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The Impact of New Technologies on Voter Confidence in Latin America: Evidence from E-Voting Experiments in Argentina and Colombia

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The Impact of New Technologies on Voter Confidence in Latin America: Evidence from E-Voting Experiments in Argentina and Colombia

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ABSTRACT. We analyze trust in electronic voting in Latin America using data from two field experiments conducted in Argentina and Colombia. We find that voters generally exhibit high levels of confidence in e-voting, although this depends on individual characteristics such as age and education, as well as on the particular type of technology used. We contrast our findings with those from industrialized democracies and show that conclusions derived from American and European e-voting experiences cannot be directly extrapolated to the Latin American context. Overall, our results suggest that e-voting could provide an attractive alternative to traditional voting procedures in the region.

KEYWORDS. Argentina, Colombia, e-voting, Latin America, trust in elections, voter confidence

Having remained virtually unchanged since the enactment of universal and secret suffrage at the end of the 19th century, voting procedures are undergoing a radical transformation in many countries through the introduction of electronic methods of voting. Almost 30 countries around the world are currently in the process of testing or implementing computerized voting, and in at least 10 countries, electronic voting (e-voting) is the main method used to elect national representatives (Alvarez & Hall, 2008; Pomares, 2010a).[1] Although it might be assumed that e-voting—understood here as the use of a computer-based machine to display an electoral ballot and record the vote—would be more likely in established democracies, the process has disseminated rapidly and extensively in the developing world. Two of the most populous democracies in the world, Brazil and India, are among the pioneers in switching to automated voting systems (Kumar, 2008; Rodrigues-Filho, Alexander, & Batista, 2006). Furthermore,

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one-third of the countries currently testing e-voting are in Latin America. What explains this trend?

In established democracies, a primary rationale for e-voting is to increase participation (Kersting & Baldersheim, 2004). However, in Latin America, where turnout levels are reasonably high—lower than in Western Europe but markedly higher than in Asia and Africa—and not plummeting like in some established democracies, one of the main motivations for the introduction of e-voting is its potential for boosting confidence in the election process (Thompson Jiménez, 2009; Tula, 2005). Although comparative evidence on Latin America is patchy, the most recent data available from *Latinobarómetro* (2006) shows that the percentage of Latin Americans reporting that elections are free and fair in their countries is only 41 percent. Against this background, new technologies offer a potential tool to mitigate electoral fraud and increase public trust in the transparency of elections in the region (Avgerou, Garzaroli, Poulymenakou, & Reinhard, 2009; Thompson Jiménez, 2009; Tula, 2005). For example, according to the rapporteur to the Special Committee on the Security of Electronic Voting (2007) established by the Brazilian chamber of Deputies in 2007, "Voting through voting machines began in Brazil in 1996 motivated particularly by the need to combat fraud" (p. 4, original in Portuguese). Interestingly, an important feature of the political context surrounding the passage of the enabling laws is that every piece of legislation was preceded by a political scandal of fraud or corruption (Pomares, 2010b). Anecdotal evidence suggests that the lack of trust in the fairness and legitimacy of elections was also an important concern of Venezuelan authorities when switching to voting machines.[2]

Nonetheless, the introduction of new voting technologies in Latin America also poses a series of challenges for voters and electoral authorities in the region. Computerized voting requires some degree of familiarity with technology, and voters who lack this familiarity may face problems when casting their ballots (Delwit, Kulahci, & Pilet, 2005; Oostveen & van den Besselaar, 2005). In addition, some authors have argued that the adoption of computerized voting in a context of large socioeconomic differences could reinforce the digital divide and skew the vote in favor of particular groups of electors (Rodrigues-Filho et al., 2006). By contrast, other scholars have suggested that the adoption of voting devices with user-friendly features could lower the cognitive barriers to electoral participation currently faced by a large proportion of the citizens due to the complex paper-based system in force in most countries in the region (Limongi, 2006).

Whether e-voting can become a tool for increasing citizens' trust in elections or, on the contrary, a barrier for political participation, depends to a great extent on voters' attitudes and perceptions regarding the new voting procedures. Besides obvious complex technological considerations, a voting system is ultimately "only as good as the public believes it to be" (McGaley & Gibson, 2003). The literature on information and communication technologies (ICTs) has long recognized that, for successful adoption and trust, technology-based transactions must appear useful, easy to use, and secure (Carter & Belanger, 2005; Davis, 1989). In the particular case of e-voting, the prerequisites for the new technologies to provide a "socially accepted" alternative to traditional, paper-based methods and to increase public confidence in elections are that citizens can cast their ballots as intended and be confident that their votes will be counted and tabulated accurately. However, more than a decade after the introduction of e-voting in Latin America, little is known about voters' assessment of e-voting along these dimensions.

This article provides a first attempt to address this topic from a comparative perspective, using survey data from two e-voting pilots conducted in Argentina and Colombia in 2005 and 2007, respectively[3]. The data collected during these two field experiments allow us to study voters' attitudes towards e-voting and its determinants, with special emphasis on the analysis of the perceived reliability and usability of the new voting methods. The randomized experimental design used in the two pilots under study mitigates some of the problems that have plagued previous

research in this area, such as endogenous adoption of voting technologies and self-selection into different voting devices (Herron & Wand, 2007; Stein, Vonnahme, Byrne, & Wallach, 2008), while allowing for a more realistic and representative environment than laboratory experiments (Green & Gerber, 2003; Harrison & List, 2004).

Our results indicate that participants in the Argentine and Colombian experiments are very confident about the new voting technologies. The extent to which they trust automated voting, though, is strongly related to individual characteristics such as age and education, as well as to the particular type of e-voting method used. In contrast to evidence from the United States, we found that voters using direct-recording electronic (DRE) technologies are more confident that their ballots are accurately counted than those using optical scanners (OS). We also find little support for the idea that the introduction of e-voting in the region could lead to "de facto" disenfranchisement of elderly and less educated voters. Quite the contrary, as these groups of voters exhibited very favorable views of automated voting in the two pilots considered. In fact, they seem to be the most likely ones to favor the replacement of the traditional manual voting procedures with e-voting. These findings have relevant policy implications in view of the ongoing debate about the convenience of shifting from paper-based to e-voting procedures in Latin America (Rezende, 2003; Rodrigues-Filho et al., 2006).

The remainder of the article is organized as follows: The next section briefly reviews the literature on the main factors influencing citizens' confidence in e-voting. We then discuss the process by which e-voting has rapidly spread throughout Latin America during the last decade. Next, we describe the Argentine and Colombian pilots examined in this article and report the main results from our descriptive and statistical analyses. We conclude by discussing the implication of our findings for the implementation of e-voting in Latin America and pointing to possible avenues for future research. The survey questions administered in the two pilots are presented in the Appendix.

DETERMINANTS OF CONFIDENCE IN ELECTRONIC VOTING

Despite growing academic interest in the study of new voting technologies (Alvarez & Hall, 2008; Herrnson, Niemi, Hanmer, Bederson, & Conrad, 2008), relatively few scholars have examined the issue of whether and to what extent voters rely on the accuracy and security of e-voting systems and what drives individuals' perceptions in this regard. This *lacuna* is not only confined to the analysis of past e-voting experiences in Latin America, but is also found in many works examining the use and performance of e-voting in other regions.

Most studies on this topic center on the United States. Alvarez, Hall, and Llewellyn (2008) used data from the 2004 U.S. election to compare the impact of different voting systems on trust in the electoral process, which they measured as the confidence voters had that their ballot was accurately counted. They found that voters who used e-voting machines to cast their vote were significantly less confident than those who used paper ballots. The authors argue that skepticism towards e-voting might stem from the fact that voters do simply not trust the "black box" nature of e-voting and is possibly influenced by the negative media reports regarding the susceptibility of e-voting to tampering, failure, or fraud in the aftermath of the 2000 election. In a related study, Stewart (2009) analyzed data from the 2008 U.S. general election and concluded that a considerable fraction of Americans distrusted e-voting. He also reported that DRE devices had a stronger negative effect on citizens' confidence in the vote count than OS, highlighting the fact that specific characteristics and types of voting machines might influence the perceived reliability and accuracy of election results.

In the same direction, several authors maintain that providing e-voting systems with a verifiable record of each vote, in particular a paper audit trail, could substantially increase the transparency of automated voting. For instance, Riera and Brown (2003) assert that voter-verifiable audit trails (VVAT) would allow citizens to

check whether the ballots cast represent their true intent, enhancing confidence in computerized voting. Others scholars, however, warn about the possibility that a VVAT could in fact undermine voters' confidence in election results in case of inconsistency between electronic and paper records (Herrnson et al., 2008). To date, we are not aware of any analysis of the impact of a voter-verifiable paper trail on confidence in e-voting.

Besides differences between DRE and OS voting machines, previous studies indicate that trust in new technologies is also significantly affected by citizens' individual characteristics (Alvarez, Hall et al., 2008; Stewart, 2009). Most scholars point to a positive influence of education and familiarity with technology on the perceived reliability of e-voting (Alvarez, Hall et al., 2008; Avgerou et al., 2009; Stewart, 2009). Nonetheless, using exit polls from Belgium's 2003 federal election, Delwit et al. (2005) found that a considerable proportion of highly educated voters distrusted automated voting procedures. Similarly, Oostveen and van den Besselaar (2004) suggest that voters with higher computer skills might be more aware of the potential vulnerabilities of ICTs and therefore less trusting of e-voting than the rest.

In light of the evidence indicating that demographic characteristics such as age and education affect voters' ability to use the new voting technologies (Herrnson et al., 2008), some scholars have also noted that computer voting may deepen the digital divide and unduly slant election results, favoring the interests of particular groups of voters to the detriment of others (Rodrigues-Filho et al., 2006). Even if this were not the case, the fact that ease of use of automated voting systems has been shown to be correlated with trust (Delwit, Kulahci, & Pilet, 2004; Delwit et al., 2005) could determine that the adoption of these new technologies might undermine confidence in elections among older and less educated voters, contravening one of the main reasons behind the introduction of e-voting in Latin America.

In sum, previous work has emphasized the role of both sociodemographic and technical factors as determinants of voter confidence in e-voting. However, the fact that there is so little research in this area and that the findings are often inconclusive and even contradictory underscores the need to examine this issue in more detail. This is particularly true for Latin America, where several countries are in the process of moving from traditional, paper-based methods to automated voting systems with little evaluation of their potential impact on citizens' perceptions and behavior.

THE SPREAD OF E-VOTING IN LATIN AMERICA

Since their introduction in Brazil in the mid-1990s, Latin America has increasingly used e-voting systems. As seen in Table 1, 10 Latin American countries have implemented some kind of e-voting system, and an additional one, Panama, announced the roll out for the 2006 referendum but cancelled it shortly before the election.[4] All of these have been "supervised" e-voting elections, in which voters go to the polling station and are asked to cast a vote on a computer at the polling place. They are not "remote" e-voting experiences—that is, Internet-based and performed outside a polling place. The type of automated voting systems used has varied across countries, with some sticking to the same technology—predominantly DRE devices—in all elections, while others have tried both DRE and OS.

In most Latin American countries, e-voting is still in a testing phase, usually implemented in mock elections at the local level. Brazil and Venezuela, on the other hand, currently use e-voting systems in all official elections. Brazil first introduced e-voting in 1996, and Venezuela followed suit in 1998; both instances were in local elections. The Brazilian experience with e-voting has been the most studied so far and provides insight into the potential consequences of introducing e-voting in the region. Pomares (2010b) shows that the main goal pursued by introducing e-voting in Brazil was to reduce fraud committed at the precinct level by centralizing the election process. The goal to introduce e-voting was done amidst a process of extreme party fragmentation and was also prompted by a very complex voting system (preferential

TABLE 1. The Road to E-Voting (EV) in Latin America: Summary of Electronic Elections and E-Voting Pilot Tests throughout the Region

Country	Type of implementation:pilot (binding or not) or roll-out[a]	Type of election (highest level)	Year of first EV election/pilot	% of registered e-voters (last election)	Type of EV technology
Argentina	Several binding and nonbinding pilots	Provincial	2003	N/A	Several devices (including Brazilian DRE)
Brazil	Roll-out for all type of elections	National	1996	100 (since 2000)	DRE (two terminals): one for voter registration and another for casting a ballot
Colombia	Nonbinding pilots	Local	1992	N/A	Several devices
Costa Rica	Binding pilot	Local	2002	2.3	
Dominican Republic	Planned to roll out in 2006 elections. procurement did take place but was not implemented. Used in primary of the incumbent party	Primary of governing party	2006	–	Brazilian DRE
Ecuador	Binding pilot. It was planned to continue in 2006 but was cancelled	Local	2004	0.7 (2004)	Brazilian DRE
Mexico	Nonbinding pilot	Local	2006	N/A	Several devices
Panama	Election authorities announced roll out for the 2006 Canal referendum but cancelled the implementation	–	–	–	–
Paraguay	Roll out in the 2003 presidential election but went back to paper ballots in 2008	National	2001	53 (2003)	Brazilian DRE
Peru	Several nonbinding and binding pilots	Provincial	1996	N/A	Brazilian DRE
Venezuela	Roll-out for all types of elections	National	1998	100 (since 1998)	Optical scanner (1998-2000); DRE (2004 onwards)

[a]Roll out – at least two consecutive binding elections. Otherwise, it is categorized as a *pilot*.

voting; a very large number of candidates and several offices at stake at each election). In this context, e-voting dramatically reduced the rates of invalid voting and increased levels of trust in the fairness of the elections.

While policy transfer of new public management and information technology policies from Organization for Economic Co-Operation and Development (OECD) countries to developing ones is increasingly studied (Cheung, 2005; Frick, 2007), the case of e-voting points to South–South diffusion insofar as the implementation of e-voting in Brazil proved to be important for the spread of e-voting to other Latin American countries in the first half of the 2000s. With the financial support from the Organization of American States, the Brazilian Electoral Supreme Court provided voting machines to conduct e-voting pilots in Ecuador, Paraguay, and Argentina. The dissemination of new voting technologies in the region accelerated after 2006, when a succession of very close and contested elections led authorities in various countries to consider the possibility

of replacing manual count and paper ballots with computerized voting as a way of enhancing public confidence in the electoral process.

As part of this trend, Argentina and Colombia recently conducted large-scale e-voting experiments aimed at appraising the feasibility of introducing computerized voting in official elections. Like in most Latin American countries, public trust in elections and electoral authorities in Argentina and Colombia is relatively low. Only 47 percent of Argentine respondents in the 2006 *Latinobarómetro* survey believed the elections in the country to be free and fair. Though this figure is above the regional average (41 percent), it is well behind the percentage Uruguay and Chile, the two countries which rank at the top of the list in the region with more than 70 percent. The results of the same survey for Colombia show an extremely low confidence rate: Only 29 percent of respondents thought that elections in their country were clean (Latinobarómetrometro, 2006, p. 18). The data from the pilot studies conducted in the two countries allow us to examine voters' confidence in the new technologies, to compare citizens' opinions about e-voting *vis-à-vis* the paper-based system currently used, and to gauge the relative impact of the sociodemographic and technical variables highlighted by the literature reviewed above within the Latin American context.

THE E-VOTING PILOTS IN ARGENTINA AND COLOMBIA

In this section, we present a brief description of the experimental design and the characteristics of the different machines tested in the Argentine and Colombian e-voting pilots.[5]

In 2004, a modification in Colombian electoral law opened the possibility of adopting an automated voting system in the country and regulating its implementation. Following this regulatory change, the first large-scale e-voting pilot was organized by Colombia's Electoral Authority (Consejo Nacional Electoral) in collaboration with the Center for Software Research and Development from the Universidad Industrial de Santander.[6] The field study took place in October 2007, the day before countrywide municipal elections were held, in the cities of Bogotá, Pereira, and San Andrés. Voting booths were installed in three shopping malls in each city; they were selected due to their geographical location so as to guarantee a large and diverse pool of potential subjects. Citizens in each of the nine testing locations were invited to take part in a mock election in which they had to choose one candidate for president and one for the senate, with a total of 2,294 participants in the test.

In the case of Argentina, the national electoral law does not allow for e-voting. However, as a consequence of the decentralized election administration system, each of its constituent units can reform its electoral law and introduce e-voting in provincial and local elections. In 2003, the electoral authority (Dirección Electoral) of the Government of the City of Buenos Aires assembled a team of political scientists, geographers, and computer scientists and assigned them the responsibility of designing and supervising an e-voting experiment. The pilot was conducted during the national legislative elections held in October of 2005, and included 14,000 participants in 43 polling stations randomly distributed throughout the city. After voting in the official election, randomly chosen participants voted in a second, noncompulsory election.[7] Subjects were asked to vote the same ticket as in the general election, casting a ballot for national representatives and another for state legislators.

The two pilots shared many features. In both cases, participation was voluntary.[8] The only eligibility requirement was to be older than 18 years of age and provide a valid form of identification; registration and inscription procedures were analogous to those used in official elections. In the two studies, participants were randomly assigned to one of the four voting machines available in each testing location and were walked through a five-minute training session in which they received the instructions needed to operate the machine. After casting a vote, subjects were asked to provide basic sociodemographic

information—age, education, and gender—and to complete a survey containing questions dealing with usability issues of the devices tested as well as with their general perceptions about e-voting. Additionally, in the Buenos Aires pilot, a quarter of the participants were randomly chosen to answer a second exit poll inquiring about their familiarity with technology, political involvement, education, and political information. Some of the survey items were identical in the two experiments under analysis, while some others were not strictly comparable (see the Appendix). We take these differences into account when discussing the empirical results below. Since in the case of the Buenos Aires pilot qualitative, data were also collected,[9] we will illustrate the quantitative analysis with some quotes from participants.

Description of the Voting Machines Tested

As noted, each pilot tested four different types of e-voting devices. While all the prototypes in the Colombian pilot were supplied by private vendors, the Buenos Aires government designed the software and hardware used in three of the prototypes, with a fourth one using off-the-shelf technology.[10] Due to the large sample sizes and the randomized treatment assignment used in the experiments, there were no systematic differences in the distribution of voters' personal characteristics across prototypes in each testing location.[11]

Argentine Pilot

Two DRE devices and two OS systems were tested in the Argentine pilot. Prototype 1 was a direct-recording electronic design with two separate modules. A screen in the first module allowed voters to review the lists of candidates, and a numerical keypad in the second module was used to register the vote. Prototype 2 was a touch-screen DRE machine. Voters could scroll and select party lists directly by tapping on the screen. Unlike Prototype 1, this second DRE device produced a VVAT. Both DRE devices were equipped with smart card readers.

Prototype 3 was an optical scanner located inside a voting booth, providing participants with a higher degree of privacy. This prototype required separate ballots for each race. The ballots corresponding to different parties were stacked on tables placed inside the voting booth. The voter would pick a ballot and introduce it into a rolling scanner that displayed the selected party on the screen, and would then proceed to confirm his or her selection. Finally, Prototype 4 was also an OS device with a single ballot listing all parties' names and numbers. The voter marked his or her preferences for each race with a pencil and then introduced the ballot into a scanner located next to the election desk.

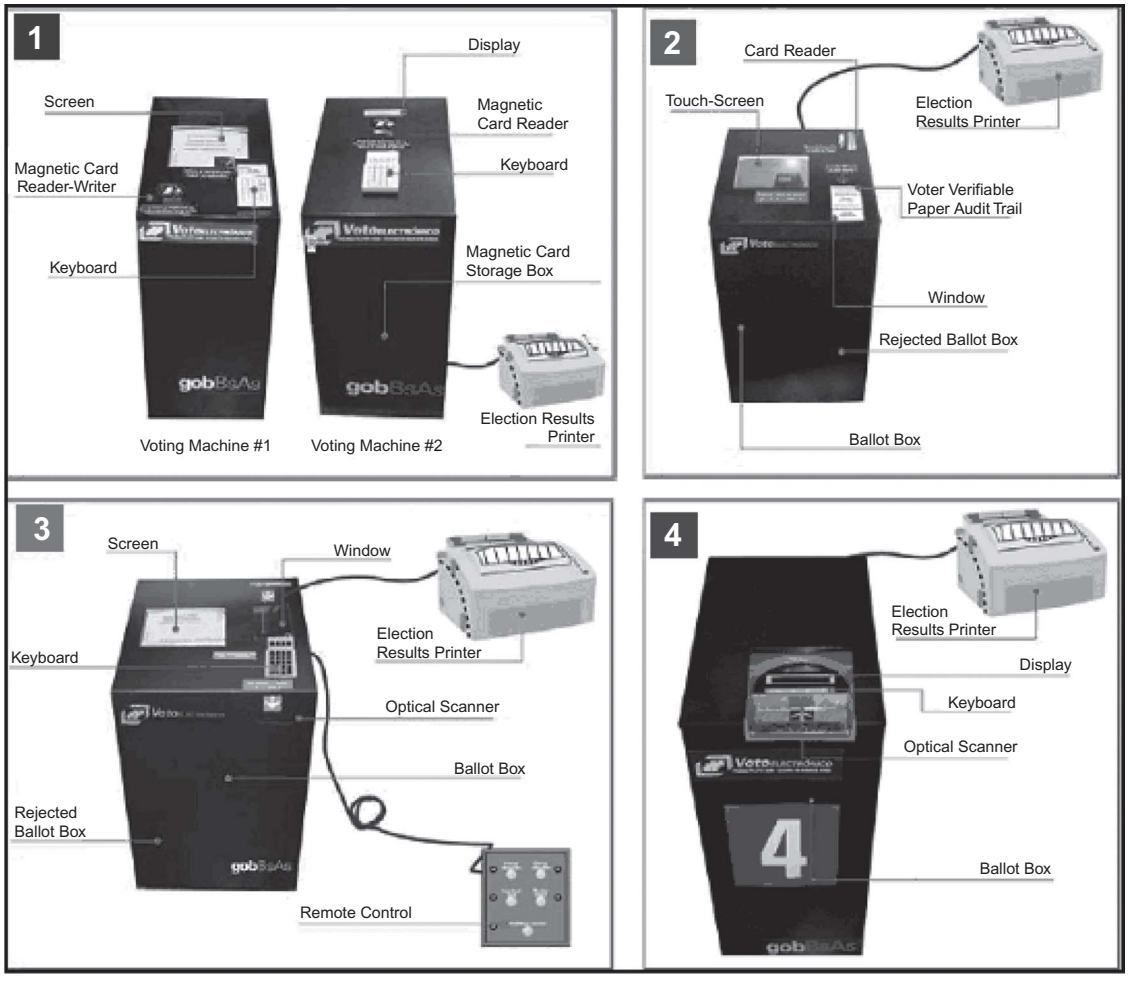
All devices allowed voters to review the selected ballots and asked them to confirm their choices at the end of the process, preventing over- and under-counts.

Colombian Pilot

The first three prototypes tested were touch-screen DRE machines. After inserting a smart card into the reader attached to the terminals, participants were shown the name, number, and logo of seven parties presenting candidates for the presidential and the senate races. The names of the candidates running for President (4 candidates) and for the Senate (58 candidates) were also displayed on the screen, and then sorted according to the party number and the candidates' personal code.[12] Voters could scroll and select their candidates—one for each race—by tapping on the screen. Participants were asked to confirm their choices at the end of the process and before their votes were registered; only at this stage could they stop, change, or cancel their votes. After the confirmation, the vote could not be changed, and the information was digitally stored in the machine. Unlike Prototype 1, both Prototypes 2 and 3 had VVAT.

The last prototype, Prototype 4, was an OS device not equipped with a smart card reader. The staff supervising the test provided each participant with a paper ballot listing all the relevant information (party name, logo, number, and the complete list of candidates for each

FIGURE 1. Prototypes tested in the Argentine e-voting pilot.



race). Voters marked their preferences for the presidential and senate race with a special pencil on the paper ballot and introduced it into the scanner. Figures 1 and 2 depict images of the prototypes tested in each pilot.

EMPIRICAL ANALYSIS

In order to explore voters' views about the reliability and usability of automated voting technologies, we used survey data from the 2,245 participants in the Colombian pilot and 2,792 participants in the Argentine experiment, combining descriptive and multivariate regression analyses. We first evaluate participants' confidence in e-voting and then compare their opinions about the new technologies vis-à-vis the paper-based system.

Assessing Voter Confidence in E-Voting and Its Determinants

The surveys administered in both pilots allow us to examine whether the participants using automated voting systems were confident that their ballots were correctly recorded. Specifically, the dependent variable of interest is built based on subjects' responses to the survey item: "Are you confident that your vote was recorded as intended?" The wording of the question was the same in the two experiments. However, in Colombia, participants were asked

FIGURE 2. Prototypes tested in the Colombian e-voting pilot (color figure available online).

to provide a "yes" or "no" answer, while in Argentina the response was coded on a four-point scale ranging from "I am absolutely sure it was not" to "I am absolutely sure it was." In order to make the results from both surveys comparable, we recoded the responses from the participants in the Argentine pilot to a binary scale.[13]

Table 2 reports the percentage of positive responses to the confidence question in each country, discriminated by sociodemographic characteristics as well as by the type of e-voting technology. The most striking result emerging from the table is that almost 94 percent of the respondents in the two experiments stated that they were positive their vote had been correctly recorded. These confidence levels are comparable to those in similar studies surveying American and European voters. For instance, in his analysis of the 2008 U.S. election, Stewart (2009) found that roughly 95 percent of Americans using e-voting machines were "very" or "somewhat" confident that their vote was counted as cast. Similarly, Delwit et al. (2005) reported that about 89 percent of Belgian citizens in 2003 trusted voting on a computer. It must be noted, however, that these studies also report equally high—or even higher—confidence rates in other voting methods and, more generally, in election administration and procedures. As mentioned, this is not the case in Argentina and Colombia—and, for that matter, in most Latin American democracies.

While the proportion of voters who trust e-voting is extremely high in the two pilots, Table 2 reveals some differences in confidence rates across sociodemographic groups and between voting technologies. In order to explore these differences in greater detail, we fit three multivariate regression models that allow

TABLE 2. Percentage of Positive Responses to the Survey Question "Are you confident that your vote was recorded as intended?"

Sociodemographic and technological variables	Argentina	Colombia
Age		
18–29	94.1	91.8
30–50	92.3	94.6
>50	94.6	95.7
Education		
Secondary or less	94.1	95.8
College	93.2	92.6
Gender		
Female	93.8	94.8
Male	93.2	93.5
E-voting technology		
DRE with VVAT	93.6	96.0
DRE without VVAT	95.0	94.0
OS	92.3	89.9
Whole sample	93.6	94.0
Sample size (N)	2,792	2,245

us to isolate the impact of relevant individual and technological characteristics on voter confidence after controlling for confounding factors.

Model 1 is a probit model combining data from the two pilots, with voter confidence in e-voting as the dependent variable. Among the regressors, we included a dummy for DRE machines and another for VVAT to account for differences in voting technology. We also included the following predictors to capture the effect of voters' sociodemographic characteristics: Age, coded as two dichotomous variables, *30–50* and *Older than 50*, with 18–29 as the baseline category; an indicator variable for *College Education*, with secondary or less as the reference category; and a dummy for *Female.* We also added a dummy for geographical location, *Colombia*, as well as interaction terms between the indicators for age and education and *Colombia*.

Given that previous research has found a positive relationship between voter confidence and usability of automated voting systems (Delwit et al., 2004, 2005), we also fit two bivariate probit models that allow us to account for this potential correlation as well as take advantage of additional information gathered in the specific surveys administered in each pilot. Besides voter confidence, the second dependent variable in these models is based on participants' dichotomous responses to a usability question included in the two surveys. In the Argentine pilot, subjects were asked whether they thought that casting a ballot using the automated voting machines was easy. In the case of Colombia, participants were asked whether they believed that e-voting was easier than the traditional voting procedure.[14]

All the sociodemographic and technological variables included in Model 1 were also used as regressors in the two bivariate probit models. In addition, for Model 2, fit to the data from the Argentine pilot, we included three supplementary predictors: *Use of Technology*, *Political Information*, and *Voting Problems*. The first of these variables seeks to capture voters' familiarity with technology and is built based on a principal component analysis on a series of items asking respondents about their use of cellular phones, computers, and Internet. The inclusion of *Political Information*, measured as the number of correct responses to three political knowledge questions asking respondents about the office held by nationally prominent politicians, is motivated by previous studies on the Argentine pilot (Calvo, Escolar, & Pomares, 2009) showing that the impact of political knowledge on electoral behavior was quite distinct from that of education. The

dichotomous variable *Voting Problems*, based on subjects' (negative) response to the question "Were you able to cast a vote for your preferred choice?", intends to reflect the technical difficulties with the voting machines—especially with the rolling scanner in Prototype 3—reported by some participants in the Argentine pilot.[15] In the case of Model 3, fit to the Colombian data, we accounted for the fact that the pilot took place in three different cities, including indicator variables for *Pereira* and *Bogotá*, along with the sociodemographic and technical variables mentioned before.

The parameter estimates are reported in Table 3. The pseudo-R^2 values for the three models are quite low, but the Hosmer–Lemeshow tests (Chiburis, Das, & Lokshin, 2010; Hosmer & Lemeshow, 1980) indicate that they actually fit the data reasonably well.[16] In addition, likelihood-ratio (LR) tests lead us to reject the hypothesis that the variables included in Models 1–3 have no joint explanatory power on participants' responses.

Whereas the results reported in Table 3 confirm some of the conclusions from previous research on e-voting in established democracies, they also point to some specific features about Latin American voters' reaction to the new technologies.

TABLE 3. Parameter Estimates and Standard Errors (in Parenthesis) for Models 1–3 Examining Confidence in E-Voting[a]

Independent variables	Model 1–joint sample(probit)	Model 2–Argentina (bivariate probit)		Model 3–Colombia (bivariate probit)	
	Confident vote was recorded as intended	Confident vote was recorded as intended	E-voting is easy	Confident vote was recorded as intended	E-voting is easier than traditional paper ballot
Age: 30-50	−0.14 (0.10)	−0.15 (0.10)	−0.07 (0.08)	0.23** (0.10)	0.25** (0.10)
Age: >50	0.04 (0.11)	0.07 (0.11)	−0.25*** (0.09)	0.33** (0.13)	0.15 (0.12)
College Education	−0.06 (0.08)	−0.10 (0.09)	0.01 (0.07)	−0.26*** (0.09)	−0.25*** (0.09)
Female	0.08 (0.06)	0.04 (0.08)	0.00 (0.06)	0.12 (0.09)	0.07 (0.09)
DRE	0.25*** (0.07)	0.21** (0.10)	0.20*** (0.07)	0.30*** (0.11)	−0.01 (0.12)
VVAT	0.01 (0.07)	−0.14 (0.10)	0.04 (0.07)	0.19* (0.11)	0.02 (0.11)
Colombia	−0.05 (0.14)				
Age 30–50 * Colombia	0.37*** (0.14)				
Age >50 * Colombia	0.28* (0.17)				
College education * Colombia	−0.23* (0.12)				
Voting problems		−0.45*** (0.11)	−0.33*** (0.09)		
Political information		0.01 (0.03)	0.01 (0.02)		
Use of technology		0.05 (0.06)	0.07* (0.04)		
Bogotá				−0.12 (0.12)	0.22* (0.11)
Pereira				−0.07 (0.13)	0.22* (0.12)
Intercept	1.40*** (0.11)	1.56*** (0.13)	0.99*** (0.10)	1.29*** (0.14)	1.40*** (0.14)
Correlation between dependent variables		0.38*** (0.05)		0.36*** (0.07)	
Pseudo-R squared	0.03	0.04		0.02	
p-value: Hosmer–Lemeshow test[b]	0.80	0.99		0.43	
L-R test statistic	45.81***	79.10***		56.96***	
Sample size (N)	5,037	2,792		2,245	

[a]Standard errors in parenthesis. Significance levels: ***0.01, **0.05, *0.1.

[b]In the case of Models 2 and 3, we use the adaptation of the Hosmer–Lemeshow test to the bivariate probit model proposed by Chiburis, Das, and Lokshin (2010). The null hypothesis is that there is no difference between observed and predicted values of the response variables.

Regarding the effect of voters' sociodemographic characteristics and in line with previous experimental studies (Oostveen & van den Besselaar, 2005), gender did not significantly affect trust in e-voting in any of the three model specifications. Also, as suggested by past research on U.S. (Alvarez, Hall, & Llewellyn, 2008; Stewart 2009) and European (Delwit et al., 2004, 2005) e-voting experiences, older voters tended to be more confident that their vote was accurately registered than younger ones, even when the former—especially those older than 50—found e-voting more difficult than the latter, as seen in the estimates for Model 2.[17] Some scholars ascribe this positive relationship between age and confidence in e-voting to the fact that older voters have had more opportunities to interact with different voting procedures in several elections (Alvarez, Hall et al., 2008). However, this explanation is not entirely appropriate for Argentina and Colombia, where e-voting—which differs considerably from the manual count and paper-based system used in these two countries—has not been implemented yet. As noted above, a more suitable interpretation for this finding, suggested by Oostveen and van den Besselaar (2004), is that younger participants, who probably have better computer skills than older subjects, are more likely to be aware of the potential security threats and vulnerabilities of ICT-mediated transactions, and thus more critical of e-voting. Qualitative data from the Buenos Aires pilot points to this explanation, since younger interviewees expressed more concerns about security vulnerabilities. In the words of a 20-year-old male voter, "How can I be sure that the information will reach its destination? I am tech savvy and I can assure you that this is so easily hacked!"

In contrast to empirical evidence from the U.S. and European elections (Alvarez, Hall et al., 2008; Delwit et al., 2005; Stewart, 2009), the estimates for Models 1 and 3 show that, in the case of Colombia, voters with a college degree are less confident in new technologies than those with secondary education or less. We also find a negative association between education and confidence in e-voting among participants in the Argentine pilot, although this relationship is not significant at the usual confidence levels. Interestingly, there is no evidence of a systematic relationship between education and usability of the e-voting devices. Model 2 reveals a marginally significant effect of *Use of Technology* on the perceived ease of use of the prototypes tested in the Argentine pilot, although familiarity with technology does not seem to be associated with greater confidence in e-voting. In sum, then, the estimated coefficients for the sociodemographic variables included in Models 1–3 do not provide support for the arguments about the potential danger of disenfranchisement of elderly and less educated voters that would go hand in hand with the dissemination of e-voting in Latin America (Thompson Jiménez, 2009).

After controlling for individual characteristics, we find that differences between voting technologies are important determinants of trust in e-voting. First, we find that the effect of the VVAT on participants' confidence is not statistically significant in Models 1 and 2 and only is marginally significant in Model 3. Whereas in the U.S. the availability of a VVAT might be important to restore voter trust after the 2000 election, it did not have a considerable influence on our subjects' beliefs that their ballots had been accurately recorded. In this sense, our results tend to support those arguments that cast doubts on the efficacy of paper audit trails for boosting confidence in e-voting (Herrnson et al., 2008).

More relevant is perhaps the fact that even though Table 2 showed that the perceived reliability of e-voting was very high among the vast majority of the participants in both pilots, the estimates in Table 3 indicate that participants who cast a vote through DRE machines were significantly more confident that their vote was accurately registered than those using OS devices. This finding is quite robust and holds for the three models we fit. It points to a clear pattern regarding voters' relative confidence in the two alternative e-voting technologies, which contrasts with the evidence reported in U.S. studies (Alvarez & Hall, 2008). It is worth noting that the ballot design and the procedures required to cast a vote using OS were much more similar to the ones used in official elections in Argentina and Colombia than those required

for DRE devices. In this regard, Delwit et al. (2004) found that voters who liked manual voting methods tended to mistrust e-voting. Hence, the relatively low levels of trust in elections in Argentina and Colombia—which, as noted above, are also characteristic of several other democracies in Latin America—might explain the positive effect of DREs on voter confidence vis-à-vis the OS devices that more closely resemble the official voting procedures. Also, qualitative materials from the Buenos Aires pilot point to the fact that OS devices were perceived as "less modern" than DRE ones, and concomitantly not as a radical a change as expected. In the words of two participants, "What?! So with e-voting there will be paper ballots like before?! That is not electronic at all! I voted faster with the traditional method!" (a 47-year-old voter), or "One of the four voting machines was a prehistoric one. Unfortunately I was assigned to that one. What an atrocity!" (a 50-year-old female voter). Moreover, several voters stated that in order to address the digital gap, optical scanners should be used over a transition process and then be replaced by a system that is "solely electronic." As a 60-year-old male voter put it, "I imagine in 5 or 6 years' time, maybe in 10, when everybody is used to voting with this machine [prototype 3], we will eliminate this system, get rid of counting ballots and move to a system that is completely electronic."

It is also worth noting that the estimated correlation coefficients for Models 2 and 3—reported at the bottom of Table 3—indicate a positive and statistically significant relationship between responses to the confidence and usability questions both in the Argentine and the Colombian pilots. That is, participants who believed that operating the e-voting devices was easy were also more likely to trust that their votes were correctly recorded. A similar conclusion can be drawn from the fact that voters who had problems casting their ballots in the Argentine pilot not only found e-voting more difficult, but were also less likely to trust the procedure. Hence, implementing automated voting procedures that are perceived to be easy to use—particularly when compared to the relatively complex paper-based system used in many countries in the region (Limongi, 2006)—could have a strong positive influence on Latin American voters' trust in the new technology, especially for those with lower education levels.

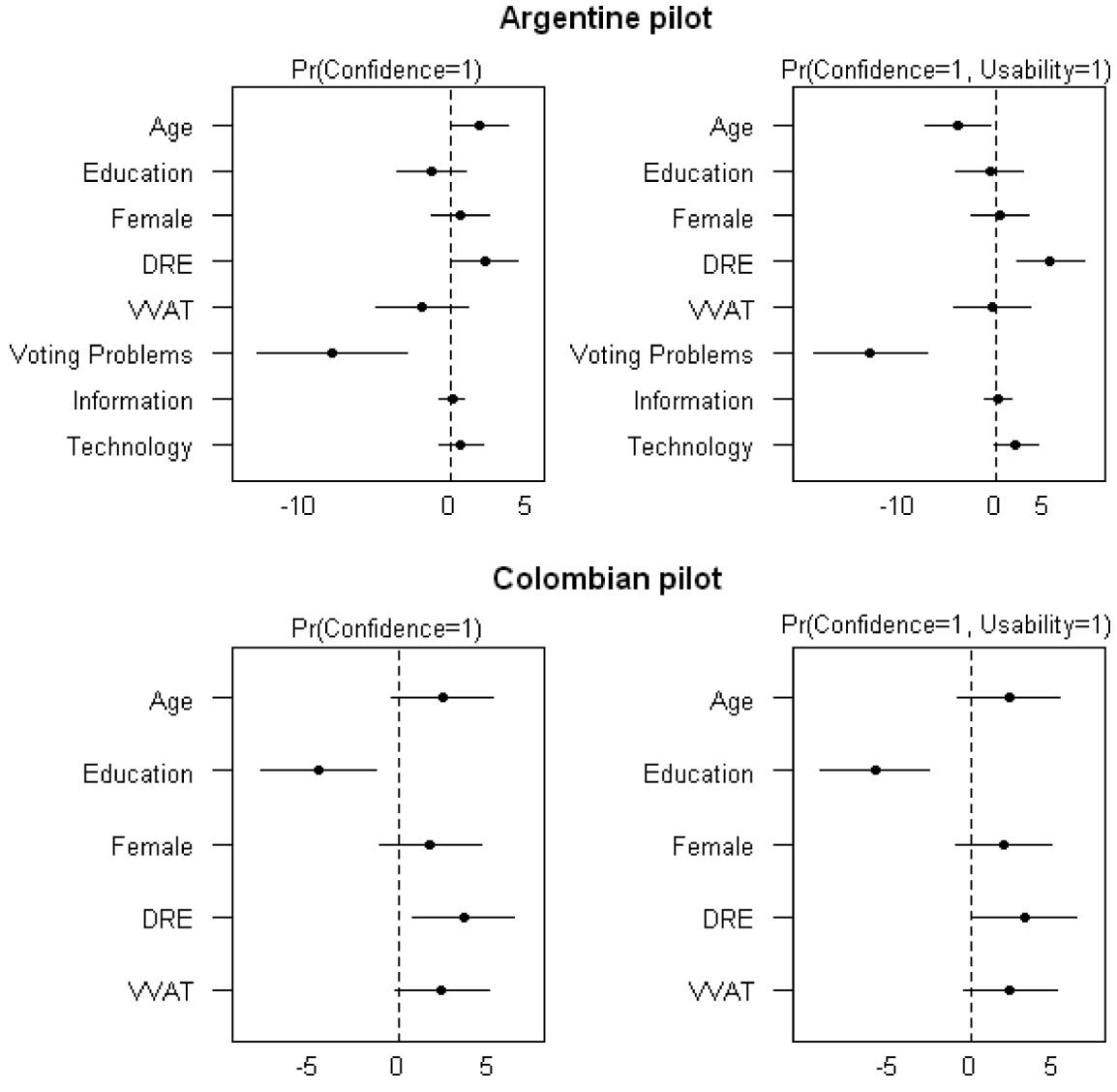
In order to provide a more intuitive interpretation of the results in Table 3, Figure 3 plots the effect of a change in each of the relevant covariates on the average probability of a positive response to the confidence and usability questions formulated in each pilot, holding the remaining predictors at their mean or modal values.[18] This allows us to quantify the relative influence of the different sociodemographic and technological variables on subjects' attitudes towards e-voting.

Younger subjects in the two pilots were about 2 percentage points less likely to trust e-voting than those over 50, although this result is not significant at the 0.05 level for Colombian respondents. More educated subjects in Colombia were also 4.5 points less likely to believe that their ballots were accurately recorded than those with secondary education or less. The influence of technical factors on respondents' attitudes towards e-voting was also very clear in the two pilots. Using a DRE device instead of an OS machine increased the average probability of a positive response to the confidence question in Argentina and Colombia by 2.2 and 3.5 percentage points, respectively. In fact, DREs increased the likelihood of e-voting to be perceived as both reliable and easy by 5.5 percentage points in Argentina and by more than 3 points in Colombia. Participants in the Argentine pilot who reported having problems operating the machines were also about 13 percentage points less likely to respond affirmatively to the two survey items analyzed than the rest.

A Comparison between Electronic and Manual Voting Systems

Some of the additional questions included in the surveys administered during the two experiments also allow us to compare respondents' opinions of e-voting relative to the paper-ballot system. Participants in the Colombian pilot were explicitly asked if they felt that e-voting was more reliable than the traditional manual procedure and whether they were more

FIGURE 3. Marginal effects of selected covariates on the perceived reliability and usability of electronic voting machines. Figure 3 plots the average effect of a change in selected covariates on the probability of a positive response to the confidence and usability questions, in percentage points. The central dots represent the point estimates (means), while the vertical lines correspond to the 95% confidence intervals.



confident that their ballots would be counted under the new system. The questions formulated in the Argentine pilot, on the other hand, do not allow a direct comparison of participants' degree of confidence in the two alternative voting systems. However, subjects were asked if they would like to use computerized voting in real elections, as well as whether they would like to replace manual count and paper ballots with the new technologies. Although responses to these two questions are not necessarily driven by the perceived reliability of e-voting and could be affected by other considerations (e.g., costs or waiting time), they do provide valuable insights about participants' general opinions and their preferences over the two alternative voting systems.

As seen in Table 4, subjects' responses suggest a strong support for e-voting vis-à-vis the traditional method currently in place in Argentina and Colombia. More than 85 percent of the participants in the Colombian pilot thought that e-voting was more reliable than the paper-based system, and an even larger proportion stated that they were more confident that their ballots would be counted with the new technology. In the case of Argentina, almost all the subjects expressed a positive opinion about the possibility of using computerized voting in official elections, and more than three-quarters said that they would actually like e-voting to replace paper ballots.[19] The qualitative data show that from voters' points of view, the most positive effect of e-voting is eliminating vote count at the polling station and replacing it by a centrally computerized tally of results. In the words of a 65-year-old male voter, "E-voting is positive because once we cast a ballot, we know that our ballot reaches a central system and is untouchable. Nobody can touch it, and so nobody can speculate with it. The word speculation is eliminated."

To better account for differences in respondents' attitudes towards e-voting relative to the paper-based method, we again fit two bivariate probit models using data from the Argentine (Model 4) and Colombian (Model 5) pilots. The dependent variables are participants' dichotomous responses to the questions presented in Table 4. The predictors included in the two models are the same as those used in Models 2 and 3.

As before, the estimates reported in Table 5 indicate that older and less educated subjects in the two experiments tended to express more favorable views towards e-voting compared to the manual system. The main discrepancy with the results in Table 3 is that responses to the two comparability questions did not differ significantly between subjects using DRE and OS devices. Hence, although DRE machines increased voters' confidence vis-à-vis OS technologies, even subjects using OS favored e-voting over the traditional manual system. This contradicts the results reported by Alvarez, Hall et al. (2008) and Stewart (2009) indicating that American voters preferred paper ballots to any other voting system, and might be explained in light of the negative correlation between voters' opinions about manual and e-voting found by Delwit et al. (2004). That is, given the low levels of public confidence in the electoral procedures currently in place in Argentina and Colombia, both OS and DRE systems seem to offer an attractive alternative to traditional

TABLE 4. Percentage of Positive Responses to Survey Items Comparing Electronic and Manual Voting

Sociodemographic and technological variables	Argentina		Colombia	
	Would like to use e-voting in real elections	E-voting should replace traditional system	E-voting is more reliable than traditional system	More confident that votes are counted
Age				
18–29	95.3	68.8	79.4	82.8
30–50	96.8	78.6	86.6	89.3
>50	97.4	81.1	93.0	90.6
Education				
Secondary or less	97.2	79.3	90.7	90.7
College	96.5	76.8	82.1	85.4
Gender				
Female	97.1	76.4	86.2	87.6
Male	96.4	79.3	85.5	87.7
E-voting technology				
DRE with VVAT	97.4	78.9	86.6	87.3
DRE without VVAT	96.7	77.4	85.8	87.0
OS	96.0	77.1	83.9	89.0
Whole sample	96.8	77.7	85.8	87.6
Sample size (N)	2,426		2,245	

TABLE 5. Parameter Estimates and Standard Errors (in Parenthesis) for Models 4–5 Comparing E-Voting and Paper-Based Methods[a]

Independent variables	Model 4–Argentina(bivariate probit)		Model 5—Colombia(bivariate probit)	
	Would like to use e-voting in real elections	E-voting should replace traditional system	E-voting is more reliable than traditional system	More confident that votes are counted
Age: 30–50	0.22* (0.13)	0.36*** (0.08)	0.30*** (0.07)	0.30*** (0.08)
Age: >50	0.24* (0.14)	0.41*** (0.09)	0.64*** (0.11)	0.33*** (0.10)
College education	−0.05 (0.11)	−0.02 (0.07)	−0.41*** (0.07)	−0.29*** (0.07)
Female	0.10 (0.10)	−0.08 (0.10)	0.08 (0.07)	0.05 (0.07)
DRE	0.11 (0.12)	0.09 (0.08)	0.11 (0.09)	−0.10 (0.10)
VVAT	0.11 (0.13)	−0.06 (0.08)	−0.01 (0.07)	−0.02 (0.08)
Voting problems	−0.07 (0.17)	−0.07 (0.11)		
Political information	0.00 (0.05)	0.02 (0.03)		
Use of technology	−0.05 (0.08)	0.02 (0.05)		
Bogotá			0.08 (0.09)	0.14 (0.09)
Pereira			0.11 (0.09)	0.25*** (0.10)
Intercept	1.56*** (0.16)	0.75*** (0.10)	0.89*** (0.11)	1.04*** (0.11)
Correlation between dependent variables	0.64*** (0.05)		0.70*** (0.03)	
Pseudo-R squared	0.09		0.19	
p-value:	0.68		0.35	
Hosmer–Lemeshow test[b]				
L-R test statistic	40.66***		92.89***	
Sample size (N)	2,426		2,245	

[a]Standard errors in parenthesis. Significance levels: ***0.01, **0.05, *0.1.
[b]We use the adaptation of the Hosmer–Lemeshow test to the bivariate probit model proposed by Chiburis, Das, and Lokshin (2010). The null hypothesis is that there is no difference between observed and predicted values of the response variables.

voting methods. In this sense, the evidence in Tables 2–5 suggests that there is strong support for the implementation of e-voting in the two countries under study, and even possibly for the replacement of paper ballots with computerized voting in official elections.

CONCLUDING REMARKS

Analyzing the impact of e-voting on citizens' trust in the electoral process seems extremely relevant at a time when Latin American election authorities are considering switching to automated voting technologies with little evaluation of the potential consequences of their introduction. In particular, although recent studies point to positive prospects of e-voting for boosting trust in elections in the region, empirical evidence in this regard is very scarce. Using data from two field experiments conducted in Argentina and Colombia, this article inquires into Latin American voters' confidence in the new technologies and their determinants, contributing to the discussion surrounding the ongoing modernization of electoral procedures in the region.

Our findings point to very high levels of trust in e-voting among participants in the Argentine and Colombian pilots. However, sociodemographic and technical factors strongly affect the perceived reliability of e-voting. Older subjects without a college education who cast a ballot through DRE devices were more confident that their votes were recorded as intended than younger, more educated voters using OS. Overall, our results suggest that e-voting could provide an attractive alternative to traditional voting procedures in the region, and that its use in official elections would be especially welcomed by older and less educated voters.

These results have several academic and policy implications. In view of the different impact of alternative computerized voting systems on voter trust, and since these technologies evolve at a fast speed, there is a need for a better understanding of the specificities of each type of technology and for avoiding broad generalizations

about e-voting "as a whole." Also, we should be more cautious when extrapolating conclusions from established democracies to Latin America or other contexts. Some of our results regarding the determinants of confidence in e-voting clearly contradict findings from research on U.S. and European elections. In addition, our findings provide little support for the argument—often espoused by opponents of e-voting—that the adoption of computerized voting in Latin America would impose considerable barriers for electoral participation among less privileged groups of voters.

Some limitations of our study should be taken into account for future research. First, whereas our randomized experimental design overcomes many of the problems that have plagued previous observational studies in this area, the fact that participation in the pilots was voluntary and that subjects were asked to cast mock ballots might have attracted voters with favorable predispositions towards e-voting and relaxed their skepticism and concerns about ICT-mediated elections. Future work should examine voters' perceptions in those Latin American countries in which e-voting is already being used in official elections, such as Brazil and Venezuela. Second, as highlighted by the Brazilian experience, confidence in the use of new voting technologies cannot be isolated from trust in election authorities (Avgerou et al., 2009). This not a minor issue in Latin America, where some scholars have warned about the negative impact of several recent contested elections on the perceived legitimacy of election administration institutions (Whitehead, 2007). While we do not explicitly examine this matter here, promoting e-voting in countries with low confidence in political and electoral institutions might not deliver the expected outcomes. Finally, although we examined the impacts of age, gender, and education on confidence in e-voting, further research is needed on the influence of other relevant individual characteristics such as race, political ideology, and socioeconomic status. Given the well-documented influence of such variables on voter behavior, it is important to examine how they affect citizens' attitudes towards e-voting to better understand whether the introduction of new technologies could contribute to increased trust in elections in the region.

NOTES

1. This figure excludes those countries that trialled e-voting for nonpolitical contests.

2. For instance, before the introduction of e-voting, certificates of tabulation at the precinct level (*actas*) in Venezuela used to be called *mata-votos* ("votes killer"), since election officials would usually modify them at their own discretion in order to alter the distribution of the votes after polls closed. The move towards e-voting in Venezuela was accompanied by changes in the criteria followed to select election officials.

3. Replication data can be found at http://dvn.iq.harvard.edu/dvn/dv/jitp.

4. Of the 18 Latin American countries, the only ones that have not implemented e-voting are Bolivia, Chile, El Salvador, Guatemala, Honduras, Nicaragua, and Uruguay.

5. The description of the pilots conducted in Argentina and Colombia draws heavily from Calvo, Escolar, and Pomares (2009) and Alvarez, Katz, Llamosa, and Martinez (2008), respectively.

6. E-voting machines had been used—along with the traditional paper ballots—in a few polling stations during the 1992 Colombian national elections, as well as in different local elections throughout the country.

7. In order to avoid confusion, voters were not allowed to participate in the experiment before taking part in the official election.

8. Note that voting is compulsory in Argentina but not in Colombia.

9. Qualitative materials were collected during the e-voting experiment by two instruments: ethnographic reports and in-depth interviews. There are 52 ethnographic reports (one per observer; each covering at least one polling station) and 50 interviews to voters.

10. This fourth prototype was available in only 14 polling locations.

11. Balance checks based on the test statistics proposed by Hansen and Bowers (2008) indicate no significant differences in the distribution of relevant individual characteristics across prototypes within testing locations.

12. Candidate names were fictitious.

13. This recoding does not affect the main findings reported here. The substantive conclusions emerging from Table 3 hold if an ordered probit model is fit to the data from the Argentine pilot.

14. The exact wording of these questions can be found in the Appendix.

15. It is worth noting that the substantive results from Table 3 remain essentially unchanged if voters using Prototype 3 are excluded from the Argentine sample.

16. The use of the pseudo-R^2 as a measure of goodness of fit has been criticized by different scholars on the grounds that there are no clear criteria to decide what a good or bad fit is and that there is no simple interpretation its value. Some authors are relatively skeptical as to its utility, and others even argue that it does not actually measure goodness of fit (Hoetker, 2007). Hence,

we also report goodness of fit statistics based on Hosmer and Lemeshow (1980) and Chiburis, Das, and Lokshin (2010), which allow for a more direct comparison between the predicted probabilities and the observed data.

17. In the case of Colombia, while respondents with ages between 30 and 50 believed that casting a vote using automated machines was easier than with the manual method, we find no significant differences in the perceived usability of the two systems for participants aged 50 or older. Similar results to those reported in Table 3 are obtained if age is coded as a continuous variable.

18. To facilitate the interpretation of the results, age was recoded using an indicator variable for participants over 50, with those aged 49 or younger as the reference category. For both pilots, the "representative" participant is female, younger than 50, with no college education, and in the experiment she was assigned to an OS machine with no voter-verifiable audit trail. In Argentina, this average subject reported no voting problems, answered the three political information questions correctly, and her degree of familiarity with technology is set at the sample average. In Colombia, she lives in Bogotá, although the first differences obtained from comparing the three geographical locations in which the pilot took place are not plotted in Figure 3, since they are of no particular interest for our analysis.

19. 366 of the respondents in the Argentine sample did not answer the questions comparing electronic and manual voting, explaining the lower number of respondents in Table 4 relative to Table 2.

REFERENCES

Alvarez, R. M., & Hall, T. E. (2008). *Electronic elections: The perils and promises of digital democracy*. Princeton, NJ: Princeton University Press.

Alvarez, R. M., Hall, T. E., & Llewellyn, M. H. (2008). Are Americans confident their ballots are counted? *Journal of Politics*, *70*(3), 754–766.

Alvarez, R. M., Katz, G., Llamosa, R., & Martinez, H. E. (2009). Assessing voters' attitudes towards electronic voting in Latin America: Evidence from Colombia's 2007 e-voting pilot. In P. Y. Ryan & B. Schoenmakers (Eds.), *E-voting and identity—Proceedings of the Second International Conference VOTE-ID 2009, Lecture notes in computer science 5767*, pp. 75–91. Berlin: Springer

Avgerou, C., Garzaroli, A., Poulymenakou, A., & Reinhard, N. (2009). Interpreting the trustworthiness of government mediated by information and communication technology: Lessons from electronic voting in Brazil. *Information Technology for Development*, *15*(2), 133–148.

Calvo, E., Escolar, M., & Pomares, J. (2009). Ballot design and split ticket voting in multiparty systems: Experimental evidence on information effects and vote choice. *Electoral Studies*, *28*(2), 218–231.

Carter, L., & Belanger, F. (2005). The utilization of government services: Citizen trust, innovation and acceptance factors. *Information Systems Journal 15*, 5–25.

Cheung, B. (2005). The politics of administrative reforms in Asia: Paradigms and legacies, paths and diversities. *Governance: An International Journal of Policy, Administration, and Institutions*, *18*(2), 257–282.

Chiburis, R., Das, J., & Lokshin, M. (2010). *A practical comparison of the bivariate probit and linear IV estimators*. Retrieved from https://webspace.utexas.edu/rcc485/www/papers/biprobitiv.pdf

Davis, F. D. (1989). Perceived usefulness, perceived ease and use, and user acceptance of information technology. *MIS Quarterly*, *13*, 319–340.

Delwit, P., Kulahci, E., & Pilet, J.-B. (2004). *Electronic voting in Belgium: Societal mistrust or trust?* Unpublished manuscript. Bruxelles, Belgium.

Delwit, P., Kulahci, E., & Pilet, J.-B. (2005). Electronic voting in Belgium: A legitimised choice? *Politics*, *25*(3), 153–164.

Frick, M. (2007). Tracking e-government in South America: Origin and impact of e-government strategies in Argentina, Chile, and Uruguay. In M. Gascó-Hernandez (Ed.), *Latin America online: Cases, successes and pitfalls* (pp. 189–224). Hershey, PA: IRM Press.

Green, D. P., & Gerber, A. S. (2003). The underprovision of experiments in political science. *The Annals of the American Academy*, *589*, 94–112.

Hansen, B. B., & Bowers, J. (2008). Covariate balance in simple, stratified and clustered comparative studies. *Statistical Science*, *23*(2), 219–236.

Harrison, G., & List, J. A. (2004). Field experiments. *Journal of Economic Literature*, *42*, 1013–1059.

Herrnson, P. S., Niemi, R. G., Hanmer, M. J., Bederson, B. B., & Conrad, F. C. (2008). *Voting technology: The not-so-simple act of casting a ballot*. Washington, DC: Brookings Institution Press.

Herron, M. C., & Wand, J. (2007). Assessing partisan bias in voting technology: The case of the 2004 New Hampshire recount. *Electoral Studies*, *26*(2), 247–261.

Hoetker, G. (2007). The use of logit and probit models in strategic management research: Critical issues. *Strategic Management Journal*, *28*(4), 331–343.

Hosmer, D. W., & Lemeshow, S. (1980). Goodness of fit tests for the multiple logistic regression model. *Communications in Statistics*, *9*(10), 1043–1069.

Kersting, N., & Baldersheim, H. (Eds.). (2004). *Electronic voting and democracy: A comparative analysis*. Basingstoke, England: Palgrave Macmillan.

Kumar, N. (2008). Use of ICTs for voting process: The Indian experience. In S. J. Krisna & N. Kumar (Eds.), *E-Voting: Perspectives and experiences* (pp. 121–135). Hyderabad, India: The Icfai University Press.

Latinobarómetro (2006). *Informe Latinobarómetro 2006*. Santiago de Chile: Corporación Latinbarometro.

Limongi, F. (2006). *Reformas institucionais, participação, competicao e inclusao politica*. Sao Paulo: USP.

McGaley, M., & Gibson, J. P. (2003). *Electronic voting: A safety critical system*. NUI Maynooth, Computer Science Department. Retrieved from www.cs.may.ie/research/reports/2003/nuim-cs-tr-2003-02.pdf

Oostveen, A. M., & van den Besselaar, P. (2004). Security as belief: User perceptions of the security of electronic voting systems. In A. Prosser & R. Krimmer (Eds.), *Electronic voting in Europe: Technology, law, politics and society. Lecture notes in infor-matics* (pp. 88–97). Bonn, Germany: Gesellschaft fur Informatik.

Oostveen, A. M., & van den Besselaar, P. (2005). Trust, identity and the effects of voting technologies on voting behavior. *Social Science Computer Review*, *23*(3), 304–311.

Pomares, J. (2010a, April). *The adoption of electronic voting from a comparative perspective: are political actors following general or particular interests?* Paper presented at the 68th Midwest Political Science Association Annual Meeting, Chicago, IL.

Pomares, J. (2010b). *A comparative analysis of the process of introduction of electronic voting in Argentina and Brazil*. Unpublished mimeo.

Rezende, P. A. (2003, July). *Electronic voting systems—Is Brazil ahead of its time?* Paper presented at the First Workshop on Voter-Verifable Election Systems, Denver, CO.

Riera, A., & Brown, P. (2003). Bringing confidence to electronic voting. *Electronic Journal of E-Government*, *1*(1), 43–50.

Rodrigues-Filho, J., Alexander, C. J., & Batista, L. C. (2006). E-voting in Brazil—The risks to democracy. In R. Krimmer & R. Grimm (Eds.), *Electronic voting 2006* (pp. 85–94). Bonn, Germany: Gesellschaft fur Informatik.

Special Committee on the Security of Electronic Voting [Subcomissão Especial de Segurança do Voto Eletrônico]. (2007). *Relatório da Subcomissão Especial de Segurança do Voto Eletrônico*. Retrieved from http://www.camara.gov.br/sileg/integras/526769.pdf

Stein, R. M., Vonnahme, G., Byrne, M., & Wallach, D. (2008). Voting technology, election administration, and voter performance. *Election Law Journal*, *7*(2), 123–135.

Stewart, C. I. (2009, April). *Election technology and the voting experience in 2008*. Paper presented at the 67th Midwest Political Science Association Annual Meeting, Chicago, IL.

Thompson Jiménez, J. (2009). La experiencia reciente del voto electrónico en América Latina: Avances y perspectivas. *Revista de Derecho Electoral*, *7*. Retrieved from http://www.tse.go.cr/revista/articulos07.htm

Tula, M. I. (2005). Las nuevas tecnologías en los procesos electorales. Perspectivas y comentarios sobre la adopción del voto electrónico en la Argentina. In M. I. Tula (Ed.), *Voto electrónico. Entre votos y máquinas. Las nuevas tecnologías en los procesos electorales*. Buenos Aires: Ariel - CIPPEC.

Whitehead, L. (2007). The challenge of closely fought elections. *Journal of Democracy*, *18*(2), 14–28.

APPENDIX: SURVEY QUESTIONS USED FOR ANALYZING VOTERS' TRUST IN E-VOTING

A) Survey items from the 2005 Argentine e-voting pilot:

1. *Are you confident that your vote was registered as intended?* (1 = not at all confident, 4 = very confident)
2. *How easy was it to use this voting machine?* (1 = not at all easy, 4 = very easy)
3. *Were you able to vote for your preferred option?* (0 = no, 1 = yes)
4. *Would you like to vote electronically in real elections?* (0 = no, 1 = yes)
5. *Would you like to replace the traditional voting system with the electronic voting system?* (1 = totally disagree, 4 = totally agree)

Responses to questions 1, 2, and 5 were dichotomized in order to enhance comparability with the Colombian pilot.

B) Survey items from the 2007 Colombian e-voting pilot:

1. *Are you confident that your vote was registered as intended?* (0 = no, 1 = yes)
2. *E-voting is easier than the traditional voting system.* (0 = no, 1 = yes)
3. *Correcting voting mistakes is easier under the new system.* (0 = no, 1 = yes)
4. *E-voting is more reliable than the traditional paper-based voting system.* (0 = no, 1 = yes)
5. *I am more confident that my votes will be counted under the new system.* (0 = no, 1 = yes)