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Ajay Vinze
Arizona State University, Tempe, AZ, United States., Ajay.Vinze@asu.edu

Benjamin Shao
Arizona State University, Tempe, AZ, United States., benjamin.shao@asu.edu

Gun-Woong Lee
Arizona State University, Tempe, AZ, United States., Gunwoong.Lee@asu.edu

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Gunwoong Lee
W.P. Carey School of Business
Arizona State University
Gunwoong.Lee@asu.edu

Benjamin M. Shao
W.P. Carey School of Business
Arizona State University
Benjamin.Shao@asu.edu

Ajay S. Vinze
W.P. Carey School of Business
Arizona State University
Ajay.Vinze@asu.edu

ABSTRACT

This research investigates the role of information and communication technologies (ICT) in transition economies (TEs). We identify how ICT spending influences the transition process of TEs with respect to socioeconomic and sociopolitical changes in the three groups of TEs from 2004 to 2010. These groups include the Central and Eastern Europe (CEE), Latin America, and BRIC (Brazil, Russia, India, and China). Our results suggest that while ICT spending is positively correlated with overall economic freedom and job creation, such investments do not significantly improve the democratic values or mitigate the existing high wealth-inequality level. Furthermore, the results from individual regions show that the impacts of ICT spending on transition processes differ according to the intention of ICT uses. These findings have implications for theorizing about the role of ICT and harnessing the potential of ICT in the transition processes in new economies.

Keywords

Information and communication technologies, transition economy.

INTRODUCTION

The advances in recent information and communication technologies (ICT) have contributed to faster economic growth and dramatic changes in societal structure around the world. This has been detailed in mass media reports and academic research studies, which suggest that investment and utilization of ICT is a critical factor for accelerating economic and sociopolitical changes in developing and developed countries (Cumps et al., 2006; Dewan and Kraemer, 1998). There is, however, a paucity of studies on the impact of ICTs on transition economies that are undergoing significant socioeconomic and sociopolitical liberalization or reforms. Since the early 1990s, countries referred to as transitional economies (TEs) have experienced rapid economic growth and sociopolitical changes. The International Monetary Fund (2001) defines transition economies as the "countries moving from centrally planned economies to market-driven economies." They are undergoing economic and social liberalization, privatization of government-owned enterprises and resources, and creation of a financial sector.

Recent economics and information systems (IS) studies have attempted to assess the changes in economic values (Piatkowski, 2004; Samoilenko and Osei-Brynson, 2010) and the level of democratization (Shirazi, 2008; Soper et al., 2011) resulting from ICT investments in transition economies. They have found that ICT has contributed a great deal to the overall economic growth and sociopolitical changes. However, the research in this area has been conducted without solid theoretical foundations or distinction of TEs from developing or developed countries. This has consequently led to ill-measured effects of ICT. Thus, a specific appreciation of key properties of transition economies is required. Furthermore, the role of ICT in transition economies may vary with different intentions of ICT utilization. While some TEs adopted ICT as a tool for accelerating economic growth, others utilized ICT to change for sociopolitical structures. As such we broaden the definition of TEs.

Prior studies have also mostly concentrated on examining the role of ICT in the early stages of the transition process where drastic economic and societal shifts occurred rather than in the later stages dynamically associated with significant ICT investments and widespread ICT use. This focus on early stages makes hard it to substantiate the exact transformative power of ICT in TEs. Our aim is to fill this research gap. We examine how ICT has been able to contribute to restructuring socioeconomic and sociopolitical environments in more recent periods of transition process, where the role ICT became more critical and essential to TEs.

By using the key tenets of theories of endogenous growth and skill-biased technological change, this study attempts to determine whether ICT plays a potentially transformative role in TEs and examines how the outcomes of transition processes differ according to the intentional uses of ICT. In order to investigate the association between ICT investments and transition processes, we use data on three groups of transition economies (i.e., Central and Eastern Europe, Latin America, and BRIC) from 2004 to 2010 and measure the effects of ICT-related spending on changes in macro economic conditions, employment, the level of democratization, and wealth equality. Consequently, this study answers the following key research questions: 1) What is the role of ICT in transition economies? 2) How do ICT investments influence socioeconomic and sociopolitical changes in transition economies? 3) Do these associations vary across different groups over time?

This study may contribute to the extant literature on IT payoff at the macro level. The studies of ICT dynamics and their impacts on the transition are important issues in various research areas. Thus, this study will provide opportunities to make new contributions to the existing body of knowledge on the subject.

THEORY DEVELOPMENT

Although research on the impact of ICT on TEs is still scarce, related literature on economics, politics, and information systems (IS) provides a theoretical groundwork for addressing the research questions. The following sections review the relevant research streams and derive a set of implications for our research hypotheses.

Literature Review

In this section, we review the literature that is relevant to the impacts of ICT on economic and sociopolitical changes at the country level. First, our study draws on the extant literature on ICT dynamics and IT productivity. Numerous IS studies examine the IT payoffs at the country level. They have commonly found positive relationships between ICT investment and economic changes (i.e., GDP growth and labor productivity). For instance, Dewan and Kraemer (1998) and Kraemer and Dedrick (2001) noted that for the developed countries, IT investment is more positively associated with economic returns (i.e., annual GDP per capita) than for developing countries.

The research concerning the effects of investments in ICT on TEs is still growing. A few recent economics and IS studies have attempted to measure the economic growth contribution from ICT investments (Smoilenko and Osei-Brynson, 2010) and IT-induced labor productivity in TEs (Piatkowski, 2004). However, those studies examined the immediate contributions of ICT on the transition process during the earlier stage of transition, in particular from the early 1990s to the early 2000s. Since, in the initial periods of transitional years, transition economies experienced drastic economic and societal shifts such as changes in fundamental economy structure from planned economies to market-driven economies and in liberalization of economies through privatization, the significant transformation might be more influential to the transition process than what was initially attributed to ICTs. Thus, the direct transformative role of ICT in TEs may not be observed appropriately.

In terms of the impacts of ICT on job creation, prior studies suggested that technological innovations have replaced the low-skill workers with new technologies (Bresnahan et al., 2002; Meng and Li 2002) and the progress of ICT implies that job could be lost through the causes of obsolesce, automation, and disintermediation (Ubraru, 2010). However, these unbalanced job opportunities do not imply job destruction. The ICTs also have capabilities of spurring new job opportunities by creating ICT-related tasks and occupations such as call center workers, telecommunication equipment providers, or installers.

In addition to economic changes, the role of ICT in facilitating sociopolitical change has caught researchers' attention. A few studies have examined he association between the ICTs and wealth inequality. Flores (2000) and Katagiri (2010) found that the utilization and progress of ICT have broadened income dispersion. In terms of transition economies, such income disparity became more severe during the first decade after the transition year mainly due to the progressive shift toward market-driven economy. Thus, the questions on how income inequality changed after the market adjustment period and whether ICT contributed to closing a widening the gap of income inequality remain largely unanswered.

Several studies have found that ICT can stimulate rapid democratization in certain regions of the world: underdeveloped countries (Ferdinand, 2000; Meier, 2000) and developed countries (Gronlund, 2001) alike. Falch (2006) also argued that ICT had a positive impact on future conditions for democratic governance. However, these studies presented mere conjectures mainly based on theories alone (e.g., IT diffusion) or particular indicators without solid empirical data and rigorous analyses. Although several recent studies (Shirazi, 2008; Soper et al. 2011) have measured a country's democratization level with civil liberties and political rights, we do not observe significant variations of these democratic values over the last decade for most countries. These indicators of democratization may not reflect well the effect of ICT on democratic shifts. They are more likely to be influenced by macro-level structural changes such as alterations of ruling party or religion.

In summary, the research on ICT impact on economic and sociopolitical changes to date is fragmented and still not well established for investigating the transformative role of ICT in transition economies. While most studies conclude that ICT is positively associated with economic growth and democratization but negatively associated with job creation and income disparity, these findings highly focused on specific country groups (i.e., developed and developing countries), early periods of the transition process, and limited chosen research variables. This study contributes to the existing literature by investigating the role of ICT in transition processes and addressing the mentioned concerns above.

Hypotheses Development

The research hypotheses draw on the existing literature discussed in the previous section. Table 1 presents a set of relevant studies and the implications for each of our research hypothesis.

Transition Process	Study	Implications for the Hypotheses
Economic Enviroment	Dewan and Kraemer (1998) Kraemer and Dedrick (2001) Piatkowski (2003) Piatkowski (2004) Samoilenko and Osei-Brynson (2010)	*Positive* impact of ICT investment on Economic growth and environment changes.
Employment	Bresnahan et al. (2002) Meng and Li (2002) Brinjoffson and McAfee (2011)	*Positive* impact of ICT investment on overall job creation, but *negative* impact on job opportunities for unskilled workers,
Wealth Equality	Flores (2003) Katagiri (2010)	*Negative* impact of ICT investment on wealth equality
Democratization	Meier (2000) Gronlund (2001) Falch (2006) Shirazi (2008) Soper et al.(2011)	*Positive* impact of ICT investment on democratic values

Table 1. Prior Studies and Implications for the Research Hypotheses

ICT and Socioeconomic Changes

While prior literature concludes that investments in ICT contribute to positive economic growth and a higher socio-technological development in TEs, these studies do not provide a solid theoretical framework or comprehensive measures for evaluating the transition process in TEs. Although there are regional differences between TEs and developed countries, researchers use common theoretical frameworks to investigate the impact of ICT investment on macroeconomic outcomes in both settings. In terms of economic growth contribution from ICT investments, numerous studies still merely utilize production functions, regardless of unique properties of TEs. For instance, Piatkowski (2006) showed that ICT has a large potential to increase long-term economic growth in TEs by stimulating productivity growth at the industry level based on the growth accounting methodology developed by Solow (1957). In the Solow's growth model, technical progress is exogenous. That is, the model does not explain the source of technical progress. However, most transition economies have adopted ICT with the intention to boost economic growth and accelerate democratic values. In line with this argument, Romer (1990) presented endogenous growth theory for technological change innovation that attributes technological progress to systematic efforts by profit-maximizing economic agents. Thus, the endogenous technological change model explains that economic changes from ICT are effected by people or countries that have incentive to push for sustained economic growth. Most transition economies have clear intentions to use ICT as a tool for making their economic conditions better, not only for keeping pace with rapidly changing global economies, but also for transforming centrally planned economies into market-driven economies effectively. Thus, we predict that the investment in ICT, with the purposeful intention of gaining economic benefits, has a positive impact on improvement in overall economic environment in TEs. This leads us to the following

hypothesis:

Hypothesis 1a (Economic Freedom): ICT investment will be positively associated with overall economic changes in transition economies.

The creation of job opportunities from ICT investment can be regarded as an indicator of sound economic policy at the country level. Many countries have adopted ICT in order to mitigate skyrocketing unemployment rates (Bresnahan et al., 2002). However, prior studies were concerned with if the adoption of ICT has led to lost jobs for unskilled workers. Meng and Li (2002) examined the pressure of unemployment from ICT's displacement effect in developing and developed countries and found that the dynamics of IT replace human labor and increase the demand for skilled labor. Such a negative impact of ICT on job creation can be explained by the theory of skill-biased technical change. Violante (2008) defined skill-biased technical change as "a shift in the production technology that favors skilled (more educated and more experienced) over unskilled labor." A large volume of economic literature provides a foundation for skilled-biased technical change. Galor and Moav (2000) argued that more educated and experienced labor deals better with technological change. Since it is less costly to teach skilled workers a new technology, firms generally prefer skilled laborers over unskilled ones. IS studies have also found that innovations in IT led to skill-biased technical changes. They mostly argue that such an increase in skill demand arose from reduced IT prices and increased use of IT (Bresnahan et al., 2002; Brynjolffson and McAfee, 2011).

Regarding transition economies, many new jobs have been created in ICT-related industries, and there is soaring demand for skilled workers. The increasing ICT spending over the past decade (e.g., CEE has increased ICT spending per GDP on average from 8.8% to 12.5% and Latin America has increased from 3.1% to 6.2%.) indicates TEs are eager to adopt new technologies. Such active technological adoptions have led to more highly skilled jobs. In addition, while ICT has radically replaced conventional tasks and jobs through automation, new technologies also have created new tasks and jobs in TEs. According to the World Bank's recent report on ICT and its impact on job creation (2009), the demand for ICT goods and services created new jobs and each new job in ICT sectors creates between two and four new jobs in other fields across transition economies (e.g., IT and telecommunication outsourcing and offshore software development in China and India). In this regard, we tested how ICT investment influences job creation in transition economies.

Hypothesis 1b (Job creation): The investment of ICT will be positively associated with job creation in transition economies.

ICT and Sociopolitical Changes

In addition to the socioeconomic transition process, the role of ICT in facilitating sociopolitical shifts should be identified. After the transition process was launched, most transition economies have faced severe income disparity. Generally, centrally planned economies distribute income more evenly than market-driven economies (including TEs). Since the beginning of the transition, increased income inequality is a common phenomenon for transition economies. In this regard, Kolodko (1999) suggested three reasons for rising income inequality in transition economies: 1) the reduction of state subsidies; 2) reduced employment from the state sector; and 3) the shift of labor from the state to the private sector.

From the perspective of the widespread use of ICT in transition economies, the theory of technological skill-bias can also account for such rising income inequality (Galor and Moav, 2000). Since the technological advances favor skilled and highly educated workers, they also lead to greater wealth inequality in transition economies. This suggests the following hypothesis:

Hypothesis 2a (Wealth inequality): The investment of ICT will be negatively associated with wealth equality in transition economies.

ICT can be viewed as a medium by which relationships can be transformed, and open interactions will lead to democratization. On the economic level, ICT plays a role in integrating TE into the global market and in the rise of worldwide electronic business activities (Zembylas and Vrasidas, 2005). On the level of social organization, ICT is seen as a mediator for civil democratic processes of citizen participation and decision-making (Noveck, 2000). From this point of view, Shirazi (2008) investigated the impact of ICT expansion on social and political freedoms in ten Middle Eastern countries. The results indicated that the use of ICT tools, such as the mobile cell phone and the Internet, enables citizens to share their opinions with others outside and inside countries and therefore promotes democracy and freedom of expression in the region.

These findings lead to the expectation that the utilization of ICT positively influences social processes of freedom and

democracy in TEs.

Hypothesis 2b (Democratization): The investment of ICT will be positively associated with improvement in democratic values in transition economies.

Consistent with the theory of endogenous growth for technological change innovation, economic and sociopolitical impacts from ICT can be influenced by policymakers in countries that have to encourage progressive economic and sociopolitical changes. Even though transition economies seem to share the same goal of accelerating transition processes, they could weigh their importance differently according to their current transition status. While some TEs use ICT for establishing strong economic foundation and stabilizing overall economic conditions rather than resolving existing social or political problems (e.g., India and China), others may utilize ICT more for mitigating severe income inequality and making gradual progress in educational coverage rather than drastic economic shifts (e.g., Latin countries). In other words, both economic and sociopolitical changes driven by the ICTs can be critical to certain TEs in order to meet the requirements for joining the advanced economic and political confederations (e.g., CEE countries for the Europe Union).

In this regard, we expect that the investment in ICT, with different intentions of reaping ICT benefits, leads to different outcomes. Consequently, we formulate the following hypothesis:

Hypothesis 3: The outcomes of transition processes will differ according to the intention of ICT uses in transition economies.

Our hypotheses are empirically tested with data about three groups of TEs from the seven-year period of 2004 to 2010. Figure 1 presents the research framework within the context of transition economies.
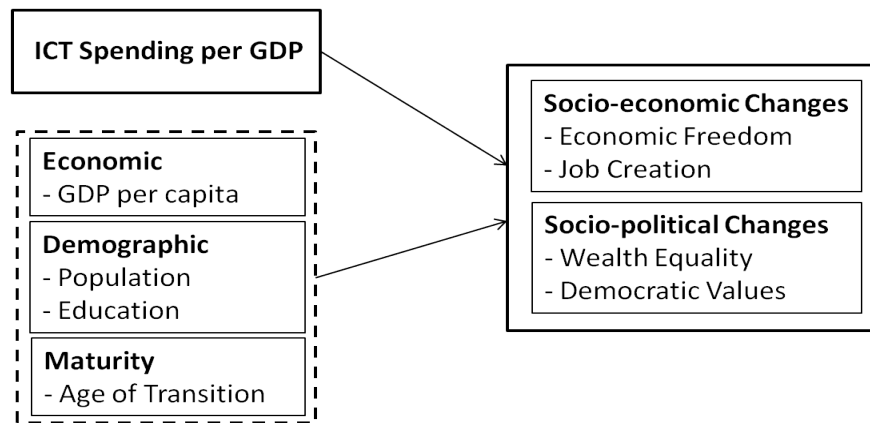

Figure1. Research Framework

For Hypotheses 1 and 2, the outcomes from transition processes are determined by ICT spending and a set of control variables that could influence the transition processes at the aggregated level. To examine the variations of transition outcomes between groups (Hypothesis 3), we estimate these associations at each individual region level.

EMPIRICAL APPROACH

Classification of Transition Economies

Sample data for our analysis was collected for the three transition economy groups, with a total of 13 countries according to IMF's classification for the groups of countries with economies in transition (2001). The three groups of transition economies are presented in Table 2. Although IMF's classification does not include Latin countries and BRIC, our study includes four countries in Latin America and BRIC because in a broader sense, the definition of transition economies applies to all countries that attempt to transform their basic market mechanism according to market-driven fundamentals.

Group	Country (Transitional Year)	Transitional Event
CEE	Czech Republic (1990) Hungary (1990) Poland (1990) Slovakia (1990) Slovenia (1990)	- The end of communism in Eastern Europe - The disintegration of USSR
Latin	Argentina (2001) Chile (1990) Columbia (1991) Peru (1990)	- Delinking Peso from the US dollar - The end of military dictatorship of Gen. Pinochet - The Columbian Constitution was drafted and ratified - Break away from hyper-inflation
BRIC	Brazil (2002) Russia (1992) India (1991) China (1992)	- The IMF rescue package - The collapse of Soviet-union - Movement from a socialist to a free market system - The plan of establishing a market-oriented economy

Table 2. Classification of Transition Economies

We grouped each country based on its transition status and purposive use of ICT. As we discussed, since most studies on transition economies have aimed at examining ICT-driven economic and political changes in the initial stages of transition process, they do not present rich insights for the transformative role of ICT in TEs. This study aims to identify salient ICT implications based on each region's transition status and intention of ICT uses during the past seven years, during which ICT has become more essential and universal in use for transition processes than the early stage of transition in the 1990s.

CEE: Countries in CEE are former communist states. They have the same transitional year of 1990, after the collapse of the communism in Eastern Europe. The selected five exemplar countries joined the European Union in 2004. Their overall economic and societal indicators became stable as compared to other transition economies after the transitional year, but these indicators remained below the European and OECD average since 2004 (The World Bank, 2011). In this regard, these countries may use ICT to stimulate economic and sociopolitical improvements. Higher ICT spending would reflect such efforts (around 13% of GDP, which is much higher than those of other groups). So we examine whether investment in ICT is effective for transition processes for these advanced transition economies.

Latin America: The selected countries in Latin America have experienced significant economic and political restructurings after initial transitional years. Their transitional years were mainly triggered by political liberalization. They have relatively healthier economic indicators as compared to other countries in the region, but they are still undergoing liberalization of economies and societal changes. While GDP per capita across the countries has continuously increased over the past decade, the gap in income distribution is still higher than those of other transition economy groups. Moreover, ICT-related social issues such as limited public access to digital services and education, lack of legal framework that encourages ICT investment, and affordability of ICT services and goods are still unsettled. However, in the last decade, there has been an increasing interest in all these countries to promote the use of ICT with attempts to develop and support e-government, e-health and e-commerce (Santos, 2009). Consequently, we regard that the countries have put more weight for their use of ICT on sociopolitical stability than on socioeconomic improvement over the past decade.

BRIC: Unlike the other two regional groups, BRIC is a group of four major emerging economies that have the potential to form a powerful economic bloc in the near future (O'Neill, 2001). Since they have restructured market structure while maintaining existing political structure, sociopolitical indicators are still much lower than other groups. For example, indices of press freedom, political rights, and civil liberties show very limited freedom across the countries. Especially, Russia and China are facing many sociopolitical challenges such as lack of political freedom, and severe income disparity is still prevalent in India and Brazil. Regarding ICT, they have adopted new technologies mainly for accelerating economic growth. Therefore, their uses of ICT could be more likely for economic changes than for sociopolitical changes.

Data Description and Measurement

Our empirical analysis was conducted on the three transition economy groups from publicly available data sources from 2004 to 2010. The set of research variables extracted from our dataset and their descriptive statistics are presented in Table 3.

Variable	Description of Variables / Data Source	Mean (S.D.)			
		Overall	CEE	LATIN	BRIC
Econ_free	Overall economic freedom (0 ~100) - Source: Heritage Foundation	61.10 (7.47)	64.25 (3.96)	64.13 (9.06)	54.04 (3.200
Unemployment	Unemployment rate (%) -Source: The World Bank	8.64 (3.13)	9.89 (3.88)	9.18 (1.84)	6.57 (1.92)
Gini	Gini coefficient (0~100) - Source: The World Bank	40.59 (11.05)	29.11 (3.55)	52.18 (4.12)	43.34 (7.47)
Press_Oppression	Press freedom (0 ~ 115) - Source: Reporters Without Borders	24.85 (24.07)	6.06 (4.44)	25.53 (13.45)	47.64 (26.99)
ICT_spending	ICT related spending per GDP (%) - Source: Digital Planet; ITU	9.39 (5.21)	13.17 (5.77)	5.22 (1.93)	8.85 (2.84)
Age_transition	Year distance from transitional year (years)	15.54 (3.73)	17.00 (2.03)	16.50 (2.100	12.75 (5.01)
GDP_capita	GDP per capita (US $) - Source: The World Bank	5334 (3242)	7792.71 (2643.34)	5215.06 (2734.96)	2379.12 (1358.74)
Secondary_edu	Secondary school enrolment (%) - Source: The World Bank	88.44 (12.04)	95.66 (4.37)	87.42 (3.47)	78.16 (17.93)
Pop_growth	Population Growth (%) - Source: CIA the World Factbook	.61 (.57)	.16 (.30)	1.12 (.23)	.66 (.64)

Table 3. Summary Statistics of the Dataset

We had two different datasets for testing the proposed hypotheses: the aggregated dataset combining three groups for testing Hypotheses 1 and 2; and the individual regional data sets for testing Hypothesis 3. In order to control for regional differences in the research variables, we normalized the variables to comparable scales.

In the analysis, we investigated how these regional differences affect transition outcomes effected by the ICTs along with each group's purposive ICT use.

Definition of Measures

To examine the impact of the investment in ICT on socioeconomic and sociopolitical changes, we utilized four dependent variables of transition processes, an explanatory variable of ICT investment, and four control variables.

Econ_free: This variable is a measurement of overall economic freedom. The Heritage Foundation measures the overall economic freedom based on 10 components of economic freedoms[1] for macroeconomic stabilization. Each of the freedoms is individually scored on a scale of 0 (not free) to 100 (free). A country's overall economic freedom score is a simple average of its scores for the 10 individual freedoms.

Unemployment: A dependent variable indicating the proportion of the transition economy's working-age population that was unemployed. We examine how ICT spending influences job creation of a transition economy.

Gini: A dependent variable indicating the level of wealth inequality of a country. A lower coefficient indicates a more even income distribution.

Press_oppression: A dependent variable indicating the level of press freedom. Reporters Without Borders annually assesses the overall press freedom based on surveys on direct attacks on journalists and the media as well as indirect sources of pressure against the free press. Note the score ranges from 0 (free) to 115 (not free).

Secondary_edu: Net enrollment ratio is the ratio of children of official school age based on the International Standard Classification of Education who are enrolled in secondary school compared to the population of the corresponding official school age.

ICT_spending: Domestic spending on computer hardware and software, communication services, and communication equipment as a percentage of GDP.

Age_transition: The time period from each TE's transition year. This variable controls the endogenous time effects on transition outcomes.

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[1]Ten components of economic freedom: property rights, freedom from corruption, fiscal freedom, government spending, business freedom, labor freedom, monetary freedom, trade freedom, investment freedom, and financial freedom

GDP_capita:It indicates the total output of a country that divides the gross domestic product by the number of people in the country. The per capita GDP was used to compare relative economic growths of the countries.

Pop_growth: Growth in population of individual countries. Due to large variations in population among countries, we used the value of the change in number of individuals in a population per unit time.

Empirical Model

Using the country-level data, we test the proposed research hypotheses. The research framework presented in Figure 1 leads to the empirical model.

$$Transition\_Process_{it} = \beta_0 + \beta_1(ICT\_spending)_{it-1} + \beta_2(Age\_transition)_{it} + \beta_3(GDP\_capita)_{it}$$
$$+ \beta_4(Secondary\_edu)_{it} + \beta_5(Pop\_growth)_{it} + \beta_5(CEE)_i + \beta_5(Latin)_i + \varepsilon_{it}$$

,where for country i in year t :

$$Transition\_Process_{it} = \begin{bmatrix} Econ\_free_{it} \\ Unemployment_{it} \\ Gini_{it} \\ Press\_oppression_{it} \end{bmatrix},$$

In order to test the hypotheses, we analyzed the dataset with multiple regression models. Each model includes socioeconomic or sociological values (i.e., *Econ_free*, *Unemployment*, *Gini*, or *Press_oppression* in a transition economy over seven years as a dependent variable and an explanatory variable (*ICT_spending*), as well as other control variables for economic (*GDP_capita*), demographic (*Secondary_edu* and *Pop_growth*), and transitional (*Age_transition*) factors in each country. In addition, two dummy variables indicating regions were included to control for unobserved heterogeneity among groups.

It is also necessary to construct a time-lagged dataset through which the impact of ICT spending on future transition processes could be longitudinally assessed. ICT spending values per GDP from 2003 through 2009 were used to predict transition processes from 2004 through 2010.

RESULTS AND DISCUSSION

We have reported the two sets of results from regressions. The first set of results includes the estimates from a pooled sample across the groups, and the second set of results presents the estimates from each individual regional dataset. While we have not reported the correlation matrix, we did not find strong correlations between the explanatory variables; all correlations were below .60; the highest correlation (ρ=-.56) among the explanatory variables was between *Pop_growth* and *ICT_spending*. Further, we tested for the presence of multicollinearity by means of Variance Influence Factors (VIF) of each explanatory variable for each regression model. The largest VIF was below 2.5, which indicates that multicollinearity was not an issue for our models.

ICT Impact on Transition Process for All Groups

First, we estimate the regressions using a pooled sample across the groups over time periods. The results of the tests of Hypotheses 1 and 2 are presented in Table 4.

Variables	Economic Freedom	Unemployment Rate	Wealth Inequality	Press Freedom
Intercept	36.694 (.357)***	5.273(4.504)	13.568(4.884)***	28.311(23.833)
ICT_spending	.522 (.176) ***	-.285(.085)***	.143(.082)*	.208(.448)
Age_transion	.119(.269)	.004(.129)	-.205(.148)	1.803(.686)**
GDP	.057(.292)	-.581(.140)***	-.506(.152)***	-1.344(.743)**
Secondary_edu	.104(.088)	- .068(.032)*	.395(.0459)***	.012(.224)
Pop_Growth	4.001(1.628)**	-.370(.783)	4.854(.850)***	-6.444(4.146)
CEE	8.426(2.615)***	6.417(1.259)***	-13.672(1.365)***	-45.251(6.661)***
Latin	10.046 (2.659)***	2.767(1.28)**	5.492(1.388)***	-31.247(6.773)***
R^2 (adj. R^2)	.545(.503)	.385(.328)	.741(.735)	.674(.643)
Sample size	91 (=13Countries * 7Years)	91 (=13Countries * 7Years)	91 (=13Countries * 7Years)	91 (=13Countries * 7Years)
* = p <.1 ** = p <.05 ***= p <.01				

Table 4. Analysis Results across Regions

Overall, the findings are supportive of the hypotheses. ICT spending is positively associated with overall economic freedom and job creation, but wealth equality and democratic value have negative or insignificant relationships with ICT spending. We examine the detailed economic and sociopolitical changes derived from ICT spending across the regions as follows.

ICT and Socioeconomic Changes: In our analyses of the impact of ICT spending on changes in economic freedom, the estimate of *ICT_spending* is positive and significant. This indicates that a 1% increase in ICT spending per GDP is projected to improve the overall economic freedom index by .52 percentage points across the groups of TEs. Furthermore, we found that higher ICT spending per GDP significantly increases the opportunity of job creation. This implies that the ICTs have created more job opportunities in transition economies by creating new ICT-related jobs and by changing existing jobs toward such new industries. In addition, the negative and significant estimate of *Secondary_edu* implies that there exist high demands for skilled workers in transition economies, an observation that stands in contrast to prior findings for more developed countries (Bresnahan et al., 2002; Brynjolffson and McAfee, 2011).

Interestingly, regional dummy variables are significant for two economic transition processes. They indicate that the outcomes from ICT-driven economic changes vary across regions. Compared with BRIC, Latin America and CEE countries have improved overall economic freedom, and countries in CEE and Latin America increased unemployment rates. In sum, we found that the ICTs have played a significant transformative role in TEs' socioeconomic changes. Consequently, the findings support Hypotheses 1a and 1b.

ICT and Sociopolitical Changes: Regarding the relationship between ICT and changes in sociopolitical values (Hypothesis 2), we found a negative association between ICT spending and sociopolitical indicators.

First, in terms of wealth inequality, the estimate of *ICT_spending* indicates a significant positive impact of ICT spending on the Gini index. Because the higher Gini index indicates more severe income inequality, as expected, the results demonstrate that a 1% increase in ICT spending per GDP is associated with a 14% increase in income inequality. Therefore, Hypothesis 2a is supported by the results.

Second, for Hypothesis 2b, the association between ICT spending and democratization is insignificant. Instead, economic growth (*GDP_growth*) in transition economies has a positive impact on shaping democratic values. This result may be partially explained by recent severe Internet censorship in BRIC countries (e.g., Google censorship in China). Two regional dummy variables indicate significant variations in democratic values exist for CEE and Latin countries against BRIC countries.

ICT Impact on Transition Process within Groups

To investigate the regional differences in the transformative role of the ICT in transition economies (Hypothesis 3), we observe the impacts of ICT spending on transition processes at the individual regional level. Tables 5 and 6 contain the results of region-level regressions.

Variables	CEE	Latin	BRIC
Economic Freedom			
Intercept	116.447(10.252)***	164.485(48.824)***	44.099(5.974)***
ICT_spending	.355(.091)***	6.79(1.082)***	.210(.259)
Age_transion	-.194(.238)	3.569(.853)***	.057(.204)
GDP	.068(.021) ***	1.927(.595)***	1.266(1.473)
Secondary_edu	.568(.095)***	-.234(.436)	.017(.089)
Pop_Growth	1.635(1.736)	–42.054(8.632)***	3.620(.706)***
R^2 (adj. R^2)	.736(.691)	.759(.712)	.781(.712)
Sample Size	35 (=5Countries * 7Years)	28 (=4Countries * 7Years)	28 (=4Countries * 7Years)
Unemployment Rate			
Intercept	34.949(11.071)***	-8.282 (12.125)	-6.449(6.199)
ICT_spending	-.616(.098)***	-.115(.299)	-.762(.269)**
Age_transion	.776(.657)	.247(.236)	.527(.211)**
GDP	-1.349(.000)***	.451(.164)**	1.286(1.523)
Secondary_edu	-.203(.103)**	.120(.121)	.117(.093)
Pop_Growth	-.122(1.873)	8.400(2.389)***	1.116(.733)
R^2 (adj. R^2)	.678(.622)	.545(.432)	.548(.410)
Sample Size	35 (=5Countries * 7Years)	28 (=4Countries * 7Years)	28 (=4Countries * 7Years)
* = p <.1 ** = p <.05 ***= p <.01*			

Table 5. Analysis Results of Individual Group's Economic Changes

Socioeconomic Changes: Overall, ICT spending is positively associated with improvements in the economic environment across three regions. Since all the regions have utilized ICT with the intention to improve economic conditions with intention,

they have experienced positive economic outcomes, economic freedom, and job creation. For CEE, the estimates for *ICT_spending* are significant for both economic factors. Meanwhile, Latin America and BRIC have experienced a significant and positive impact of ICT only on economic freedom and job creation, respectively. The findings imply that ICT has contributed to solving each region's critical economic problems in their transition status.

Variables	CEE	Latin	BRIC
Wealth Inequality			
Intercept	-16.934(11.072)	43.438(8.975)***	23.716(3.752)***
ICT_spending	-.358(.257)***	1.319 (.222)***	.884(.163)***
Age_transion	.211(.330)	-.989(.175)***	-.750(.128)***
GDP	-.539(.257***	.397(.000)***	-.458(.925)
Secondary_edu	.474(.103)**	.006(.089)	.237(.056)***
Pop_Growth	-1.593(1.874)***	14.022(1.768)***	5.44(.444)***
R^2 (adj. R^2)	.616(.550)	.748(.735)	.787(.784)
Sample Size	35 (=5^{Countries} * 7^{Years})	28 (=4^{Countries} * 7^{Years})	28 (=4^{Countries} * 7^{Years})
Press Oppression			
Intercept	88.143(22.615)***	-103.575(56.796)*	40.461(56.320)
ICT_spending	-.503(.502)	-3.017(1.105)**	13.309(2.448)***
Age_transion	-.475(1.008)	-4.812(1.402)***	-6.302(1.92)***
GDP	.625(.332)**	-.609(.772)	- 5.559(1.389)***
Secondary_edu	-.482(.206)**	.451(.565)	1.379(.846)
Pop_Growth	-6.773(4.388)	61.373(11.188)***	-12.306(6.658)**
R^2 (adj. R^2)	.488(.400)	.819(.774)	.798 (.734)
Sample Size	35 (=5^{Countries} * 7^{Years})	28 (=4^{Countries} * 7^{Years})	28 (=4^{Countries} * 7^{Years})
* = $p <.1$ ** = $p <.05$ ***= $p <.01$			

Table 6. Analysis Results of Individual Region's Sociopolitical Changes (** = $p < .05$)

Sociopolitical Changes: Unlike the findings for economic changes, the findings for sociopolitical changes do not present a consistent association with ICT spending among regions. Regarding wealth inequality, while CEE has experienced a significant and negative impact of ICT spending, the other two regions had a positive association with ICT. Because of increasing wage gaps between high-skill jobs and low-skill jobs that arose from imbalanced ICT use, Latin America and BRIC countries did not mitigate their existing income disparity, but CEE countries showed a stable employment rate and more even income distribution based on their well-balanced ICT use.

When it comes to democratization (*Press_oppression*) in transition economies, for CEE and Latin countries with the high intention to improve democratic values, ICT spending is positively associated with the vitalization of democracy. However, in the meantime, the estimate of *ICT_spending* for BRIC with lower intention for sociopolitical shifts indicates a negative effect of ICT spending on accelerating democracy, although they spent a higher portion of their GDP on ICT. A summary of the results is presented in Table 7.

	Overall	CEE	LATIN	BRIC
Economic Freedom	+***	+***	+***	+
Unemployment	-***	-***	-	-***
Wealth inequality	+*	-***	+***	+***
Press Oppression	+	-	-**	+***
* = $p <.1$ ** = $p <.05$ ***= $p <.01$				

Table 7. Summary of Results (** = $p < .05$)

Consequently, the findings confirm Hypothesis 3. With higher intentional use of ICT for economic changes, three regions commonly have seen improvements in economic conditions and better employment from ICTs. However, different levels of intention for sociopolitical transformation via ICT among regions have led to different results.

CONCLUSION

This research has attempted to examine the impact of ICT investment on the transition process of TEs. The results demonstrate that while ICT spending has a positive association with overall economic freedom and job creations, ICT investment is negatively or insignificantly associated with wealth equality and democratization of transition economies. Further, we have found that these associations differ according to each transition economy's intention of ICT use.

This study contributes to the extant literature on IT payoff and helps policymakers in transition economies. From a research perspective, this study provides new insight into the transformative role of ICT in transition economies over the past decade. Furthermore, it provides a diverse set of issues for future research. The growing demand for theorizing about the role of ICT in new economies will require researchers to conduct in-depth studies on specific aspects of the findings presented in this paper. From a practical perspective, these findings will assist policymakers from transition economies in utilizing ICT to achieve economic success and increase their sociopolitical status.

This paper's findings await further refinement from future studies. These findings are based on only three groups of transition economies. Thus, the results might vary with large observations and different model settings. Researchers will more completely investigate the full relationship between ICT investment and the transition process of transition economies by including other country groups.

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