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ICT, MARKET CONTESTABILITY
AND ECONOMIC PERFORMANCE:
LESSONS FROM ERF COUNTRIES

Abdelhamid Mahboub and Doaa M. Salman

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ICT, Market Contestability and Economic Performance: Lessons from ERF Countries

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Abstract

Using a panel data of 107 countries including developed, developing and ERF (Economic Research Forum for Middle East, Iran and Turkey) countries over the 1995-2004 period, this paper explores the impact of information and communication technology (ICT) growth on overall economic performance through its positive impact on market contestability, with respect to ERF countries and other developing and developed countries. We follow two hypotheses: that improvement and growth of ICT make domestic markets (industries) more contestable, and that the higher degree of market contestability improves the overall performance of the economy, measured by the increase in real GDP. This paper finds that the degree of overall contestability is positively and significantly affected by the increase in ICT services in all three groups of countries. This result supports the hypothesis concerning the importance of information in making markets more contestable. Moreover, there is a positive and significant impact of ICT on per capita GDP. As for the impact of increase in the degree of contestability on economic performance, we found that developed countries experienced a positive and significant relation, but such a relation was insignificant in the other groups — developing countries and ERF sample.

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I - Introduction

Information and Communication Technology (ICT) has developed fast in terms of quantity and quality and in terms of innovating new varieties over the past 20 years. Research studies have been testing the effect of this on the performance of economic activity in several ways. In this concern, ICT products and applications have been studied as inputs to the production of other products, or as means of improving the productivity of other inputs; namely labor and capital.

We argue in this paper that the development and growth of ICT products and applications make the markets more contestable (more accessible for prospective firms), and this improves the performance of economic activities. Therefore, the paper's contribution is twofold. On one hand, this connection between ICT development and market contestability has not been econometrically tested before, even though it might have been theoretically understood. On the other hand, an index of overall contestability is used in the econometric test. It is not an index for measuring the contestability of a specific market or industry, but it rather measures how conductive the conditions of the whole economy are to allowing firms to access new markets and industries. The concept of overall (economy-wide) contestability is new. And like any new index, we start with a simple (but indicative) one, leaving the door open for further improvements. The paper applies the 2SLS regression analysis on panel data for three groups of countries; OECD or developed countries, non-OECD or developing countries, and ERF countries as our specific subgroup of developing countries. The purpose is to answer two questions. First, what is the effect of ICT on the overall contestability of the economy? Second, what is the effect of overall contestability on GDP?

Our empirical results point to positive and significant effects in all three groups of countries with regards to the first question. As for the second question, the effect is found positive and significant for the first group, but insignificant for the other two.

The rest of the paper is divided as follows. An overview of the theoretical foundations as well as a survey of the existing literature on the subject will be extended in section II. The results of the empirical test are presented in section III. Finally, the paper ends with some concluding remarks in section IV.

II – Literature Review

II.A Impact of ICT on Economic Performance

Contemporary literature on economic development has lately focused on the changing role of the service sector in the process of development, or more precisely the relative position of services in the process of economic structural change. Service sector was traditionally thought to grow fast in later stages of the economy's development to replace the manufacturing sector as a leading sector. The most famous studies —Chenery (1973) and Chenery and Syirquim (1975) — gave a strong positive test to this idea by analyzing the structural changes in a number of countries over the period 1950-1970. Among other results, they found that the service sector starts growing, as a relative share of GDP, at the expense of the secondary (industrial) sector when the latter reaches 30 to 40% of GDP.

Many other empirical researches followed similar steps to test these results in different case studies and/or across different historical periods. As a result of these tests, the suggested sequence of structural change became one of stylized that describe the course of economic development. The rationale for such a sequence of structural change is that demand is the driving force that leads to the emergence and growth of new sectors which happens when income increases in the course of development. Income elasticity of demand for manufactured products is greater than that for agricultural products, and this explains why the former grows faster than the latter as income grows in the early stages of development. The

income elasticity of demand for sophisticated and business related services (such as transportation, communication and financial services) is also greater than that for manufactured products, which logically explains why these services represent a higher percentage of GDP than manufactured products in the more developed economies.

Recent studies such as Thirlwall (2003, 111), UNCTAD (2003, 1-3) and others reported that the more recent observations (since the beginning of the 1990s) show that services in LDCs, which are still in the early stages of development, tend to grow fast and take the lead in terms of their relative weight in GDP and employment. This seems to happen even before the manufacturing sector reaches its theoretical 30 - 40% of GDP. The pattern of structural change, therefore, has become different since the early 1990s. Mahboub and Salman (2007), and Mahboub (2007) argued that one possible explanation for this change could be the fast and unprecedented growth and development of information and communication technology (ICT). This growth is counted by itself as part of the growth of the service sector. Moreover, and more importantly, the development of ICT products (such as personal computers, cellular phones and internet) allowed for a wide spectrum of ready-to-use applications for economic purposes whether by businesses or by individuals. Other services, especially trade and financial services, expanded rapidly as a result of ICT improvements.

One should notice that the increasing varieties of ICT applications and products became available for civilian and commercial use only since the early 1990s, although ICT had been developing for almost 20 years prior to that, albeit for official purposes (particularly motivated by the race between Eastern and Western blocs during the era of the Cold War, in space exploration and weapon development). In addition to what was mentioned, globalization and opening up the domestic economies of LDCs for international trade in goods as well as free mobility of capital caused a great increase in demand for trade-related services such as transportation, financial services and telecommunications.

Therefore, since the early 1990s, LDCs did not have to wait for industrialization to mature nor for the growth in income to create higher growth of services due to its higher income elasticity of demand. Instead, LDCs were able to use the available ICT applications and products and integrate them into their national output.

At the same time, the above discussion led some to conclude that ICT growth results in an increase in GDP. In short, services (more specifically ICT services) now work on the supply side of GDP growth by enhancing it, instead of just being the result of the demand due to the increase in GDP (the traditional view before the beginning of 1990s).

In line with this proposed impact of ICT on GDP, the ongoing literature considers ICT products as inputs for many economic activities, and/or as facilitators for the use of other inputs. For example, Piatkowski (2003) examined the impact of ICT on labor productivity and GDP in Poland. He found that between 1995 and 2000, investment in ICT hardware, software and telecommunication equipment contributed by 8.9% to GDP growth and by 12.7% to labor productivity growth. His results did not differ (in the direction of effect) from other studies on more advanced economies. On another front, Guitat and Drine (2007) used estimates of the stock of ICT capital (hardware, software, and telecommunication equipment) to estimate the direct and indirect contributions of ICT to growth in 14 MENA countries between 1992 and 2004. They concluded that there was a positive and significant direct impact of ICT on GDP (especially for oil producing countries). The indirect impact through the effect on human capital was less significant. They made comparison with other regions and found that the overall impact of investing in ICT capital on GDP was positive and significant for OECD (Organization of Economic Cooperation and Development) countries and East Asian countries, while it was negative and significant for Sub Saharan Africa. They interpreted this by referring to the possible bias of new technology improvements (related to

the use of ICT products) towards labor saving techniques of production in a labor abundant economy, and also the possibility of fast growth in the more advanced world at the expense of the economies which are still lagging behind. Supporting the same results of cross-country differences in the impacts of ICT on GDP, OECD (2003) reported that among the OECD group "countries with equal ICT diffusion will not always have similar impacts of ICT on economic performance." Specifically "in countries with less competition, firms might be able to extract a greater part of the returns [of ICT improvement], and spillover effects [of that improvement] might be more limited" (OECD (2003, pp. 9-13)). In other words, countries with more competitive markets are more able to gain from the external or network effects of ICT improvements than other countries. The reason is that monopoly power makes the distribution of external benefits more uneven. This is why the same report states that US economy benefited the most from ICT compared to other OECD countries. Therefore, we can conclude from the above that ICT improvement and growth may or may not positively affect the GDP performance. The relation may even be negative. We then need to test such a relation for the member countries of the ERF.

II.B Contestability and Economic Performance

We argue in this paper that there is another channel through which ICT may positively affect the economic activities. This new line of thinking focuses on the ability of ICT to make an institutional improvement by making markets and industries more contestable, and therefore leading to better performance of the economy in general. In fact, perfect information and even distribution of information among all potential firms are essential conditions for making markets contestable, and the importance of ICT improvement arises from this point. We first shed some light on the pure concept of contestability and then survey some applications of the concept, especially those in close relation with the subject matter of our paper.

The theory of contestable markets emerged in the late seventies and early eighties of the 20th century. It can be "considered a generalization of the concept of perfect competition" (Baumol and Lee, 1991 p. 2). Simply, the threat from entry of new firms and/or their actual entry into the market (industry) can force the incumbent firms to price their products at the average cost (including the normal profit). This result is true even if the number of incumbent firms in the market is very small or even just one. Not only will the output price be equal to the average cost, but it will be equal to the marginal cost as well. In other words, perfect contestability will lead to the equality between the product price and the minimum average cost (the optimal price). This is similar to perfect competition. However, unlike perfect competition, perfect contestability does not require the existence of a great number of incumbent firms. Moreover, the above-mentioned results can hold where economies of scale exist. In general, competition among incumbent firms already operating in the market (perfect competition model) is replaced by competition among potential firms contesting for the market, or attempting to enter the market (perfect contestability model).

According to the original book on the theory of contestable markets (Baumol et al 1982), and several other commentators and critiques since the publication of the book, one can simply and briefly categorize the required conditions for a market to be perfectly contestable through three items. First, exit from the market must be costless. Otherwise, entry will not be easy. For example, government regulations, which may protect the incumbent firm(s) and close the market, or may restrict the size of the firm, or any other similar restriction, must be eliminated. Sunk costs also can make exit from the market costly. In case of the existence of sunk costs associated with entering the market (such as cost of capital equipment which cannot be resold), the new entrant is assumed be able to recover these costs (through profits) before the incumbent firm(s) can change their prices. This way, the new entrant can plan for future sales and profits based on prices prevailing before entry. The possible fall in prices

because of new firms' production is predictable by all firms, of course. Yet, unpredictable predatory pricing policies of incumbent firm(s) are assumed away. Second, consumers are assumed to respond directly to the price differentials between the incumbent and new entrant firms. This allows the new firms to undercut the extra normal profits being gained by the incumbent firm(s) and thus forcing the latter to price output at average cost. Third, new prospective entrant-firms are assumed to have perfect access to the required data and information on prices, demand size, costs of production, technology, import and export potentials as well as domestic regulations, etc. Thus, they will be able to serve the same customers on equal footing with the incumbent firm(s).

Average cost pricing (P = AC) is guaranteed, therefore, it is to be applied by incumbent firm(s) if the market is perfectly contestable. Moreover, as long as this price is different from the marginal cost (MC), there will still be a threat of entry or an actual entry. If the price of the incumbent firm's output is greater than marginal cost (the incumbent firm is operating on the falling portion of its AC), the potential firm can enter and use the same technology (same cost curves), produce a little more than the incumbent firm, and price its output lower than the incumbent, thus undercutting the latter's profit. The incumbent firm(s) will have to move down and to the right along their AC curves to avoid such a result. If, on the other hand, price is more than marginal cost (rising portion of AC), the potential firm can enter, produce a little less and price its output less than the incumbent firm, and the latter will have to move down and to the left along AC curve. The only way for the incumbent firm(s) to avoid this threat of undercutting their profits is to choose an output at the intersection of AC and MC and price output equal to both of them. Needless to say, if total demand does not match total supply, the actual number of firms and the output of each, will adjust until this happens. All variables, namely the number of incumbent firms, the size of each, the output quantity and price will continue changing until P = MC = AC in each firm and the market demand and supply are equal. Overall, perfect contestability results in: (a) optimal price of output, (b) optimal number of incumbent firms, (c) and optimal size of incumbent firms. Optimal here means the least cost, or in other words no other arrangement of (a), (b) and (c) can produce the same total output with lower costs. See Baumol et al (1982, Chapters 1,2) and Spence (1983).

Just like the theory of perfect competition, one need not expect that perfect contestability exists in practice. It is just a matter of degree as Graham and Lawrence (1996, p.2, 8) stated, meaning that if it becomes easier and less costly for new firms to have access to a market (an industry) we simply say that this market has become more contestable. It should be noted that the overall performance of the economy improves when markets (industries) become more contestable. Contestability theory, as can be easily noticed, is to microeconomic theory the same as new classicism is to macroeconomic theory. The latter emphasizes the power of free market forces in restoring the 'classical' macroeconomic stability with the minimum (or even without) government intervention. The former emphasizes the ability of free market forces to achieve the 'classical' perfect competition optimality without the need for direct intervention from the government, such as regulating monopoly or imposing legal pricing. Again, only minimal and indirect government actions may be required.

Although the theory of contestable markets was first introduced to analyze the behavior of domestic firms in their access to domestic markets, it was extended later to include the access of foreign firms to domestic markets. In fact, it became a common feature in international agreements to embody conditions for such an access. As an example of studies that dealt with foreigners' access to domestic markets, Caves (1982, p.101) focused on the importance of reducing the level of market concentration in order to increase competition in foreign countries and ease the access to their markets. It is worth noting that a higher concentration ratio in a market (an industry) is a sufficient condition, but not a necessary condition, for a

lower degree of contestability according to Graham and Lawrence (1996, p. 9). However, some scholars confined this relationship to the case of developed countries. For developing countries, which have a very different industrial structure from developed ones, foreign entry to these markets will have different effects. Specifically, it may or may not increase market concentration. Moreover, Newfarmer & Marsh (1992) demonstrated that FDI inflows into developing countries have an independent impact on market structure by increasing its concentration (decreasing contestability). On the other hand, UNCTAD (1997) found out that the opening up of economies and markets to FDI inflow and to trans-national corporations (TNCs) can directly contribute to increasing the contestability of host country markets. The received literature is not clear, as it appears, about the effect of FDI on domestic market contestability, and therefore, we need to include this specific factor in our work.

The above survey of the theory suggests the importance of even (equal) distribution of information among all firms, incumbent as well as prospective. This is considered an important condition for reaching a more contestable market. Lack of this condition would help the incumbent firm(s) gain a better position against new entrants, increasing the risk and uncertainty associated with their entry to the market. Simply, the cost of starting a new business becomes high and the market is said to be closed or uncontestable. ICT improvements help in this matter through increasing the capacity of storing and exchanging information. The new entrant firm will be able to undercut the incumbent price and excess profit, only if it is able to move fast. This in turn requires good access to a great deal of data and information.

III – Data, Research Methodology and Hypotheses

We use data, taken from the World Development Indicators (2006). The time period used in the panel data is from 1995 to 2004, for three groups of countries; 23 OECD countries (developed countries), 84 developing countries, and 10 ERF countries that represent a subgroup of the developing countries. Differences were found between these groups and interpretation was provided. Data for all variables is annual.

III .A Data Definition

The following is a description of the variables we used in this study, and how the datasets have been constructed for each variable:

   OCI 'Overall Contestability Index':
The first step we faced was having a measure for overall contestability of the economy in general. The concern was to have a measure for the conditions in the economy that make the entry by a new firm and the exit by an incumbent firm easier, less costly, less risky and less uncertain. Fortunately, we have found an index that was being regularly published by Heritage Foundation and Wall Street Journal since 1995 (See Index of Economic Freedom, 2007). Out of the ten sub-indexes contained in the index of economic freedom, we have chosen six, which mostly reflect the conditions of contestability. The other four are mainly related to conditions of economic freedom per se. The two concepts of economic freedom and market contestability are overlapping. Yet, there is a slight difference between them. For example, the sub-index of the freedom from government taxation is a good measure for the freedom of 'all' firms, those in business and also potential entrants, from such a burden. This one is excluded as it does not relate directly to the ease of accessing markets. Similarly, we excluded the sub-index of freedom from monetary government actions that may cause inflation, because inflation affects 'all' firms not only those willing to start business. By looking carefully into each sub-index we ended up with six that are relevant to our purpose.

The six chosen sub-indexes, reflecting overall contestability are as follows (See Index of Economic Freedom, Chapter 3, pp. 37 – 52 for details): Business Freedom, Trade Freedom,

Investment Freedom, Financial Freedom, Property Rights and Freedom from Corruption. We take the average of these sub-indexes and call it overall contestability index OCI . It is an 'overall' index because it does not relate to a specific market. Higher values of OCI (maximum 100) reflect favorable values or higher degrees of overall contestability.

ICT Information and Communication Technology Index:
To construct an ICT index for the period between 1995-2004 we use the four components: internet users (per 1,000 people), mobile phone subscribers (per 1,000 people), telephone mainlines (per 1,000 people), and personal computers (per 1,000 people). Each of these four components is standardized and then the coefficients become the weights used to come up with the ICT index.

The rest of the variables are: the logarithm of the gross fixed capital formation (lGFK), the logarithm of the government final consumption expenditure (lGEXP), the logarithm of the foreign direct investment as a percentage of GDP (lFDI), and its lag (laglFDI), the logarithm of the secondary school enrollment as a percentage of population in the related age group (lHC), and its lag (laglHC), the logarithm of the total labor force (lLF), the logarithm of the ICTindex (lICTindex), gross domestic product per capita (GDPK) and the estimated value of the overall market contestability OCI taken as instrumental variable for it.

III. B Methodology
The model we are using for testing the hypotheses is composed of two equations

$$OCI = A_0 + A_1 \, lICTindex + A_2 \, lag1lHC + A_3 \, lLF + A_4 \, lFDI$$

$$\hat{GDPK} = B_0 + B_1 \, OCI + B_2 \, lICTindex + B_3 \, lGFK + B_4 \, lGEXP + B_5 \, lLF + B_6 \, lag1lFDI$$

The first equation is to test the effect of ICT on contestability OCT. We add the FDI as a determinant of contestability because the reviewed literature suggested that the relation could be positive or negative.

The second equation is our attempt to measure the effect of contestability OCI on economic performance measured by per capita gross domestic product GDPK. The effect of ICT (the variable (lICTindex) on GDPK is included to reflect the direct impact. The indirect impact comes through the effect of lICTindex on contestability OCI .

IV– Analysis of Empirical Results
The results of 2SLS regression using STATA program for panel data are listed in the appendix. Table 1 represents the first equation and Table 2 represents the second equation. From Table 1 we find that the degree of overall contestability OCI is positively and significantly affected by the increase in ICT services (lICTindex) in all three groups of countries. This result supports our expectation of the importance of information in making markets more contestable. The ICT services include main telephone lines, mobile phone lines, personal computers, and internet services. The value of the coefficient was much higher in OECD countries compared with developing countries and ERF countries. The ability of the economy to benefit from the externalities of ICT is stronger where markets are more competitive. Naturally, the OECD economies possess more competitive markets compared to developing countries.

The results of the second equation (Table 2) show a positive and significant impact of ICT on per capita GDP. This was the case for all three groups. Growth and development in ICT seem to play an important role in the economic performance in all countries.

The effect of FDI on contestability was positive and significant for OECD countries, but insignificant for the other two groups. This result is not inconsistent with the reviewed literature indicating that FDI may increase or decrease the concentration ratio according to whether it it flows into the economy in connection with existing firms or through new, independent firms. It seems that the former is the general case for developing countries while the latter is the general case for developed countries. This is why the inflow of FDI is positively related to OCI in OECD group of countries.

As for the impact of increase in the degree of contestability on economic performance, we can see from Table 2 that OECD countries experience a positive and significant relation, but this relation is insignificant in the other groups. The increase of GDP in developing countries may not always be explained by internal forces related to the performance of domestic markets. A good part of this increase may very well be depending on external factors not included in our model. Therefore, although ICT improvements do increase the degree of overall contestability in developing countries (including ERF countries), this increase in OCI does not significantly improve GDP.

V-Conclusions

Data from 107 countries (developed and developing) over the period 1995 – 2004 were used to test our hypotheses on the relation between ICT, contestability and economic performance. The econometric analysis of the data leads us to conclude the following.

1. The results of the paper strongly support the benefits of ICT to the economy. In all countries, there is a positive and significant impact – in a direct way – of improvement in ICT on GDP per capita as a measure of economic performance (Table 2). Besides, in all countries, the impact of ICT on overall contestability (OCI) was positive and significant (Table 1). Markets perform better (in terms of being more contestable) due to improvements in ICT products and applications. This is an important outcome of the spread of ICT through an economy. Although the effect of information and communication technology on market contestability could be understood and expected theoretically, we were able to establish a solid empirical support for it in all developed and developing countries.

2. Given this positive direct impact of ICT on GDP, what about the indirect impact through the OCI channel? We found that the impact of increase in the degree of overall contestability (which was positively affected by ICT) on the economic performance measured by per capita GDP was positive and significant in the OECD group of developed countries. This is a good result because it proves our hypothesis on the importance of overall contestability. However, we failed to accept the same relation at acceptable levels of significance, for developing countries (and for the subgroup of ERF countries). The determinants of GDP in developing countries seem to be unrelated to domestic market improvement (unrelated to increases in OCI). As may be expected, developing economies are tied to external and international factors more than developed economies.

3. More attention should be given in our countries to the availability of information and to its even distribution among all firms. Rules of transparency in business fields should be developed and enforced. Any channel through which some firms may have a monopoly over vital business information should be carefully observed and ruled out in order to increase the OCI, and hence the overall economic performance.

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Appendix

Table 1: Regression Estimates for the Three Groups of Countries of the Dependent Variable OCI

Variable	Equation one		
	OECD	NON OECD	ERF
lICT_index	13.81884	0.874	1.537
	(5.59)**	(2.82)**	(2.03)*
lag1lHC	50.277	3.402	-19.203
	(3.17)**	(2.47)*	(2.19)*
lLF	-1.269	-1.398	-7.950
	(-0.57)	(1.81)	(1.79)
LFDI	1.589	0.732	1.503
	(1.97)*	(1.39)	(1.05)
lag1lFDI	1.828	.4690992	0.857
	(3.50)**	(0.98)	(1.23)
Constant	-243.232	43.523	259.632
	(3.37)**	(3.29)**	(3.96)**
Observation	105	402	45
Countries	23	84	10
R- squared Within groups	56.4	5.6	67.3

Absolute value of z-statistics in parentheses
* significant at 5%; ** significant at 1%

Table 2: Regression Estimates for the Three Groups of Countries of the Dependent Variable GDPK

Variable	Equation two		
	OECD	NON OECD	ERF
OCI	36.608	-11.483	12.886
	(2.66)**	(1.15)	(0.51)
lICT_index	61.71287	71.174	153.139
	(1.8)**	(5.81)**	(2.91)**
lGEXP	7,124.950	57.947	294.697
	(5.84)**	(0.63)	(0.47)
lGFK	3,985.696	407.571	531.930
	(5.33)**	(4.50)**	(2.07)*
lag1lFDI	1.828	11.659	98.201
	(3.50)**	(0.87)	(1.00)
Lag1LF	-14,499.209	-950.636	-3,269.958
	(6.14)**	(5.72)**	(2.26)*
Constant	-123491.8	15,156.701	49,053.888
		(5.93)**	(2.52)*
Observation	209	770	85
Countries	23	84	10
R- squared Within groups	67.7%	13.5%	6%

Absolute value of z-statistics in parentheses
* significant at 5%; ** significant at 1%