Are Mass Media and ICTs associated with Inequality and Poverty?

Sanghamitra Bandyopadhyay

Queen Mary University of London

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Abstract

We examine associations of mass media and information and communications technologies (ICTs) with inequality and poverty. We find that mass media and ICT variables are robustly negatively associated with inequality and poverty. Newspapers have a robust negative association with inequality. Radios and TVs also have a negative association with inequality and poverty. ICT expenditures have a negative association with poverty. An ICT index is constructed which also has a negative association with poverty. ICT is positively associated with inequality for the full sample, but is negatively associated with inequality for the developing country sample.

Correspondence: School of Business and Management, Queen Mary, University of London, Mile End Road, London, E1 4NS

email: s.bandyopadhyay@qmul.ac.uk

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1. Introduction

The rise of mass media as an indispensible accessory of modern society's access to information has been phenomenal. The availability of information is crucial for efficient decision making by citizens and consumers (Stigler 1961, Stiglitz 2000). For the voter, information about government actions and political candidates is essential for accurate voting choices. Likewise, consumers and investors require information to purchase products and securities.

Access to information is, however, circumscribed by the instruments that are made available to the citizen. Less developed economies particularly suffer from the lack of adequate communications technologies. While access to communications infrastructure and information is largely asserted to be a prerequisite for growth and productivity, there is little empirical evidence which establishes this fact. This paper empirically investigates the association of Information Communications Technologies (hereafter ICT) and mass media as instruments of access to information, with inequality and poverty.

The impact of ICT and telephony, is a double edged innovation - one which results in both driving economic growth and in increasing spatial and individual inequalities. While increasing returns and technological progress are conceptually distinct, both theory and evidence seem to suggest that they often come together and result in technological lock-in (David 1985), such that technologies that have an initial advantage tend to endure. Prominent theories on the sources of economic growth reinforce such concerns. The ‘weightless’ properties of such technologies, with little regard for geographical barriers (Quah 2001a, b) enhance their rapid spread. These properties, however, due to unequal adoption rates, are predisposed to result in rapid increases in spatial and individual inequalities. Thus, in an LDC context, concentration in telephony and ICT penetration is likely to wedge the urban and the rural areas apart, as well as the rich and poor. Skill-biased technologies such as those engendered by development of ICT may also result in high wage inequalities - studies on the US increasing wage gap evince that skill-biased technological change (as a consequence of the increasing computerisation of the US work force) is an important driving force of US wage inequality (Autor and Katz 1999, Goldin and Katz 1996, DiNardo and Pischke 1994).

The impact of mass media, however, is less selective on its target audience and not likely to directly accentuate spatial or individual inequalities in the manner of ICTs. Its development and penetration is endogenous in a manner that ICT is not in that the quality of news generated by the media industry is also dependent of how the government treats the media industry. Deeper media penetration, unlike ICT, has no unequal effects in its impact. On the other hand, the underdevelopment of media is often a consequence of governments attempting to evade scrutiny from poor delivery or non-delivery of public goods, or government failure. Mass media functions to enhance citizens' abilities to scrutinise government actions.

We use OLS to show that newspapers are significantly associated with lower inequality. Mass media is also associated with lower poverty, though this is not the case with ICT/telephony.

Radios are found to be robustly associated with lower poverty levels. We obtain mixed results with ICTs and telephony. We find robust evidence of the association of ICT expenditures with corruption and inequality. We also construct an ICT infrastructure index and find that its association with inequality varies with the sample chosen - it is positively associated with inequality for the sample with both developed and developing countries, but not robustly associated with inequality for the developing country sample.

The rest of the paper is organised as follows. In Section 2 the current literature relating to mass media and ICT/telephony is discussed. Section 3 discusses the data and presents the empirical strategy and Section 4 presents the results. Section 5 concludes.

2. Mass Media and ICT

2.1. Political Accountability

2.1.1. Political Mechanisms

Despite the obvious justifications that mass media creates a more educated and responsive citizen, it is only recently that the political economy literature has seriously begun to address these issues. While most countries have media in some form or another, there is no guarantee that it is a successful vehicle of information. This is affected by a variety of government actions - ranging from policy decisions affecting the regulation and entry and ownership of media on the one hand, to

bribery and threats to the media bodies on the other. Besley and Prat (2001) study the determinants and the consequences of captured media, and find that capture is more likely if there is more state ownership of newspapers and there is greater concentration in ownership of newspapers. Petrova (2008) focusses on media misreporting, and explains media bias by conscious manipulation by media owners or editors and finds that it has an impact on public expenditures on education and health. Corneo (2006) finds that a higher concentration in firm ownership to be likely asssociated with higher media bias and lower welfare. Baron (2006) also explains persistent media bias that originates with private information obtained by journalists and persists despite profit-maximizing news organizations and rivalry from other news organizations.

2.1.2. Corruption

The existence of an active mass media body is usually seen to be associated with an active democracy. A small but growing cross country literature connects the incidence of a free press and the political framework that accompanies it. There are though countries which are democratic in structure but have low press freedom, especially in the developing world. Brunetti (2003) and Ahrend (2002) find robust correlations between press freedom and corruption. Djankov et al. (2003) also uncover robust cross-country evidence of state ownership of the media to be negatively correlated with a number of measures of good governance. Using a panel of 16 Indian states, 1958-1992, Besley and Burgess (2001) find that Indian state governments' provision of public food and calamity relief expenditure is more responsive to falls in food production and crop flood damage in states where newspaper circulation is high. The role of media in moderating business cycles is examined by Shi and Svensson (2002) - using a panel of 123 developed and developing countries over a 21-year period, they indeed find larger political budget cycles in countries where few people have radios.

Greater media outlets on the other hand are found to be encouraging for the emergence of a free press (Besley, Burgess and Prat 2002). Competition, though, may result in two different effects. While Besley and Prat argue that more media outlets are an impediment to politicians trying bribe the media, Mullianathan and Shleifer (2005) argue that greater competition could result

in newspapers (or other media forms) printing or broadcasting stories which confirm readers' prior opinions rather than presenting the real facts. Other lines of research investigate governments' incentives to engage in corruption in the presence of independent media bodies (Vaidya 2005).

2.2 The Effect of ICT

While ICTs are a principal carrier of information, its effect on economic development is more tangible than that of mass media - ICT carries with it technology that directly affects economic productivity and growth.

2.2.1. Growth

Increased investment in ICT has led to significant increases in economic growth (Haacker and Morsinck 2002, Timmer and van Arky 2005). The US, for instance, had an increase in TFP by one half percentage point per year over the last two decades. Europe's experience with ICT's contribution to economic growth is relatively sporadic. Daveri (2002) reveals that ICT contributions to growth were significant in only 10 countries out of 14 in his study. In only 6 of these, was ICT related capital-deepening associated with greater aggregate total factor productivity or growth in labour productivity. Among the newly industrialised economies in East Asia, the deepening of ICT has been of significant importance, particularly in production - 28% of their manufacturing exports are ICT products (Kenny 2003). The contribution of ICT related capital-deepening in Japan contributed to increasing growth by one half to three quarters

2.2.2 Inequality

What prominently distinguishes the outcomes of ICTs as different from other forms of information carriers is that on the production front it is pervasively characterised by increasing returns. Arthur (1994) and Krugman (1991) emphasise that the predominance of increasing returns in a certain industry leads to spatial agglomeration, in a manner similar to how technological lock-in sets in. From this point of view, ICT is no different from other industries - the location of geographic

clusters simply reflects the high skilled and fast-producing nature of the technology. ICT clustering is more pronounced in the EU than in the US (Koski et al 2000, Quah 2001a). Similarly, unequal access to ICT and thus information, may exacerbate already existing individual inequalities.

Combining all these issues, one is prompted to ask whether ICT investment is just growth spurring or inequality increasing, or both. Some casual empiricism as discussed above suggests both, but its effects are yet to be empirically established. While the phenomenon of spatial agglomeration is clearly understood in the literature, whether it is associated with increasing individual inequalities is not clear.[1] The empirical analysis that follows attempts to uncover any such correlations between various development outcomes discussed above and ICTs.

3. Data and Empirical Strategy

This section discusses the data on ICT, media, press freedom and corruption, the specifications estimated in the empirical analysis, and explains the econometric methodology used. The database has been put together from a variety of sources, each to be described in turn.

[Insert Table 1 here]

3.1. Measures of Mass Media Penetration

Mass media penetration is measured by using the number of newspapers in circulation, and the ownership of radios and televisions, per 1,000 people. The principal data source has been the World Bank Indicators data base.

3.2. Measures of ICT and Telephony

The data has been compiled from the World Bank indicators data set (2004). The variables for which we have obtained maximum coverage of countries are the following:

- Mobile phones (per 1,000 people)

- Internet Users (per 1,000 people)
- ICT expenditure as a percentage of GDP
- Fax machines (per 1,000 people)
- Telephone mainlines (per 1,000 people)
- Telephone mainlines per employee
- Telephone revenue (per 1,000 people)
- Number of personal computers per 100,000 people.

There exists a large number of other ICT indicators, but the country coverage dramatically drops, and are therefore not included in the analysis.

To identify the collective effect of the ICT variables, we construct an index of ICT using factor analysis. This technique is a method of data reduction and attempts to describe the indicators as linear combinations of a small number of latent variables. We accept the first factor (f1) to be the general index of ICT and telephony infrastructure (presented later in tables as ICTindex), which takes an eigenvalue of over 5. In performing the factor analysis, the data has been normalised for comparability of the numerical values (for example, comparing revenues in US dollars to number of personal computers per 1,000 people). (Factors and factor loadings are not presented here for lack of space but are available from the author.) For our estimations we mainly use the first factor, and for robustness use the second factor f2. We also use the UNCTAD index of ICT diffusion as an alternate indicator of ICT penetration.

3.3. Measure of press freedom

Our main measure of press freedom is assembled by Freedom House, having published widely used indexes for political rights and civil liberties for the last 25 years. Here again the data presented is in the form of a ranking of the countries in increasing order of freedom.

3.4. Measure of inequality

We use the Gini measure (of income inequality) from the WIID2b database published by UNU-WIDER, which documents annual measures of country Ginis, for the time period 1992-1997.

4. Associations of Inequality and Poverty with ICT and media

In this section, we present OLS estimates of the correlations of inequality and poverty with ICT infrastructures and mass media. Given that the nature of their impact of any of these outcomes is unknown, we estimate our models using OLS. Tables 2 and 3 present the results with Ginis (inequality) as the dependent variable and Table 4 with poverty as the dependent variable.

4.1. Inequality, and ICTs and Media

In Tables 2 and 3 we present the results of the associations of media and Telephony/ICT variables with levels of inequality. The dependent variable is the Gini coefficient, obtained from the UNU-WIDER (2005) database (WIID2b) for years 1992-1997. We estimate both for the full sample of countries, and the developing countries' sample, to observe whether the relationship only holds for LDCs.

The basic specification that we are testing is as follows:

$$GINI_i = \beta_0 + \beta_1 NEWS_i + \beta_2 RADIO_i + \beta 3 TV_i + \beta_4 ICTindex_i + \beta_5 BUREAU_i + \beta_6 RULE_i + \beta_7 TRADE_i + \beta_8 RISK_i + \varepsilon_i$$

Table 1 lists the abbreviations and the sources of the variables in use. $NEWS_i$, $RADIO_i$ and TV_i represent the incidence of newspapers, TVs and radios in country *i*. The $ICTindex_i$ is the index (the first factor, in most cases) that has been estimated using factor analysis in Section 3.2.

We include a number of variables as controls which represent the quality of rule of law and institutions, which engender knowledge and information creation and its spread. Rule of law, presented above as RULE, is a variable obtained from the ICRG, which measures the extent of the citizens' capabilities to monitor the extent of corruption. It represents the presence of sound

political institutions, a functional legal system and ‘provisions for an orderly succession of power’. BUREAU accounts for the quality of bureaucracy in the government, also provided by the ICRG based on evaluations from country experts. It indicates the degree of autonomy (of the bureaucracy) from political pressure. Both variables are typically positively associated with lower values of corruption and knowledge-bias.

In addition to these we include a number of country-level characteristics which act as proxies of determinants of corruption.

TRADE is a proxy for distortions and restrictions of competition in an economy. It measures the exposure of an economy to foreign trade and is defined as the sum of exports and imports as a percentage of GDP. It has been argued that open countries are subject to larger competitive pressure which reduces monopolistic rents and thus corruption (Ades and Di Tella 1999), therefore one would expect a negative relationship with corruption, and a positive association with the corruption index.[2] We also include a variable collected by the ICRG, an index of expropriation risk, named here as RISK, which is scaled such that high values of RISK indicates low risk of appropriation. We would therefore expect a positive relationship with the ICRG corruption index.

Given these factors, one can conjecture that higher incidence of media variables - such as newspapers, radios and televisions - and higher access to ICTs – such as higher internet usage, and deeper telecommunications' penetration – can be associated with lower levels of inequality. Other country specific controls are also included. Ln GDP and Literacy measure the level of per capita GDP in 1995 (calculated at purchasing power parity US $), and the educational attainment. These both act as proxies for external controls – higher levels of GDP and education serve to act to reduce inequality by raising personal incomes.

We envisage the association of any of the media or ICT variables with inequality to be due to media and ICTs facilitating access to information and information technology. Also, societies with higher rule of law indicate the existence of high quality institutions and legal bodies, which can positively affect the impact of ICT and mass media infrastructure on citizen's education or awareness in general. Over time, access to information could translate into higher skills and thereby higher incomes. This impact, if partial across the distribution - that is, positively affects one section of the distribution more than others - may wedge the sections apart, resulting in a rise in

inequality. This is often the case in developing countries when access to the knowledge-based technology involved is expensive, and infrastructure-intensive.

The reverse may also happen; the knowledge it engenders, may 'equalise' society on some development outcomes (for example, awareness about birth control amongst men and women, brought about by national health programmes, brings down household size and thereby raises household per capita income in poor countries). ICTs and media can therefore serve to work either way on the extent of inequality.

Higher international exposure via TRADE makes the economy competitive, and enhances the quicker spread of information and associated technologies, by bringing down the prices of many of these technologies. As discussed earlier with relation to RULE, its effect may be either positive or negative. In addition, we choose two sets of country-specific controls used by Perotti (1996) and Barro (1999) as has been popularly used in the inequality and growth literature (Banerjee et al. 2002). This is because a central concern for the empirical literature is that any of the right hand side variables used as controls could proxy for omitted variables. The choice of the variables entails judgements about causality that are hard to substantiate. Therefore, we use an already established set of controls: those used in Perotti (1996) and those used in Barro (1999). Specifications empirically tested for are repeated with two sets of controls. These specifications are useful benchmarks for two reasons. First, the Perotti specification has been used by most subsequent studies. Second, they represent two extremes, the Perotti specification using the smallest number of control variables and the Barro specification the largest.[3] The Perotti specification excludes most variables (in particular, investment and government spending) through which inequality could be affected. The variables included are male and female education and the purchasing power parity of investment goods, a measure of distortions. Barro, on the other hand, includes a much larger set of variables through which inequality could be affected - investment share of GDP, fertility, education and government spending. The interpretation of the coefficients in two regressions is therefore slightly different. The results presented in Tables 2 and 3 allow for both sets of controls. To separate out the associations for developing countries only, we estimate the model for both the full sample of countries and the developing country sample separately, presented in Tables 2 and 3 respectively.

[Insert Tables 2 and 3 here]

Table 2 presents the estimates for the full sample – Column 1 estimates the basic model, with the individual media and ICT and telephony variables included individually, and the country-level controls BUREAU, RULE, Ln GDP, literacy, TRADE and RISK. We observe that newspapers, TVs and faxes are negatively and significantly associated with inequality. Telephone mainlines are also negatively and significantly associated with inequality. Of the ICT variables, only number of internet users is observed to be significant and positively associated with inequality. Inclusion of continent dummies in Column 3, and the Perotti controls, reveals both the Africa and Latin America continent dummies to be significant. We obtain the same results with the Barro controls (results not presented in Table).

For the estimates in Columns 4 to 7, we replace the individual variables with the ICT/telephony index - Columns 4 and 5 present the results using the first factor obtained from the factor analysis exercise, with the Barro and Perotti controls; the ICT/telephony index is not significant when included as levels, but is positive and significant when included as f1 squared. Other media variables - newspapers and TVs continue to be negative and significant. Fit drops on inclusion of the ICT index, particularly so for the model including the Barro controls. We replace the first factor by the second factor obtained from the factor analysis as the ICT index in Column 6 (using Barro controls) - here we obtain a significant and positive co-efficient for the ICT index. In all the specifications, the continent dummies are significant.

In Column 7, for robustness, we report results with the 2SLS regression for the ICT index (f2) lagged by 3 years as the instrument for f2. The ICTindex is again significant, as are newspapers and TVs. We do not obtain a significant co-efficient for both full and developing country samples. Two stage least squares regressions were also run instrumenting newspapers by press freedom. It does not appear to function as a successful instrument for newspapers in this case. These results were presented in an earlier version of the paper, obtainable from the authors.

Table 5 presents the estimates for the developing countries' sample – Columns 1 and 2 present the results for inclusion of the individual media and ICT/telephony variables, with the Barro

and Perotti controls respectively. Newspapers are negatively and significantly associated with inequality, but TVs are no longer significant. Continent dummies are significant for both specifications. We replace the individual media and ICT variables with the ICTindex in Columns 3 and 4 - we obtain a negative co-efficient for the model including the Perotti controls, but it is not significant. We include squared f1 and f2 as well, and obtain no significance. The same models were tested using the UNCTAD ICT diffusion index as well, and no significant results were obtained (results available from authors).

In both sets of models for full sample and developing country sample, there have been mixed outcomes for the country level controls – RULE for the full sample has been negative and significant throughout, likewise mostly for RISK, but not so for the developing country sample. BUREAU has also been positive and significant under some specifications for the developing country sample, while TRADE and literacy even rarely so. Ln GDP for several specifications is positive and significant under both the full sample and developing country sample. Newspapers are also instrumented using press freedom as an instrument; however, the coefficient on the newspapers variable has the opposite sign (results available from authors).

Finally, the results tabulating the regressions of inequality on mass media and ICT indicators in Tables 2 and 3, established two sets of relationships. For the full sample of countries, ICT is found to be positively associated with inequality, while for the developing country sample, it is either not significantly associated, or weakly negatively associated with inequality.

To affirm this non-linear relationship between inequality and the ICT index, we plotted some kernel regressions of inequality (Ginis) on the ICT index to ascertain the non-linear nature of this relationship. The non-linear relationship between growth and development indicators and inequality is well documented - starting from Kuznets's inverted U-curve hypothesis, to recent studies on inequality and growth (Banerjee and Duflo 2002, Quah 2002), and it well possible that a similar "stage of development" -specific relationship exists for inequality and the ICT infrastructure index.

Kernel regressions of the Gini on the ICT index are plotted for both f1 and f2 (the first two factors from the factor analysis exercise retained as indices of ICT) in Figures 1 to 2. We use two types of kernel estimators, the Epanechnikov estimator, and a quartic estimator - both reveal

similar non-linearities in the relationship between ICT indices and the Gini. For the regression of the Gini on the first factor, f1 in Figure 1 we observe that for lower values of f1, the relationship is positive, and for higher values of f1, it is negative. For the regression of the Gini on the second factor, f2 in Figure 2 we observe a clearer negative relationship, though this negative relationship often switches to a positive relationship for rising levels of ICT index f2.

To summarise our results obtained:

- Inequality is found to be negatively and significantly associated with several media variables, most notably with newspapers. Newspapers is negative and significant under all specifications: OLS, IV, for the full sample and developing country sample, and including Perotti and Barro controls. TVs are also found to be negatively associated with inequality, though the levels of significance varies with the model and controls included.
- Inequality is also found to be significantly associated with the ICT index under several specifications for the full sample. For the full sample models, it is positive and significant, particularly for the models where it is included as with higher orders, but for the developing country sample it is not significant. The relationship is sensitive to specification, and could be due to non-linearities in the relationship, to be investigated in the following section.

4.4. Poverty, ICTs and Media

The next relationship that we will be investigating is the association of the media variables and the ICT index with poverty. The main model estimated is

$$POVERTY_i = \beta_0 + \beta_1 NEWS_i + \beta_2 RADIO_i + \beta 3TV_i + \beta_4 ICTindex_i + \beta_5 BUREAU_i + \beta_6 RULE_i + \beta_7 TRADE_i + \beta_8 RISK_i + \varepsilon_i$$

Poverty is measured using two definitions of poverty - the one dollar a day definition (poverty headcount ratio at $1 a day (PPP) (% of population)) , and the two dollar a day definition (poverty headcount ratio at $2 a day (PPP) (% of population)) of the World Bank. Data is obtained from the World Bank indicators' database over the years 1992 - 1997. We also estimated the models with the poverty headcount ratio at national poverty line (% of population), but due to the number of observations being very low, most speci.cations did not run. For this analysis we only consider the sample of LDCs (83 countries). Here again we use the same set of controls as determinants of poverty as before, via the same political economy routes. Controls of BUREAU and RULE account for good governance, and provide the institutional set up for growth and economic development. TRADE and RISK ensure the competitiveness required for economic growth and development, thereby lowering levels of poverty. We would expect a negative association of poverty with all of these four controls. Country level characteristics of Ln GDP and literacy are also included, and are expected to be negatively associated with poverty.

In Table 4, Column 1 presents the results of the basic specification with newspapers, radios, and TVs as the media variables, and the ICT and telephony individual variables, using the one dollar a day definition of the poverty measure. Due to the small sample size we only include the Perotti controls, and the country-specific characteristics. Newspapers are not significantly associated with poverty - this result holds for all specifications, barring Column 2 where it is positively associated with poverty. This result is not observed elsewhere. Radios are however, significant and negative for all models tested. This is observed for all the models presented, and also for any other model that has been tested. TVs are not significant, and this holds for most specifications using the one dollar a day measure of poverty. None of the individual ICT variables are significantly associated with poverty, but telephone revenues is significant. In Column 2, we also observe mobile telephony to be negative and significant as well. TVs and newspapers are significant and positive - this result is sensitive to the specification, and does not hold for the rest of the results presented.

[Insert Table 4 here]

In the following two columns, we replace the individual ICT variables with the ICT index - we have tested with both f1 and f2 factors, and higher order terms (squared terms), and it has not been significant in any of the specifications. Radios continue to be negatively and significantly associated with poverty. The continent dummies included in Column 4 are not significant - this is observed for all specifications estimated.

Columns 5 to 7 present the results using the two dollars a day measure of poverty. We again observe the negative and significant association of radios with poverty, but also observe that TVs is also negative and significant. This result holds for all specifications tested with the two dollar a day measure of poverty. Of the ICT variables tested, we observe that ICT expenditure as a percentage of GDP to be negative and significant. Internet users are also observed to be negative and significant - this result holds for all specifications. None of the telephony variables are significant. On replacing the individual ICT variables with the ICT index, we do not obtain a significant co-efficient. It is possible that the ICT variables that are individually significant are proxying for the level of development.

To summarise our results:

- We find that newspapers and radios are significantly and negatively associated with poverty. This result holds for all the models that have been estimated.
- The ICT index is not significantly associated with poverty. We find this to hold for most of the specifications. Of the individual ICT variables, ICT expenditures are significantly associated with poverty under some specifications.

5. Conclusion

Mass media and ICTs are two important vehicles of information in developing and developed countries alike. In this paper we present some robust evidence of some associations of ICTs and mass media with inequality and poverty.

We observe that inequality (measured with the Gini index), is negatively associated with newspaper penetration – this is one of the most robust results from all of our estimates. The ICT and telephony variables and the ICT index have mixed outcomes in their associations with inequality - for the full sample there exists a positive association, and a weak association (mostly negative) for the developing country sample. ICT expenditures as a percentage of GDP are found to have a negative association with inequality. For poverty, the most prominent result observed was the negative association with the incidence of radios and TVs - this result has been robust to all specifications tested, particularly for radios.

There are several avenues for future research - testing for specific political economy routes of causality for any of these associations will take this literature further. The literature on media capture and bias (Corneo 2006, Petrova 2008 for effects of income inequality on media bias, for example) addresses some of the issues that are tested here. Causality related to the effects of information infrastructures on inequality and poverty require micro-level empirical surveys, which the cross-country macro-approach adopted in this paper can only partially address. Country-specific micro-studies will therefore allow researchers to test for causality.

The role of ICTs in developing countries is much discussed in policy spheres; studies which examine the micro-level impact of these infrastructures will shed light on their effectiveness on local level welfare. With the role of media bias being much studied in a cross-country context, more research on its impact in developing countries in particular, in light of their weak legal institutions would contribute to the developing country literature specifically.

With the empirical literature on relationships between information infrastructures and development outcomes still at its early stages, the evidence obtained however is convincing that there exists a significant association between media and communications infrastructures, and inequality and poverty.

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Table 1: Variables used in the paper and their sources.
All years refer to the period 1992-1997

Variable name	Abbreviation	Years	Source
Press Freedom	Press	1994-1997	ICRG
Average quality of the bureaucracy	Bureau	all years	ICRG
Average Trade ((Export+Import) /GDP)	Trade	all years	WDI 2005
Average rule of law	Rule	all years	ICRG
Risk Premium	Risk	all years	ICRG
Natural Log of GDP, per capita	lgdppc	all years	WDI 2005
Education	lit	all years	WDI 2005
Latin America dummy	latin	all years	--
Africa dummy	africa	all years	--
OECD country dummy	oecd	all years	--
UNCTAD ICT diffusion index	unctad	1997	UNCTAD
Gini index	gini	all years	WIDER
Poverty, one dollar a day, head count ratio	pov1dd	all years	WDI 2005
Poverty, two dollars a day, head count ratio	pov2dd	all years	WDI 2005
Mobile phones (per 1,000 people)	mobile	all years	WDI 2005
Internet Users (per 1,000 people)	intusers	all years	WDI 2005
ICT expenditure as a percentage of GDP	ictexp	all years	WDI 2005
Fax machines (per 1,000 people)	fax	all years	WDI 2005
Telephone mainlines (per 1,000 people)	telmain	all years	WDI 2005
Telephone mainlines per employee	telmainemp	all years	WDI 2005
Telephone revenue (per 1,000 people)	telrev	all years	WDI 2005
Newspaper circulation (per 1,000 people)	news	all years	WDI 2005
Radios, (per 1,000 people)	radios	all years	WDI 2005
Televisions, (per 1,000 people)	tvs	all years	WDI 2005

Table 2: OLS Regressions of Gini Index 1992-1997, for full sample

	1	2	3	4	5	6	7
	OLS	OLS	OLS	OLS	OLS	OLS	IV
			Perotti	Barro	Perotti	Barro	Barro
news	-0.058***	-0.051***	-0.062***	-0.061***	-0.088***	-0.065***	-1.23***
radios	0.000	-0.000	-0.001	0.000	-0.001	-0.001	-0.000
tvs	-0.040***	-0.039***	-0.024***	-0.043***	-0.035***	-0.030***	-0.016***
fax	-0.364**	-0.313*	-0.001				
ictexp	0.172	-0.08	-0.88				
intusers	0.000*	0.000**	0.000**				
mobiles	0.019	0.055	-0.0211				
f1				-0.178			
f1sq					10.56***		
f2						6.162*	4.15*
bur	0.263	0.552	1.264	-0.190	1.449*	0.583	-0.283
rule	-3.639***	-2.584***	-1.412	-3.257***	-0.993	-1.078	-1.09
lgdppc	3.136**	2.495*	0.578	1.301	3.69***	-0.411	0.387
lit	0.0712	0.104	0.133	0.123	0.383***	0.176	0.176
tradegdp	0.029	0.003	0.107***	0.023	0.131***	0.084***	0.085***
risk	-0.627	-1.758	-2.14*	-0.697	-1.321	-2.491**	-1.128**
telmain		-0.013*					
africa			10.8***		12.47***	10.73***	9.23***
latin			13.0***		13.38***	11.9***	10.92***
cons	49.5***	61.1***	55.3***	62.4***	-6.27	66.7***	52.04***
N	97	84	97	83	83	83	83
Adj R^2	0.70	0.71	0.78	0.67	0.74	0.75	0.73
F	19.06	15.98	23.79	17.66	20.79	22.12	21.3

Notes ***: Significant at 1% level of significance
** : Significant at 5% level of significance
*: Significant at 10% level of significance

Table 3: OLS Regressions of Gini Index 1992-1997, for developing country sample

	1	2	3	4	5
	OLS	OLS	OLS	OLS	IV
	Barro	Perotti	Barro	Perotti	Perotti
news	-0.068**	-0.065*	-0.083**	-0.081**	-1.080**
radios	-0.001	-0.001	-0.001	0.000	0.000
tvs	0.002	-0.011	0.007	-0.005	-0.005
fax	0.424	0.026			
ictexp	0.321	-1.386			
intusers	0.000	0.000			
mobiles	0.013	0.019			
ICT index			1.004	-2.614	-2.64
bur	2.022*	2.776**	2.246**	2.773**	-2.110*
rule	-1.253	-0.536	-1.321	-0.142	-0.121
lgdppc	4.433**	-0.618	3.788*	0.076	0.023
lit	-0.062	0.2	0.029	0.184	0.110
tradegdp	0.012	0.124**	0.036	0.107**	0.090*
risk	-0.083	-0.73	0.149	-0.212	-0.212
telmain					
africa		14.4*		9.6	7.6
latin		15.2**		11.5**	10.5**
cons	24.1	33.8	19.6	20.9	19.9
N	58	58	48	48	48
Adj R^2	0.44	0.49	0.47	0.51	0.46
F stat	4.46	4.70	5.19	5.04	5.23

Notes ***: Significant at 1% level of significance
** : Significant at 5% level of significance
*: Significant at 10% level of significance

Table 4: OLS Regressions of Poverty 1992-1997, for developing country sample

	1	2	3	4	5	6	7
Dep variable	pov1dd	pov1dd	pov1dd	pov1dd	pov2dd	pov2dd	pov2dd
news	0.031	0.127**	0.029	0.036	-0.06	0.007	0.008
radios	-0.018*	-0.029**	-0.016*	-0.015*	-0.034**	-0.045***	-0.046***
tvs	0.059	0.116**	-0.008	-0.026	-0.127**	-0.087**	-0.087*
fax	3.753	-3.684			7.426		
ictexp	-0.034	3.679			-4.507*		
intusers	0.000	0.000**			0.000*		
mobiles	-0.076	0.755*			-0.59		
f1			-1.791	4.791		-9.562	9.612
bur	0.432	-0.766	-2.138**	-1.628	-1.365	-2.707	-2.93
rule	-0.691	-5.334**	-0.058	0.312	5.569	1.857	1.17
lgdppc	-9.792*	-13.542***	-2.697	-2.210	-2.643	-3.699	-2.468
lit	-0.334	-1.241***	-0.567**	-0.629**	0.006	-0.875**	-0.951**
tradegdp	-0.105**	-0.238***	-0.089**	-0.092**	-0.109	-0.159***	-0.226***
risk	-2.256	4.671	-0.749	-1.090	-3.93	0.658	-0.876
telmainrev	0.028**	0.026**					
telmainemp		-0.017					
africa				-0.648			-8.405
latin				1.294			-7.46
cons	111.43**	178.77	105.657**	110.579**	123.919**	168.349**	201.208***
N	25	21	21	21	25	25	21
Adj R^2	0.56	0.89	0.63	0.60	0.86	0.87	0.87
F	3.18	12.17	4.48	3.50	12.60	11.65	12.18

Notes ***: Significant at 1% level of significance
** : Significant at 5% level of significance
*: Significant at 10% level of significance

Appendix A: Countries used in the analyses.

Algeria	El Salvador	Korea, Republic	Poland	Uruguay
Angola	Ethiopia	Kuwait	Portugal	Venezuela
Argentina	Finland	Lebanon	Qatar	Vietnam
Australia	France	Liberia	Romania	Yemen, Rep.
Austria	Gabon	Libya	Russian Federation	Yugoslavia
Bahamas	Gambia	Luxembourg	Saudi Arabia	Zaire
Bahrain	Germany, FR	Madagascar	Senegal	Zambia
Bangladesh	Ghana	Malawi	Sierra Leone	Zimbabwe
Belgium	Greece	Malaysia	Singapore	
Bolivia	Guatemala	Mali	Slovakia	
Botswana	Guinea	Malta	Somalia	
Brazil	Guinea-Bissau	Mexico	South Africa	
Brunei	Guyana	Mongolia	Spain	
Bulgaria	Haiti	Morocco	Sri Lanka	
Burkina Faso	Honduras	Mozambique	Sudan	
Cameroon	Hong Kong	Myanmar	Suriname	
Canada	Hungary	Namibia	Sweden	
Chile	Iceland	Netherlands	Switzerland	
China	India	New Zealand	Syria	
Colombia	Indonesia	Nicaragua	Taiwan	
Congo	Iran	Niger	Tanzania	
Costa Rica	Iraq	Nigeria	Thailand	
Cote d'Ivoire	Ireland	Norway	Togo	
Cuba	Israel	Oman	Trinidad and Tobago	
Cyprus	Italy	Pakistan	Tunisia	
Czech Republic	Jamaica	Panama	Turkey	
Denmark	Japan	Papua New Guinea	UAE	
Dominican Republic	Jordan	Paraguay	Uganda	
Ecuador	Kenya	Peru	United Kingdom	
Egypt	Korea, DPR	Philippines	United States	

The developing country sample consists of the following countries:

Algeria	Gambia	Morocco	Yemen, Re.
Angola	Ghana	Mozambique	Zaire
Argentina	Guatemala	Myanmar	Zambia
Bahamas	Guinea	Namibia	Zimbabwe
Bahrain	Guinea-Bissau	Nicaragua	
Bangladesh	Guyana	Niger	
Bolivia	Haiti	Nigeria	
Botswana	Honduras	Oman	
Brazil	India	Pakistan	
Brunei	Indonesia	Panama	
Burkina Faso	Iran	Papua New Guinea	
Cameroon	Iraq	Paraguay	
Chile	Jamaica	Peru	
China	Jordan	Philippines	
Colombia	Kenya	Qatar	
Congo	Kuwait	Saudi Arabia	
Costa Rica	Lebanon	Senegal	
Cote d'Ivoire	Liberia	South Africa	
Cuba	Libya	Sri Lanka	
Dominican Republic	Madagascar	Surinam	
Ecuador	Malawi	Syria	

Egypt	Malaysia	Thailand
El Salvador	Mali	Trinidad and Tobago
Ethiopia	Malta	UAE
Gabon	Mexico	Venezuela

[1] Some work in this area has been done on the impact of ICTs on wage inequalities in the US, see Autor et al (1998).

[2] A large number of cross country studies investigating differential development outcomes, have often included the extent of cultural diversification as a possible determinant of differential growth and development outcomes. It is purported to affect corruption in particular by impeding competitiveness. Ethnic fragmentation has been included in several specifications but has not shown up to be significant and hence is not presented.

[3] The list of variables included in both specifications are as follows: Perotti: Log(GDP(1990), PPP I (1990), male education (1990), female education (1990). Barro: Log(GDP(1990)), log(GDP(1990)) squared, government consumption(1990-1995), secondary and higher education(1990), fertility(1990), 1/30*(term of trade(1995)-terms of trade(1990)), rule of law, democracy (1990), democracy (1990) squared, inflation(1990-1995), investment share (1990-1995).

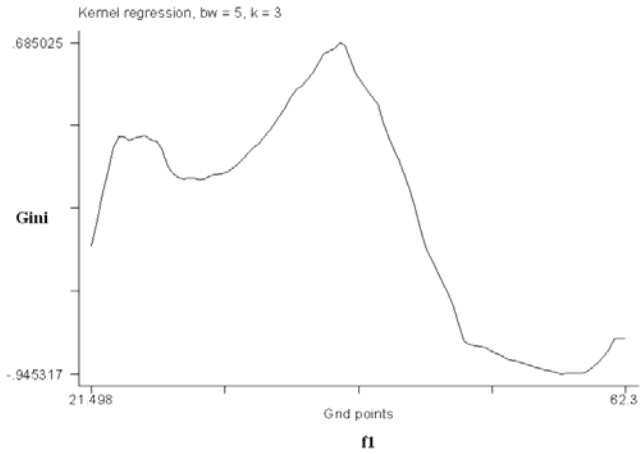

Figure 1 Kernel regression of Inequality on f1, Epanechnikov kernel

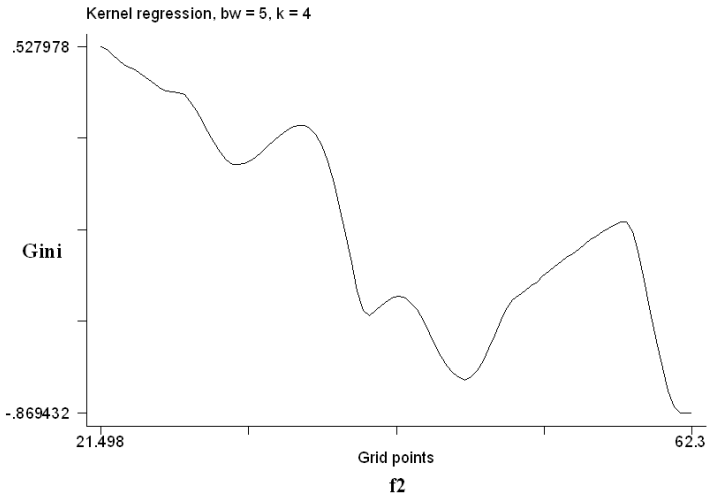

Figure 2 Kernel regression of Inequality on f2, Epanechnikov kernel