic development and education are significant predictors, which confirms previous studies (Corrales & Westhoff, 2006; Hargittai, 1999; Milner, 2006), and even gain in substantial influence over time. Population size, urbanization and globalization are statistically insignificant in almost all of the models.[12]

[11] For this I included the democracy dummy in combination with each autocratic regime subtype. I also reran the models featuring only the democracy variable without controlling for autocratic subtypes. Democracy displayed the same temporal pattern as in Fig. 3, Panel A in all of these specifications. Furthermore, I included all five regime variables in one model and rotated the regime type used as reference category. All of these analyses confirmed the temporal pattern for democracies and also identified monarchies as the most important regime subtype in terms of statistical significance and Pseudo R^2.

[12] The central results are robust to several alternative specifications and statistical tests. I ran OLS regressions with robust standard errors which lead to only marginally different results from the ones reported here. The levels of multicollinearity, as indicated by low values in VIF tests, were within acceptable ranges (VIF <

6. Conclusion

Whether the political system of a country is democratic or authoritarian leaves considerable marks in patterns of Internet diffusion. However, the picture is more complex than simplified "liberation technology" perspectives assume, which emphasize the democratizing potential of digital technologies. Democracies have had a temporary advantage in Internet diffusion thanks to their superior innovation capacities, but the preferences of autocratic rulers changed with the increasing economic value of digital technologies. Empirically, the article reveals similar levels of Internet diffusion in autocracies since 2013, all else being equal, and the best performance in monarchies which even outperform democracies. Theoretically, the study challenges long-held assumptions regarding the role of digital technologies in non-democratic contexts. Authoritarian regimes do not generally prohibit the use of digital technologies, but rather employ multidimensional ICT policies consistent with the political preferences of ruling elites. Therefore, in order to get to a holistic understanding of telecommunications policies outside Western democracies, the empirical literature, which has so far mostly focused on infrastructural aspects, needs to also consider state policies shaping the production and dissemination of (political) contents on the web (Greitens, 2013; Stier, 2016).

The methodology of the study expands the empirical literature insofar as it introduces a research design open to temporal changes in relationships between variables. Nevertheless, there remain limitations. Fine-grained and disaggregated measurements of legislation and regulation could enhance our understanding of authoritarian telecommunications policies, but such indicators are not available yet or do not have the necessary temporal and spatial coverage. Furthermore, the results need to be constantly revisited as soon as newer data is available. Finally, the causal mechanisms underlying the considerable performance of autocracies, especially monarchies, should be elucidated by qualitative case studies and interviews with involved stakeholders.

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Appendix A.

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Democracy $_{t-1}$	0.145	−0.156	−0.608	−0.850	−0.502	0.392	1.317	1.776	1.198
	(0.573)	(0.856)	(1.212)	(1.597)	(1.900)	(2.011)	(2.360)	(2.431)	(2.565)
GDP/Capita$_{t-1,\ log}$	1.43***	2.46***	3.76***	5.62***	6.94***	8.08***	10.2***	11.6***	12.0***
	(0.294)	(0.432)	(0.628)	(0.825)	(0.945)	(1.012)	(1.229)	(1.266)	(1.292)
Education $_{t-1}$	0.109	0.227	0.441*	0.529	0.614	0.780*	0.886*	0.618	0.676
	(0.125)	(0.185)	(0.264)	(0.335)	(0.393)	(0.398)	(0.480)	(0.499)	(0.527)
Population size$_{t-1,\ log}$	−0.0698	−0.319	−0.639*	−0.325	0.102	0.110	−0.0188	0.266	0.554
	(0.181)	(0.271)	(0.384)	(0.491)	(0.579)	(0.599)	(0.711)	(0.730)	(0.753)
Urbanization$_{t-1}$	−0.0224	−0.0283	−0.0397	−0.0743	−0.0660	−0.100	−0.124*	−0.121*	−0.0991
	(0.0177)	(0.0260)	(0.0373)	(0.0484)	(0.0569)	(0.0624)	(0.0736)	(0.0727)	(0.0737)
Trade$_{t-1}$	−0.00056	−0.00960	−0.0199	−0.0122	0.00593	0.00129	−0.00840	−0.00290	−0.00103
	(0.0066)	(0.0099)	(0.0138)	(0.0173)	(0.0202)	(0.0179)	(0.0215)	(0.0241)	(0.0237)
Monarchy$_{t-1}$	−2.261*	−3.306*	−5.046**	−7.766**	−10.5***	−10.09**	−11.30**	−8.597*	−8.603*
	(1.191)	(1.755)	(2.506)	(3.262)	(3.861)	(4.244)	(4.856)	(4.553)	(4.764)
Natural resources$_{t-1}$	0.00032	4.79e−06	−0.00056	−0.00025	−0.00032	−0.00047	−0.00069	−0.00089	−0.0011*
	(0.0003)	(0.0004)	(0.0005)	(0.0009)	(0.0008)	(0.0005)	(0.0007)	(0.0008)	(0.0006)
Constant	−7.858**	−10.28**	−13.00*	−29.2***	−46.3***	−52.5***	−62.4***	−74.8***	−83.7***
	(3.481)	(5.189)	(7.289)	(9.376)	(11.02)	(11.25)	(13.46)	(13.91)	(14.53)
N	127	127	129	128	128	138	139	141	141
Pseudo R^2	0.104	0.114	0.113	0.119	0.128	0.129	0.131	0.144	0.148

Notes: Tobit regressions; standard errors in parentheses. Log=logged; t−1=value from preceding year.
* p < .10.
** p < .05.
*** p < .01.

	2005	2006	2007	2008	2009	2010	2011	2012	2013

(*footnote continued*)
5.7 in the reported models and VIF < 3.5 when excluding the insignificant control variables).

$Democracy_{t-1}$	2.276	3.761	5.869**	6.67***	6.72***	4.404*	5.171**	4.176*	3.075
	(2.615)	(2.453)	(2.383)	(2.379)	(2.407)	(2.365)	(2.214)	(2.194)	(2.289)
$GDP/Capita_{t-1,\ log}$	11.9***	12.3***	12.4***	12.8***	12.4***	13.8***	12.9***	12.5***	12.6***
	(1.342)	(1.316)	(1.358)	(1.386)	(1.457)	(1.454)	(1.385)	(1.402)	(1.501)
$Education_{t-1}$	0.897	0.942*	0.888*	0.857	1.214**	1.283**	1.65***	2.06***	2.30***
	(0.554)	(0.514)	(0.525)	(0.536)	(0.560)	(0.528)	(0.506)	(0.523)	(0.551)
$Population\ size_{t-1,\ log}$	0.716	0.903	1.155	1.153	0.978	0.717	0.497	0.441	0.254
	(0.775)	(0.719)	(0.733)	(0.732)	(0.737)	(0.709)	(0.681)	(0.698)	(0.727)
$Urbanization_{t-1}$	−0.0864	−0.0990	−0.0434	−0.0265	0.00511	0.00063	0.00916	0.0455	0.0519
	(0.0752)	(0.0724)	(0.0728)	(0.0728)	(0.0754)	(0.0716)	(0.0692)	(0.0697)	(0.0722)
$Trade_{t-1}$	0.00619	0.0161	0.0342	0.0308	0.0269	0.00512	0.0157	−0.00123	−0.0118
	(0.0247)	(0.0246)	(0.0238)	(0.0248)	(0.0238)	(0.0268)	(0.0241)	(0.0235)	(0.0240)
$Monarchy_{t-1}$	−6.524	−4.743	−2.809	3.774	5.783	5.315	11.27**	16.4***	16.8***
	(4.927)	(4.691)	(4.998)	(4.976)	(5.067)	(4.799)	(4.662)	(4.784)	(4.787)
$Natural\ resources_{t-1}$	−0.001*	−0.001**	−0.001**	−0.001***	−0.001***	−0.001**	−0.001***	−0.001***	−0.001***
	(0.0005)	(0.0004)	(0.0003)	(0.0004)	(0.0003)	(0.0005)	(0.0004)	(0.0003)	(0.0004)
Constant	−88.7***	−95.9***	−105***	−109***	−106***	−106***	−98.7***	−95.9***	−92.5***
	(15.00)	(13.90)	(14.18)	(14.27)	(14.75)	(13.92)	(13.47)	(13.97)	(14.64)
N	143	155	152	154	151	150	153	152	147
Pseudo R^2	0.147	0.152	0.164	0.169	0.172	0.188	0.196	0.198	0.195

Notes: Tobit regressions; standard errors in parentheses. Log=logged; t−1=value from preceding year.
* p < .10.
** p < .05.
*** p < .01.

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