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E-readiness and Entrepreneurship: A Cross Country Study of the Link between Technological Infrastructure and Entrepreneurial Activity

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Abstract

This current study focuses on the relationship between a country's e-readiness environment and entrepreneurial activities. Many government policies assume there is a direct causal relationship between e-readiness and entrepreneurial activity and some past studies have reported evidence supporting such a link. In this paper, a cross country panel data analysis using three different measures of entrepreneurial activity and different measures of e-readiness examines this relationship. The results of this study provide only weak support for the hypothesized relationship. Furthermore, the results appear to be very sensitive to the choice of proxy variables chosen to represent entrepreneurial activity and the different measures of e-readiness.

I. Introduction

The factors influencing entrepreneurial activity have been a major focus of both theoretical and empirical research in the past. Various studies have proposed or examined the relationships between entrepreneurial activity and economic development and economic growth, private sector profit opportunities, job creation, export opportunities, urbanization, societal wealth and income, educational level of the workforce, government policies, and availability of financing. Other studies have focused on more behavioral factors driving entrepreneurial activities including individual's attitudes toward self employment, commerce, risk taking and entrepreneurial opportunities, assessment of the competitive environment, gender, and integration into social and business networks. This current study focuses on the relationship between a country's technological environment, or "e-readiness", and entrepreneurial activity.

The electronic readiness (or e-readiness) of a country refers to the degree to which a country and its economy have developed an information technology infrastructure that has been adopted by individuals and firms operating in that country.¹ Dada (2006) explains that the concept of e-readiness is a reflection of the state of the extent to which Electronic Commerce (E-commerce)

¹ See Dada (2006) for an extensive review of the relevant literature concerning different measures of e-readiness.

and Electronic Government (E-government) is available to the population. Dada also explains that e-readiness is often measured by data that reflect the physical technological infrastructure of a country or the use of that infrastructure with indices such as telephone lines, internet and cellular phone usage, or spending on infrastructure. There are a number of government initiatives and some published research that suggests that a country's degree of e-readiness is positively related to entrepreneurial activity. This relationship, which is discussed in more detail below, is the focus of this current research.

Using data from the World Bank, the Global Entrepreneurship Monitor (GEM) and measures of e-readiness from the Economist Intelligence Unit (EIU), this paper presents a cross country panel data analysis of the factors influencing various measures of entrepreneurial activity with a focus on e-readiness as a major factor. This paper is structured as follows. In Section II, a review of the existing literature relating to the concept of e-readiness, the link between e-readiness and entrepreneurial activity, and other factors affecting entrepreneurial activity, is presented. Section III discusses the data and methodology employed. Section IV presents the results of the analysis and Section V presents a summary and some conclusions about the link between e-readiness and entrepreneurial activity.

II. E-readiness and the Determinants of Entrepreneurial Activity

1. E-Readiness and what it means

There is no consensus in the literature of how to define or measure e-readiness. Choucri, Maugis, Madnick and Siegel (2003) provide a broad overview of over a dozen reports, surveys, and case studies that attempt to define and measure various aspects of e-readiness. Many of these surveys and reports rank countries according to their state of e-readiness. Those that rank countries usually focus on measures of technological infrastructure, connectivity, and government and private sector support for electronic communications and commerce. The authors also present an alternative model that focuses on e-business and electronic banking they argue is superior to existing models. Dada (2006) also makes the point that there exists a range of different measures of e-readiness and that there is strong debate over which type of measure is the best as he reviews the major literature that addresses this issue.

Closely associated with the concept of e-readiness is the concept of a "digital divide". The term "digital divide" refers to social, demographic and geographic differences in the use of information and communication technology (ICT) in different countries. Vehovar, Sicherl, Husing, and Dolnicar (2006) provide an excellent review of the literature that attempts to define and describe the general theoretical framework relating to the digital divide and discusses the shortcomings associated with measuring e-readiness that have been identified by other authors. They also discuss two categories of the digital divide; the "basic digital divide" that focuses on the availability of internet access and a "second level digital divide" that focuses on differences in access, usage, and depth of integration for those with access. Closely related to this second divide and important for business and entrepreneurial use of electronic resources is the extent of e-readiness support provided by different segments of the operating environment. In this study, variables that reflect the importance of both the basic and the second level digital divide are incorporated into the analysis.

Luyt (2006) also discusses how the need to close the digital divide between developed and developing countries spurred the development of various measures of e-readiness as measurement tools for measuring the divide. He focuses on one measure of e-readiness, the “Networked Readiness Index” and explains how it reflects political, infrastructure and market characteristics of developed countries rather than broader measures that would be applicable to both developed and developing countries. He then argues that more inclusive measures that reflect the realities of the developing world are needed.

Jutla, Bordorik, and Dhaliwal (2002) develop a framework for governments to use in their development of an “e-readiness” environment that would be conducive to Small and Medium Sized Enterprise (SME) development. Their framework includes the following six dimensions of e-readiness support: (1) knowledge and innovation (education, research, and public/private partnerships), (2) infrastructure (broadband, cable, telephone, cellular infrastructure), (3) regulatory and financial infrastructure (ease of transacting trans-border business), (4) skills distribution network (e-readiness educational opportunities and variety of SME business applications), (5) government e-services adoption (as a model for private sector adoption), access to content (access to educations, private and government data) and (6) measurement problems (associated with measurement of e-readiness and use). Many of the dimensions of their framework are directly related to the categories in the EIU e-readiness measures that are used in this paper. For example, in the paper discussed above, the “knowledge and innovation” dimension is equivalent to the EIU’s “social and cultural environment” category, the “infrastructure” dimension is equivalent to the “connectivity” category, the “government e-services adoption” is equivalent to the EIU “government policy and vision” category and the “skills distribution network” reflects the EIU “business environment” and “consumer and business adoption” categories.

While most studies focus on the technological infrastructure, Berthon, Pitt, Cyr and Campbell (2006) focus on the cultural attributes of trust and corruption and their impact on the adoption of e-commerce in different environments. They use a “Corruptions Perceptions Index” published by Transparency International (2006) to reflect the cultural attitudes towards trust and find a significant relationship between corruption and the degree of e-readiness.

Boyer-Wright and Kotterman (2009) identify six common variables that are often incorporated into different e-readiness frameworks and examine the relationship between these six variables and e-readiness using a partial least squares approach. The six common variables are economic prosperity, technological innovation, education, internet server provider (ISP) competition, legal environment, and information technology penetration into society. Measures of e-readiness includes country specific average survey responses that reflect the extent to which respondents thought internet usage was integrated into business activities (e-business environment) or the extent to which online government services were available (e-government environment). Their results indicated that five of the six variables (all except education) were significantly related to the e-business environment and that innovation, ISP competition, and the legal environment were related to the extent of the e-government environment.

2. The Link between E-Readiness and Entrepreneurial Activity

The perceived relationship between e-readiness and entrepreneurial activity is well established in government planning circles. For over 10 years, many national governments have worked together to promote e-readiness with the idea that an “e-ready” environment would foster entrepreneurial activity. At the G-8 meeting in July of 2001, the Digital Opportunity Task Force (DOT) laid out a plan of action (the Genoa Plan of Action) that contained a key goal of promoting e-readiness as a means of fostering and promoting increased entrepreneurial activity.² In the Danish National Executive Report (2000) published by the Global Entrepreneurship Monitor, the e-readiness infrastructure of the country is credited with creating new opportunities for entrepreneurs and providing easier access to existing markets. In a World Bank publication, Kenny, Navas-Sabater, and Qiang (2002) provide an extensive discussion of the link between technology infrastructure and economic development. They note, for example, that the internet allows entrepreneurs to “reduce costs, increase market coverage, and achieve economies of scale” and that “recent econometric studies have found increasing evidence of a causal link between telecommunications development and economic development”.³ It’s obvious that many government organizations believe this link between e-readiness and entrepreneurial activity exists and they subsequently devise and follow policies designed to expand their e-readiness in order to encourage more entrepreneurial activity.

In addition to the government interest, there have been a number of research studies that examine the relationship between e-readiness and entrepreneurial activity. Autio (2003) examines a measure of what he defines as “high potential” entrepreneurial activities and explains that these firms experience rapid growth, innovate new products, focus on newer technology and export products overseas. In a study of data from 37 countries he finds significant correlations (at the .05 level) between entrepreneurial activity and various components of e-readiness such as computer, internet, and cell phone use and broadband access. Martin and Matlay (2003) present case studies of three entrepreneurial firms in the UK and show how their access to the internet and a well developed e-readiness environment encourages innovative marketing strategies that exploit the technological infrastructure. Sarkar and Sawy (2003) examine e-business infrastructure models in four different countries and note that in Ireland, the e-business infrastructure stimulated local entrepreneurial activity. Gregorio, Kassicieh, and De Gouvea Neto (2005) examine the relationship between e-readiness and a measure of country entrepreneurial activity across a sample of 26 countries and find a significant positive relationship (at the 10% level) between the two variables. They also note that many Austrian economists argue that entrepreneurs improve the flow of information in an economy and so there should be a symbiotic relationship between e-readiness and entrepreneurial activity. Low, Henderson and Weiler (2005) use a regression analysis to study the factors that impact regional entrepreneurial activity in the US. They find that regional entrepreneurial activity is positively related to access to broadband internet connectivity (significant at the .0001 level). Todd and Javalgi (2007) examine the factors that impact entrepreneurial activity in India and argue that improving the

² See “Digital Opportunities for All: Meeting the Challenge (2001)” .

³ Quote from page 410 of the referenced chapter.

technological infrastructure (i.e. the e-readiness environment) is necessary to encourage more entrepreneurial activity.

While many studies either find evidence of or argue for a positive relationship between the components of e-readiness and entrepreneurial activity, not all studies support this view. Cumming and Johan (2010), for example, examine the effects of the introduction of internet access on entrepreneurial activities in rural communities in Canada. They report that the introduction of the internet actually suppressed local entrepreneurial activities as customers used the internet to shift their purchasing activities away from local firms to larger firms located in larger urban locations. Most of the existing literature, however, does find evidence for a positive relationship between the components of an e-readiness environment and entrepreneurial activity.

3. Other Determinants of Entrepreneurial Activity

Identifying the determinants of entrepreneurial activity has important implications for national policy. Reynolds, Bosma, Autio, Hunt, deBono, Servais, Lopez-Garcia, and Chin (2005) identify two important ways entrepreneurial activity impacts a nation: (1) fostering innovation and competitiveness, and (2) job creation. One of the most common sources of data reporting entrepreneurial activity across countries is the Global Entrepreneurship Monitor (GEM) database.⁴ It has been used by a number of researchers as a source of data used to explore different aspects of country specific entrepreneurial activity. Bhasin (2007) explores the key government policies and cultural attitudes that are responsible for the relatively low ranking of Singapore using the main GEM variable that represents Total Entrepreneurial Activity (TEA). Pretorius, Millard and Kruger (2006) examine creativity, innovation, and idea implementation in South Africa as reasons for the relatively low ranking of that country in the TEA measure of entrepreneurship. Maula, Autio and Arenius (2005) use the GEM survey data to examine factors influencing micro-angel investing in Finland. Szerb, Rappai, Makra and Terjesen (2007) examine the major cultural factors responsible for informal investment activities in Croatia, Hungary and Slovenia. Using data from the China Entrepreneur Survey System 1999-2000, Chow (2006) examines cultural and governmental control of commerce as factors that influence entrepreneurial activity in China. Tominic and Rebernik (2006) use the GEM data and focus their analysis on how gender differences impact entrepreneurial activity in Slovenia. Harding and Cowling (2006) use GEM data to explore the extent that financial markets and governmental organizations in the United Kingdom help provide equity financing for new ventures and find that limited availability of equity capital for investments in ventures of a certain size depresses entrepreneurial activity for those firms.

While most of the studies noted above focus on cultural factors in a single country that influence entrepreneurial activities, other studies include or focus on the relationship between entrepreneurial activities and both cultural and/or non-cultural factors in a cross country context. In van Stel, Carree, and Thurik (2005), the authors focus on whether entrepreneurial activity (as measured by the GEM TEA measure) is related to GDP growth. In their empirical analysis they also include per capita income and a Growth Competitiveness Index as control variables. Using a regression methodology and a dataset representing 37 countries their results indicate that in large

⁴ This data source is discussed in greater detail in Section III below.

mature economies there is a significant positive relationship between entrepreneurial activity and GDP growth.

Wennekers, van Stel, Thurik and Reynolds et al (2005) examine GEM data from 36 countries and explore the relationship between the GEM measurement of nascent entrepreneurship, defined as individuals who have been in business for less than 3 months, and the level of economic development in the country. They find that in developing countries entrepreneurship is negatively related to economic growth while in developed countries the relationship is positive. In their study they incorporate a number of control variables including population growth, unemployment, income disparity, computer use and internet use, education, and taxes. Their reported results are interesting in that they find no significant relationship between internet and computer use and entrepreneurial activity, a finding that contrasts with the other literature discussed above. In almost all of these studies the single common fact of design is that they ignore the importance of the information and communication technology environment and its possible impact on entrepreneurial activity. This study is designed to fill that gap in the existing literature.

III. Data and Methodology

1. Data

The data used in this study are drawn from the annual Global Entrepreneurship Monitor (GEM) Reports, the Economist Intelligence Unit (EIU) annual e-readiness rankings, the 2008 World Bank Group (WBG) Entrepreneurship Survey database and the WBG Country Survey data. The GEM data and WBG Entrepreneurship Survey data are the source for this paper's three measures of entrepreneurial activity. The EIU data is the major source of various measures of country e-readiness and characteristics of each country's electronic communications infrastructure and environment. In addition to the EIU e-readiness data, additional control variables reflecting a country's communications infrastructure and additional economic and business variables are drawn from the WBG World Development Indicators database. All of these variables are discussed in detail below.

1a. Global Entrepreneurship Monitor Data

The GEM program was designed to examine entrepreneurial activity across countries. The primary method of data collection is an annual Adult Population Survey (APS) that is carried out simultaneously in multiple countries. The survey data are collected via telephone and face-to-face interviews with over 2,000 respondents per country. Data collection began in 1999 with surveys performed in 10 countries and the most recent survey in 2009 collected data from 54 different countries. Each year the data are collected from all participating country teams and combined into a master dataset. Summaries of the survey responses are published in the annual editions of the GEM Global Reports. Reynolds et al (2005) provide an extensive discussion of the GEM research program, data collection activities relating to the APS, measures of entrepreneurial activity and the resulting GEM databases.

The APS variable of interest for this study is the “Early Stage Entrepreneurial Activity prevalence rate” which has come to be called the “Total Entrepreneurial Activity (TEA) index. This variable is calculated in the same manner in all countries and represents the extent of entrepreneurial activity in the general population. In the telephone survey, researchers identify a group of entrepreneurs representing both “nascent entrepreneurs” who have been in business for less than 3 months and “new business owner-managers” who have been in business and paying salaries for between 3 and 42 months.⁵ The TEA variable is defined as the percentage of the population aged between 18 and 64 that meet the definitions of one of the two types of entrepreneurs described above. For this study the TEA variable is drawn from the summary data presented in the annual GEM publication and is used as a measure of nascent and early stage entrepreneurship.

1b. World Bank Entrepreneurship Survey Data

In 2008 the World Bank published the results of an updated entrepreneurship survey that presents data from over 100 countries for the 2000 to 2007 time period. The two corporate entrepreneurship variables examined in this study represent the rate of registration of new corporations relative to existing corporations in the economy (“Entry” of new corporations) and the ratio of new corporations established to the working age population in the country (“NewDen” or the density of new corporations relative to the population). These two variables are used to reflect corporate entrepreneurial activity.⁶ In addition to the variable measuring entrepreneurial activity, a final variable from this data source is used as an explanatory variable and reflects the number of days it takes for an entrepreneur in that country to file the appropriate paperwork to open a new business (NewDays) as a measure of government support for entrepreneurial activity. We would expect that the shorter the number of days to start a new business in a specific country, the more entrepreneurial activity.

1c. The Economist Intelligence Unit e-readiness Data

The Economist Intelligence Unit (EIU) working together with the IBM Institute for Business Value and its Centre for Economic Development have created various measures of country e-readiness using over 100 different qualitative and quantitative criteria that reflect 6 broad categories or dimensions of e-readiness. These categories are then used to construct a single country score (“Escore” or e-readiness score) that is published in their annual publication. The six dimensions of e-readiness and their weightings in the overall score are shown below.⁷ These six variables are also examined in separate regressions in place of the overall Escore variable.

⁵ A detailed discussion of the GEM survey method and this TEA index variable is included in Appendix II.

⁶ From the World Bank, "Entrepreneurship Survey 2008" by Leora Klapper. The survey dataset is available from <http://go.worldbank.org/T8G73Z9ZM0>

⁷ The category titles and weights reflect the variables used in the 2007-2009 editions of the EIU publication. In the 2003-2006 editions of the publication, the category titles and weights were slightly different for a few of the categories. Because of the design of our analysis this should not have an impact on the results.

Category	Variable	Weight
Connectivity and technology infrastructure	Connect	20%
Business environment	Bus	15%
Social and cultural environment	SocCul	15%
Legal environment	Legal	10%
Government policy and vision	Govt	15%
Consumer and business adoption	Adopt	25%

This current study examines both the total e-readiness score (Escore) published by the EIU and additional variables that reflect the six individual e-readiness category scores (Connect, Bus, SocCul, Legal, Govt, and Adopt) that are used to construct the Escore for each of the countries in each of the years. All of these variables and their method of construction are more fully discussed in Appendix I that presents the original EIU discussions of variable construction. Following the framework of Vehovar, Sicherl, Husing and Dolnicar, (2006), the total Escore represents the degree of e-readiness within the concept of the basic digital divide while the component scores reflect the second level digital divide e-readiness environment. If e-readiness actually does promote entrepreneurial (or at least is related to entrepreneurial activity), then we would expect to find positive relationships between these variables and our measures of entrepreneurship.

1d. World Bank Development Indicators & Global Development Finance Data

The WBG maintains an extensive set of databases that contains information on most countries in the world.⁸ In this particular database economic data are available on an annual basis for over 50 years for most countries.⁹ For the years covered by this study, country data for annual Gross Domestic Product growth (GDPg) and Population growth (Popg) are included in the analysis. An additional variable represents the relative wealth of the country, the natural log transformed gross net income per capita (Lgnipcap). These variables are included in the study to control for the impact of the economic environment on entrepreneurial activity. Many past studies mentioned above have either argued these variables are important determinants of entrepreneurial activity.

In addition to this economic data, the World Bank database includes information on cell phone and internet usage. This study also includes a variable that reflects the percentage of the population that uses the internet (Intuse) and another variable that reflects the average number of cell phone subscriptions per person (Celluse). These measures are more direct measures of the technological environment than are the EIU measures of e-readiness.

⁸ See <http://data.worldbank.org/data-catalog> for a listing of online databases.

⁹ See <http://databank.worldbank.org/ddp/home.do?Step=1&id=4> for online access to this database.

2. Methodology

A cross-sectional time series methodology is used in this paper to examine the relationship between the measures of entrepreneurship (TEA, Entry, NewDen) and the various explanatory and control variables discussed above. Two different fixed effects models are examined for each of the three dependent variables. The first three models are of the general following form:

$$(\text{TEA, Entry or NewDen}) = f(\text{Escore, GDPg, Lngnipcap, Popg, NewDays}), \quad (1)$$

where the focus is on the explanatory power of the EIU measure of e-readiness (Escore).

Following the Wennekers, van Stel, Thurik and Reynolds (2005) study, various control variables are included in the model. Growth in Gross Domestic Product (GDPg) is included in the model to capture the effects of economic growth opportunities on entrepreneurial activity. It is expected that in faster growing economies there will be more entrepreneurial opportunities. The Natural Log of Gross National Income per Capita (Lngnipcap) is included to control for different levels of existing wealth across countries since earlier work found different relationships for developing and more developed economies.¹⁰ Since the countries represented in the sample tend to be more mature economies, a positive relationship between existing wealth and entrepreneurial activity is expected. Population growth (Popg) is included and is expected to have a positive relationship with entrepreneurial activity since a growing population provides an expanding market and contributes to economic growth. Finally a variable that reflects the ease with which an entrepreneur can start a new business, the number of days required to register a new business with the appropriate government agency (NewDays), is included. It is expected that the longer the time it takes, the lower the entrepreneurial activity.

The second set of models use both the six components of the EIU Escore variable and the additional e-readiness variables from the World Bank database:

$$(\text{TEA, Entry or NewDen}) = f(\text{Connect, Bus, SocCul, Legal, Adopt, Gov, Intuse, Celluse, GDPg, Lngnipcap, Popg, NewDays}). \quad (2)$$

In these final models the single e-readiness variable (Escore) has been replaced with its component scores as reported by the EIU (Connect, Bus, SocCul, Legal, Adopt, Gov). Two additional E-readiness variables, internet use (Intuse) and cell phone use (Celluse) have also been included to focus attention on the state of technological infrastructure.

¹⁰ While the 24 countries represented in this sample are the more developed economies in the world there is a still a large difference between the larger mature economies such as the US and the UK and the smaller national economies of Spain and Slovenia.

IV. Results

1. Sample Statistics

The data used in this study represent data from 22 different countries during the 2003 to 2008 period.¹¹ A country had to have data available for all variables of interest for at least 3 years during the sample period to be included in the analysis. This data requirement tended to restrict the countries included in the study to the largest developed market economies. Sample statistics are presented in Table I.

(Insert Table I about here)

Country/year values for the TEA variable representing nascent and early stage entrepreneurship range from 1.5% to 17.6% of the population. Country/year values for the WBG Entry variable that represents new corporate formations ranges from 4.1% to 19.4% of the number of existing corporations. Analysis of the model using TEA as the dependent variable uses 107 country/year data observations and analysis of the model using the World Bank Entry measure of entrepreneurship uses 81 country/year observations.

The explanatory variables represent various measures of e-readiness. The single comprehensive e-readiness variable from the EIU studies (Escore) in this sample ranges from approximately 6.0 to 9.0.¹² The values of the 6 components of the Escore (Connect, Bus, SocCul, Legal, Adopt and Gov) range from approximately 5.0 to 10.0. Internet usage (Intuse) ranges from approximately 16% to approximately 86% of the population and cell phone subscriptions range from approximately .4 subscriptions per person to 1.5 subscriptions per person.¹³

2. Panel Data Regression Results

The results of the analysis are presented in Tables II, III and IV. For all six models the null hypothesis of no fixed effects is rejected by an F-test at the .0001 level of significance, lending support for the use of a fixed effects model analysis.

In Table II the results of the analysis of the TEA measure of entrepreneurial activity are presented.

(Insert Table II about here)

The TEA variable is the measure of nascent entrepreneurial activity from the GEM database. In the first regression that uses the Escore as the sole measure of e-readiness the model has an R-square of over 86% but the Escore variable is not significant. In fact, the only significant

¹¹ The countries represented in the sample data are listed in Appendix 3.

¹² Note that the original EIU dataset includes data from up to 70 countries for the most recent year of data and those total e-readiness scores range from approximately 3.0 to 9.0. This suggests the data in this study reflects the most “E-ready” countries.

¹³ While it seems counterintuitive to have more than one cell phone subscription per person this may be a result of separate cell phone subscriptions for both individuals and accounts for business use. This data used in this study has been checked against the World Bank source data and is consistent with the original raw data.

explanatory variable (other than many of the country dummy variables which are not shown) is the NewDays variable coefficient that exhibits the expected negative relationship to the TEA variable and is significant at the .05 level. In the second model where Escore is replaced by the other, more focused, e-readiness variables, The R-square is slightly higher at over 88% and some of the e-readiness related variables are marginally related to the TEA measure. The Legal environment and the extent of cell phone usage are both positively related to the TEA variable at the .10 significance level. The NewDays variable is also significantly related to TEA at the .01 level.

In Table III the results of the analysis of the Entry measure of corporate entrepreneurial activity are presented.

(Insert Table III about here)

This measure of corporate entrepreneurship reflects the creation of new corporations relative to existing corporations in the economy. While both models have R-squares of approximately 95% and the F-tests for country level fixed effects are significant (at the .0001 level), the results do not lend support to a link between corporate entrepreneurial activity and e-readiness. In the first model that includes the Escore variable as a measure of e-readiness the only variable that is significantly related (at the .05 level) to new corporate registrations is the population growth variable (Popg), A finding that does reflect results reported by other studies. In the second model, none of the e-readiness variables are related to the Entry measure. Only the GDPg variable, representing the annual rate of growth in Gross Domestic Product, is positively related to Entry at the .10 significance level.

In Table IV an alternative measure of corporate entrepreneurial activity, the ratio of new corporations to the working age population (NewDen), is examined.

(Insert Table IV about here)

The R-square values for both models are approximately 98% and the F-tests for country level fixed effects are both significant (at the .0001 level). In the first model the Escore variable is positively related to the measure of corporate entrepreneurial activity (at the .05 significance level) providing some evidence of the hypothesized relationship. The net income per capita variable (Lngnipcap) is also positively related to the dependent variable (at the .01 significance level). In the second model, three variables (Bus, Legal, and Celluse) are all positively related to the NewDen measure of corporate entrepreneurial activity (all at the .01 significance level). The business environment variable (Bus), while a component of the overall e-readiness variable (Escore), actually reflects aspects of the general business environment rather than a true e-readiness variable.¹⁴ The legal environment variable (Legal) does, however, reflect the aspects of a country's legal infrastructure that are directed towards electronic commerce and the e-readiness environment. The extent of cellular phone usage (Celluse) is also a true measure of e-readiness that is related to this measure of corporate entrepreneurial activity. Finally, as in the earlier model, the scaled income variable (Lngnipcap) is also related to this measure of activity (only at the .10 significance level).

¹⁴ See Appendix II for a description of the “category Criteria” for this and other EIU variables.

V. Summary and Conclusions

While many governments formulate policies based on the assumption that there is a strong positive link between e-readiness environments and entrepreneurial activity, the results of this current study does not support the existence of such a relationship. When a measure of nascent and early stage entrepreneurial activity is used (TEA) there is little evidence to support the hypothesized relationship with only the legal environment and cell phone use marginally related to the entrepreneurial measure. A stronger relationship is found between the ease with which an individual can start a new business, as measured the days to register a new business; the shorter the number of days, the higher the TEA measure. When the number of new corporations relative to existing corporations is examined as a measure of corporate entrepreneurship (Entry), none of the e-readiness variables are significant. Finally, when the number of new corporations is scaled by the working age population (NewDen), there is some evidence that the legal e-readiness infrastructure and cell phone usage are positively to this scaled measure of new corporations but the evidence is not overwhelming.

The results reported here do, however, reflect the results reported in the few multi-country studies published in the past and discussed earlier. There is some evidence that there is a relationship between e-readiness and entrepreneurial activity, but the evidence is not very strong and appears to be dependent on the specification of the variable that is used to represent entrepreneurial activity and the measure of e-readiness used. Given the lack of empirical support for the relationship, governments might want to reconsider their policies that are built on this supposed relationship.

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Table I – Sample Statistics

	N	Mean	Std Dev	Minimum	Maximum
TEA	107	0.0626	0.0282	0.0150	0.1760
Entry	81	0.1073	0.0388	0.0408	0.1935
NewDen	81	5.2777	4.2771	0.7749	23.5424
Escore	107	7.8378	0.7744	6.0600	9.0000
Connect	107	6.9074	1.1272	4.0800	9.6000
Bus	107	8.0983	0.5648	6.7700	8.7700
SocCul	107	8.0419	0.8872	5.8000	9.6000
Legal	107	8.2281	0.6830	6.2500	9.7000
Adopt	107	8.0630	1.0970	5.2500	10.0000
Gov	107	8.5379	0.9457	4.8500	10.0000
Intuse	107	0.5889	0.1701	0.1607	0.8680
Celluse	107	0.9616	0.1957	0.4196	1.5524
GDPg	107	0.0296	0.0187	-0.0230	0.0958
Lngnipcap	107	10.3481	0.4300	8.7979	11.2564
Popg	107	0.0072	0.0068	-0.0148	0.0313
NewDays	107	21	20	2	114

Table II – Analysis of Nascent and Early Stage Entrepreneurship (TEA)

Intercept	0.0979 (1.10)	0.0295 (0.14)
Escore	0.0052 (0.94)	
Connect		-0.0032 (-1.36)
Bus		0.0165 (1.34)
SocCul		0.0023 (0.74)
Legal		0.0103 (1.84)*
Adopt		0.0030 (1.14)
Gov		0.0021 (0.78)
Intuse		-0.0032 (-0.10)
Celluse		0.0442 (1.91)*
GDPg	-0.0533 (-0.59)	-0.0631 (-0.69)
Lngnipcap	-0.0031 (-0.34)	-0.0208 (-1.20)
Popg	0.1435 (0.44)	-0.1113 (-0.32)
NewDays	-0.0003 (-2.10)**	-0.0004 (-2.79)***
R-Square	.8678	.8881
F-statistic	15.49***	14.36***

Notes: T-statistics shown in parentheses below coefficient estimates. (n=107).
Coefficients for country level effects not shown.

*** significant at .01 level, ** significant at .05 level, * significant at .10 level

Table III – Analysis of New Corporate Entrepreneurship (Entry)

Intercept	-0.1297 (-1.20)	-0.3419 (-1.48)
Escore	0.0054 (0.75)	
Connect		0.0026 (0.95)
Bus		0.0221 (1.41)
SocCul		-0.0045 (-1.14)
Legal		0.0101 (1.44)
Adopt		-0.0014 (-0.40)
Gov		-0.0031 (-0.88)
Intuse		0.0022 (0.05)
Celluse		-0.0169 (-0.59)
GDPg	0.2084 (1.41)	0.3186 (1.98)*
Lngnipcap	0.0189 (1.66)	0.0243 (1.23)
Popg	0.6784 (1.98)**	0.2340 (0.56)
NewDays	0.0001 (0.87)	0.0001 (0.71)
R-Square	.9430	.9504
F-statistic	28.69***	24.40***

Notes: T-statistics shown in parentheses below coefficient estimates. (n=81).
Coefficients for country level effects not shown.

*** significant at .01 level, ** significant at .05 level, * significant at .10 level

Table IV - Analysis of New Corporate Density Entrepreneurship (NewDen)

Intercept	-40.4704 (-5.73)***	-48.5934 (-3.71)***
Escore	0.7207 (1.64)*	
Connect		-0.0722 (-0.46)
Bus		2.9912 (3.35)***
SocCul		-0.1545 (-0.68)
Legal		0.9906 (2.70)***
Adopt		0.0194 (0.10)
Gov		-0.2054 (-1.03)
Intuse		-1.6213 (-0.71)
Celluse		4.7894 (2.99)***
GDPg	4.0943 (0.43)	9.2721 (1.02)
Lngnipcap	3.5151 (4.79)***	1.8468 (1.66)*
Popg	25.2017 (1.13)	-19.4584 (-0.83)
NewDays	0.0135 (1.38)	0.0054 (0.62)
R-Square	.9798	.9867
F-statistic	87.17***	101.74***

Notes: T-statistics shown in parentheses below coefficient estimates. (n=81).

Coefficients for country level effects not shown.

*** significant at .01 level, ** significant at .05 level, * significant at .10 level

Appendix 1

Category definitions for the Economic Intelligence Unit e-readiness rankings 2009¹⁵

1. Connectivity and technology infrastructure

“Connectivity measures the extent to which individuals and businesses can access mobile networks and the Internet, and their ability to access digital services through means such as digital identity cards. Effective access uses two primary metrics: penetration and affordability. Penetration of each market’s mobile-phone subscriptions, overall Internet users and broadband Internet accounts are ranked as a percentage of the total population.”

“**Category criteria:** Broadband penetration; broadband affordability; mobile-phone penetration; Internet user penetration; international Internet bandwidth; Internet security.”

2. Business environment

“ In evaluating the general business climate, the Economist Intelligence Unit screens 74 sub-indicators to provide a comprehensive and forward view of each country’s attractiveness as a trading economy and as a destination for business investment from 2009 to 2013. The criteria covers such factors as the strength of the economy, political stability, taxation, competition policy, the labour market, and openness to trade and investment. The aggregate scores of the individual sub-indicators are grouped into nine higher-level indicators, shown below.”

“**Category criteria:** Overall political environment; macroeconomic environment; market opportunities; policy towards private enterprise; foreign investment policy; foreign trade and exchange regimes; tax regime; financing; the labour market.”

3. Social and cultural environment

“Basic education is a precondition to being able to utilize Internet services, but this category also considers a population’s web-literacy — its experience using the Internet and its receptivity to it — and the technical skills of the workforce. These technical skills are evaluated by both evidence of the familiarity of a country’s population with information technology (IT) applications and the extent to which its schools and governments provide the education infrastructure to engender it.

Continued from previous years is an assessment of entrepreneurship, while our scoring of innovation levels in each market (measured by the number of patents and trademarks registered, as well as the level of spending on research and development, R&D) evaluates how well the

¹⁵ The information in this appendix is taken directly from the Appendix I in the 2009 e-readiness publication.

society fosters creative business activity that can lead to the creation of intellectual property, new products and industries.”

“**Category criteria:** Educational level (measured by school life expectancy and gross enrolment in education); Internet literacy; degree of entrepreneurship; technical skills of workforce; degree of innovation (measured by the generation of patents and trademarks, as well as R&D spending).”

4. Legal environment

“ E-business development depends on both a country’s overall legal framework and specific laws governing Internet use. This category reflects those legal frameworks that have a direct impact on the use of digital technology to inform, communicate and transact business. Governments need to be forward-thinking in their creation of legal frameworks to cater to Internet commerce. These include legislative approaches to such issues as cybercrime, data privacy and spam, but just as importantly countries need to create a legal atmosphere that works to minimise abuses and non-competitive behaviour, including provisions covering consumer protection and legal jurisdiction.

E-ready countries are those that allow businesses and individuals to move nimbly and freely, where there is little bureaucracy to interfere with the registration of a new business or restrict access to information. The commitment of the country to implementing digital identity cards is also considered as a means of determining how a country’s population can access digital commerce and digital government services.”

“**Category criteria:** Effectiveness of traditional legal framework; laws covering the Internet; level of censorship; ease of registering a new business; electronic ID.”

5. Government policy and vision

“ E-ready governments supply their constituents — citizens and organizations — with a clear roadmap for the adoption of technology, and they lead by example in their use of technology to create efficiencies. The Economist Intelligence Unit assesses the activities of governments in this area, and their ability to lead their countries towards a digital future. Are governments employing technology to operate and provide public services with less resource investment? Are they spending on ICT to stimulate similar spending in the greater economy? Are “savings” translated into service gains for citizens? Can more people interact with, and receive information from, the government regardless of their own access to technology? This category also analyses, in each country, the availability of digital channels to individuals and businesses for accessing public services, and to citizens for obtaining government information about civic issues and engaging in consultation with government officials on matters involving the political process.”

“**Category criteria:** Government spend on ICT per head; digital development strategy; e-government strategy; online procurement; availability of online public services for citizens and businesses; e-participation (based on the UN e-participation index).”

6. Consumer and business adoption

“ If connectivity, societal adoption, and legal and policy environments are necessary enabling platforms for e-readiness, then the actual utilisation of digital channels by people and companies is a measure of successful implementation. The Economist Intelligence Unit looks at the amount that businesses and consumers spend on accessing ICT services, the extent and range of Internet features used by individuals, their online purchasing activity, and the extent to which individuals and businesses use the online public services that have been made available.”

“**Category criteria:** Consumer spending on ICT per head; level of e-business development; use of Internet by consumers (assessing both the range of Internet features used by individuals and their online purchasing activity); use of online public services by citizens and businesses.”

Appendix 2

Early Stage Entrepreneurial Activity or the TEA index¹⁶

One of GEM's best known measures of entrepreneurial activity is the Early Stage Entrepreneurial Activity prevalence rate (also called TEA index). This indicator is calculated in an identical way in each country:

- A telephone survey of a representative sample of the adult population in each country is conducted between May and September.
- Respondents are asked to respond to three questions that are the basis of the TEA index: Are you, alone or with others, currently trying to start a new business independently of your work? Are you, alone or with others, currently trying to start a new business as part of your work? Are you, alone or with others, currently the owner or manager of a business?
- Those who respond positively to these questions are also asked filter questions to ensure they are actively engaged in business creation as owners and managers, how long they have been paying wages to employees, and other questions about cost and time to start up, sources of finance and numbers of jobs created. A distinction is made between two types of entrepreneurs: nascent entrepreneurs (those that have been paying salaries for less than three months) and new business owner-managers (those that have been paying salaries for between three and 42 months).
- Early-Stage Entrepreneurial Activity is the sum of the nascent entrepreneurs and baby business owner/managers minus any double counting (i.e. those who respond positively to both).

The Early-Stage Entrepreneurial Activity rate is comparable across nations and it measures the propensity of a country to be entrepreneurial.

¹⁶ This information is taken directly from the GEM website.
http://www.gemconsortium.org/about.aspx?page=re_adult_population_survey