The Digital Divide:
The Role of Political Institutions in Technology Diffusion.

Helen V. Milner
Columbia University
Hvm1@columbia.edu
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Abstract:
What factors have promoted and retarded the spread of the internet globally? The internet is one example of the diffusion and adoption of technology generally. Much as other technologies, the internet has diffused unevenly across countries. This uneven spread has raised concerns over an increasing "digital divide". The main proposition here is that its spread has been driven by neither technological nor purely economic factors alone. Rather political factors, especially the type of domestic institutions, exert a powerful influence. Groups that believe they will lose from the internet try to use political institutions to enact policies that block the spread of the internet. Some political institutions make this easier to do than others. Data from roughly 190 countries over the past decade (1991-2001) show that a country's regime type matters greatly, even when controlling for other economic, technological, political and sociological factors. Democratic governments facilitate the spread of the internet relative to autocratic ones. Thus the spread of democracy may help reduce the digital divide.

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"This gap between rich and poor is also mirrored in the new information economy. A digital divide — the name given to the disparity in information resources — is emerging between North and South. Industrialized economies are moving towards greater dependence on and access to increasingly sophisticated information technologies. Yet more than one-half of humanity has never used a telephone, and there are more telephones [in] Montréal than in all of Bangladesh."
http://www.acdi-ida.gc.ca/INET/IMAGES.NSF/vLUImages/Publications2/$file/rpp2002-2003_e.pdf. Canadian International Development Agency, Annual Report 2002-3. p. 10.

I. INTRODUCTION.

What factors that have promoted and retarded the spread of the internet globally? The internet is one example of the diffusion and adoption of new technology. As a means for spreading information at very low cost, however, the internet may have a wider impact than some prior forms of communications technology. It is an important element of the current globalization process that is linking countries ever more tightly to a single global economy. Many scholars, as the quote above exemplifies, worry that its uneven spread is exacerbating the "digital divide" between the rich and poor. As Franda (2002: 11) notes, "The introduction of the internet has not made any part of the world poorer…But the internet is contributing to a widening of the gap between the better-off and worse-off parts of the world because it has enabled some nations to create new sources of wealth and of international diplomatic and political power relative to others."

The diffusion of technological innovations is a topic of great importance. Scholars now believe that economic growth is propelled largely by technological change (e.g., Parente and Prescott 2000). Countries hoping to develop must innovate or adopt new technologies that increase productivity. Factors that influence the adoption rate of new technologies are therefore of critical importance for economic development (Mokyr 1990; Hall and Jones 1999: Parente and Prescott 2000; Acemoglu and Robinson 2000 &

2002). Basically, some countries exploit the latest and most efficient technologies and production processes and experience very rapid growth, while others countries fail to do so and lag far behind. Some scholars attribute the rise of the West to its superior ability to innovate and adopt new technologies (e.g., Diamond 1997). Today the widening gap between the rich and poor countries is often attributed to faster rates of growth in the richest countries, driven in part by their willingness to adopt innovations rapidly (e.g., Landes 1998). Thus understanding what variables affect the rate of adoption of new technologies, like the internet, is of great importance.

Since the world stock of knowledge is capable of use by all countries, and since differences in human and physical capital do not seem to account for differences in the adoption of technology, scholars have turned to other factors. Primary among these have been political factors, such as the role of institutions, ruling elites and public policy. Some scholars now claim that the rate of adoption of technology depends heavily on the political environment and the preferences of those in power (e.g., North and Thomas 1973; North 1990; Acemoglu and Robinson 2000 & 2002). Some institutional environments allow governments and ruling elites who so desire to foster technological change; others slow it down or derail it completely. Political obstacles, not economic ones, are now seen as the central cause of differential rates of technological change and hence of economic growth.[1]

This paper seeks to explain the distribution of the internet across space and time. Much as other technologies, the internet has diffused unevenly across countries. My

[1] . Acemoglu and Robinson (2000: 126) propose the "political loser" hypothesis. They claim that the effect of technological changes on the political power of groups is key in predicting whether such innovations will be adopted. Those groups whose political power (and not their economic rents) is hurt by technological change will block innovations. Their main point is that one should focus on the nature of political institutions to understand the sources of technological backwardness.

main proposition is that the pattern of internet adoption among countries has been driven neither by technological forces nor by purely economic ones. Rather political factors, especially the nature of domestic institutions, exert a powerful influence. Groups that believe they will lose from the internet try to use political institutions to enact policies that block the spread of the internet. These "losers" hope to slow down or stop its diffusion, and some institutions make this easier to do than others.

Political institutions matter for the adoption of new technologies because they affect the manner and degree to which winners and losers from the technology can translate their preferences into influence. In particular, countries that are democratic are more likely to adopt at faster rates than are non-democracies. The ruling group in autocracies will tend to see the disadvantages of the internet as outweighing its advantages. Because they have non-democratic institutions, it will also be easier for them to slow down its spread. Autocratic governments then will have both greater interests in and more ability to impede the adoption of technologies, such as the internet. Regime type is thus a major factor explaining the digital divide.

This paper has 5 sections. After the introductory section, I present data showing that the adoption of the internet has varied greatly among countries. I present data that demonstrate the democratic advantage in internet adoption. The next section discusses why regime type influences how new technologies are treated by countries and suggests why it matters a great deal. The fourth section presents a quantitative analysis of 184 countries from 1991-2000 of the spread of the internet. The main finding is that regime type, in particular democracy, promotes the adoption of new technologies, or at least that autocracies tend to slow it down. The fifth section concludes.

II. ARE DEMOCRACIES DIFFERENT?

The rate of adoption of the internet has varied considerably among countries. For instance, in 2000, almost a decade after the internet became a publicly-known technology, Iceland led the world in the percentage of its population using the internet; close to 60% were users.[2] In the next group of heavy users were Norway, Sweden, the US, and Canada with more than 40% using it. Some rich and technologically adept countries like Germany and Japan had just less than 30% of their population online, or half of Finland's rate. Very rich countries like France and Spain had only 14% of their populations as internet users. Other well-off countries had even fewer users: Saudi Arabia had less than 1% of its population online; Russia, less than 2%; and Greece, less than 10%. In fact, by 2000, 73 countries out of 184 for which we have data (about 40% of the world) had less than 1% of their populations online. What accounts for this variation in the adoption of an important new technology?

A country's regime type seems at first glance to have a salient impact. Among countries coded as democratic, the average percentage of the population that was an internet user in 2000 was 12%.[3] The same figure for autocracies was only 2%. For the number of internet hosts per 10,000 inhabitants, democracies on average in 2000 had 211, while autocracies had 10. Figure 1 shows this relationship for the entire decade (the figures all use per 10,000 inhabitants); it is always the case that democracies have a

[2] . For a complete discussion of data sources, see the description in the empirical section.
[3] . Countries were coded as democratic if they scored at or above a 6 on the POLITY scale; otherwise they were autocratic. The POLITY scale combines the scores for democratic and nondemocratic scales into a 21 point index ranging from -10 to 10.

greater percentage of users and hosts than autocracies. This advantage escalates over time as well.

[INSERT FIGURE 1a, b HERE]

Because democracy and level of development are closely related (r=.43), one might interpret this as a function of the fact that democracies are richer. But if one controls for level of income, the same results arise. Figure 2a shows that in countries that the World Bank classifies as low income, democracies on average have more users per capita than do autocracies; in 2000 for instance, poor democracies averaged 0.5% of their population as users, while for poor autocracies only 0.3% were users. In figure 2b one sees that with respect to the number of hosts per capita, the differences are much smaller. For the poorest countries buying the equipment to support internet hosts is going to pose the biggest constraint, and thus one might expect the least difference here. In figure 3 the data reveals that for middle income countries the same result holds: democracies have more people online than autocracies. In 2000, middle income democracies had 6% of their populations online, and autocracies had only 2%. In terms of hosts, democracies had 45 per 10,000 inhabitants and autocrats had a mere 3 in 2000.

The data for high income countries during the 1990s is presented in figure 4. The rich democracies outscore the rich autocracies in internet users and hosts. In 2000 for example, nearly 30% of rich democracies' populations were online, while in rich autocracies this figure was only 17%. Rich democracies also had more hosts per capita than did rich autocracies (602 per 10,000 versus 143). At all levels of development, democracies have more users per capita than do autocracies, and at all levels but the

poorest they have an advantage in hosts as well. In nearly every case, this democratic advantage was growing over time as well.

[INSERT FIGURES 2-4a, b HERE]

III. WHY ARE DEMOCRACIES MORE LIKELY TO ADOPT THE INTERNET?

As with any technology, its successful adoption is likely to depend on the underlying political order. The laws, regulations, subsidies, and taxes that governments choose to employ or not may substantially affect whether actors invest in the new technology, as North (1990) among others has argued. Political and economic groups that lose from the spread of the internet may also try to retard its diffusion through such political means (e.g., Acemoglu and Robinson 2000). They may seek to use the country's political institutions to enact policies that do this. Some institutions may be more susceptible to such purposes than others.

Some have claimed that autocratic governments are more opposed to and restrictive of the internet. Goodman et al. (1998:243) conclude from their study of 13 countries that "It appears clear at this point in the studies that government policy plays a key role in the diffusion of the Internet. A general rule that has emerged is that stronger centralized control results in slower Internet development and less proliferation. This is likely due to the fact that the strength of government control is somewhat inversely proportional to popular participation in and support of the government."

In contrast, other scholars suggest that the internet will be much more benign and leaders capable of greater control over it. They imply that authoritarian governments may not desire to impede the growth of the net. Chase and Mulvenon (2002: 87-89), for

example, point out that China has been very successful in preventing the net from influencing politics and that the government has used the internet to blanket the country with its official propaganda and bolster its political control. Kalathil and Boas (2002: 137) likewise argue that "states still call the shots." They conclude their study of eight authoritarian governments by noting that "the state plays a crucial role in charting the development of the internet in authoritarian regimes and in conditioning the ways it is used by societal, economic and political actors. Through proactive policies … authoritarian regimes can guide the development of the internet so that it serves state-defined goals and priorities. This may extend the reach of the state in significant ways" (2002: 136). They see little to indicate that authoritarian governments should fear the internet and a great deal of evidence that they are going to promote it, for their own purposes of course. Hence it is not clear cut that non-democratic regimes will oppose the internet.

Many have argued about whether the internet will have a democratizing effect (e.g., Norris 2001; Kalathil and Boas 2003), but few have systematically examined whether a country' regime type affects its rate of internet adoption. Among the extant studies, a number of them do not find clear cut evidence for the impact of regime type. Kedzie (1997), examining data on email usage from 1993, shows that a strong correlation exists between country's rankings on their levels of interconnectivity and Freedom House measures of political and civil liberties. He disavows any causal claim about whether democracy promotes the internet or vice versa, however. Norris (2001: 62) again shows that in a simple OLS regression on cross section of countries in 2000 democracy has a significant effect on the percent of the population online. She, however, attributes most

of its impact to economic development levels, rather than political institutions. Later she shows that the impact of democracy fades into insignificance when other socio-economic factors are introduced (2001: 63). Oxley and Yeung (2001) again in a cross section on internet hosts per capita demonstrate that the rule of law as measured by La Porta et al. (1997) has a positive effect; it seems to have none for internet users, however. Finally, Guillen and Suarez (2001) show that Polity's democracy score predicts higher levels of internet users and hosts in a cross section of countries.

This study attempts to move this research agenda on regime type and technology diffusion forward. I first explore the theoretical linkages between regime type and internet development and second provide different statistical models than used in earlier studies by adding a time series dimension, using better measures of democracy, and employing more appropriate statistical methods. This study then attempts to provide a stronger test of the linkages between domestic regime type and technological change.

In what ways might regime type matter for choices about adopting the internet? What differentiates democracies from autocracies in their adoption of new technologies? All technological change creates groups who gain and lose from the change: its winners and losers. The type of political institutions in place may allow the losers to block or slow down its adoption or they may enable winners from its adoption to promote it. Governments and groups who support them if they lose from the spread of the internet may try to use political institutions to slow down its diffusion. Political actors need to possess both the desire and capacity to block or promote technological change. Autocratic governments, I claim, are more likely to possess both than are democratic ones. This argument is different from those that focus on the way in which democracy

enhances human capital and public goods provision (e.g., Lake and Baum 2001; Baum and Lake 2003; Bueno de Mesquita et al. 2003).

The central goal for both autocratic and democratic governments is staying in office, which --much evidence has shown-- depends on the state of the economy. Leaders must pay keen attention to the economy for their survival; they certainly must pay attention to the economic fortunes of the groups that are their major supporters. But democratic governments tend to be more sensitive to economic failure and its consequent political failure (e.g., Bueno de Mesquita and Siverson 1995). This heightens their concern for economic growth and in turn enhances their desire to promote, or at least not block, technological change that portends faster economic growth. Autocrats, who tend to survive longer and be less sensitive to economic problems, can fail to promote or even block technological change that threatens them or their supporters. Below I detail some of the many ways in which autocratic governments have gone about squelching the internet. A consequence of these policies is lower internet use and slower internet adoption.

On average, autocratic governments should be more likely to prefer and be better able than democratic ones to prevent the spread of the internet. Autocratic regimes may create environments that hinder the growth of the internet since it allows the freer flow of information. They should be better able than democratic leaders to determine the supply of the internet and other communications infrastructure. As Goodman et al. (1998: 23-4) claim, “To the extent that it provides an additional communications medium, the Internet can be seen as a threat to coercive control, whether internal or external. In its most basic form, it is merely another means of sharing information. However, the robust nature of the international network and the fact that it is a store-and-forward medium

(asynchronous) presents unique problems to [national] security services." This suggests that autocratic governments will desire to regulate the internet closely and perhaps restrict its diffusion, if not just its content. As one report on internet freedom notes, "45 countries now restrict Internet access on the pretext of protecting the public from subversive ideas or violation of national security—code words used by censors since the sixteenth century" (Sussman 2000: 1); they are all autocracies.

Autocratic leaders are caught in a dilemma, however. They face contradictory pressures regarding technological innovation and the internet in particular. Their country's economic growth rate, and thus their legitimacy, may depend upon such innovations, but they may also undermine a regime's control capabilities. For example, "China faces a very modern paradox. The regime seems to believe that the Internet is a key engine of the new Economy… and that future economic growth in China will depend in large measure on the extent to which the country is integrates with the global information infrastructure. Economic growth is directly linked to social stability of the Beijing leadership, maintenance of prosperity has become the linchpin of regime legitimacy and survival… Chinese leaders view the development of information technology, particularly the internet, in China as an indispensable element of their quest for recognition as a great power. In the words of a recent *People's Daily* article, 'the degree of development of information networking technology has become an important yardstick for measuring a country's modernization level and its comprehensive national strength. …At the same time, however, China is still an authoritarian, single party state with a regime whole continued rule relies on the suppression of antiregime activities. The installation of an advanced telecommunications infrastructure to facilitate economic

reform greatly challenges the state's pursuit of internal security. … Faced with these contradictory forces of openness and control, China has sought to strike a balance between the information-related needs of economic modernization and the security requirements of internal stability" (Chase and Mulvenon 2002: 45-6).

In general, there are a variety of ways in which governments can delay or prevent the spread of the internet. Most of these require an authoritarian government that desires and is able to limit political and civil rights. The eight main ways that a regime can "squelch the net" provide an interesting inventory of such governmental practices (Wired, August 2003: 31).

1. Firewalls. Governments employ proxy servers—that is, computers that act as intermediaries between the global internet and domestic users on private networks— to scan email for "offensive" or prohibited content and to review all web traffic by checking URLs against a constantly updated blacklist. For instance, in the late 1990s a number of Middle Eastern countries, such as Saudi Arabia, UAE, and Yemen, used a firewall that monitored their few access points to the global internet (Franda 2002; Kalahtil and Boas 2003).

2. Routers. Firewalls will not work well once a country has a high volume of web traffic or where multiple ISPs have established many servers that can access the global net. China, for example, would need thousands of proxy servers to monitor all incoming and outgoing web traffic. The approach of countries in this position is to force the ISPs to monitor the web for them. Routers capable of blocking offending IP addresses and even filtering content must be installed by ISPs.

3. Software filters. Censorship can be imposed by using software to filter all email and web traffic. Governments can use their proxy servers or can force their ISPs to install software filters that comb the email and web traffic of their users. Some filters block entire banned sites; others use keywords or messages with offensive terms to stop email or prevent access to a URL. Singapore, among other tactics, had made extensive use of such filters, as do many Moslem countries (Guillen and Suarez. 2001: 357-60).

4. Internet police. They conduct surveillance on users and act as informants. Wired notes that China has 30,000 email police who enforce a bevy of net-related laws and monitor messages.

5. Coercion. Governments often employ "self-regulatory measures," in particular those aimed at ISPs. In 2002, for instance as the Wired article notes, , China required all ISPs and media to sign "Public Pledge on Self-Discipline for the Chinese Internet Industry," which forced all ISPs to agree to abide by all laws and regulations regarding he internet or be punished; failure to sign resulted in being blacklisted or losing one's access. In many other countries as well, including Singapore and most of the Middle East, these types of policies have forced ISPs to self censor, thus relieving the government of this direct role (Kalathil and Boas 2003). Its inhibitory effect on use and content is well known.

6. Restricted access. Many countries force all users to register with their ISP or governmental authority. Users then know that the government can track them down, and are often inhibited in their behavior. Moreover, some countries restrict access to institutions and prevent individuals from gaining entrée. They hope that by permitting access only in group situations, users will be deterred from prohibited behavior since

others can more easily monitor them. Cuba, for example, limits web access very severely; a few public institutions are granted permission (Kalathil and Boas 2003: chap. 3). Its objectives are "not the greatest freedom for market actors" but rather "limited and managed access subject to resource constraints and the imperative of information control" (Seror and Arteaga. 2000: 214). This policy means Cuba has less than 1% of its population with email accounts and only half of that with connections to the global web as of 2000 (Kalathil and Boas 2003: 44, 53).

7. High access prices. Three sets of costs matter for users: the prices of local telephone calls for making an ISP connection, the prices users pay ISPs for access to the net, and the prices for ISPs to lease local lines. High prices make access unaffordable to the vast majority in a country. While more manipulable in non-democratic countries, democracies can and do affect these costs. An autocratic country, like Jordan, uses high taxes and instructs its telecommunications monopoly to keep the cost of the net very high, so that fewer than 30,000 Jordanians were on line around 2000. Argentina, a much more democratic country, however, faced the same problem. In the early and mid 1990s, Argentina had a state-controlled monopoly on telecommunications, very high prices for leased lines, and very high prices for telephone calls. Among its regional peers, it was last in internet penetration. In the late 1990s, however, the government changed policies, reducing all prices related to the internet. By 2001, then Argentina had raced ahead of its regional peers, leading in internet penetration (Petrazzini and Guerrero 2000).

8. National Intranet. Another method is to develop a national intranet that is controlled solely by the government and that limits all contact with the global web. China has been trying to wall itself off from international cyberspace and develop an intranet for Chinese

speakers governed by the authorities using the Chinese language only; this system is called the “169 network” (Franda 2002: 198).

Governments thus have an assortment of policies that they can employ to hinder the spread of the internet. Some types of governments will be more able to use these policies than others. Most democratic governments, for instance, could not employ many of these strategies without violating basic civil and political rights and hence facing enormous public resistance. Elected leaders trying to adopt these policies would face near certain eviction from office and probably legislative and judicial pressure to desist. Democratic governments can thus credibly commit to not adopting many of these policies, leaving private actors more willing to invest in and spread new technologies.

Autocratic governments, on the other hand, seem perfectly capable of most of these policies. They thus have tools for impeding the growth of the internet that democratic countries do not. Moreover, autocracies have fewer ways to credibly commit to not adopting such policies now or in the future (Wintrobe 1998: 25-27). Hence in addition to the stultifying effect these policies have on technological change, they also face the problem of getting private actors to invest in and spread new technologies. Thus I argue that on average autocratic countries are likely to have less penetration by the internet as a result of their greater desire to squelch it, their superior ability to do so, and their lack of ability to commit not to do so. By motivation and capacity, democratic governments will be less able to impede it.

IV. EMPIRICAL ANALYSIS.

Over time and space, what factors have caused the spread of the internet? In particular, does a country's regime type affect its adoption of internet technology? The primary sources of evidence here will be the use of a database on the number of internet hosts and users per capita among roughly 200 countries from 1991-2001.

The main data here is collected by the World Bank in its 2001 World Development Report on the number of internet users (INTUSERS), which is taken from the International Telecommunications Union (ITU, www.itu.org). INTUSERS measures the number of people with access to the worldwide network; these are not just subscribers to internet service providers (ISPs) nor are they actual users. I supplement the World Bank data on users with data from the ITU for 2000 and 2001. This is normalized the number by a country's population, per 10,000 inhabitants. Second, I use the number of internet hosts (HOSTS), or computers with active Internet Protocol (IP) addresses connected to the internet, as collected by the Internet Software consortium (ISC, www.isc.org). The ISC runs an electronic survey pinging all internet hosts on the web globally to determine their domain names and numbers. The domain survey attempts to discover every host on the Internet by doing a complete search of the Domain Name System. (See the ISC website for an extensive discussion of the survey methodology and its problems.) I normalize HOSTS by a country's population, per 10,000 inhabitants.[4]

[4] . A problem with using number of hosts is that it does not measure the number of users or the intensity of their use. Moreover, there are ambiguities connected with defining what a host is. Assigning each host to a country can be tricky. In this paper I follow others who use the simple rule that the two-letter ISO country code Top Level Domain identifies where the host is actually located, but this is not always the case. The data for the number of users is probably more reliable as a measure of internet adoption than is the number of hosts.

Summary statistics for all variables used in the cross sectional analysis are in table 1; table 4 contains the summary measures for the time-series cross sectional (TSCS) data.

As a first cut, I examine the cross-sectional patterns of the spread of the internet. The question is why by 2001 had some countries adopted it faster than others. Tables 2 and 3 present cross-sectional regressions showing the impact of regime type controlling for many other variables. Cross sectional regressions allow us to compare the experiences of countries over a longer period of time; they highlight the structural features of states that make them more willing to adopt new technologies. The independent (RHS) variables are measured as averages for each country from the period 1990-1999. The two dependent variables are the number of HOSTS and INTUSERS (per capita) for 2001. In other words, the RHS variables are effectively lagged. The cross-sectional regressions pick up about 140 countries (out of a total of 238 countries, territories, dependencies, etc.), but these tend to be the biggest countries that account for most of the world's people and its trade. The central question in this cross sectional analysis is what long-run, structural factors make countries adopt the internet at faster rates than others.

I use a negative binomial regression to estimate these models. The dependent variables are counts of hosts and of users per capita; they are always positive and in early periods are often zero. As is well known, such count variables rarely assume a normal distribution, and hence they tend to be better fitted by various maximum likelihood estimators, such as the Poisson or negative binomial, which can handle nonlinear functional forms better. I choose the latter since goodness of fit tests rejected the Poisson model.[5] The negative binomial is preferred to the Poisson when two key assumptions of

[5] . The Poisson distribution has a special and restrictive assumption that the variance is equal to the mean. Often this condition is violated and then other models, such as the negative binomial, which assume only

the latter are likely to be violated: that events accumulating during the observation period are independent and that they have a constant rate of occurrence (King 1989: 51). As shown later, strategic interaction does seem to be occurring, and accelerating adoption at times is prevalent. Both of these facts call into question the validity of Poisson models, suggesting a preference for the negative binomial one.

These cross sectional regressions include controls for a country's size (population LNPOP), its level of development (GDP per capita), its urban density (percent living in urban areas, URBAN), its war proneness (WAR), and its political institutions as the baseline model. The first three of these are from World Bank WDI; the war variable is complied from the Correlates of War and includes all types of wars, internal and external (see http://cow2.la.psu.edu). Adoption of an innovation tends to be correlated with the potential adopter's wealth, education, and propensity for risk-taking (Morrill et. al. 1988: 52). Wealthier countries tend to have a greater demand for and supply of the new technology. Urbanization also tends to matter, since urban centers are wealthier generally. Earlier studies, for example, have shown that the diffusion of the television in Poland predominated in the richest and the most urban parts of the country (Loboda 1974). Both Hargatti (1999) and Norris (2001) show that a country's level of economic development is critical for explaining its level of internet connectivity. The level of violent conflict a country is experiencing may also matter for explaining the adoption of new technologies. Countries involved in wars, whether international or civil, should be less likely to adopt since their capital spending and investment and their attention are

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that the variance is somehow proportional to the mean, are preferable. In all of the cross sectional regressions, the goodness of fit chi squared statistic implied that we could reject the null that the data are Poisson distributed at the 0.000 level.

diverted to winning the war and not adopting new civilian technology. These variables are thus important controls.

I employ three measures of regime type for the sake of robustness. POLITY refers to the Polity IV dataset measuring regime type on a scale from -10 for complete autocracies to 10 for full democracies (Marshall and Jaggers 2001). This index combines data on five factors that capture the institutional differences between democracies and autocracies: 1.) the competitiveness of the process for selecting a country's chief executive, 2.) the openness of this process, 3.) the extent to which institutional constraints limit a chief executive's decision-making authority, 4.) the competitiveness of political participation within a country, and 5.) the degree to which binding rules govern political participation within it. Following Gurr et al. (1989) and Jaggers and Gurr (1995), these data are used to create an 11-point index of each state's democratic characteristics (*DEMOC*) and an 11-point index of its autocratic characteristics (*AUTOC*). The difference between these indices, *POLITY = DEMOC - AUTOC*, yields a summary measure of regime type that takes on values ranging from -10 for a highly autocratic state to 10 for a highly democratic one.

I also use two other democracy indicators to show how robust the findings about democracy are. ACLP is taken from Przeworski, Alvarez, Cheibub and Limongi (2000) and measures regime type as a dichotomous variable, with democracy=1 and 0, otherwise. This measure codes a regime as democratic if and only if high political offices are chosen through fair and free contested elections where alternation of leaders occurs. POLRITES is a measure of political liberties taken from Freedom House (2000); it ranges from 1 to 7, with 7 being the least democratic. To code the political rights

variable, Freedom House considers to what extent the system offers voters the opportunity to choose freely from among candidates in competitive elections and to what extent the candidates are chosen independently of the state. In countries where the military, the monarchy, or an unelected dictator retains a significant political role over elected leaders, these are also coded as undemocratic. Note that this variable runs opposite the other two: higher number of POLRITES indicate less democracy, and thus we expect a negative sign here. These three measures then comprise a wide variety of meanings and codings for democracy.

I also examine the impact of other variables. The extent of civil liberties may also matter; more freedom of the press, association, religion, etc. may all encourage the development of internet activity. It is important to separate out the impact of political institutions from civil liberties, even though the two are closely related. These two factors could have quite different causal mechanisms. To distinguish regime type from a country's press freedom, I include a variable that measures such freedoms, but that does not measure regime type. Van Belle (1997) employs this variable to distinguish among presses that are free from government intervention and competitive (PF=1) and those that are highly censored or run by the government (PF=5). (As expected, it is significantly related to the democracy variables, correlated at -0.6 with POLITY).

Other control variables must be included as well. The fraction of the population that speaks English (ENGFRAC from Hall and Jones 1999) might be important since the internet is mostly in English, although this is declining. Government policy toward the telecommunications sector can affect the internet's spread greatly. Policies regarding government control over and intervention in telecommunications sector, as well as

licensing, taxation, subsidization, foreign investment, access control, infrastructure investment, and standards setting in this sector are of particular importance. Different governments will make different choices about these policies, and in doing so will affect the rate of internet adoption (e.g., Petrazzini and Guerrero 2000; Franda 2002; Kogut 2003). In particular, the extent of privatization of the telecommunications industry may matter. I include a variable here for the period of time in the 1990s over which a country's telecommunications systems was privatized. More privatization should lead to greater internet use as prices fall and competition rises. Some have argued that the type of legal system matters for economic growth and technological change (LaPorta, et. al. 1997). I examine the impact of the country's legal system as well using the currently available classification of systems into ones with British-like origins and French-like ones (LEG_ENG, LEG_FR). Since the British one was never significant, it was dropped.

The spread of technology often relies on the transmission of information about the new technology and as such tends to follow existing social lines of communication (e.g., Rogers 1995; Dekimpe, Parker and Sarvary 1998 & 2000). Scholars have shown that these lines tend to connect similar groups within countries. Information spreads less quickly when groups are dissimilar, especially in terms of language and culture. Hence many have noted that ethnic heterogeneity is a major obstacle to such transmission (e.g., Dekimpe, Parker and Sarvary 1998 & 2000). I look at a variety of indicators for social homogeneity. The extent of ethnic fractionalization (ETHFRAC), of religious diversity (% of largest religious group in country), and of particular religious groups (Catholics, Protestants, and Moslems) in the population are explored.

Economic competition among countries can serve as a mechanism of diffusion and thus help explain global internet adoption patterns. The internet may provide important economic advantages. Scholars (e.g., Freund and Weinhold 2000) have shown that it increases trade flows, largely by reducing information and transaction costs. For these reasons, countries may be forced by competitive pressures to imitate their neighbors or rivals and adopt this technology. To control for this, I add a variable to capture the impact of diffusion pressures from other countries. This (HOSTALL) measures the sum of all other countries' hosts or users per capita in 1999, excluding the country itself.

Tables 2 and 3 show that regime type matters significantly. For users in table 2, all three measures of regime type are correctly signed and highly significant. More democratic countries have far more users per capita, even holding many other factors constant. The same result occurs for the number of internet hosts in a country. More hosts are a function of more democratic governments. This variable also seems to have a substantial effect on the spread. An increase in democracy by unit on the POLITY scale leads to a 5% rise in the number of internet users per capita, using equation 2 in table 2. A one unit rise in POLITY leads to a 12% increase in the number of hosts per 10,000 inhabitants, using equation 2 in table 3.

Many of the other variables are related as one would expect. More developed countries (i.e., ones with higher GDP per capita) generally have more users and hosts. Countries that are more urbanized have more users and hosts. Urbanization is highly correlated with level of development (r=.60) and with levels of education (r=.74), indicating at least two distinct paths for its influence. In addition, research on diffusion sees cities as dense environments filled with risk-taking "change agents", which may be

another reason why they promote technologic change. The percentage of time a country is engaged in civil or international war also plays a role. Certainly, for the number of hosts conflict seems to impede their spread. The percent of the population that speaks English has either no impact or an unexpected one.

The policy variables also seem to play a role. The nature of a country's legal system, especially if it had French origins, tends to make it unfavorable to technological change. Privatization of the telecommunications industry matters as well. The longer countries had had privatized networks, the more hosts and users of the internet they had. Press freedom also is important. Greater freedom had a significant impact mostly on the number of users in a country, even holding regime type constant. More press freedom probably implies more interesting and varied content on the web itself. But it is important to note that regime type is still significant even when controlling for press freedom. Finally, the percentage of users and hosts in the rest of the world is salient. But not as one might expect. More users and hosts in the rest of the world in 1999 are correlated with fewer users and hosts at home in 2001.

I also looked at a variety of cultural and political factors. Using the equations in tables 2 and 3 as a baseline, they were never significant when added to these. In terms of political variables, I examined Henisz's political constraints (POLCON) index, indicating the extent of veto players in a country. It does not play an important role in the adoption of this technology. In terms of cultural factors, I examined the percent of the population from the largest religious group, percent Moslem, percent Catholic, percent Protestant, and whether the country had been a British colony (all from ACLP). When these variables were added singly or sequentially, they were never near statistical significance.

This may be partly because some of them reduced the sample by half to two-thirds (N=60). Finally, the measure of the existing telecommunications infrastructure, the number of telephone lines per capita (PHONES), was introduced and was significant. But it caused serious collinearity problems with GDP per capita (r=.88), and made the measure of level of development negative. I then ran equation 2 in table 2 and 3 dropping GDP per capita and using the telephone lines instead. It was significant but had no impact on the regime variables. Since it was also highly correlated with the regime variables, I choose to include GDP per capita in the tables. But controlling for the existing telecommunications infrastructure had no real impact on the regime type results.

As a check for endogenity, I regressed the number of users and hosts averaged over the decade on the last values of regime type. Using variables from the equations from tables 2 and 3 plus other well-known ones, I checked to see if more internet hosts or users led to more democracy. I averaged the number of hosts for each country from 1990-99 and then used the 1999 value of regime type to test this. Neither the hosts variable nor the user one was ever a significant predictor of democracy. Given the short span of time of the internet, I would not expect it to affect a country's regime type. However, given more time and greater penetration, the internet may well generate great pressures for democratization. As they say, time will tell.

Exploring the cross sectional evidence is useful since it allows us to examine the impact of slowly changing variables (structural ones) that differentiate among countries. However, a more thorough investigation requires a time series cross sectional analysis (TSCS); by adding a time series element, one is better able to make claims about causality. To do this, I use negative binomial regressions, in particular conditional, fixed

effects, overdispersion models. All RHS variables are lagged one period. The inclusion of country fixed effects has a similar effect to first differencing the data, except that the differences are calculated from the country means. This means that the cross sectional elements of the data are eliminated; the analysis is done on the longitudinal changes within countries. Any variable that does not vary within a country over time is eliminated from the analysis. Hence the TSCS analysis differs significantly from the cross sectional one. All time invariant variables are excluded from this analysis. The TSCS models then address the question of what drives a country's pattern of adoption of new technology over time.

Tables 5 and 6 present results from the TSCS analysis. The dependent variable in table 5 is the number of internet users per 10,000 inhabitants. The main control variables are the same ones as before: a country's size (LNPOP), its level of development (GDP_PC), its regime type (POLITY or ACLP or POLRITES), its urban density (% URBAN), and a time trend. In addition, I examine in some models the state of the pre-existing telecommunication infrastructure (proxied by the number of telephone lines per capita), policy toward the telecommunications industry in general (as shown by its extent of privatization), the role of American hegemony in internet technology (the percent of global users or hosts that are American), and the extent of global diffusion of the technology (the average number of users or hosts in the rest of the world).

The two new variables are the telecommunications infrastructure and American hegemony. Past innovations and how successfully they were adopted may shape the environment for future innovations. For instance, evidence exists that the distribution of the internet may follow that of the existing communications infrastructure (e.g., Moss and

Townsend 1998 & 2000); hence, controlling for the telecommunications infrastructure is important. Furthermore, the adoption of new technology is likely to depend on the diffusion of that technology from the leading innovator. The US is clearly the leading adopter and innovator of internet technology. Thus we expect that the more hegemonic the US is, the more others will follow its lead. These variables provide controls for the most important alternative explanations for the spread of the internet.

The results in table 5 for the number of users strongly support the regime type argument. More democratic governments promote the faster spread of the internet. As countries become more democratic, the number of users rises. This regime effect is true for all three measures of democracy. The result is substantively important as well. A one unit rise in democracy, holding all other variables at their mean in equation 3 in table 5, leads to a 1.03 increase in the incidence rate of internet users in a country. The democratic advantage endures even when controlling for many of the alternative factors that drive technological change. All regressions in table 5 were also run with a lagged dependent variable; the results for the regime variables did not change.

As in the cross sectional regressions, countries with higher per capita incomes and those with more urbanization have more users. The population variable is always positive and significant for the TSCS, while it is not so for the cross section. Bigger countries foster more internet users. And as in the cross sections, the existing telecommunications infrastructure (telephone lines per capita) has a positive effect. Oddly, while privatization was beneficial for adoption in the cross sections, here it is not. Changing to a privatized system lowers the number of users. American dominance of the internet lowers the number of users elsewhere, but this may reflect the fact that US

dominance has been declining over the 1990s and the number of users elsewhere has been rising. Indeed, the time trend variable had to be dropped from this equation since it was correlated extremely highly with this measure of US hegemony (r=.90). Finally, unlike in the cross section, the global diffusion variable is positive and significant. More users elsewhere promote more users at home. War was never significant.

Table 6 reveals that regime type plays an important role in influencing the number of hosts per capita as well. More democratic countries have more hosts per inhabitant. This result is true using any of the three democracy measures. Regime type has an important effect. A one unit increase in democracy, holding all the variables at their means in equation 3 in table 6, leads to a 1.03 increase in the incidence rate of internet hosts per capita. This result holds up despite the inclusion of a wide variety of controls. The regressions in table 6 were also conducted using a lagged dependent variable; the results for the regime variable did not change.

As with the number of users, larger countries also have more hosts. Urbanization has a weaker but still positive effect. A country's development level is now negatively, but more weakly, related. The existing telecommunications infrastructure has a positive effect, as before. Other research indicates that a central element necessary for the internet is a high urban population and an extensive telecommunications network (e.g., Kiiski and Pohjola 2002; Goolsbee and Klenow 1999). And indeed both the percentage of residents living in urban areas and the number of telephone lines per capita are strongly positive factors. Privatization had no durable impact, nor did conflict. American dominance of the internet now has a positive effect, rather than the negative one on users. Finally, global diffusion pressures promote internet development, as they did the number

of users. After controlling for all of these influences, a country's regime type still matters.

V. CONCLUSIONS.

This paper investigates the factors that explain the geographic and temporal spread of the internet. As an example of a new technology, the internet seems to be following well-known patterns. Its s-shaped diffusion process and economic determinants are not surprising. But it is also clear that political factors matter. The internet is being adopted at very different rates by different countries. Given that the technology is widely known and has large benefits, why have some countries not adopted as fast as others?

Much as earlier literature on the New Institutional Economics has stressed the importance of political institutions for economic growth, my argument is that political institutions play a large role in determining the spread of the internet. Regime type is particularly important. Democracies adopt the internet at a much faster pace than do autocracies. This result stands using various definitions of democracy and controlling for a large number of well-known alternative explanations.

All technological change creates groups who gain and lose from the change: its winners and losers. The political institutions in place affect the ability of losers to block or slow down its adoption, or they can enable winners to promote it. Governments have to capacity to affect the rate of technological change by making policies that shape the costs and benefits of its use, thus affecting both demand and supply for the technology. These policies can range over a wide gamut. Some institutions allow governments to block technological adoption by instituting such policies more easily than others. But

governments must possess both the desire and capacity to block technological change. The claim is that both autocratic and democratic governments need to worry about staying in office and hence rely upon the state of the economy at least in part for their survival. But democratic governments, which are more sensitive to economic failure and its consequent political fallout, will desire to promote, or at least not block, technological change that accelerates economic growth. Autocrats, who tend to survive longer and be less sensitive to economic problems, can fail to promote or even block technological change that threatens them or their supporters.

Above I detail the many ways in which autocratic governments have squelched the internet. The consequences of these policies are lower internet use and slower internet adoption. This finding has two important implications: this behavior by autocracies lessens the integration of these countries into the world economy, and it slows down their economic development. It thus facilitates the prolongation, and perhaps deepening, of the "digital divide." Political institutions and changes in them can affect the extent of the digital divide. In turn, the rate of technology adoption affects economic development. Hence this research underscores that regime type can indirectly affect economic growth, with autocratic institutions tending to impede technological change and thus growth.

This paper only examines the broadest type of political institutions. It would be interesting to investigate the impact of different types of political institutions, especially those more narrowly drawn than regime type. For example, it would be interesting to see if characteristics like the degree of federalism, bicameralism, the number of parties, or the type of autocracy matter. In addition, could partisanship matter? Are left or right

governments more supportive of the spread of a new technology? In general, can one better specify the political factors that foster technological change?

The adoption of technology, in this case of the internet, has a clear political component. Both international and domestic political factors can affect its spread. One cannot explain the growth of the internet, and perhaps of any other new technology, without considering such political variables. Political institutions matter for overcoming the digital divide. Democracy may indirectly spur economic growth through its salutary effect on technological change. The spread of democracy around the globe may thus help reduce the digital divide and indirectly accelerate economic development.

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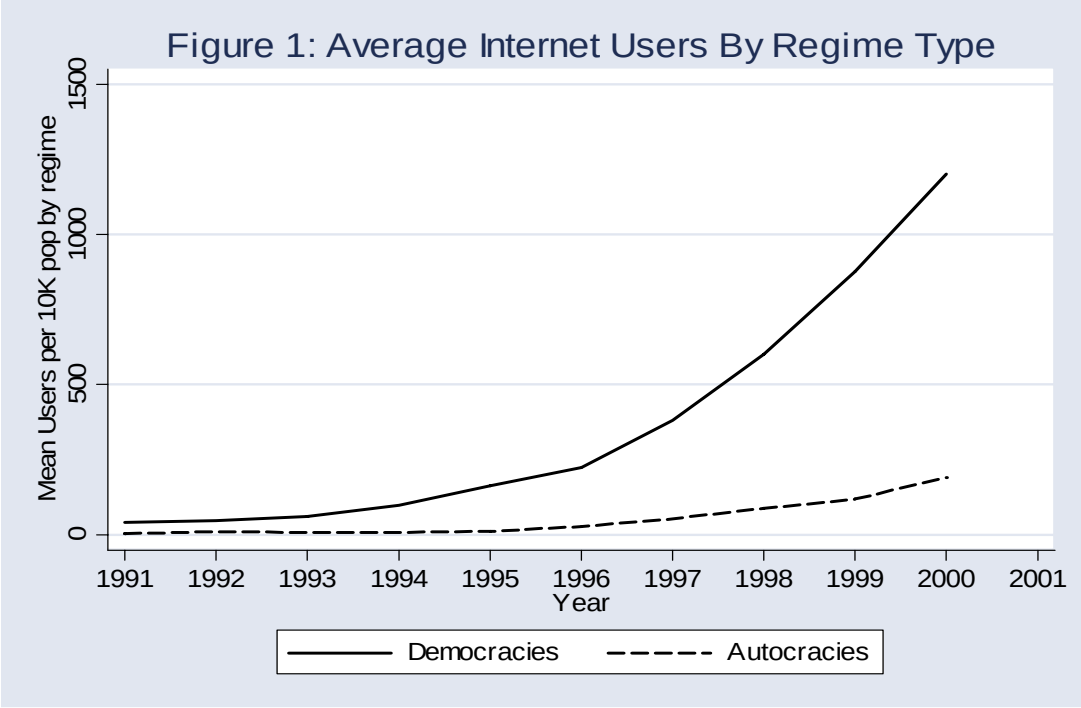
Figure 1: Users and Hosts by Regime Type.



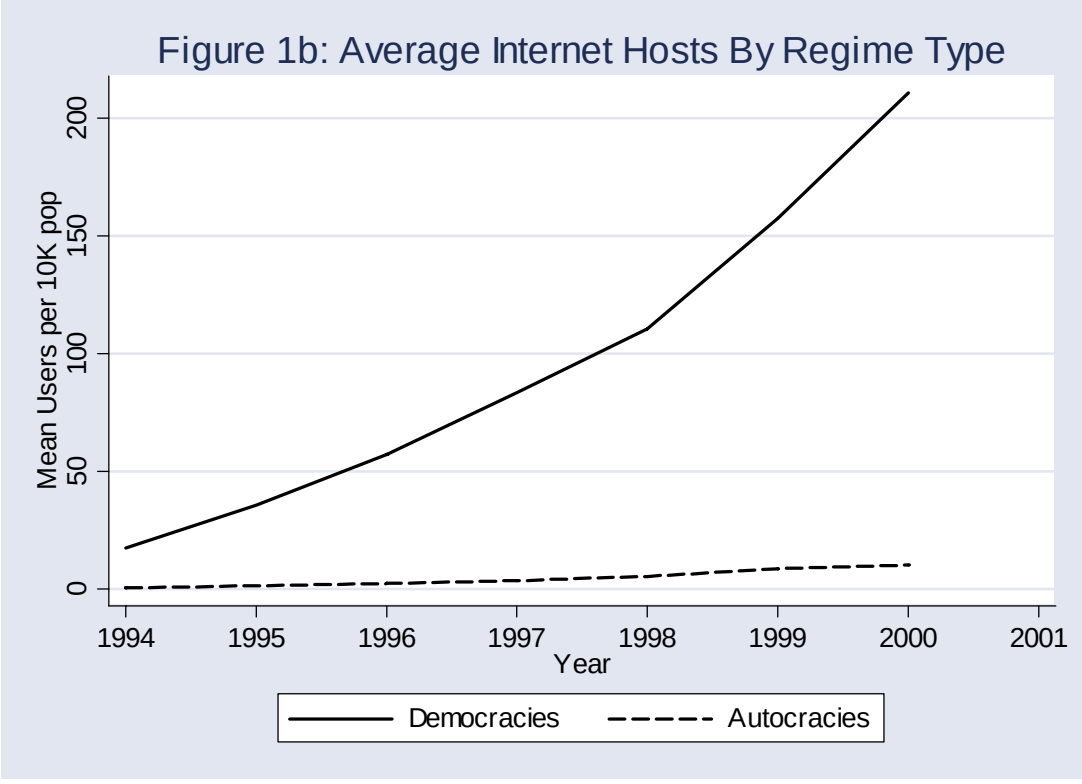
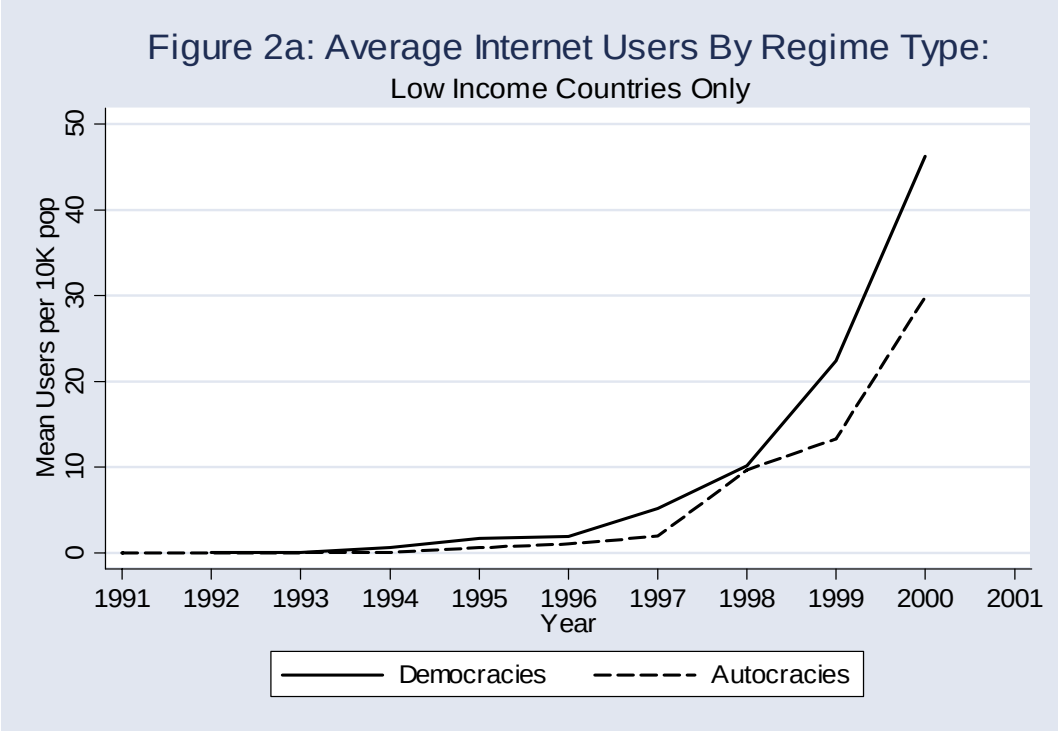


Figure 2: Low Income Countries, Users and Hosts by Regime Type.



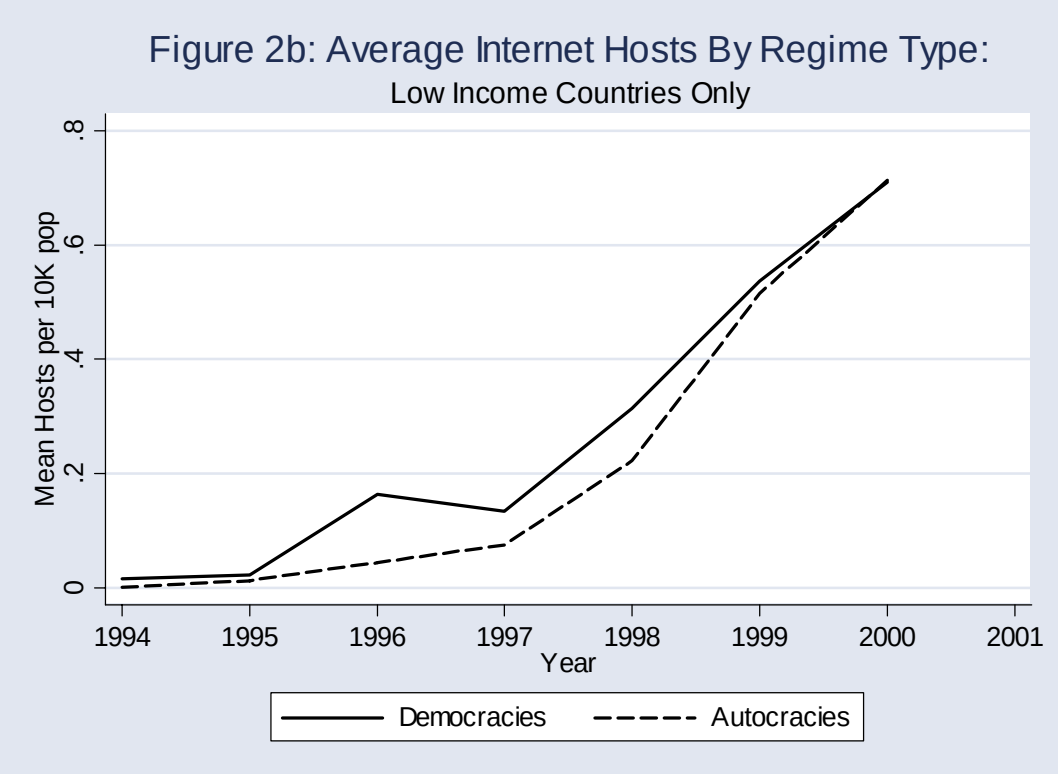
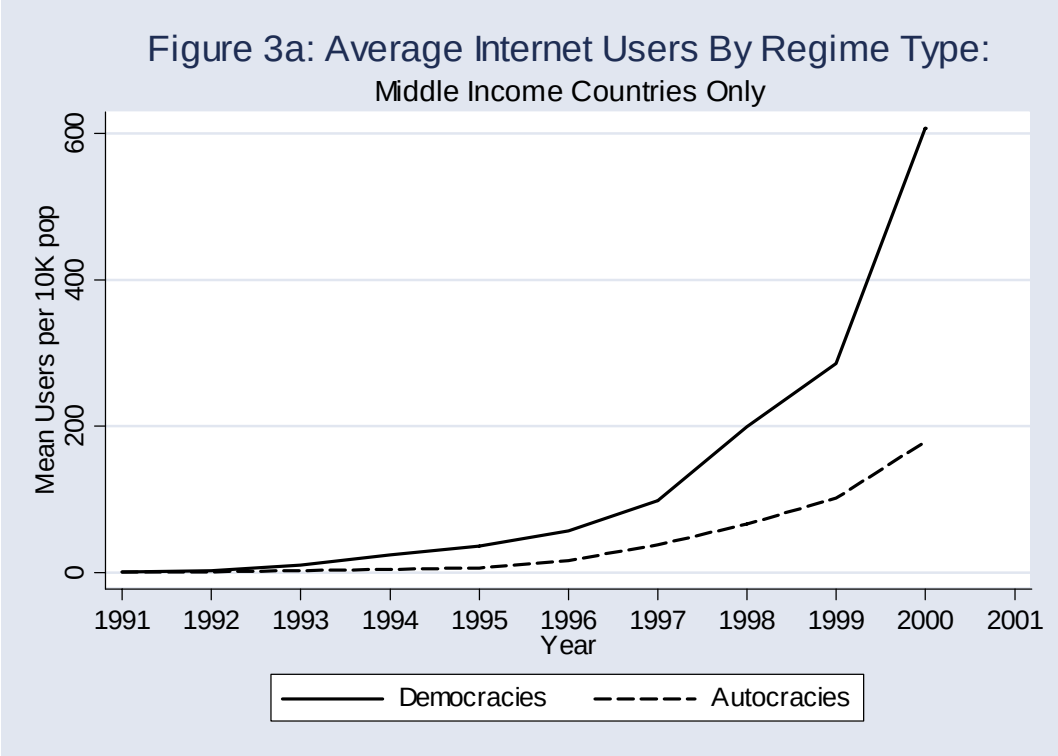


Figure 3: Middle Income Countries, Users and Hosts by Regime Type.



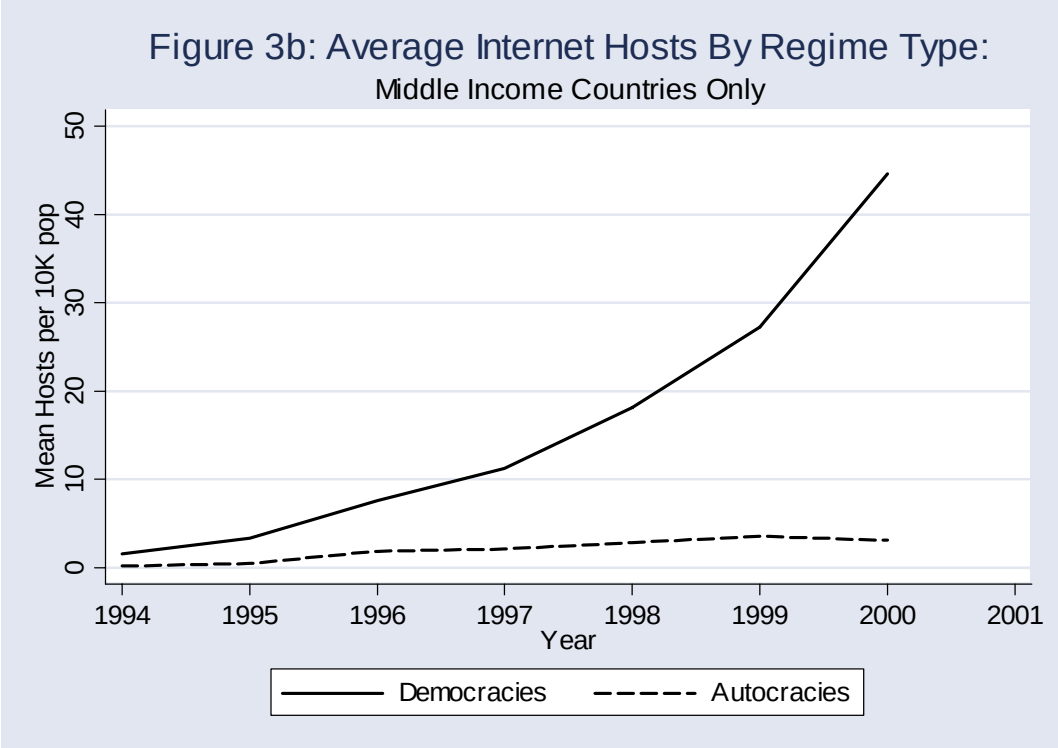
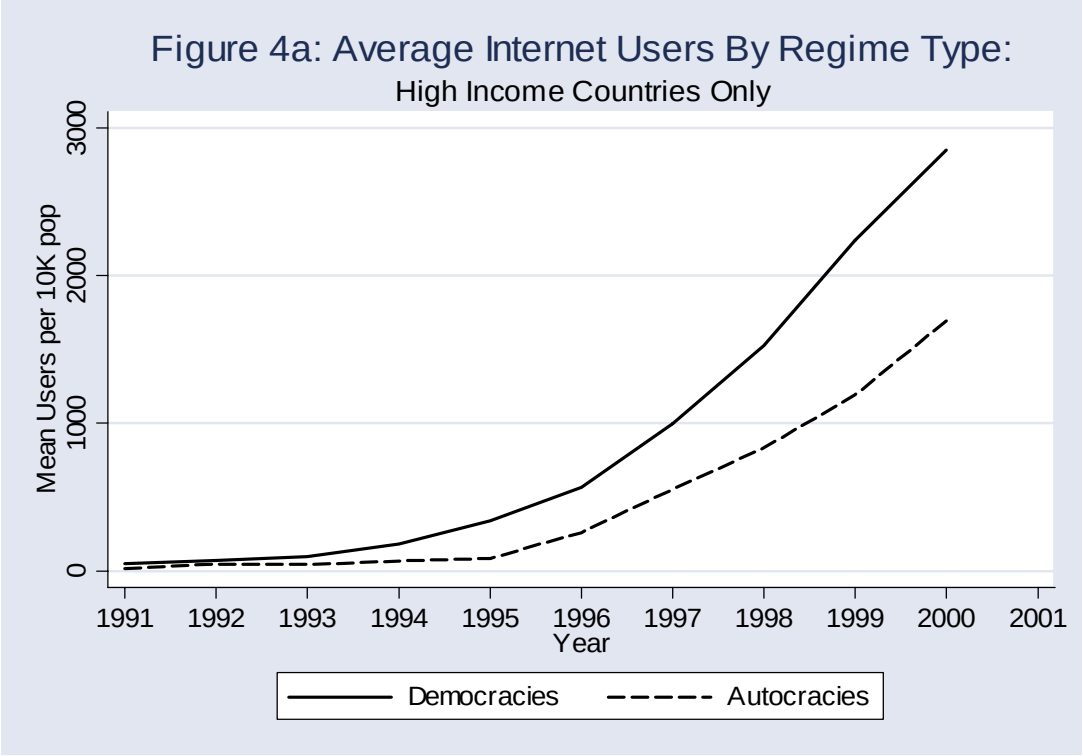


Figure 4: High Income Countries, Users and Hosts by Regime Type.



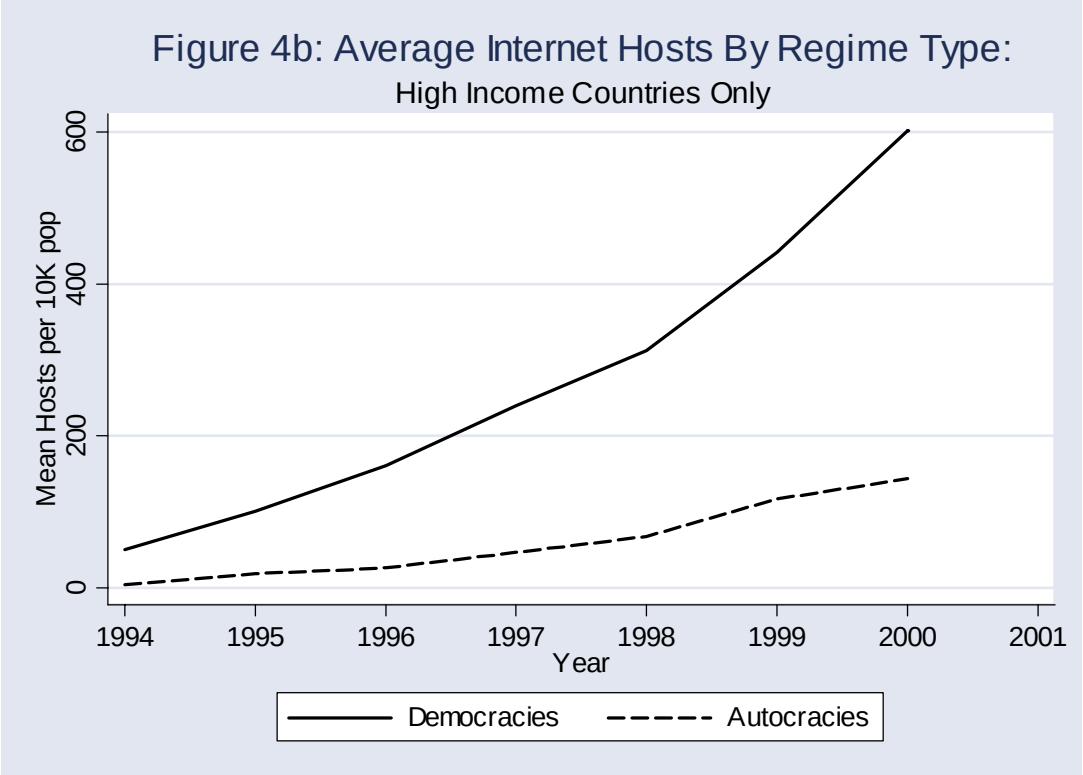


TABLE 1: Summary Statistics for Cross Sectional Regressions.

Variable	Obs	Mean	Std. Dev.	Min.	Max.
HOSTS	202	152.61	367.87	0.00	2171.90
USERS	191	929.27	1399.29	0.21	6866.20
POLITY	151	2.36	6.65	-10.00	10.00
ACLP	185	0.54	0.48	0.00	1.00
POLRITES	190	3.52	2.11	1.00	7.00
LNGDP PC	175	6032.93	9437.35	102.05	44485.03
LNPOP	202	15.06	2.27	9.85	20.90
URBAN	200	53.34	23.99	5.68	100.00
WAR	207	0.09	0.22	0.00	1.00
ENGLISH	146	0.10	0.27	0.00	1.00
LEGAL FR	202	0.44	0.50	0.00	1.00
PRESSFRD	183	1.91	0.81	1.00	3.00
PRIVTZ	239	0.18	0.32	0.00	1.00
ALLUSER	191	99924.89	958.64	95045.41	100450.70
ALL HOST	202	15660.39	197.39	14465.98	15738.30
ETHFRAC	65	0.71	0.27	0.11	1.00

Table 2: Cross Sectional Regressions on Internet Users.

Dependent Variable :	Internet Users per capita 2001	intuser2001			
	(1)	(2)	(3)	(4)	(5)
POLITY	**0.079*** **	**0.048*** **	**0.062*** **		
	(0.014)	(0.013)	(0.023)		
ACLP				**0.505*** **	
				(0.168)	
POLRITES					**-0.194*** **
					(0.044)
LNGDP_PC	**0.000*** **	**0.000***	**0.000*** **	**0.000***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LN_POP	-0.015	0.027	0.159***	-0.026	0.011
	(0.065)	(0.047)	(0.048)	(0.036)	(0.035)
URBAN	**0.033*** **	**0.034*** **	**0.017*** **	**0.032*** **	**0.032*** **
	(0.005)	(0.005)	(0.006)	(0.004)	(0.004)
WAR	**-1.198*** **	-0.406	-0.272	-0.410	-0.313
	(0.355)	(0.277)	(0.365)	(0.309)	(0.287)
ENGLISH		-0.270	-0.163	-0.350	-0.429
		(0.373)	(0.201)	(0.259)	(0.268)
LEGAL_FR		**-0.535*** **	-0.080	**-0.461** **	**-0.469** **
		(0.198)	(0.219)	(0.193)	(0.182)
PRESSFRDM		**-0.523*** **	**-0.498*** **	**-0.443*** **	**-0.393*** **
		(0.120)	(0.122)	(0.108)	(0.105)
PRIVTZ		**0.640** **	**0.547** **	**0.814*** **	**0.797*** **
		(0.279)	(0.242)	(0.241)	(0.237)
userall99		-0.000	**-0.000*** **	**-0.000*** **	**-0.000*** **
		(0.000)	(0.000)	(0.000)	(0.000)
ETHFRAC			0.462		
			(0.356)		
Constant	**3.932*** **	**19.434** **	**34.992*** **	**31.409*** **	**30.704*** **
	(1.069)	(9.835)	(7.051)	(10.351)	(9.426)
Observations	140	116	61	136	137
R2	0.09	0.11	0.12	0.10	0.11
Wald chi2	408	842	605	649	799
Prob > chi2	0.00	0.00	0.00	0.00	0.00
alpha	0.92	0.70	0.31	0.69	0.66

Negative binomial regressions with robust standard errors in parentheses (NBREG in STATA 8.1). All IVs are averages from 1990-99 or from a single year if they do not change over time. DV is from 2001 or last year available. Two-tailed tests: * significant at 10%; ** significant at 5%; *** significant at 1%.
xsectu7-03b

Table 3: Cross Sectional Regressions on Internet Hosts.

Dependent Variable:	Internet Hosts per capita 2001	inthost2001			
	(1)	(2)	(3)	(4)	(5)
POLITY	**0.122*** **	**0.113*** **	**0.203*** **		
	(0.026)	(0.028)	(0.024)		
ACLP				**1.163** **	
				(0.500)	
POLRITES					**-0.553*** **
					(0.103)
LNGDP PC	**0.000*** **	**0.000*** **	**0.000*** **	**0.000** *	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LNPOP	**-0.172** **	-0.017	**0.317*** **	**-0.306*** **	**-0.187*** **
	(0.086)	(0.079)	(0.078)	(0.092)	(0.072)
URBAN	**0.039*** **	**0.035*** **	**0.038*** **	**0.035*** **	**0.028*** **
	(0.010)	(0.009)	(0.006)	(0.011)	(0.009)
WAR	**-1.803*** **	**-0.909** *	**-1.418*** **	**-1.225** *	-0.430
	(0.404)	(0.486)	(0.313)	(0.628)	(0.654)
ENGLISH		**-0.899** **	-0.194	**-2.606*** **	**-3.003*** **
		(0.431)	(0.355)	(0.710)	(0.628)
LEGAL FR		**-0.962*** **	**-0.465** **	**-1.180*** **	**-1.179*** **
		(0.249)	(0.233)	(0.381)	(0.297)
PRESSFRDM		**-0.428** **	**-0.434*** **	0.154	0.106
		(0.173)	(0.144)	(0.250)	(0.214)
PRIVTZ		**0.791** **	**0.569** *	0.822	**0.901** **
		(0.387)	(0.339)	(0.568)	(0.424)
ALL HOSTS		**-0.001** **	**-0.001*** **	**-0.005*** **	**-0.006*** **
		(0.001)	(0.000)	(0.002)	(0.002)
ETHFRAC			**1.196*** **		
			(0.426)		
Constant	**2.754** *	**19.850** **	**17.917*** **	**82.702*** **	**98.219*** **
	(1.634)	(9.348)	(5.362)	(29.816)	(27.854)
Observations	140	116	61	136	137
R2	0.14	0.17	0.19	0.11	0.13
Wald chi2	367	565	843	156	170
Prob > chi2	0.00	0.00	0.00	0.00	0.00
alpha	1.68	1.33	0.47	2.38	2.00

Negative binomial regressions with robust standard errors in parentheses (NBREG in STATA 8.1). All IVs are averages from 1990-99 or from a single year if they do not change over time. DV is from 2001 or last year available. Two-tailed tests: * significant at 10%; ** significant at 5%; *** significant at 1%.
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Table 4: Summary Statistics for TSCS regressions.

Variable	Obs	Mean	Std. Dev.	Min.	Max.
USERS	1443	380.49	854.74	0.00	6866.20
HOSTS	1528	60.19	198.75	0.00	2171.90
POLITY	1562	2.60	7.00	-10.00	10.00
ACLP	1812	0.54	0.50	0.00	1.00
POLRITES	2027	3.52	2.22	1.00	7.00
LNGDP PC	2036	7.58	1.55	4.44	10.98
LN POP	2276	15.35	2.06	9.85	20.96
URBAN	2398	53.68	23.97	5.20	100.00
PHONES	2139	172.83	193.86	0.30	869.80
AV HOSTS	1910	59.32	46.67	7.43	150.25
US HOSTS%	1910	0.07	0.01	0.07	0.08
AV USERS	2866	264.23	297.94	7.81	927.13
US USERS%	2627	0.06	0.03	0.03	0.11
PRIVTZ	2866	0.21	0.41	0.00	1.00
YEAR	2866	1995	3.45	1990	2001

Table 5: TSCS Regressions on Internet Users.

Dependent Variable:	Internet Users Per 10K. Pop	intuser_p				
	(1)	(2)	(3)	(4)	(5)	(6)
POLITY	**0.038*** **	**0.040*** **	**0.032*** **	**0.033*** **		
	(0.007)	(0.008)	(0.007)	(0.008)		
ACLP					**0.431*** **	
					(0.107)	
POLRITES						**-0.113*** **
						(0.022)
GDP PC	**0.172*** **	0.074	**0.147*** **	**0.144*** **	**0.215*** **	**0.150*** **
	(0.050)	(0.068)	(0.052)	(0.052)	(0.052)	(0.047)
POP	**0.107*** **	**0.108*** **	**0.095*** **	**0.096*** **	**0.061** **	**0.081*** **
	(0.032)	(0.031)	(0.032)	(0.031)	(0.027)	(0.024)
URBAN	**0.011*** **	**0.011*** **	**0.011*** **	**0.011*** **	**0.010*** **	**0.009*** **
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
YEAR	**0.465*** **	**0.453*** **				
	(0.007)	(0.009)				
PHONES		**0.001** **				
		(0.000)				
AV. USERS			**0.002*** **	**0.002*** **	**0.002*** **	**0.002*** **
			(0.000)	(0.000)	(0.000)	(0.000)
US USERS%			**-34.65*** **	**-35.08*** **	**-33.80*** **	**-35.37*** **
			(1.732)	(1.752)	(1.630)	(1.568)
PRIVTZ				**-0.101***		
				(0.060)		
Constant	**-930.90*** **	**-906.1*** **	**-1.70*** **	**-1.68*** **	**-1.77*** **	**-0.856***
	(14.719)	(18.065)	(0.585)	(0.582)	(0.498)	(0.464)
N	1085	1071	1085	1085	1142	1309
COUNTRIES	139	139	139	139	168	170
log likelihood	-4115.39	-4057.36	-4130.01	-4128.62	-4059.43	-5001.50
Wald chi2	5856	6008	5410	5424	5013	6306
Prob> chi2	0.00	0.00	0.00	0.00	0.00	0.00

Negative binomial regression (XTNBREG in STATA 8.1) with country FE. All IVs lagged one period except for year, average users, and US users as % of world. Standard errors in parentheses. Two-tailed tests: * significant at 10%; ** significant at 5%; *** significant at 1%.

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Table 6: TSCS Regressions on Internet Hosts

Dependent Variable:	Internet Hosts Per 10K. Pop	hosts_0 _ppop				
	(1)	(2)	(3)	(4)	(5)	(6)
POLITY	**0.039*** **	**0.032** **	**0.032** **			**0.031** **
	(0.013)	(0.016)	(0.013)			(0.013)
ACLP				**0.640*** **		
				(0.202)		
POL RITES					**-0.116*** **	
					(0.034)	
GDP_PC	0.058	**-0.232** **	-0.006	0.031	0.022	-0.013
	(0.088)	(0.113)	(0.083)	(0.091)	(0.076)	(0.083)
POP	**0.109** *	**0.121** **	**0.129** **	**0.268*** **	**0.334*** **	**0.132** **
	(0.065)	(0.059)	(0.055)	(0.044)	(0.038)	(0.056)
URBAN	0.005	0.002	0.003	**0.014** **	0.005	0.003
	(0.005)	(0.005)	(0.005)	(0.006)	(0.004)	(0.005)
YEAR	**0.405*** **	**0.380*** **				
	(0.008)	(0.010)				
PHONES		**0.002*** **				
		(0.001)				
AV HOSTS			**0.017*** **	**0.021*** **	**0.017*** **	**0.017*** **
			(0.000)	(0.001)	(0.000)	(0.000)
US HOSTS%			**38.66*** **	**12.97*** **	**37.72*** **	**37.74*** **
			(4.082)	(4.426)	(3.800)	(4.099)
PRIVATZ						0.106
						(0.071)
Constant	**-810.07*** **	**-757.02*** **	**-4.60*** **	**-6.23*** **	**-7.85*** **	**-4.60*** **
	(16.727)	(19.561)	(1.093)	(0.816)	(0.728)	(1.094)
N	1061	1048	1061	1154	1325	1061
COUNTRIES	137	137	137	167	169	137
log like-lihood	-1774.32	-1748.58	-1877.88	-1778.53	-2292.45	-1877.85
Wald chi2	3436	3592	2334	2569	2844	2335
Prob>chi2	0.00	0.00	0.00	0.00	0.00	0.00

Negative Binomial regression (XTNBREG in STATA 8.1) with country FE.
All IVs lagged one period, except year, US hosts, and average hosts.
Standard errors in parentheses. Two-tailed tests: * significant at 10%;
** significant at 5%; *** significant at 1%.
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