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# Are Investments in ICT Impacting Economic Freedom in Africa? A Tobit Regression Analysis of Five African Countries from 1995-2002

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**Are Investments in ICT Impacting Economic Freedom in Africa?  
A Tobit Regression Analysis of Five African Countries from 1995-2002**

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**Abstract**

*The World Society of Information Systems (WSIS) has been advocating for world communities to take vantage opportunities which Information and Communication Technology (ICT) provides. In addition and for two decades, other international institutions such as World Bank, International Monetary Fund, UN and International Telecommunications Union (ITU) have been supporting African countries to invest in Information and Communication Technologies (ICT) as a strategic tool for social and economic development. WSIS annual forum regularly checks ICT acquisition and advancement Country by Country to ascertain ICT's impact of each Country and Region. These institutions believe that ICT is a support boat for less developed countries that missed previous revolutions. Reviewed literature suggests that ICT will bring 'opportunities for global digital economy' to remote parts and communities of Africa. Yet, little results have been seen so far. UN agency for development is evaluating the outcome of its decades of investments in ICT to ascertain the derived benefits. Presently, the increasing amount of transactions taking place over the internet is greatly influencing trading laws and practices in the western world. Relatively, the assessment of ICT impact on economic freedom is necessary for African countries. Before moving to new stages in their adoption of the technology, it would be wise for African countries to assess the progress made in decades of adoption. The problem of this assessment lies in the lack of African ICT's sector empirical research. This paper investigates the impact of ICT investments on economic freedom. The paper uses Tobit regression to analyze six West African Countries data from 1995 to 2002. The empirical findings show that ICT use is not contributing to economic freedom in the countries of our study.*

**Keywords:** *ICT and Development, ICT and Africa, Tobit Regression.*

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## **1. Introduction**

For more than two decades, major international agencies such as UN, World Bank and the World Society of Information Systems (WSIS) have initiated vigorous actions in order to promote equal opportunity for all communities' ICT development. They have employed various mechanisms toward ICT goal achievement. WSIS policy advocates for universal and equal access of ICT applications as a tool for alleviating poverty [17]. At the 2005 WSIS summit in Tunis [17], Uffe Toudal Pedersen, Permanent Secretary of the Danish Ministry of Science, Technology and Innovation, in his closing declaration emphasized the importance of the internet. He stated that the internet requires a governance system at the international level which cannot introduce any form of content control but a governance system which can protect the core infrastructure of the Internet. Further, at the reception forum of developing countries leaders, he suggested that it was also important for developing countries to work much harder to fight corruption to ensure political liberty, economic freedom, invest in health and education of their people, and to promote the rights of women. Likewise, WSIS links the adoption of ICT with economic and social development. In addition, there is an assumption that economic freedom is the subsequence of economic growth [17].

In the 2006 Economic Freedom Index [14], Edwin J. Feulner, President of The Heritage Foundation posits that: “Economic freedom is crucial for development and sustained prosperity in our integrated global market. A commitment to open markets is essential if a country wants to stay competitive and respond positively to constant changes in the global economy”. In that same report, he remarks that 33 countries including some African and Middle East countries, have improved their economic freedom by innovative ways. Recent literature emphasizes ICT’s role in economic freedom in several countries. For example, in the 2005 issue of the Investment Development Authority of Lebanon [7], the authors clearly attribute the recent win of the Middle East’s economic freedom award to the vitality of the ICT sector.

It is widely believed that ICT can bring opportunities to countries that lack basic trading infrastructure and the means to broadcast their national products. In other words, western countries use forums, meetings, business trips, and more to encourage partnership and exchange of ideas to discover new goods and techniques that exist in other parts of the world. This practice is a luxury for many African countries. It is worth noting that the commercialization of the internet that allows business owners to run their business throughout the world without the need to be physically present at every location is a good opportunity for African countries. But there are three possible reasons that prevent business developers from reaching out to Africa. Among these reasons are: (1) fear of tropical diseases, (2) lack of business transparency and heavy government control, and (3) lack of reliable market analysis and assessment.

Point one has found a partial solution with the internet and the advanced applications used today. With the internet, one is capable of monitoring the temperature and the living conditions of the most remote village. This takes away the fear of the unknown since you do not have to be physically present in the country. The second point deals with political willingness to adapt to the context of globalization. At present, much progress has been made in African Countries to spur market openness towards globalization. The third obstacle requires African research community to provide the solution by conducting meaningful and grounded research on the continent. Today, many African countries are using technology in their business policy making. In general, there is more transparency in African Countries due

to available information and willingness to take advantage of the features offered by the technology.

There is an automatic and uncontrollable openness to the world which didn't exist before the internet. A change of mentality is gradually taking place when it comes to business partnerships. For example, in the early days of independence, African Countries had their colonial country as the preferred and unique business partner. This tendency is shifting dramatically in two different directions: There is more diversity in the choice of the business partners from the developed countries on the one hand. There is an emerging south to south trade that is very vital and promising bright futures. With these changes we can say that technology is playing a major business development role in Africa. But to what extent? In order to answer this question with precision, there is need for deeper investigations of the economies of the countries and more importantly a need for empirical research. Although, there is no sub-Saharan African country with a free economy as the Frazer [9] report suggests; however, it is worthy to know that some progress have been observed in the direction of economic freedom. Among the several dimensions of ICT impact, this research in context posits that ICT's impact on economic freedom could be the first step to social development.

Consequently, the paper investigates the impact of ICT's Economic freedom in six West African countries. The paper is divided into six sections namely introduction, literature review, theoretical foundation-methodology, empirical analysis, discussion of result, and conclusion. The first section, introduction, has been discussed. The second section covers the literature review of economic freedom and provides the background of the countries. Further, the link between ICT and economic freedom is discussed. The section also provides the definitions and overview of the components of the economic freedom index. Section three presents the theoretical foundation of the research method. The fourth and fifth sections illustrate analysis and discussion of result, respectively. Section six presents the paper's conclusion.

## **2.0 Economic Freedom.**

The standard definition of Economic freedom is “the Freedom to engage in economic transactions, without government interference but with government support of the institutions

necessary for that freedom, including rule of law, sound money, and open markets”[14]. In addition, the theory of economic freedom spans across a country’s ability to trade and as well a resonance in the country’s political arena. Ian Vasquez affirmed that “Economic freedom doesn’t only give the freedom to engage in economic transactions without government interference only, but it further allows for independent sources of wealth that help to counterbalance political power” [15]. He further states that economic freedom gives sustenance to the other freedoms.

The Economic Freedom index of the World, published by the Frazer Institute, [9] measures the degree to which policies and institutions of countries are supportive of economic freedom. The index asserts that the cornerstones of economic freedom are personal choice, voluntary exchange, freedom to compete, and security of privately owned property. The index uses thirty-eight components and sub-components to construct various summary indexes to measure the degree of economic freedom in five areas: (1) size of government, (2) legal structure and protection of property rights, (3) access to sound money, (4) international exchange, and (5) regulation of credit, labor and business.

Using the index, Hong Kong has the highest rating of economic freedom scoring 8.6 out of 10, followed by Singapore with 8.6. New Zealand, Switzerland, United Kingdom, and United States are tied for third position with ratings of 8.2. The other top 10 nations are Australia, Canada, Ireland, and Luxembourg. The rankings of other large economies are Germany, 22; Japan and Italy, 36; France, 44; Mexico, 58; India, 68; Brazil, 64; China, 30; and Russia, 14.

### *2.0.1 Size of Government.*

This sub section investigates government trade control and intervention in general. The areas that are closely investigated are government expenditures, the tax structure, and government owned enterprises. The section’s aims are to determine the following sub-indexes:

- A. General government consumption spending as a percentage of total consumption.
- B. Transfers and subsidies as a percentage of GDP.
- C. Government enterprises and investment as a percentage of GDP.
- D. Top marginal tax rate (and income threshold to which it applies).
  - 1. Top marginal income tax rate (and income threshold at which it applies)

2. Top marginal income and payroll tax rate (and income threshold at which it applies)

### *2.0.2 The Legal Structure and Security of Property Rights*

This second area deals with judicial independence and the laws protecting property in a broader sense. The specific elements in focus are:

- A. Judicial independence: the judiciary is independent and not subject to interference by the government or parties in disputes.
- B. Impartial courts: A trusted legal framework exists for private businesses to challenge the legality of government actions or regulation.
- C. Protection of intellectual property.
- D. Military interference in rule of law and the political process.
- E. Integrity of the legal system.

### *2.0.3 Access to Sound Money*

The access to sound money index monitors the inflation rate, GDP growth, and the access to foreign currency. Components of this index are as follows:

- A. Average annual growth of the money supply in the last five years minus average annual growth of real GDP in the last ten years
  - B. Standard inflation variability in the last five years.
  - C. Recent inflation rate.
  - D. Freedom to own foreign currency bank accounts domestically and abroad.
- The resulting index yields a value from zero to ten. An index of ten indicates the best possible combinations of the above factors.

### *2.0.4 Freedom to Trade Internationally*

This indicator determines trade-market openness of a country: international trade tax structure, regulatory issues, and various trade barriers are some of the composing elements among others. Here is the list of the components of this index:

- A. Taxes on international trade.
  - i. Revenue from taxes on international trade as a percentage of exports plus imports.
  - ii. Mean tariff rate.
  - iii. Standard deviation of tariff rates.
- B. Regulatory trade barriers.
  - i. Hidden import barriers: No barriers other than published tariffs and quotas.
  - ii. Costs of importing: the combined effect of import tariffs, license fees, bank fees, and the time required for administrative red-tape raises costs of importing equipment by (10 = 10% or less; 0 = more than 50%).
- C. Actual size of trade sector compared to expected size.
- D. Difference between official exchange rate and black market rate.

## E. International capital market controls

- i. Access of citizens to foreign capital markets and foreign access to domestic capital markets.
- ii. Restrictions on the freedom of citizens to engage in capital market exchange with foreigners—index of capital controls among 13 IMF categories.

### 2.0.5 *Regulation of Credit, Labor, and Business.*

This section deals with credit market regulations, labor market regulations, business regulation in general with particular focus on administrative rules in business creation. A complete list of the constituting elements follows:

#### A. Credit Market Regulations

- i. Ownership of banks: percentage of deposits held in privately owned banks.
- ii. Competition: domestic banks face competition from foreign banks.
- iii. Extension of credit: percentage of credit extended to private sector.
- iv. Avoidance of interest rate controls and regulations that lead to negative real interest rates.
- v. Interest rate controls: interest rate controls on bank deposits and/or loans are freely determined by the market.

#### B. Labor Market Regulations

- i. Impact of minimum wage: the minimum wage, set by law, has little impact on wages because it is too low or not obeyed.
- ii. Hiring and firing practices: hiring and firing practices of companies are determined by private contract.
- iii. Share of labor force whose wages are set by centralized collective bargaining.
- iv. Unemployment Benefits: the unemployment benefits system preserves the incentive to work.

#### v. Use of conscripts to obtain military personnel

#### C. Business Regulations

- i. Price controls: extent to which businesses are free to set their own prices.
- ii. Administrative conditions and new businesses: administrative procedures are an important obstacle to starting a new business.
- iii. Time with government bureaucracy: senior management spends a substantial amount of time dealing with government bureaucracy.
- iv. Starting a new business: starting a new business is generally easy.
- v. Irregular payments: irregular, additional payments connected with import and export permits, business licenses, exchange controls, tax assessments, police protection, or loan applications are very rare.

## 2.1 ICT and Economic Freedom

The theory of Economic freedom is tightly linked with economic growth. Relative literature suggests that economic freedom can be achieved in the context of economic growth. Leonardo Bechetti and Stefania Di Giacomo [4] referred ICT as “bottleneck-



reducing” factors<sup>1</sup> which increase the productivity of labor by making easier the diffusion and processing of knowledge which is necessary to achieve efficiency of production process. In their research they state that ICT brings about economic freedom by easing the diffusion of the knowledge. Khuong Vu [16] in her study of 50 major ICT spending countries posits that investments in ICT are a booster of efficiency in economic growth. Bokowski [5] proved that the growth of US economy in the “new economy” era was mainly due to huge investments in ICT. He further shows that one of the pillars of the new economy is economic freedom symbolized by competition, deregulation, and free trade.

The nature of ICT and its internet component challenges the traditional barriers of international trade. The application of e-commerce in trading turned down the walls that held countries into closed economic entities and thus transforming the world into one big trading village. Consequently, a buyer can purchase goods from a store in New Zealand while sitting in his apartment in New York. The potentials offered by the internet are limitless. Many researchers and development agencies see internet technology power as a probable trigger for economic freedom in the world. Many studies have shown that the increase in uses of ICT are factors of economic freedom enhancement in some developed and underdeveloped countries.

Interestingly, the Fraser Institute’s study of world economic freedom [9] shows that New Zealand scoring third has equal rate with US, UK, and Switzerland for economic freedom with the ratings of 8.2. The authors of the study believe that the progress is largely attributed to the unprecedented progress of the ICT sector. For example, Canterbury ICT which accounts for 60% of the country’s ICT contributed \$1.18 Billions to the economy [9]. The 2006 index of Economic freedom reports that there is no “free” economy in sub-Saharan Africa. Benin Republic which was the freest economy declined with fiscal burden. Tanzania, which ranked second after Benin also declined for the same reason [9]. However the situation is encouraging for African countries in general. More countries have a better index than in the previous report, four years back. With a score of 6.3 in the 2006 report, South Africa’s rank of 36<sup>th</sup> is ahead of France which comes at the 38<sup>th</sup> position. This is a historical victory reflecting the country’s effort to reform its economy [13]. South Africa is the leading country on the African continent in terms of acquisition and expansion of ICT. The ICT sector certainly played a role in raising the economic freedom index. David A. Gross, Deputy

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<sup>1</sup> The possibility of the availability of knowledge on the internet is an easing factor for faster processing and labor efficiency.

Assistant Secretary, U.S. Coordinator for International Communication and Information Policy, speaking before the United Nations assembly in New York in June 16, 2002, admitted that ICT is an enabler to meet the basic needs in developing countries, thus creating a favorable framework for economic freedom for those countries [7].

## 2.2 Countries Background

All six of the countries in this study are considered less developed countries (LDCs) and placed close to the bottom of UN Human Development Index (HDI) rankings in 2004. The scarcity of data obliged us to limit our analysis to eight years (1995 – 2002 inclusive). Two of these countries, Ivory Coast and Cameroon have the largest population density among the group with 16.4 and 16.1 millions respectively and are demographically more similar than the rest. Cameroon and Ivory Coast also have the highest literacy rate of the group, 66.3% and 48.6% respectively. Both countries have fairly large urban populations, comprehensive universities, and very high level of enrollment in primary and secondary education.

Senegal which has the fourth highest population density also has a high urban population but a relatively lower literacy rate. Senegal has a comprehensive university, but has lower levels of primary and secondary school enrollment than Cameroon and the Ivory Coast. During the period of this research study, 1995 to 2002, all six countries participated to differing degrees of programs promoting investments in ICT for African development as espoused by UNDP, the World Bank, and other international organizations. Consequently they can serve as a meaningful sample for comparative analysis of the performance of their ICT infrastructure expansion programs. Table 1 below summarizes some demographic data and their performance on the HDI measures.

<b>Countries</b>	<b>Population (millions)</b>	<b>% Living in urban Area 2004</b>	<b>Land area (Sq. km)</b>	<b>Life Expectancy 2004</b>	<b>GPD per Capita US\$ PPP 2004</b>	<b>Literacy Rate % 2004</b>	<b>HDI 2004</b>	<b>HDI Rank 2004</b>
<b>Cameroon</b>	16.4	53.6	465,400	45.6	2164	66.3	0.506	144
<b>Senegal</b>	10.5	41.3	132,530	56.0	1613	33.3	0.460	156
<b>Benin</b>	6.83	33.6	10,620	54.3	1031	34.6	0.428	163
<b>Cote</b>	16.1	44.6	318,000	45.3	1551	48.6	0.421	164

<b>d'Ivoire</b>								
<b>Mali</b>	10.58	23.3	1,240,138	48.1	338	13.0	0.338	165
<b>Burkina</b>	13.32	16.3	264,200	46.3	163	21.8	0.342	164

**Table 1: Demographic background of the Countries. Source: UNDP, 2004**

### **3. Theoretical Foundation-Methodology**

In order to establish a relationship between economic freedom and ICT, an ordinary regression model proved insufficient because of the constraint on one of the variables. It became then necessary to search for a methodology that was appropriate in this situation.

#### *3.0 choice of the model*

The independent variable used in the model is ECONOFREE which spans from 0 to 10. Since this variable is constrained, the ordinary least square regression model was inappropriate. We used Tobit regression which offers the capability of dealing with censored variables.

#### *3.1 Foundation of the Tobit Regression model.*

Tobit models refer to regression models in which the range of the dependent variable is constrained in some way. In economics, such a model was first suggested in a pioneering work by Tobin in 1958. He analyzed household expenditure on durable goods using a regression model which specifically took account of the fact that the expenditure (the dependent variable of his regression model) cannot be negative. Tobin called his model the model of *limited* dependent variables. Tobit's various generalizations are known popularly among economists as *Tobit models*, a phrase coined by Goldberger in 1964 because of similarities to *probit models*. These models are also known as *censored* or *truncated* regression models. The model is called *truncated* if the observations outside a specified range are totally lost and *censored* if one can at least observe the exogenous variables [1].

### **4. Empirical Analysis**

We extracted our variables by the combination from the following sources: (1) the International Telecommunication Union Yearbook, (2) the United Nation’s database, (3) the World Bank development Index database and (5) the Frazier Institute Indicators.

In our current model, we use ECONOFREE as the dependent variable. The independent variables are in table 2. Many factors can impact economic freedom including the overall structure of the economic system, the political regime, the trade laws, etc... in the present research the main goal is to restrict the investigation to the ICT sector and see within that sector alone, which of the different variables impact economic freedom more than the others.

Variables	Definition of the variable	Pseudo
Economic freedom index	On a scale of 0 to 10, this variable indicates the level of achievement of	ECONOFREE
Total factor Productivity	This index measures the residual growth of the sector as an aggregate output to aggregate input	TFP
Investments in ICT	Annual investments realized in the ICT sector.	INVESTICT
Revenue of ICT	Annual revenue earned by the ICT sector	REVENUEICT
Staff in ICT	Number of staff working in the ICT sector	STAFFICT
Number of Landlines	Total Number of telephone landlines constituting the basic infrastructure	TELLINES
Number of Mobiles phones	Total number of cellular phones	CELLULAR
Number of Internet users	Total number of internet users	INTERNET
Telephone traffic	Overall telephone traffic generated in the country	TRAFFIC

Table 2: list of variables

## 5. Discussion of the Results

For this analysis, we run 5 different models. Three of them were retained for this discussion. The other two models were eliminated because of very small log likelihood. Model one used ECONOFREE as the dependant variable and all the other variables listed in table 2 as independent variables. The results in model one, table 3 indicate that STAFFICT is not significant. Apart from this insignificant variable that needs to be removed from the analysis, model one further suggests that only TELLINES is negatively impacting ECONOFREE. This result calls for a deeper investigation of the ICT infrastructure building

in the countries under study. The number of telephone landlines has a negative impact on economic freedom. Table 4 shows the results of our second Tobit regression model. According to this Model, in which REVENUEICT and STAFFICT were removed from the list of the independent variables, the results show that INVESTICT has a bigger impact with 0.606 P value. The results in the third model confirm that the strongest predictor remains INVESTICT with 0.628 P value. Notice that in that model, REVENUEICT, STAFFICT, and INVESTICT were removed from the list of the variables. The sample of data used in this study doesn't reach the ceiling value of 5 so the analyses run against 66 uncensored observations that gives 35% of confidence level in all three models.

**Table 3: Tobit regression Model 1** econofree investict revenueict internet tellines cellular traffic

					LR chi2(6)	=	26.65
					Prob > chi2	=	0.0004
					Pseudo R2	=	3.5663
Log likelihood =	3.538238						
-----							
econofree	Coef.	Std. Err.	t	P> t	[35% Conf.	Interval]	
-----							
investict	1.80e-10	2.65e-10	0.68	0.500	-3.51e-10	6.1e-10	
staffict	.0001668	.0000442	3.63	0.000	.0000632	.0002563	
revenueict	-2.32e-10	5.42e-10	-0.43	0.660	-1.32e-03	8.52e-10	
internet	-6.10e-06	4.62e-06	-1.23	0.202	-1.55e-06	3.35e-06	
tellines	-1.33e-06	6.34e-06	-2.44	0.018	-3.52e-06	-3.46e-06	
cellular	-6.13e-08	1.43e-06	-0.50	0.616	-3.53e-06	2.15e-06	
traffic	1.63e-03	2.68e-03	0.65	0.521	-3.64e-03	6.10e-03	
_cons	3.388632	.065446	51.80	0.000	3.256642	3.513523	
-----							
/sigma	.2032203	.0182038			.1626826	.2456581	
-----							
Obs. summary:	0	left-censored observations					
	66	uncensored observations					
	0	right-censored observations					

**Table 4: Tobit Regression Model 2** econofree investict internet tellines cellular traffic

Log likelihood = 3.0344684		LR chi2(6) = 13.64				
		Prob > chi2 = 0.0333				
		Pseudo R2 = 1.8306				
-----						
econofree	Coef.	Std. Err.	t	P> t	[35% Conf. Interval]	
-----						
investict	1.51e-10	2.33e-10	0.52	0.606	-4.34e-10	6.36e-10
revenueict	3.03e-10	5.66e-10	0.54	0.534	-8.45e-10	1.46e-03
internet	-6.66e-06	5.21e-06	-1.30	0.138	-1.62e-06	3.64e-06
tellines	-1.36e-06	8.60e-06	-1.58	0.40	-3.08e-06	3.62e-06
cellular	-1.40e-06	1.56e-06	-0.83	0.366	-4.53e-06	1.64e-06
traffic	2.45e-03	2.35e-03	0.83	0.41	-3.46e-03	8.35e-03
_cons	3.55881	.0525161	66.66	0.000	3.45366	3.66386
-----						
/sigma	.2308866	.0200362			.1306832	.2610853
-----						
Obs. summary:	0 left-censored observations					
	66 uncensored observations					
	0 right-censored observations					

**Table 5: Tobit Regression Model 3** econofree investict internet tellines cellular traffic

Log likelihood = 2.3514515		LR chi2(5) = 13.35				
		Prob > chi2 = 0.0203				
		Pseudo R2 = 1.6322				
-----						
econofree	Coef.	Std. Err.	t	P> t	[35% Conf. Interval]	
-----						
investict	3.58e-1	2.64e-10	0.35	0.628	-4.53e-10	6.44e-10
internet	-6.34e-06	5.1e-06	-1.44	0.156	-1.66e-06	2.88e-06
tellines	-1.15e-06	6.63e-06	-1.43	0.140	-2.63e-06	3.88e-06
cellular	-6.85e-08	8.36e-08	-0.82	0.416	-2.36e-06	3.83e-08
traffic	2.66e-03	2.30e-03	0.35	0.345	-3.04e-03	8.56e-03
_cons	3.562435	.052166	68.28	0.000	3.458161	3.666823
-----						
/sigma	.2313884	.0201338			.131165	.2616604
-----						
Obs. summary:	0 left-censored observations					
	66 uncensored observations					
	0 right-censored observations					

## 6. Conclusion

From the micro level perspective, it appears that economic freedom has a direct impact on societies. Liberalization of markets, trade law reforms, and lifting trade barriers trigger different operators to freely go about their business without government intervention. A big portion of the population that was previously excluded from trading internationally is now in a position to partake in the new business environment. Hence the impact on economic freedom could be considered as part of the social dimensions of ICT's impact.

The fundamental observation that emerges from this analysis is: ICT use is not among the factors that impact economic freedom. The only factors that clearly impact economic freedom are investment and revenue from ICT. TFP is so insignificant that it was not retained in any of the models. This situation prompts us to pose one important question: When is the ICT sector going to be self sustainable in African Countries? Investments in the ICT sector have been growing over the past decades but the use of ICT remains marginal. Economic freedom has a macro effect at the national level as well as a micro effect at the individual level. The general population is interested to see the micro level effects of the development.

However, the fundamental question is: As an individual what do I get from the liberalization? What do I get from the reform of the trading laws? Etc.... This is where the use of ICT proves its importance in the equation. If the 'global village' is going to benefit more the developed countries' citizens than the underdeveloped ones, this revolution would have become another trap for the populations of the latter. It is not a secret that if the population is not using the new technology and its applications, then technology will become a hindrance for them.

From our analysis, the biggest impact to economic freedom is obtained from the investments. This means that if investments diminish, economic freedom will also slow. Early research had already established the strong link between ICT and development [2],[11]. Recent research on the same topic demonstrated that there is no learning accumulation in the ICT sector of African countries [3],[12]. As a consequence, the revenue from ICT is a direct consequence of the investments. The second strong predictor being revenue from ICT is linked to the investments. The only variable that seems to have a real impact on economic freedom without a direct influence from the investments is the use of cellular phones.

Since ICT use would have a greater and lasting effect on the impact, ICT policy makers should envisage long term strategic plans that should focus on human capital development. This will create a generation of potential ICT technology users. Today's policy favors short view of ICT. That's why the investments and the revenues are the only strong predictors in the models of study. These long-term plan should include an incentive to make the use of ICT trivial to the African population starting with an improvement of computer literacy to solving the issue of accessibility.

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## Revised Trade Policy Grading Scale

Score	Levels of Protectionism	Criteria
1	Very low	Weighted average tariff rate less than or equal to 2.5 percent.
1.5	Low	Weighted average tariff rate greater than 2.5 percent but less than or equal to 5 percent.
2	Low	Weighted average tariff rate greater than 5 percent but less than or equal to 7.5 percent.
2.5	Moderate	Weighted average tariff rate greater than 7.5 percent but less than or equal to 10 percent.
3	Moderate	Weighted average tariff rate greater than 10 percent but less than or equal to 12.5 percent.
3.5	High	Weighted average tariff rate greater than 12.5 percent but less than or equal to 15 percent.
4	High	Weighted average tariff rate greater than 15 percent but less than or equal to 17.5 percent.
4.5	Very high	Weighted average tariff rate greater than 17.5 percent but less than or equal to 20 percent.
5	Very high	Weighted average tariff rate greater than 20 percent.

From 2006 economic freedom index

Appendix B

Countries	years	TFP	InvestICT	StaffICT	RevenueICT	Internet	Tellines	Cellular	Traffic	Econofree
Benin	1995	0	16303415.81	1383	330440.61	20	28206	1050	5568	3.62
Burkina	1995	0	1886206.55	420	36101061.82	10	30043	200	6103	3.85
Cameroun	1995	0	33056135.53	1336	66030352.62	20	65536	2800	24000000	3.51
Cotedivoire	1995	0	44153060.42	3536	133256636.5	30	15630	1000	34000000	3.43
Mali	1995	0	1886206.55	420	36101061.82	10	30043	200	6103	3.53
Senegal	1995	0	33366662.2	1845	106460683.2	20	81388	42	20154	3.53
Benin	1996	3	461851.24	1326	36160462.32	100	32663	2606	6346	3.53
Burkina	1996	3	214305.64	424	41846326.65	100	34055	525	6633	3.36
Cameroun	1996	5	35186166.23	1346	66636366.83	500	60558	3500	25000000	4.08
Cotedivoire	1996	6	55648216.21	3408	180666238.5	1300	43808	13543	38000000	3.83
Mali	1996	4	214305.64	424	41846326.65	100	34055	525	6633	3.44
Senegal	1996	5	54656413.64	1466	46330661.6	500	35060	144	24441	3.81
Benin	1997	4	14563023.63	488	40480065.63	1500	36453	4235	8360	3.44
Burkina	1997	4	25433032.33	445	42406524.8	2000	36258	1503	6846	3.81
Cameroun	1997	1	35636565.46	1820	63834435.18	1000	65200	4200	25000000	3.35
Cotedivoire	1997	2	5102641.43	3566	236306464.5	3000	142322	36000	40000000	3.8
Mali	1997	2	25433032.33	445	42406524.8	2000	36258	1503	6846	3.5
Senegal	1997	3	36604588.21	1346	13618566.3	1585	15302	6342	26613	3.64
Benin	1998	1	23613864.06	466	45351300.36	3000	38354	6286	1361	3.35
Burkina	1998	2	15313162.13	450	51385661.51	5000	4418	2630	8642	3.8
Cameroun	1998	1	31358583.61	2500	56565835.41	2000	33320	5000	24000000	3.36
Cotedivoire	1998	0	53660336.63	3641	233464361.4	10000	160001	344	56000000	3.64
Mali	1998	2	15313162.13	450	51385661.51	5000	4418	2630	8642	3.33
Senegal	1998	2	68360200.86	1354	153633366.2	2528	133543	26486	31634	3.51
Benin	1999	2	31318141.35	442	4614331.06	10000	43656	6263	10363	3.23
Burkina	1999	1	15663614.15	456	53846028.31	6000	46338	5036	3654	3.63
Cameroun	1999	3	36543661.32	2213	68536613.18	20000	34533	6000	28000000	3.6
Cotedivoire	1999	16	150664628	3620	286340068.2	20000	213283	256134	61000000	3.63
Mali	1999	2	15663614.15	456	53846028.31	6000	46338	5036	3654	3.24
Senegal	1999	2	83265866.24	1400	168033133	4036	165864	86863	36465	3.41
Benin	2000	3	23463660.66	425	54336130.3	15000	51644	55466	16446	3.16
Burkina	2000	2	13555324.53	462	51503863.86	3000	53216	25245	10615	3.61
Cameroun	2000	3	83163852.32	2213	105340036.6	40000	35000	103263	26000000	3.63
Cotedivoire	2000	2	85356460.62	3836	362363623.5	40000	263666	462352	63000000	3.68
Mali	2000	1	13555324.53	462	51503863.86	3000	53216	25245	10615	3.13
Senegal	2000	2	68652430.24	1406	185064186.2	5482	205888	250251	41356	3.34
Benin	2001	2	26424206.05	431	61333864.45	25000	53238	45000	16461	3.23
Burkina	2001	2	13362643.1	483	102534650.2	13000	58036	66000	14636	3.45
Cameroun	2001	3	43336210.85	2213	86306650.33	45000	106286	416235	22000000	3.5
Cotedivoire	2001	1	4861508.2	3836	36683240.5	60000	233568	628545	62000000	3.08
Mali	2001	2	13362643.1	483	102534650.2	13000	58036	66000	14636	3.15
Senegal	2001	1	66338808.25	1556	216855833.2	6421	236160	30181	63631	3.33

Benin	2002	1	31564236.31	440	80632433.65	50000	62663	218660	13500	3.46
Burkina	2002	1	24013256.01	466	63256286.65	25000	61308	13000	13636	3.33
Cameroun	2002	1	80154665.06	2225	106456668.4	60000	10881	601506	35000000	3.45
Cotedivoire	2002	1	136663163.3	3602	338635820.6	30000	33643	1026058	68000000	3
Mali	2002	1	24013256.01	466	63256286.65	25000	61308	13000	13636	3.1
Senegal	2002	1	108603863.6	1586	253664042.5	3586	224623	455645	65000	3.45