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More politics, or just more talking?

An assessment of teledensity and political participation

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Datasets used: Polity IV, UN MDG, Penn World Table
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Note: The author has partially drawn on an earlier essay (see Miard 2007 in the reference chapter).

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1. Introduction

With the rise of mobile telephony, many less developed countries suddenly enjoy teledensities[1] on a previously unthinkable scale, as mobile networks grow and disperse quickly and even surpass the number of landline connections. Mobile phone use is growing twice as fast in developing countries as in developed countries, and nowhere as fast as in Africa (BBC 2005; Vodafone 2007). However, with the emphasis largely put on studying economic effects, the academic literature on whether increased connectivity by new technologies such as the mobile phone has any socio-political effects is "extraordinarily slender" (Mudhai 2003: 2).

In an adequate regulatory environment, and with the right policies (see Baudrier 2001: 4-9), telecommunications has long been understood as an enabler of economic growth, not just as a sector in itself but also more generally as a vital service to business and industry. The economic returns are far greater than investment itself: the positive effect on transaction costs between businesses and customers is potentially very high (Gillwald 2005: 9; see also The Economist, 12.5.2007). Higher teledensity has been linked to social effects as well, as countries with more phone lines per capita can also expect significantly higher rates of life expectancy and literacy (Gillwald 2005: 10; see also Kenny 2001). What if one would extend the logic of transaction costs from the economic sphere to the social one? A similar potential for "unleashing" hitherto concealed and obstructed social, or political, activity is perfectly conceivable.

Little seems as yet to be known of how for example political activists make use of mobile phones. The device's potential is considerable, as events in Eastern Europe and some African countries have shown. In the Ukraine during the 'Orange Revolution' in 2004 or in Serbia's youth-led protests earlier on popular unrest and even outright revolt was greatly facilitated by the use of mobile phones and text messaging (see Radio Free Europe 2005; Van Zon 2005: 387). Some argue that Ethiopia's authoritarian regime switched off the text messaging service precisely for

[1] Teledensity is a common term describing the number of telephone connections in relation to area and population, e.g. per 100 inhabitants in a given country.

this reason. It remains unavailable.[2] North Korea's decision to shut down its mobile network altogether in 2004 may also be linked to a paranoid regime fearing revolt.[3] Politically motivated use of mobile phones has also occurred in African countries. During Senegal's 2000 presidential elections, reporters 'armed' with mobile phones apparently stood by the polling stations and transmitted the results instantly to radio stations, from where they were announced – before the government could manipulate them (e.g. during the ballots' relocation to the capital). Allegedly, plans of the incumbent president Abdou Diouf to rig the votes were thereby thwarted. He lost the elections (Abel 2000). Other election monitoring by means of mobile phones reportedly happened in Zambia in 2001 and in Kenya in 2002 (Mudhai 2003: 7).

Such events have raised the author's curiosity whether there is any substance to be found. Is there a general pattern behind those events that somewhat connects political activity with mobile phones?

2. Research question and hypothesis

With these findings in mind I would like to formulate my research question as follows: *Is there any real connection between teledensity and how politics are in a given country? Do countries with higher teledensities have more political activity?*

Consequently, my hypothesis is:

In countries with higher levels of teledensity, political participation is higher.

3. Research design and methodology

3.1 Concepts

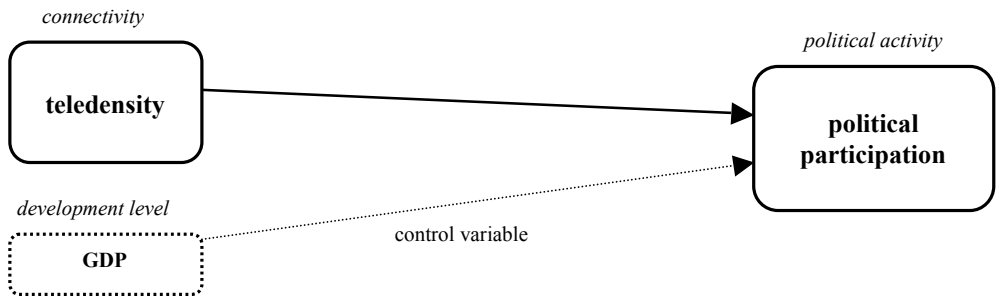
The underlying concept, or "background concept" (Adcock and Collier 2001), from which I wish to draw in this work states that the world's history of economic prosperity is characterized by the development of methods and mechanisms that allow human

[2] Information received from personal conversation with Norwegian journalist Tarjei Olsen, May 2007.
[3] Allegedly, owners of the now illegal mobile phones risk execution in North Korea (http://www.cellular-news.com/story/24361.php).

beings to tap more effectively and make use of knowledge embedded within local contexts (see Chamlee-Wright 2005). The argument boils down to transaction costs: new tools and methods reduce transaction costs between human beings. Chamlee-Wright mainly argues with regard to economic activity. One element she emphasizes is "connectivity", a concept that is meant to speed up or catalyze the dispersion of "word-of-mouth" (Chamlee-Wright 2005: 8). A simple phone call may help you to choose on which market to sell your goods, or save you long journeys to pick up information you could have received through, say, a message texted to you. That is efficient and the expected cost of engaging in a certain activity is lowered. Chamlee-Wright's focus lies on mobile phones, but other means such as the Internet are also conceivable, albeit less so in underdeveloped countries.[4]

I wish to contribute to this discussion by extending the argument into the closely related social, or more narrowly defined: the political realm. In Adcock and Collier's (2001) words, my "systematized concept" containing my hypothesis and the relevant variables needs to be outlined previous to operationalization; it could be expressed as follows: *just as it is claimed in the case of economic activity, connectivity is expected to have an impact on political activity as well, because it reduces organizational transaction costs*. By finding indicators measuring connectivity and political activity, linking the former to the latter (see Fig. 1), I would be able to test my hypothesis.

Fig. 1 Model of stated relationship between the independent and dependent variable(s).



[4] The mobile phone has a range of advantages over the computer which explain its rapid success in less developed countries: the most striking one is that illiteracy is less of a problem – anybody can talk, while using a computer requires literacy and often English language skills. This lowers the social entry barriers for mobile telecommunication. Other characteristics of mobile telephony include its ability to overcome geographic barriers – e.g. mountains, wetlands, and deserts; the lower installation costs and shorter payback periods compared to landlines; its scalability – "simply" add antennas as the number of users grows; no (steady) requirement of electricity for the handsets and, finally, the innovative pricing, e.g. pre-paid solutions (Dholakia and Kshetri 2003: 248).

3.2 Operationalization of variables

3.2.1 The dependent variable *Political Participation*

The dependent variable is the level of political participation measured by a composite index "competitiveness of participation" including a range of relevant indicators (Polity 2005; for details, see Appendix). The measure is categorical with six values from 0-5 (see Tab. 1) and does not have normal distribution (see Fig. A.1 in the Appendix). That is of little relevance in this case (see chapter 4.1). The total number of observed units is rather low (N = 149). In order to avoid difficulties in running a statistical analysis, i.e. having too many variables (or, as in this case, categories) in relation to the number of units observed, I recoded the variable into three values (Not Applicable = Missing; Repressed/Suppressed = 0; Factional/Transitional = 1; Competitive = 2). The not-applicable category was treated as missing, as it is somewhat a non-category (see Appendix). The last category stands out as having the highest-developed participatory patterns and remains therefore coded as a single category, while the other categories are merged for similarity patterns.[5] This political competitiveness index is used as a proxy for political activity. As such, it is not perfect but should cover the concept well enough.[6] There are also other available indicators to measure the concept both from Polity IV (see Polity 2005) and other sources (e.g., see Vanhanen 2000). More elaborate and inclusive composite indices were considered for the analysis, but not used to retain parsimony. Moreover, more complex indicator sets usually attempt to measure the concept "democracy", which is not of primary interest at this point.[7] Political activity does not have to be of democratic character.[8]

Tab. 1 Frequencies

(0) Not Applicable	2
(1) Repressed	14
(2) Suppressed	23
(3) Factional	34
(4) Transitional	41
(5) Competitive	35
Total	149

[5] The merged pairs were seen as more alike to one another than to the remaining categories. Also, the authors of this index clearly intended the measure to be of ordinal character (see Appendix). This reduces the scope for merging without taking the given order into account. Grouping *Not Applicable/Repressed* into the value 0, *Supressed/Factional* into 1, and *Transitional/Competitive* into 2, delivered similar but slightly weaker results. The model used was concluded to be a better fit.

[6] The indicator may, in certain circumstances, "hit the target" only partially. If for example a regime in a given country decides to move from a one-party system to a multi-party one, it is likely to change its score on the competitiveness measure. This, however, does not mean that actual political activity is to increase. The author remembers an example given by a lecturer: After Tanzania abolished its one-party system, people still kept on voting for the same party. Some citizens allegedly stated that "one of that kind was enough already".

[7] The author plans to extend this work into his master thesis.

[8] However, I am aware of the fact that my own indicator set attributes highest levels of competitiveness to the most democratic regimes. This could be the focus of a more theoretical discussion.

3.2.2 The independent variables *Teledensity* and *GDP*

The main independent variable is *teledensity*, a continuous measure of the number of landlines and mobile phone subscriptions per 100 inhabitants in a country, for which I use a country-year based dataset from the United Nations (MDG 2006). Using teledensity as a proxy to connectivity appears as straightforward and sufficient to cover the concept.[9] Landlines were included in the data at hand, but this is not considered as problematic as their number remains almost constant, while mobile networks have expanded dramatically in the last decade.[10] Teledensity data is collected by the ITU[11] and is considered very accurate and very reliable data (see MDG 2006 for more). Satisfying levels of reliability and validity should therefore be given. The teledensity data does not show a normal distribution (see Fig. B.1 in the Appendix), but this is not usually a condition for independent variables and is therefore disregarded. Of the 149 countries included in the dataset, four had no data on the chosen year (t = 2004-1; N = 145).[12] Teledensity levels registered ranged from 0.77 to 170.94 per 100 inhabitants (see Fig. B.1 in the Appendix).

Real domestic product per capita (GDP, or RGDPL[13]) is included as a control variable. *GDP* is measured continuously and was retrieved from the Penn World Table (Heston et al. 2006). Here, RGDPL is obtained by adding up consumption, investment, government and exports, and subtracting imports in any given year. It is a fixed base index in 2000 constant international dollars (called "Laspeyres", see Heston et al. 2006 for details). The underlying concept can be expressed as the development level of a country, which I intend to cover with the chosen indicator GDP per capita. Measuring economic strength with GDP is common in the social sciences; there should be little validity and reliability concerns bar the ongoing academic

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[9] Another possible measurement would be internet connections per 100 inhabitants. However, such connections are rare and expensive in many developing countries. Such an indicator cannot deliver useful data in a study that includes most countries on earth. See Dholakia and Kshetri (2003: 248) for a lucid argumentation on this.

[10] Take for example the case of Uganda: The number of mobile phone subscribers has skyrocketed from 3000 to over 3 million between 1996 and 2006, while the country has a "minuscule amount of fixed line access" (Gillwald and Esselaar 2005: 21): landline subscriptions have increased from 45'000 to roughly 137'000 in the same period (UCC 2007).

[11] International Telecommunication Union, see www.itu.int.

[12] For an explanation of the t-1 data used, see chapter 3.3.

[13] This type of GDP measure is also called Real GDP Laspeyres, hence the acronym RGDPL (see below). The terms GDP and RGDPL are used interchangeably in this work, yet always refering to Real GDP per capita.

discussion on comparability issues.[14] It is equally lacking normal distribution. Five out of 149 countries included had no data on the year chosen (t = 2004-1; N = 144). The values ranged from 580 to 36'183 international (annual) dollars per capita (see Fig. A.3 in the Appendix).

Why include this variable? Earlier research states that teledensity is closely interrelated[15] with economic growth (Röller and Waverman 2001). In other words, it is unlikely to observe one potential causal factor without the other (Skog 2004: 410).[16] Finding teledensity changes and simultaneously observing economic changes can therefore be expected, i.e. there may exist a certain collinearity between the two (see also Tab. A.1 in the Appendix). With a sufficient number of observation units, the statistical effect may be reduced, but in this case (N < 200) this is not given (see Skog 2004: 410-414). As a consequence, leaving GDP out in a regression model would lead to wrong estimates of the effect of teledensity on political participation (Skog 2004: 271-276 and 286-290). If GDP acts as a previous factor, either suppressing or increasing the effect of teledensity, a sequential analysis may reveal this (Skog 2004: 405).

To retain a parsimonious model no other variables were included. The focus lies on the effect of teledensity on political participation. With reference to the available academic literature, the most relevant effects for which one needs to control in this case are economic ones.

[14] The choice of real (as opposed to nominal), i.e. inflation-adjusted dollars, which also account for purchase-power parity should produce a valid measurement here (see Heston et al. 2006 for further data considerations).

[15] Interestingly, the question has long been whether telecommunication infrastructure generates economic growth or whether economic growth creates demand for upgraded infrastructure. In a study, Röller and Waverman (2001; see also Waverman et al. 2005) concluded that the causality is in fact two-way: telecommunication infrastructure and economic growth catalyze one another. It seems, however, that the critical mass of the network for economic growth to kick in is near 40% teledensity - which is almost universal access. Teledensity in non-OECD countries remains on average around 4%.

[16] Another aspect the author is aware of but that is not at the focus of this study is the relation between economic and democracy indicators, on which a rich academic literature exists. See e.g. Przeworski and Limongi (1993).

3.3 Unit of measurement, data discussion and missing cases

In this cross-section analysis, countries (N = 149) and the year 2004 are employed as the unit and point of measurement.[17] The scores for the indicator political activity will be from that year, while GDP and teledensity scores will be from the previous year (t-1) to control for reverse causality.

The analysis rests on a given dataset provided by the Polity IV (see Polity 2005) database, which is already coded in country-years and readily available in SPSS format.[18] The teledensity data, retrieved in Excel format from the United Nations (MDG 2006), was transformed to fit the base dataset and imported therein.[19] GDP data, originally in CSV-format (for the technical approach, see Heston et al. 2006), was loaded into the Excel table containing the teledensity data for control and matching, and loaded into the SPSS dataset thereafter.

Working with available data, the country selection is somewhat biased towards what the data providers deemed as worthy units. My two main datasets, Polity IV and MDG do not converge completely. Polity IV includes 161 contemporary countries, excluding those whose population was less than 500'000 in 2002.[20] The teledensity database includes all kinds of miniature countries but excludes for example Taiwan.[21] Penn World Table's 2006 edition includes 188 countries. The GDP indicator (RGDPL) has missing data for a range of countries, e.g. Myanmar and Libya. As mentioned above, the Polity IV dataset has been used as a base. All units not present in all of the three datasets were excluded from the analysis. This left me with 149 units, of which a few had no data on the independent variable on the chosen year 2004-1 (see variable discussion above).

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[17] Dynamic problems with measuring the unit "country", such as territory changes etc. can be avoided that way, while sovereignty issues are taken care of by excluding such cases (see below). For a discussion on how to control for contextual problems with the country unit, see Hantrais (1999).

[18] SPSS 13.0 (2006) for Macintosh was used to run the statistical analysis.

[19] Helene Roshauw from the Faculty of Social Sciences at the University of Oslo was so kind to help me figuring out the most time efficient and error-safe method, for which I would like to thank her at this place. Further help can be found in Christophersen (2006: 85-94)

[20] For more details, see the Polity IV Dataset User's Manual (Polity 2005).

[21] It is anybody's guess to suspect "the long arm" of China here. This is unfortunate, as this country may serve as an interesting case to study economic growth, technological improvement and democratization. Data is probably available from private operators or the Taiwanese government but was not collected in this research project.

Countries that were not, by definition (see Polity 2005 for details), fully sovereign and operational in 2004, i.e. in periods of *interruption* (foreign occupation), *interregnum* (central state collapse), or *transition* (state reconstitution) were excluded from the database.[22] The correlation model computed (Tab. C.1 in the Appendix) showed considerable improvement as a result of this decision. In addition, the GDP indicator values were divided by the factor 1000 to move the decimals. This generates smoother numeric results without affecting the data's properties.

4. Analysis and Results

4.1 Regression Model

A multinomial logistic regression was chosen to analyze the data. An ordinary least square (OLS), or linear, regression is not adequate when the dependent variable is categorical, i.e. dichotomous or polytomous. With a non-continuous dependent variable, the OLS condition of linearity between the independent and the dependent variable(s) is no longer given. Instead of expressing relations in absolute terms, logistic regression does so in relative terms (see Skog 2004: 351-366 and 377). Conditions made for regular OLS regression are relaxed in logistic regression; dependent variables or their residuals do not need to have a normal distribution.
Neither is a homoscedastic distribution of the residuals required (Christophersen 2006: 203; Skog 2004: 360). While logistic regression is limited to the analysis of dichotomous data, dependent variables with more than two categories – polytomous data – require the multinomial logistic regression approach (for a discussion of this approach and its varieties, see Fox 1997: 466-492; also Agresti 1996).

The dependent variable *competitiveness of participation* with originally six categories was reduced to three (see variable discussion above); a further reduction to dichotomy would have resulted in a substantial loss of data and was therefore not considered. In logistic regression, values of independent variables may either be categorical or continuous. The latter is the case here.

[22] An example would be Bosnia and Herzegovina (Polity 2005). Polity IV codes such "outliers" with the values -88, -77, and -66, respectively. To exclude them, the data was sorted with a Y >= 0 command, where Y stands for the dependent variable (see SPSS log chapter in the Appendix).

The analysis was performed sequentially in order to detect whether the control variable GDP would add, as expected, any additional information to the results. Model one includes only teledensity, while model two also includes GDP.

4.2 Results Model 1

The significant, decreasing -2 Log Likelihood, or "-2LL", value (Tab. 2) indicates that the model is improving (Christophersen 2006: 206-208; Skog 2004: 368). With teledensity as an independent variable, the model improves by 85.289.[23]

Tab. 2 Model Fitting Information (Model 1)

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	290.932			
Final	205.643	85.289	2	.000

Table 3 shows the estimated results of the first model. A substantially meaningful interpretation of the intercept, i.e. where all independent variables have the value zero, cannot be given. Neither zero teledensity nor zero GDP can be observed in reality.[24]

Tab. 3 Parameter Estimates (Model 1)

parcomp recoded 3cx[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval	
								Lower	Upper
(1) Factional / Transitional	Intercept	.693	.278	6.199	1	.013			
	teldens [t-1]	.002	.007	0.085	1	.770	1.002	0.989	1.015
(2) Competitive	Intercept	-3.370	.710	22.514	1	.000			
	teldens [t-1]	.049	.009	29.908	1	.000	1.051	1.032	1.069

a The reference category is: (0) Repressed / Suppressed.

The effect of teledensity is positive, but only significant for competitive polities (Y=2), with repressed/suppressed polities as the reference category (Tab. 3). There is 95% confidence that teledensity has an effect on competitive participation levels.

[23] Using the Chi-Square value to indicate this (see Tab. 2). The respective value excluding the independent variable (called $-2LL_0$, as it represents the null hypothesis stating no effect) is 205.643 + 85.289 = 290.932. The relative change is expressed by McFadden's R^2: $-2LL_0-(-2LL_1)/(-2LL_0)$ = 85.289/290.932=0.293 or 29.3% (Christophersen 2006: 207). SPSS calculation results of McFadden's R^2 can be found in the Appendix (Tab. D.1). Apart from giving an indiciation of a model's improvement, this R^2 has no substantial meaning (Christophersen 2006: 207-208).

[24] Theoretically, the scale includes the value zero, and a sovereign state without any phone line and an utopian, non-monetary, non-materialistic society is imagineable. However, in the contemporary world such a thing is inexistent.

The estimated regression coefficient of teledensity (.049) in that case can be interpreted via its antilogarithm exp(.049)[25] which is 1.051. The odds for a country to have a competitive participation level increase therefore with an expected factor of 1.051if teledensity in that country increases by one scale unit, compared to having a repressed/suppressed level. Put in other words, the expected odds increase by 5.1%. For the expected odds of a country being factional/transitional, rather than repressed/suppressed, there is no base to argue for a difference between countries with higher or lower teledensities, as the result is not significant. Comparing the first and second category's results also indicates that the expected odds for competitive compared to factional/transitional polities increase with teledensity.

4.3 Results Model 2

A decreasing -2LL value indicates again that the model is improving. With teledensity and GDP included, the model improves by 117.977 (Tab. 4). The effect of teledensity is positive in both categories, with repressed/suppressed polities as the reference category. There is 95% confidence that teledensity has an effect on factional/transitional and competitive participation polities. The estimated regression coefficients of teledensity (.074 and .083) can be interpreted via their antilogarithms exp(.074) and exp(.083) which are 1.077 and 1.086, respectively (see Tab. 5).

Tab. 4 Model Fitting Information (Model 2)

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	282.482			
Final	164.505	117.977	4	.000

The odds for a country to have a factional/transitional participation level, rather than a repressed/suppressed one, increase therefore with an expected factor of 1.077, or 7.7% if teledensity increases by one scale unit, controlled for GDP. The factor for competitive participation levels is 1.086, or 8.6%.

[25] This can also be expressed as $e^{.049}$.

Tab. 5 Parameter Estimates (Model 2)

parcomp recoded 3cx[a]			B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval	
									Lower	Upper
(1) Factional / Transitional		Intercept	1.415	.354	15.984	1	.000			
	[t-1]	teldens	0.074	.019	14.922	1	.000	1.077	1.037	1.118
	[t-1]	gdp div	-0.435	.097	20.225	1	.000	0.647	0.535	0.782
(2) Competitive		Intercept	-2.831	.708	15.979	1	.000			
	[t-1]	teldens	0.083	.019	18.782	1	.000	1.086	1.046	1.128
	[t-1]	gdp div	-0.171	.074	5.399	1	.020	0.842	0.729	0.974

[a] The reference category is: (0) Repressed / Suppressed.

GDP effects are significant as well. However, they are negative in both categories. This seems counterintuitive; it may indicate that the expected odds for factional/transitional and competitive polities, compared to repressed/suppressed ones, decrease with increasing GDP. The expected odds for a country to have a factional/transitional rather than a repressed/suppressed participation level decrease therefore with an expected factor of 0.647, or 35.3% if GDP increases by one scale unit, controlled for teledensity (Tab. 5). The expected factor for competitive participation levels is 0.842, or 15.8%.

4.4 Sparse data effect

One caveat that needs to be issued against the reliability of the results is the problem of small cell counts that was encountered when running the regression analysis. This is also called *sparse data effect* (Agresti 1996: 190) and can for example occur when the number of observed units is small, as in this case. According to Agresti (1996: 190-193; 134 for an example), empty cells represent a category with zero counts. Applied to my case, an example with zero counts could be a cell representing very low teledensity and competitive participation. It is probably very unlikely to exist. In most cases, “even though a cell is empty, its true probability is positive” (Agresti 1996: 191), i.e. a positive count is theoretically possible and may occur if the number of observed units were higher. This is called a *sampling zero*. Theoretically impossible counts can also occur and are called *structural zeros* (Agresti 1996: 190-

191). The latter is very rare and is disregarded here.[26] When processing sparse data, maximum-likelihood estimates can tend towards infinity. Its occurrence can be suspected when statistical software reports large estimates, in relative terms, and very large estimated standard errors (Agresti 1996: 191). This was not the case in this analysis, but a certain degree of caution with the results should be kept in mind. Agresti argues that in some cases, sample zeros can cause severe distortion of results, while in others results remain unharmed (Agresti 1996: 192).

A possible method to deal with this problem with the available data was to group the values of the independent variables. This was tested with teledensity and GDP each divided into three categories with cut-off points at the 33rd and 66th percentiles.[27] Running the same regression with this, the sample zeroes were reduced but did not disappear. As categorizing leads to information loss, this approach was dropped and the original model kept.

5. Conclusion

The results of the analysis imply that higher teledensity can be associated with more developed levels of political participation. My hypothesis was insofar confirmed. However, there are two aspects that suggest caution with such a conclusion. One is the sparse data effect problem. It puts some uncertainty on whether the results can be trusted. This issue could be mended by increasing the number of observation units, e.g. by running a time-series analysis.[28] The other aspect is the dependent variable competitiveness of participation, which is a useful approximation to the concept of political activity but should be refined. If such an improved variable would also have a higher measurement level, it would open up other statistical approaches such as OLS regression, incidentally also resolving the sparse data issue. However, the conceptual properties of political participation do not facilitate continuous or interval measurement.

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[26] Certain cell value combinations in my model are very unlikely but cannot with absolute confidence be denied. Structural zeros only occur when something is logically not possible.

[27] For Teledensity (N=145) the cut-off points were at 33.1% (value .77 through 10.61), 66.2% (11.48 through 50.20), and the remainder (50.36 through 170.94). For GDP (N=144), they were at 33.3% (580 to 2990), 66.7% (3006 to 9562), and the remaining (9778-36183). SPSS frequency tables were used to find the cut-off points and crosstabulation to check whether nothing had gone missing.

[28] Which the author considers for his master thesis. Time-series analysis was beyond the scope of this assignment.

The fact that including GDP into the analysis produced rather counterintuitive results evidently calls for further scrutiny. This is clearly the most surprising discovery in this analysis. Taken together, the scope for improving this analysis lies mainly in amending the dependent variable, as this would tackle both the statistical and validity issues. On the independent variables' side, finding intervening factors which one needs to control for would be another way to improve the results' validity.

6. Literature

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Appendix

I. Summary of tables and figures

II. Definition of *Competitiveness of Participation* categories

The index is constructed as follows (for more details, see Polity 2005):

Competitiveness is coded on a five-category scale:

(0) Not Applicable: This is used for polities that are coded as unregulated, or moving to/from that position, in Regulation of Political Participation (see Polity 2005).

(1) Repressed: No significant oppositional activity is permitted outside the ranks of the regime and ruling party. Totalitarian party systems, authoritarian military dictatorships, and despotic monarchies are typically coded here. However, the mere existence of these structures is not sufficient for a Repressed coding. The regime's institutional structure must also be matched by its demonstrated ability to repress oppositional competition.

(2) Suppressed: Some organized, political competition occurs outside government, without serious factionalism; but the regime systematically and sharply limits its form, extent, or both in ways that exclude substantial groups (20% or more of the adult population) from participation. Suppressed competition is distinguished from Factional competition (below) by the systematic, persisting nature of the restrictions: large classes of people, groups, or types of peaceful political competition are continuously excluded from the political process. As an operational rule, the banning of a political party which received more than 10% of the vote in a recent national election is sufficient evidence that competition is "suppressed."
However, other information is required to determine whether the appropriate coding is (2) Suppressed or (3) Factional competition. This category is also used to characterize transitions between Factional and Repressed competition. Examples of "suppression" are:
i. Prohibiting some kinds of political organizations, either by type or group of people involved (e.g., no national political parties or no ethnic political organizations).
ii. Prohibiting some kinds of political action (e.g., Communist parties may organize but are prohibited from competing in elections).
iii. Systematic harassment of political opposition (leaders killed, jailed, or sent into exile; candidates regularly ruled off ballots; opposition media banned, etc.). This is evidence for either Factional, Suppressed, or Repressed, depending on the nature of the regime, the opposition, and the persistence of political groups.
A newly enacted right to engage in political activities is most likely a change from category 1 to 2.

(3) Factional: Polities with parochial or ethnic-based political factions that regularly compete for political influence in order to promote particularist agendas and favor group members to the detriment of common, secular, or cross-cutting agendas.

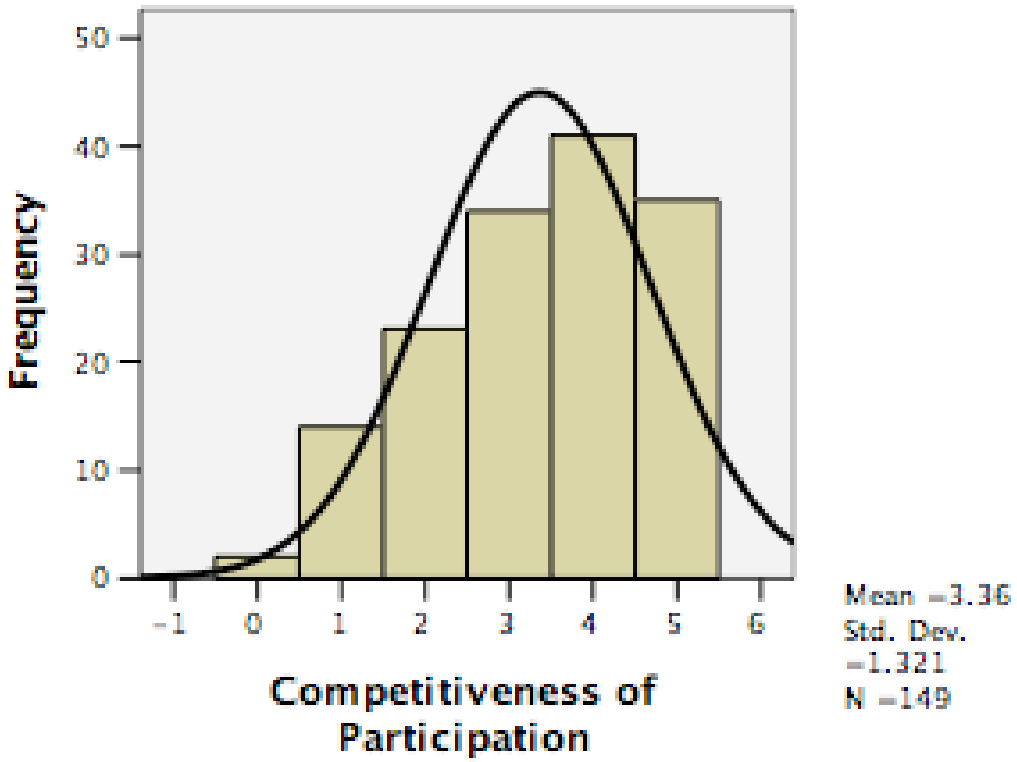
(4) Transitional: Any transitional arrangement from Restricted or Factional patterns to fully Competitive patterns, or vice versa. Transitional arrangements are accommodative of competing, parochial interests but have not fully linked parochial with broader, general interests. Sectarian and secular interest groups coexist.

(5) Competitive: There are relatively stable and enduring, secular political groups which regularly compete for political influence at the national level; ruling groups and coalitions regularly, voluntarily transfer central power to competing groups. Competition among groups seldom involves coercion or disruption. Small parties or political groups may be restricted in the Competitive pattern.

III. Descriptive Statistics

A. Dependent variable Competitiveness of Participation

Fig. A.1 Histogram of the (original) Dependent Variable Competitiveness of Participation



Tab. A.1 Frequencies of Competitiveness of Participation (marked, last two columns: after recoding)

		Frequency	Percent	Valid Percent	Cumulative Percent	Frequency Recoded	Valid Percent Recoded
Valid	(0) Not Applicable	2	1.3	1.3	37	[missing]	-
	(1) Repressed	14	9.4	9.4	75	37	25.2
	(2) Suppressed	23	15.4	15.4	35		
	(3) Factional	34	22.8	22.8	147	75	51.0
	(4) Transitional	41	27.5	27.5	2		
	(5) Competitive	35	23.5	23.5	149	35	23.8
	Total	149	100.0	100.0		147[+2]	100.0

B. Independent variables Teledensity and GDP

Fig. B.1 Histogram of the Independent variable Teledensity [t-1]

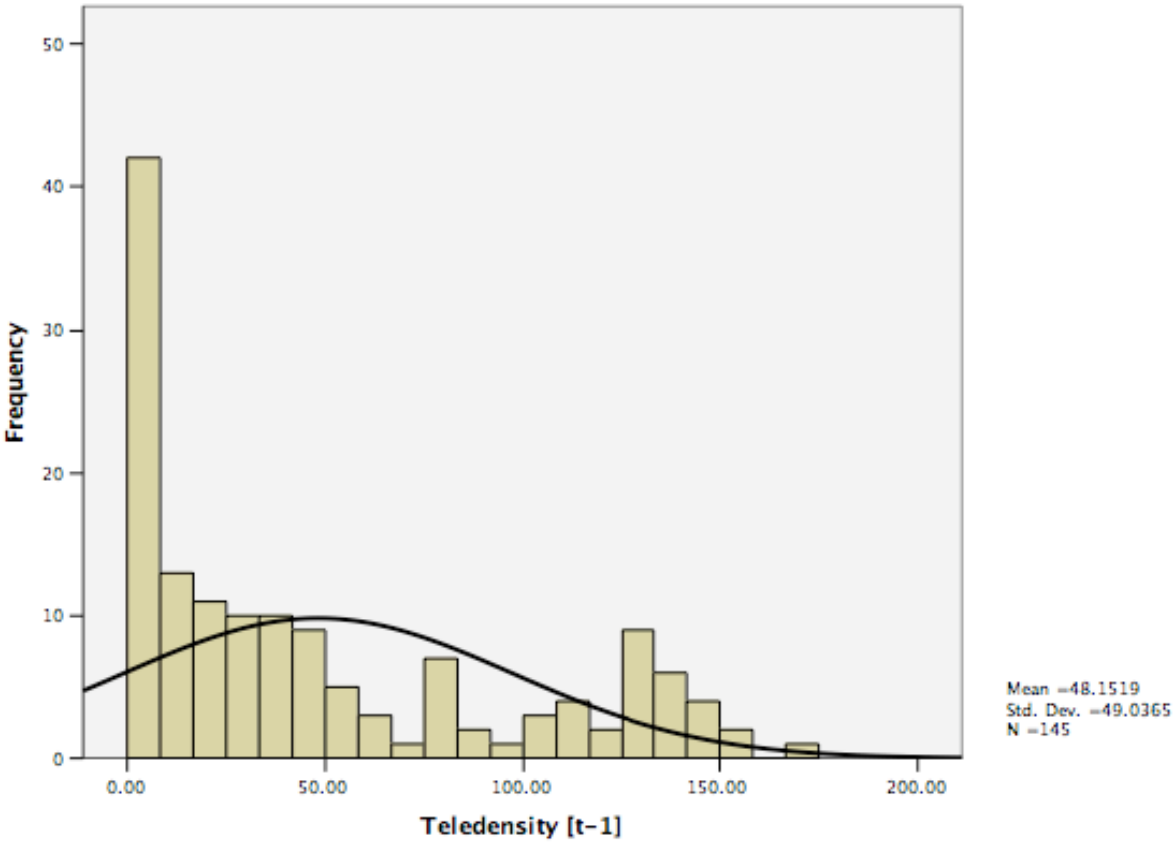
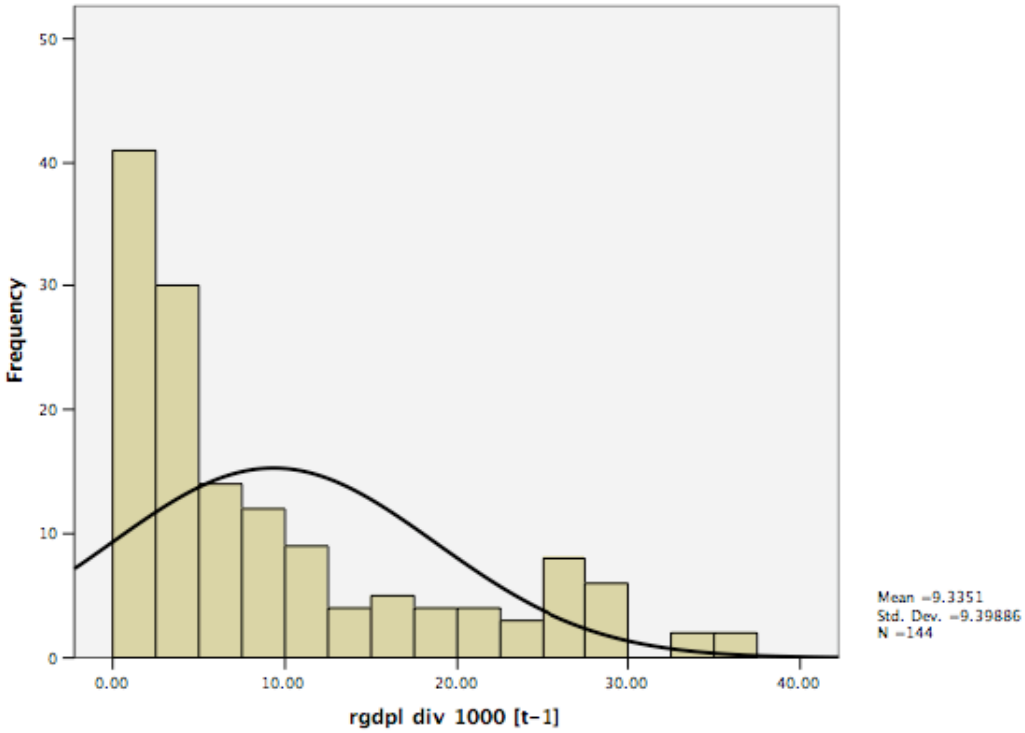


Fig. B. 2 Histogram of the Control variable Real GDP per capita [t-1] (divided by the factor 1000)



IV. Bivariate Correlations

Tab. C.1 Correlations (excluding polity interruption, interregnum, and transition cases) prior to Recoding

		real GDP per capita (Laspeyres)	Teledensity	Competitiveness of Participation
real GDP per capita (Laspeyres)	Pearson Correlation	1	.875(**)	.393(**)
	Sig. (2-tailed)		.000	.000
	N	145	141	145
Teledensity	Pearson Correlation	.875(**)	1	.568(**)
	Sig. (2-tailed)	.000		.000
	N	141	145	145
Competitiveness of Participation	Pearson Correlation	.393(**)	.568(**)	1
	Sig. (2-tailed)	.000	.000	
	N	145	145	149

** Correlation is significant at the 0.01 level (2-tailed).

Tab. C.2 Correlations after Recoding and Recomputing

		Teledensity [t-1]	rgdpl div 1000 [t-1]	Comp. of Participation Recoded [3 categ.]
Teledensity [t-1]	Pearson Correlation	1	.874(**)	.618(**)
	Sig. (2-tailed)		.000	.000
	N	145	140	143
rgdpl div 1000 [t-1]	Pearson Correlation	.874(**)	1	.446(**)
	Sig. (2-tailed)	.000		.000
	N	140	144	142
Comp. of Participation Recoded [3 categ.]	Pearson Correlation	.618(**)	.446(**)	1
	Sig. (2-tailed)	.000	.000	
	N	143	142	147

** Correlation is significant at the 0.01 level (2-tailed).

V. SPSS Regression Outputs

Relevant tables not inserted in the regression analysis chapter above are presented here:

Regression Sequence 1 [teledensity only]

Tab. D.1 Pseudo R-Square

Cox and Snell	.449
Nagelkerke	.515
McFadden	.290

Tab. D.2 Likelihood Ratio Tests

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	290.719	85.076	2	.000
teldens	290.932	85.289	2	.000

The chi-square statistic is the difference in -2 log-likelihoods between the final model and a reduced model. The reduced model is formed by omitting an effect from the final model. The null hypothesis is that all parameters of that effect are 0.

Regression Sequence 2 [teledensity & GDP]

Tab. D.3 Pseudo R-Square

Cox and Snell	.575
Nagelkerke	.660
McFadden	.418

Tab. D.4 Likelihood Ratio Tests

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	254.517	90.012	2	.000
teldens	205.874	41.369	2	.000
gdp / 1000	199.844	35.338	2	.000

VI. SPSS Logs

Data preparation

```
GET
  FILE='basedata.sav'.
FILTER OFF.
USE ALL.
SELECT IF(year = 2004).
EXECUTE .
FILTER OFF.
USE ALL.
SELECT IF(parcomp >= 0).
EXECUTE .

RECODE
  parcomp
  (0=SYSMIS)  (5=2)  (1 thru 2=0)  (3 thru 4=1)  INTO  parcomp_3cx .
VARIABLE LABELS parcomp_3cx 'parcomp recoded 3 cat 0 excl'.
EXECUTE .

COMPUTE rgdplrecomp = rgdpl / 1000 .
EXECUTE .
```

Multinomial Logistic Regression Sequence 1

```
NOMREG
  parcomp_3cx  (BASE=FIRST ORDER=ASCENDING) WITH teldens
  /CRITERIA CIN(95) DELTA(0) MXITER(100) MXSTEP(5) CHKSEP(20) LCONVERGE(0) PCONV
   ERGE(0.000001) SINGULAR(0.00000001)
  /MODEL
  /STEPWISE = PIN(.05) POUT(0.1) MINEFFECT(0) RULE(SINGLE) ENTRYMETHOD(LR) REMOV
   ALMETHOD(LR)
  /INTERCEPT =INCLUDE
  /PRINT = FIT PARAMETER SUMMARY LRT CPS STEP MFI .
```

Multinomial Logistic Regression Sequence 2

```
NOMREG
  parcomp_3cx  (BASE=FIRST ORDER=ASCENDING) WITH teldens rgdplrecomp
  /CRITERIA CIN(95) DELTA(0) MXITER(100) MXSTEP(5) CHKSEP(20) LCONVERGE(0) PCONV
   ERGE(0.000001) SINGULAR(0.00000001)
  /MODEL
  /STEPWISE = PIN(.05) POUT(0.1) MINEFFECT(0) RULE(SINGLE) ENTRYMETHOD(LR) REMOV
   ALMETHOD(LR)
  /INTERCEPT =INCLUDE
  /PRINT = FIT PARAMETER SUMMARY LRT CPS STEP MFI .
```