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Linking Investments in Telecoms to Microeconomic Outcomes in Transition Economies: Empirical Investigation

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ABSTRACT

We propose and test a conceptual model allowing for investigating the microeconomic impact of investments in Telecoms, where Telecoms are used as a proxy for Information and Communications Technology (ICT) in general. While the impact of investments in Telecoms on the macroeconomic outcomes in the form of productivity growth has been previously investigated, there seems to be no published research that looked at the microeconomic impact of Telecom investments.

Keywords

Telecom investments, information technology for development, information technology in developing economies.

INTRODUCTION

Investments in Telecoms represent an important subset of overall investments in Information and Communication Technologies (ICT) that is made by almost any economy of the world. Multiple investigations inquired into the contribution of investments in Telecoms to the macroeconomic bottom-line represented by revenues from Telecoms and the overall growth in productivity. The general conclusion of the existing studies is that the more effective and efficient economies, with the higher levels of investments in Telecoms and more productive full-time labor, have a greater macroeconomic impact of investments. The mechanism of the microeconomic impact of investments, however, still remains an under-researched "black box". The overall objective of this study is to present and test a conceptual model to help understand the more detailed, "white box", path between investments in Telecoms and impacts of the investments delivered by means of Telecom products and services. While the macroeconomic impact of investments in ICT and specifically investments in Telecoms has been previously investigated, there seems to be no published research that looked at the linkage between Telecom investments and microeconomic outcomes as reflected in the private wealth of citizens.

We conducted our investigation in the context of *Transition economies* (TE), for it was noted that from a research perspective TEs are advantageous (Samoilenko, 2008), for this group is comprised of economies that share many characteristics with developed countries, and economies that share characteristics mainly with less developed regions (OECD 2004).

Consequently, finding in the context of TEs may be better generalized beyond the small group of highly developed countries, for it was previously noted that the insights reporting the overall positive effects of investments in ICT (OECD, 2005a,b,c; IMF, 2001; Samoilenko & Osei-Bryson, 2008a,b) in the context of the relatively homogenous developed countries (Lam & Lam, 2005; Madden & Savage, 1999; Dunne *et al*., 2004; Siegel, 1997) might not be applicable to more diverse environment of emerging, developing and transition economies. By concentrating on two groups of TEs, the more advanced *Leaders*, and less developed *Followers*, we pursue two goals in this investigation. First, we aim to identify the common pathways of the microeconomic impact of investments in Telecoms for two groups of TEs. Second, we seek to identify the pathways that differentiate the two groups. Knowing the nature of the differences between the *Leaders* and the *Followers*, the accomplishment of the first goal will allow us to possibly identify the context-independent impacts of investments that are not affected by the levels of capital investments, revenues, efficiency and effectiveness of an economy. By accomplishing the second goal we will be able to identify the impacts of investments that are context-dependent and are associated with the differences in the level of economic development of TEs. We describe the research model in the next section of the paper.

RESEARCH MODEL

The research model of our investigation is based on a set of intuitive assumptions that are well supported by the existing research and common knowledge. These are as follows:

A1: Some of the common outcomes of investments in Telecoms for a given economy are Telecom-related products and services intended for consumption on its internal market.

A2: A level of consumption of Telecom-related products and services for a given economy is associated with the price of one-time access fee (cost of entry) to, and the price of consequent continuing utilization (cost of use) of the network of the Telecom-related products and services.

A3: For a given economy, a decline in price of the utilization of the network of the Telecom-related products and services is associated with the decline in the price of access to the network.

A4: Decline in prices of entry and use of the network of the Telecom-related products and services makes the access to the network more affordable and allows for a greater access by the general population.

A5: For a given economy, a greater access to the network of the Telecom-related products and services is associated with the greater level of the private financial wellbeing of its consumers, greater participation of an economy in the international trade market, and in greater opportunities for the labor force of an economy.

A6: The level of a private financial wellbeing of the population has a positive impact on the participation of an economy in the international market and on the labor force of an economy.

The stated above assumptions could be summarized as follows:

> *For a given economy, investments in Telecoms result in lower costs and a greater affordability of the Telecoms-related products and services, this positively impacts the level of a disposable income of the population, the opportunities of the workforce, and the participation of the economy in international trade.*

The proposed model, depicted in Figure 1, is comprised of six constructs.

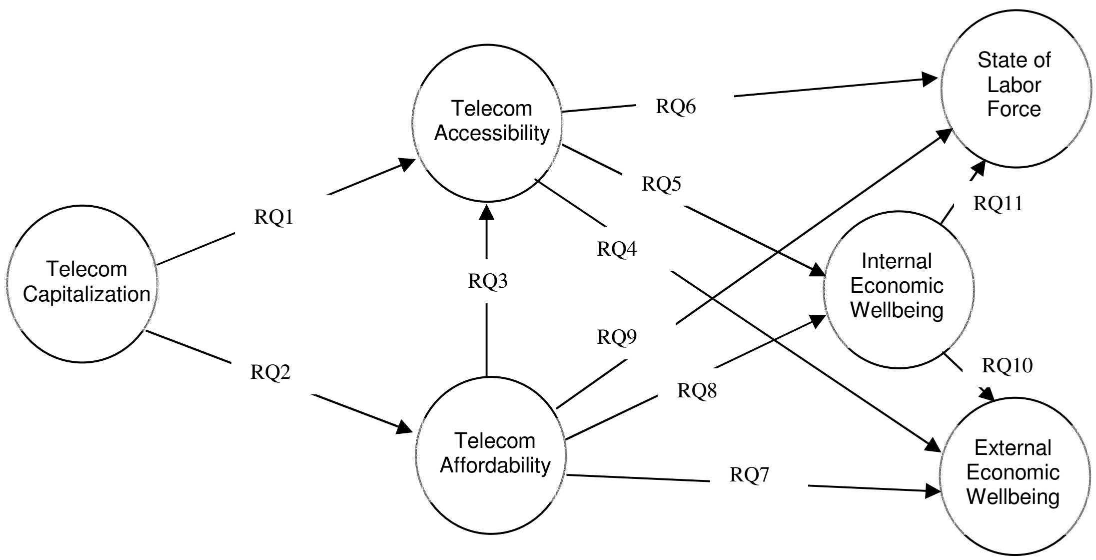

Figure 1 Conceptual model of macroeconomic and microeconomic impact of Investments in Telecoms

We provide the operational definitions of the constructs in Table 1.

Construct	Operational Definition
ICT Capitalization	A representation of the fiscal state of Telecoms in a given economy, conceptualized using the overall level of accumulated Telecom capital, Telecom investments, and a full-time Telecom workforce
ICT Affordability	A representation of the cost of joining the network of Telecom-related products and services
ICT Accessibility	A representation of the cost of the continuing participation in the activities offered by the network of Telecom-related products and services
Internal Economic Wellbeing	A representation of the level of disposable income of the population of an economy
External Economic Wellbeing	A representation of the level of the international trade-related participation and activities of an economy
State of Labor	A representation of the state of the workforce of an economy

Table 1 Operational Definition of the Constructs of the Research Model

Based on the proposed model we can formulate eleven research questions (see Table 2), which correspond to the paths between the constructs shown in the model.

RQ#	Path in the model	Formulation of the Research Question
RQ1	Telecom Capitalization ->	*Do capital investments in Telecoms result in greater accessibility of the Telecom*

	Telecom Accessibility	*infrastructure, products, and services?*
RQ2	Telecom Capitalization -> Telecom Affordability	*Do investments in Telecoms result in greater affordability of the Telecom infrastructure, products, and services?*
RQ3	Telecom Affordability -> Telecom Accessibility	*Whether a greater affordability of the Telecom infrastructure, products, and services is associated with the greater accessibility of the Telecom infrastructure, products, and services?*
RQ4	Telecom Accessibility -> External Economic Wellbeing	*Whether a greater accessibility of the Telecom infrastructure, products, and services is associated with improvements in external economic wellbeing?*
RQ5	Telecom Accessibility -> Internal Economic Wellbeing	*Whether a greater affordability of the Telecom infrastructure, products, and services is associated with a greater accessibility of the Telecom infrastructure, products, and services?*
RQ6	Telecom Accessibility -> State of Labor Force	*Whether a greater accessibility of the Telecom infrastructure, products, and services has a positive impact on the state of the labor force?*
RQ7	Telecom Affordability -> External Economic Wellbeing	*Whether a greater affordability of the Telecom infrastructure, products, and services is associated with improvements in external economic wellbeing?*
RQ8	Telecom Affordability -> Internal Economic Wellbeing	*Whether a greater affordability of the Telecom infrastructure, products, and services is associated with improvements in internal economic wellbeing?*
RQ9	Telecom Affordability -> State of Labor Force	*Whether a greater affordability of the Telecom infrastructure, products, and services has a positive impact on the state of the labor force?*
RQ10	Internal Economic Wellbeing -> External Economic Wellbeing	*Do improvements in internal economic wellbeing of an economy result in improvement in its external economic wellbeing?*
RQ11	Internal Economic Wellbeing -> State of Labor Force	*Do improvements in internal economic wellbeing of an economy positively impact its state of the labor force?*

Table 2 The hypothesized relationships between the constructs of the research model and the corresponding research questions

We use structural equation modeling (SEM) implemented with a partial least squares (PLS) approach to answer the research questions of the study.

OVERVIEW OF THE DATA ANALYTIC METHOD

Structural Equation Modeling (SEM) implemented with Partial Least Squares (PLS)

SEM is a methodology representing the second generation of multivariate analysis (Fornell, 1987). Unlike first generation statistical tools, exemplified by such techniques as cluster analysis, multiple regression, principal component analysis and others, SEM allows researchers to address a set of interrelated objectives within a single comprehensive analysis (Gefen *et al.,* 2000). Use of SEM allows researcher to posit a presence of the relationships between the unobserved variables, where every such variable is associated with one or many observed variables; unobserved variables are referred to as *latent* variables, and observed variables are referred to as *indicators* or *measures*.

SEM consists of two parts. The first part involves testing the *measurement* model and primarily deals with the validation of the latent constructs included the model. The second part involves the assessment of the *structural* model and involves testing of the hypothesized relationships between the latent constructs of the research model. The results of the assessment are based on the significance of the structural paths, which can be estimated by using such methods as general least squares (GLS), ordinary least squares (OLS), maximum likelihood estimation (MSL), partial least squares (PLS), and others. The basic structure of a SEM is depicted in Figure 2 below.

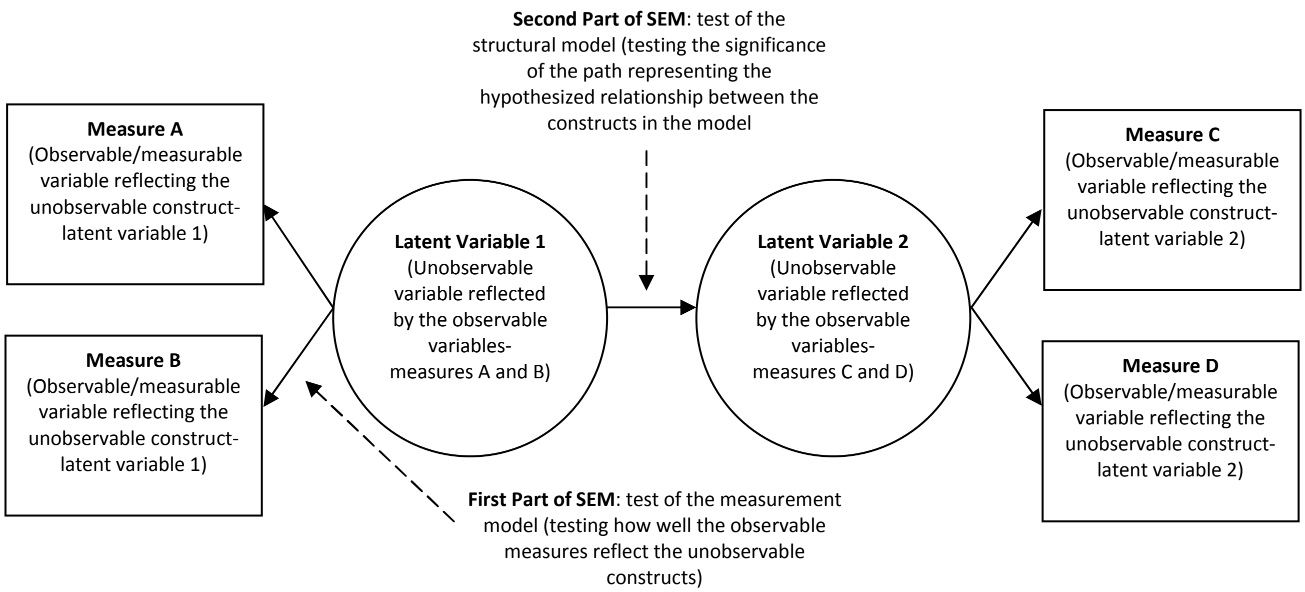

Figure 2 Structural Equation Modeling (SEM): Basic Structure and Components

There are two common approaches to SEM, covariance-based and variance-based. The covariance-based approach is based on the objective of minimizing the difference between the covariance matrix of the sample and the covariance matrix of the model. Thus, this approach is also commonly called factor-based, for the goal is to maximize the fit of the model by means of minimizing the unique variance; because of this goal of optimization of the fit the covariance-based approach is suitable for the investigations supported by a strong theory. In contrast, a variance-based approach attempts to optimize the predictive capability of the research model relative to the sample. The optimization of the prediction is achieved by estimating the parameters of the model by means of the minimization of the residual variances of the variables in the model (Chin, 1998); Because of the assumption that all the measured variance is useful variance to be explained, this method is commonly referred to as component-based.

One of the least restrictive methods for estimating parameters in covariance-based SEM is partial least squares (PLS) (Wold, 1966). The popularity of PLS is due to its minimal demands on measurement scales, sample size, and residual distribution (Chin, 1998). While covariance-based methods are more appropriate when the research model is supported by strong theory and well-developed measures, PLS is recommended and often used for the purposes of theory development (Barclay *et al.*, 1995).

Because the research questions of the study express the hypothesized relationships between the SEM' model constructs, we can answer them by assessing the results of the structural model of SEM with PLS. The assessment will involve evaluating strength of the relationships between the constructs, where each path is represented by the null hypothesis; the research questions with the associated null hypotheses are summarized in Table 3.

RQ#	Corresponding Null Hypothesis
RQ1	$H0_1$: *There is no statistically significant relationship between the constructs Telecom Capitalization and Telecom Accessibility*
RQ2	$H0_2$: *There is no statistically significant relationship between the constructs Telecom Capitalization and Telecom Affordability*
RQ3	$H0_3$: *There is no statistically significant relationship between the constructs Telecom Affordability and Telecom Accessibility*
RQ4	$H0_4$: *There is no statistically significant relationship between the constructs Telecom Accessibility and External Economic Wellbeing*
RQ5	$H0_5$: *There is no statistically significant relationship between the constructs Telecom Accessibility and Internal Economic Wellbeing*
RQ6	$H0_6$: *There is no statistically significant relationship between the constructs Telecom Accessibility and State of Labor Force*
RQ7	$H0_7$: *There is no statistically significant relationship between the constructs Telecom Affordability and External Economic Wellbeing*
RQ8	$H0_8$: *There is no statistically significant relationship between the constructs Telecom Affordability and Internal Economic Wellbeing*
RQ9	$H0_9$: *There is no statistically significant relationship between the constructs Telecom Affordability and State of Labor Force*
RQ10	$H0_{10}$: *There is no statistically significant relationship between the constructs Internal Economic Wellbeing and External Economic Wellbeing*
RQ11	$H0_{11}$: *There is no statistically significant relationship between the constructs Internal Economic Wellbeing and State of Labor Force*

Table 3 Null Hypotheses of the Study

DATA

The data for this study were obtained from the *World Development Indicators* database (web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS) and the *Yearbook of Statistics* (2009) of the *International Telecommunication Union (ITU)(* www.itu.int*)*. To minimize the heterogeneity of our sample we use TEs that are classified as *Transition economies in Europe and the former Soviet Union* (IMF, 2001). Overall, we were able to construct the data set on 18 TEs covering the period from 2003 to 2008. The complete membership of the sample of 18 TEs is represented in terms of two clusters presented in Table 4: the more efficient *Leaders* and the less efficient *Followers* (Samoilenko & Osei-Bryson, 2010).

Subgroup	General Membership of the subgroup
The *Leaders*	Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovenia, Slovakia

The *Followers*	Albania, Armenia, Azerbaijan, Belarus, Bulgaria, Kazakhstan, Kyrgyz Republic, Moldova, Romania, Ukraine

Table 4 Two subgroups of the sample of 18 TEs (Samoilenko & Osei-Bryson, 2010)

In order to account for the heterogeneity of the sample we will test two SEM models, one for the *Followers*, and one for the *Leaders*.

The representation of the latent variables of the research model is provided in Table 5 below. The representation of the construct *Telecom Capitalization* was modeled after the construct *ICT Capitalization* of Samoilenko and Osei-Bryson (2008a, b), the representation of the rest of the constructs is unique to this study.

Measure	Source variables	Representation	Latent Construct
ICTCap1	*GDP per capita*(in current US$) *Annual Telecom Investment per capita* (in current US$)	Ratio of *GDP per capita* to *Annual Telecom Investment per capita*.	Telecom Capitalization
ICTCap2	*Annual Total Revenue from Telecoms*(% of GDP) *Annual Investments in Telecoms*(% of GDP)	Ratio of *annual Total revenue from Telecoms* to *Annual investments in Telecoms*	
ICTCap3	*Full-time Telecom Staff* *Annual investment in telecoms(in current US$)*	*Ratio of Full-time telecom staff to the Annual investment in telecoms*	
Access1	*Business telephone connection charge, US$*	*Business telephone connection charge, US$*	Telecom Accessibility
Access2	*Residential telephone connection charge, US$*	*Residential telephone connection charge, US$*	
Afford1	*Price of a 3 minute fixed telephone local call, off peak rate, US$*	*Price of a 3 minute fixed telephone local call, off peak rate, US$*	Telecom Affordability
Afford2	*Business telephone monthly subscription, US$*	*Business telephone monthly subscription, US$*	
Afford3	*Residential telephone monthly subscription, US$*	*Residential telephone monthly subscription, US$*	
ExtW1	*Imports of goods and services (% of GDP)*	*Imports of goods and services (% of GDP)*	External Economic Wellbeing
ExtW2	*Exports of goods and services (% of GDP)*	*Exports of goods and services (% of GDP)*	
ExtW3	*Foreign direct investment, net inflows (% of GDP)*	*Foreign direct investment, net inflows (% of GDP)*	
IntW1	*Estimated Internet users per 100 inhabitants*	*Estimated Internet users per 100 inhabitants*	Internal Economic Wellbeing

IntW2	*Health expenditure, private (% of GDP)*	*Health expenditure, private (% of GDP)*	
IntW3	*International tourism, expenditures (current US$)* *GDP (current US$)*	*International tourism, expenditures(% of GDP)*	
EL1	*Employment to population ratio, ages 15-24, female (%)*	*Employment to population ratio, ages 15-24, female (%)*	State of Labor Force
EL2	*Employment to population ratio, ages 15-24, male (%)*	*Employment to population ratio, ages 15-24, male (%)*	
EL3	*Labor participation rate, female (% of female population ages 15+)*	*Labor participation rate, female (% of female population ages 15+)*	
EL4	*Labor participation rate, male (% of male population ages 15+)*	*Labor participation rate, male (% of male population ages 15+)*	

Table 5 Measures of the Current Research Model

RESULTS OF THE DATA ANALYSIS

Preliminary Data Analysis: Principal Component Analysis (PCA)

We used PASW Statistics 18 (formerly SPSS) package to conduct an exploratory PCA in order to determine whether our latent constructs and measures demonstrate a specific pattern of loadings, align in the same direction and the measures associated with a given latent construct load together on the same principal component. The detailed results of the PCA are presented in Table 6 and Table 7. Overall, six components were extracted under the pre-specified condition of eigenvalue of a component being greater than one, and using the most common rotation option, *varimax*, in order to obtain an easy to interpret solution where each measure would be maximally associated with a single construct. The cumulative variance extracted by six components was 85.31%, which is sufficiently high. The value of Kaiser-Meyer-Olkin (KMO) test of sampling adequacy was above 0.5 and the value of Bartlett's test of sphericity was less than 0.05 (Bollen & Long, 1993). Thus we conclude that our data set is suitable for PCA.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.587
Bartlett's Test of Sphericity	Approx. Chi-Square	1670.948
	df	153
	Sig.	.000

Table 6 Principal Component Analysis: Descriptive Statistics

The assessment of the results of PCA presented in Table 7 strongly suggests that our measures represent their respective latent constructs well; this allows us to continue our inquiry and perform PLS analysis. The three measures marked "(R)", namely, ExtW3, IntW1, and EL1, were later removed from the further analysis.

	Component						Communalities
	1	2	3	4	5	6	Extraction
Access1					0.919		0.933
Access2					0.900		0.893
Afford1			0.768				0.707
Afford2			0.902				0.861
Afford3			0.876				0.909
Cap1		0.959					0.976
Cap2		0.955					0.932
Cap3		0.869					0.842
ExtW1						0.777	0.881
ExtW2						0.765	0.838
ExtW3 (R)						0.590	0.498
IntW1 (R)			0.573	0.623			0.875
IntW2				0.937			0.913
IntW3				0.938			0.895
EL1 (R)	0.910						0.888
EL2	0.838						0.893
EL3	0.777						0.737
EL4	0.834						0.885

Table 7 Principal Component Analysis: Pattern of Loadings and Extracted Variance

Assessment of the research model involves two distinct steps. The first step, assessment of the *measurement model*, primarily deals with the evaluation of the characteristics of the latent variables and measurement items that represent them. The second step, assessment of the *structural model*, involves evaluation of the specified by the research model relationships between the latent variables.

SEM with PLS: Measurement Model

The process of evaluating the adequacy of the measurement model involves assessing the reliability of the individual items and their constructs, the convergent validity of the measures representing each construct, and discriminant validity of the measures (Hulland, 1999). We offer a summary of the assessment of *the Leaders'* model in Table 8, and the assessment of *the Followers'* model in Table 9. Table 10 contains the results of the assessment of the convergent validity of both models.

A test of the reliability of the individual items involves assessment of the loadings of the measures on their latent construct and in turn the assessment of the reliability of the constructs is conducted by assessing the composite reliability of the constructs. All measures of the internal consistency were above 0.7 (Nunnaly, 1978) and the values of variance shared by each construct and its measures were greater than 0.5 (Rivard & Huff, 1988). The results of the assessment of reliability of the individual measures illustrate that the measures and the constructs share the significant amount of variance (individual loadings of the all items are greater than 0.7); thus, our research model fares well in regard to the assessment of the reliability of the individual items.

Construct	AVE	Square Root of AVE	Composite Reliability	R Square	Cronbach's Alpha	Communality
Telecom Capitalization	0.9112	0.954568	0.9685	0	0.956	0.9112
Telecom Accessibility	0.9728	0.986306	0.9862	0.1725	0.9721	0.9728
Telecom Affordability	0.898	0.947629	0.9463	0.0347	0.8864	0.898
Internal Economic Wellbeing	0.9843	0.992119	0.9921	0.2717	0.984	0.9843
External Economic Wellbeing	0.7201	0.848587	0.8373	0.8382	0.6114	0.7201
State of Labor Force	0.9023	0.949895	0.9652	0.1435	0.946	0.9023

Table 8 Assessment of the Measurement Model of *the Leaders*

Construct	AVE	Square Root of AVE	Composite Reliability	R Square	Cronbach's Alpha	Communality
Telecom Capitalization	0.7728	0.87909	0.9105	0	0.863	0.7728
Telecom Accessibility	0.9728	0.986306	0.9862	0.2048	0.9721	0.9728
Telecom Affordability	0.8968	0.946995	0.9456	0.0729	0.8864	0.8968
Internal Economic Wellbeing	0.9173	0.957758	0.9569	0.1217	0.91	0.9173
External Economic Wellbeing	0.953	0.976217	0.9759	0.1618	0.9516	0.953
State of Labor Force	0.7799	0.883119	0.9139	0.6015	0.8621	0.7799

Table 9 Assessment of the Measurement Model of *the Followers*

The evaluation of the measure of internal consistency is commonly used for assessing convergent validity of the measures (Fornell & Larcker, 1981). The evaluation process involves assessment of the magnitude and significance of the t-values for the loadings of each of the individual items as well as the assessment of the loadings of the measures on their own constructs. It is expected that the t-values are significant and the measures representing their construct exhibit high loadings on that construct and low loadings on the other constructs in the model. The results (provided in Table 10) demonstrate that the research model passed the test of the convergent validity, for all t-values for all measures of the constructs are significant. Further assessment of convergent validity (Table 7) demonstrate that all measures in our research model share a lot of variance and loads highly only on their own constructs; this pattern is indicative of high convergent and high discriminant validity of the model.

Constructs and Measures	T-statistics, *the Followers*	T-statistics, *the Leaders*
Cap1 <- Telecom Capitalization	3.627	2.3271
Cap2 <- Telecom Capitalization	2.3857	3.828
Cap3 <- Telecom Capitalization	4.9152	3.2811
EL2 <- State of Labor Force	14.2762	6.2654
EL3 <- State of Labor Force	18.3242	7.5116
EL4 <- State of Labor Force	9.4139	9.6654
ExtW1 <- External Economic Wellbeing	9.921	20.1553
ExtW2 <- External Economic Wellbeing	12.809	16.5783
ICTAccess1 <- Telecom Accessibility	28.4769	66.4215
ICTAccess2 <- Telecom Accessibility	27.437	58.1425
ICTAfford1 <- Telecom Affordability	17.2509	26.8014
ICTAfford2 <- Telecom Affordability	19.4057	34.3235
IntW2 <- Internal Economic Wellbeing	42.2121	57.1787
IntW3 <- Internal Economic Wellbeing	41.4016	57.6581

Table 10 Assessment of Convergent Validity

The successful evaluation of the adequacy of our measurement model allows us proceed further with the assessment of the structural model.

SEM with PLS: Structural Model

The testing of the significance of the hypothesized relationships between the specified in the research model constructs requires assessing the paths of the structural model. Once the path coefficients between the constructs in the model have been calculated, we can evaluate the significance of the path coefficients and the significance level of the path. In SmartPLS t-values are obtained by running a bootstrapping procedure, while the significance level of the path is established by using 2-tailed t-distribution table. We present the results of the assessment of the structural model in Table 11.

Structural Path	*The Leaders*		*The Followers*	
	T Statistics	**Test of $H0_n$**	**T Statistics**	**Test of $H0_n$**
Telecom Capitalization -> Telecom Accessibility	0.1553	Accepted	2.4696	Rejected
Telecom Capitalization -> Telecom Affordability	2.0233	Rejected	3.8681	Rejected
Internal Economic Wellbeing -> External Economic Wellbeing	6.1307	Rejected	4.2627	Rejected
Internal Economic Wellbeing -> State of Labor Force	0.3615	Accepted	10.8886	Rejected
Telecom Accessibility -> External Economic Wellbeing	6.9537	Rejected	2.013	Rejected
Telecom Accessibility -> Internal Economic Wellbeing	4.5063	Rejected	0.2762	Accepted
Telecom Accessibility -> State of Labor Force	2.4555	Rejected	6.4332	Rejected
Telecom Affordability -> External Economic Wellbeing	11.6644	Rejected	5.0855	Rejected
Telecom Affordability -> Internal Economic Wellbeing	1.2904	Accepted	6.0657	Rejected
Telecom Affordability -> State of Labor Force	2.7258	Rejected	0.3609	Accepted
Telecom Affordability -> Telecom Accessibility	2.8256	Rejected	3.2728	Rejected

Table 11 Assessment of Structural Model

Overall, out of eleven paths of the research model we can identify six that are common to both groups of TEs (see Figure 3), while the rest of the paths represented by two that are unique to the Leaders, and three that are unique to the Followers (see Figure 4).

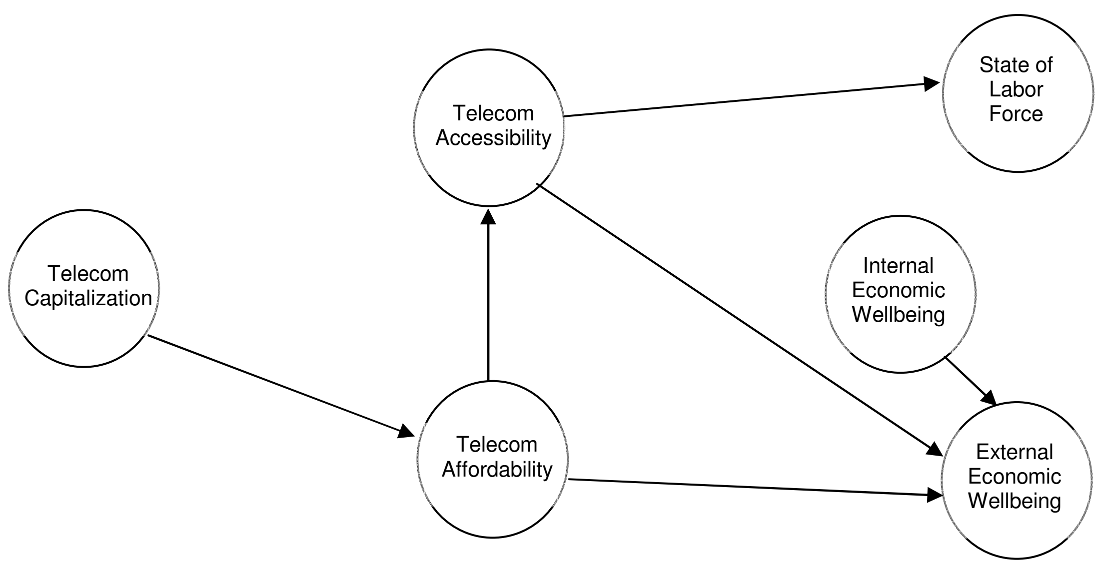

Figure 3 Common Paths in the Model

The common paths possibly indicate the routes by which investments in Telecoms impact microeconomic outcomes of economies regardless of the level their economic development. For example, it is reasonable to assume that overall cost of using Telecom products and services decreases regardless of the context as capital investments in Telecoms transformed into the Telecoms infrastructure- this may explain the commonality between the Leaders and the Followers in regard to *Telecom*

Capitalization->Telecom Affordability path. However, it also reasonable to assume that the construct *Telecom Accessibility* does not only depict the cost of access of the network of Telecoms-related products and services, but also reflects the "last mile problem", solution of which is dependent on the level of existing infrastructure. If this is so, then it is understandable why the construct *Telecom Capitalization* of only *the Followers,* but not *the Leaders,* is associated with *Telecom Accessibility*, for the level of the accumulated Telecom capital of *the Leaders* is much higher than the capital of *the Followers* (Samoilenko, 2008). Meaning, *the Leaders* can make Telecom-related products and services more affordable by making them cheaper, but *the Leaders* cannot make them more accessible, for they are already accessible enough to all who wants to access them, by virtue of the accumulated Telecom capital and Telecom infrastructure. *The Followers*, however, still lag in this regard (Samoilenko, 2008) and could increase the level of accessibility by making additional investments in Telecoms.

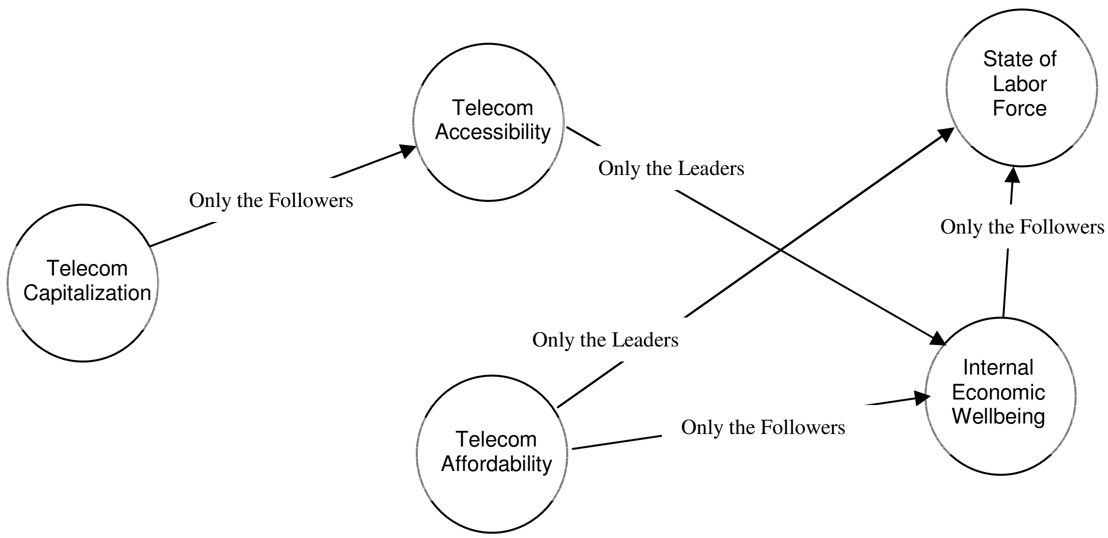

Figure 4 Paths in the Model differentiating *the Leaders* from *the Followers*

DISUSSION AND CONCLUSION

Regardless whether the context is represented by developed, developing, or least developed economies there are two routes by which investments in Telecoms may impact a macroeconomic bottom line. The first way is via the *spillover effect*, where the impact of investments is indirect and investments work by causing other economic factors or entities to be more productive. The second way is by providing a return on investments in the form of revenues that contribute directly to the overall GDP. Samoilenko and Osei-Bryson (2008a,b) found that in the context of TEs those countries with higher levels of telecom investments also produced higher level of revenues. However, the findings also suggest that the lower level of investments is not the only culprit staying on the path to the high level of revenues, for the TEs with the lower levels of investments also exhibit a much greater levels of inefficiencies in the process of converting investments into revenues and display a lack of complementary effects of investments in Telecoms and Telecom labor. The current investigation offers additional insights into the mechanism by which *Investment-to-Revenues* route works, for the constructs *Telecom Accessibility* and *Telecom Affordability* are the integral components of the revenue-generating process by which investments in Telecoms impact macroeconomic bottom-line.

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