

Awaworyi Churchill, Sefa; Okai, Davidson; Posso, Alberto

**Preprint**

## Internet Use and Ethnic Heterogeneity in a Cross-Section of Countries

*Suggested Citation:* Awaworyi Churchill, Sefa; Okai, Davidson; Posso, Alberto (2015) : Internet Use and Ethnic Heterogeneity in a Cross-Section of Countries, ZBW - Deutsche Zentralbibliothek für Wirtschaftswissenschaften, Leibniz-Informationszentrum Wirtschaft, Kiel und Hamburg

This Version is available at:

<https://hdl.handle.net/10419/110902>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

## Internet Use and Ethnic Heterogeneity in a Cross-Section of Countries

Sefa Awaworyi Churchill<sup>1</sup>, Davidson Okai<sup>2</sup>, Alberto Posso<sup>3</sup>

<sup>1</sup>Department of Economics, Monash Business School, Monash University, VIC 3800, Australia

<sup>2</sup>CAL Bank Ltd, Accra - Ghana

<sup>3</sup>School of Economics, Finance and Marketing, RMIT University, VIC 3000, Australia

<sup>1</sup>Email: [sefa.awaworyi@monash.edu](mailto:sefa.awaworyi@monash.edu)

<sup>2</sup>Email: [dokai@calbank.net](mailto:dokai@calbank.net)

<sup>3</sup>Email: [alberto.posso@rmit.edu.au](mailto:alberto.posso@rmit.edu.au)

### Abstract

This paper investigates the association between ethnic heterogeneity and information technology related outcomes such as internet access and internet use. We argue that the global digital divide, as measured by cross-country differences in internet access and use, could be explained by cross-country differences in ethnic heterogeneity. We use indices of ethnic and linguistic fractionalization as measures of ethnic heterogeneity. Using data on a cross-section of 93 countries, we find evidence of a negative association between ethnic heterogeneity and the use and access of internet. Thus, cross-country differences in the global digital divide can be explained by the levels of ethnic fractionalization. Other determinants of the digital divide include income, infrastructure, literacy level, level of urbanization and inequality.

**Keywords:** ethnic diversity, digital divide, information inequality, internet

## 1. Introduction

Economic equity and reduction in income inequality has long been pursued at various levels in several countries in the world. In fact, a vast body of literature explores the association between inequality and economic performance (see, e.g., Castelló & Doménech, 2002; Chen & Fleisher, 1996; Gyimah-Brempong, 2002; Kuznets, 1955; Panizza, 2002; Seguino, 2000; Shin, 2012). Similarly, equity in information access is gradually becoming part of the globalization orthodoxy. Thus, easy access to information is a growing priority in most parts of the world.

Today, the internet has rapidly acquired a place in society, and without doubt, it is indeed a viable way to achieve information equity. While the internet appears to have a global reach, its use across countries seems uneven. For instance, data from the Statistics Portal on internet usage suggests that only 19% of the Indian population have access to the internet, compared to 43% of Vietnamese. On the other hand, 92% of South Koreans have internet access. Despite the benefits of the internet and technology in general, and the prospects it presents to development and information equity, one cannot help but observe the roles of variables such as gender, education and other socio-economic variables in determining internet usage. A vast literature examines the impact of gender on the use of internet and ICT in general (see, e.g., Bimber, 2000; Joiner et al., 2005; Li & Kirkup, 2007; Shaw & Gant, 2002; Weiser, 2000), and also the impact of socio-economic status such as education and income (see, e.g., Birru et al., 2004; Fogel, 2002; Schmar-Dobler, 2003). However, the digital inequality and social heterogeneity nexus can be traced not only to gender, education and income, but potentially to race and ethnicity. This study focuses on whether and how ethnic heterogeneity affects equity in information proxied by internet access and use.

Conceptually, ethnic diversity could affect internet access and use in various ways. For instance, existing research shows that pupils and girls from ethnic-minority backgrounds often have less affinity for technology, and also less experience in using them (see, e.g., Sutton, 1991; Volman & van Eck, 2001; Volman et al., 2005). Of course, it is not obvious that these categories of individuals are in this predicament because of their ethnicity. In fact, ethnic minorities are often poorer and less educated, which could explain this phenomenon.

Consider also an example in the context of demographic characteristics. Various geographic locations have been associated with specific ethnic groups. For instance, in Ghana, the Ewes are often located in the Volta Region while the Fantes are located in the Central Region. These geographic locations are characterized by different levels of development and thus, demographic characteristics could be a potential channel through which ethnic diversity could affect the use of technology. Also, research has shown that different cultural and ethnic groups respond differently to technological innovations, and thus technological innovations such as the internet would gain acceptance in some areas much rapidly than others (see, e.g., Dwyer et al., 2005; Edwards et al., 2002; Takada & Jain, 1991; Yenyurt & Townsend, 2003). For example, some ethnic groups believe that technology might interfere with the integrity of their culture.

Overall, the conventional wisdom gathered by the extant literature reveals that ethnic minorities are less likely to use and have internet access (see, e.g., Fox & Livingston, 2007). Our study is

differentiated from these existing studies given that we examine the effect of ethnic fractionalization on internet use and access. We argue that an increase in ethnic heterogeneity is characterized by an inherent hierarchical system which projects one ethnic group as superior over the other. Thus, the disadvantages faced by the so called ethnic minorities emerge as a result of fractionalization which basically labels some groups as inferior to others. We use indices of ethnic and linguistic fractionalization to capture ethnic and linguistic diversity, while our measures of internet access and use include subscribers of broadband internet and users of internet, respectively. Evidence points to a negative association between fractionalization and our outcome measures.

The remainder of this paper is structured as follows. The next section presents the data and empirical approach. Sections 3 and 4 discuss the results and robustness exercises, respectively. Finally, Section 5 concludes.

## **2. Data and Empirical Approach**

### **2.1. Data**

Our measures of ethnic and linguistic fractionalization are drawn from Alesina and Zhuravskaya (2011). They construct indices of ethnic and linguistic fractionalization for a cross-section of countries. Indices of fractionalization capture the probability that two randomly selected individuals are from different ethnic/linguistic groups<sup>1</sup>. Indices from Alesina and Zhuravskaya (2011) are created based on data availability and thus constructed indices for each country do not belong to one specific year. The Indices are therefore calculated based on information drawn from census closest to the year 2000. Given the persistence of ethnic and linguistic fractionalization over long horizons, the differences in years of the fractionalization indices do not pose a problem for us. However, for other variables included in our analysis, we take the average value for each country for the decade 2000 to 2009.

Our measures of internet access and use are drawn from the World Bank database. Measures of internet access include mobile phone subscriptions per 100 people and fixed broadband internet subscription per 100 people. Mobile phones subscriptions are subscriptions to a public mobile telephone service using cellular technology, which provide access to the public switched telephone network. This measure includes both post-paid and prepaid subscriptions. Fixed broadband internet subscribers are the number of broadband subscribers with a digital subscriber line, cable modem, or other high-speed technology. Our measure of internet use is internet users per 100 people. This indicator captures individuals who have used the Internet (from any location) in the last 12 months. Internet can be used via a computer, mobile phone, personal digital assistant, etc. We use these three measures as dependent variables in our regressions.

With regards to explanatory variables, previous literature shows the importance of various factors in determining internet use. First, existing research shows that social and demographic characteristics significantly affect internet use (see, e.g., Jiang, 2009; Lin, 1998; Rogers, 2010; Zhu & He, 2002). Particularly, the nature of a population group could be a determinant of internet use, and thus social demographics is an important factor to consider given that users and non-users of the internet may be differentiated by demographics. For instance, individuals living in urban areas may have the

---

<sup>1</sup> For details about index construction, see Alesina and Zhuravskaya (2011).

advantage of internet use over those in rural areas. Urbanization is therefore an important predictor of internet use. In this study, consistent with existing literature, we use the percentage of the total population living in urban areas as a measure of urbanization.

Researchers have also identified education as a determinant of internet use and technology adoption as a whole. Busselle et al. (1999), for instance, argue that the young, educated and affluent are often among the early adopters of new technologies relating to ICT. Related evidence also shows that the use of information technology is more prevalent among better educated individuals (see, e.g., Consoli, 2008; DiMaggio et al., 2001; James et al., 1995). This is mainly because, the use of internet requires the basic ability to read, and thus one would expect a correlation between literacy and the adoption of technologies such as the internet. We therefore control for literacy rate in our regressions.

From another perspective, it is argued that higher income enables households and individuals to purchase new technologies, and access other devices that are not available to others (see, e.g., Al-Hammadany & Heshmati, 2011; Kshetri, 2001). Thus, it is expected that economic factors such as income level and available infrastructure would affect internet availability, access and use. Income level is proxied by GDP per capita. To capture variations in income level within each country, we also include the GINI coefficient. Furthermore, internet use could be a function of not just current levels of economic activity per person, but also economic growth. Thus, we also control for economic growth using GDP growth rates. For internet related infrastructure, consistent with the existing literature, we use telephone lines (see, e.g., Chinn & Fairlie, 2006).

Additionally, given that ethnic fractionalization is less disruptive in democracies (Collier, 2000), we adopt the POLITY IV democracy index to control for democracy. This measure captures the level of democracy or autocracy in an economy. 'Polity Scores' range from -10 to +10, with -10 to -6 corresponding to autocracies, -5 to 5 corresponding to anocracies, and 6 to 10 to democracies.

Lastly, given that most software and internet platforms are in English, it has been argued that the internet tends to favour the English speaking population. This is also true given that a large percentage of the World Wide Web content is in English (Nunberg, 2000). Thus, we control for countries that have English as their first language or were colonized by the English. Except for our democracy index and dummies capturing language, we use the log form of all variables as they are all skewed compared to our indices of fractionalization which take values between zero and one. Table 1 presents a summary statistics and description of variables used in our regressions.

[Table 1 here]

## **2.2. Empirical Approach**

Our primary goal is to establish whether ethnic and linguistic fractionalization is associated with internet access and use, conditional on other relevant determinants. We therefore run regressions of the form;

$$INTERNET_i = \alpha + \beta F_i + \sigma' X_i + \varepsilon_i$$

Here,  $i$  indexes countries, *INTERNET* stands for measures of internet use and access;  $F$  represents indices of ethnic and linguistic fractionalization;  $X$  is a vector of country level covariates that could potentially affect internet use and access. Finally,  $\varepsilon$  is the heteroskedastic error term.

We estimate the above model using OLS regressions adjusted for heteroskedasticity. This regression approach seems appropriate as we do not expect endogeneity. It is unlikely that internet access and use may affect the composition of ethnic groups in society. Furthermore, given that measures of ethnic and linguistic fractionalization are highly persistent, changes in indices of fractionalization would occur only over a long period of time, possibly over a 30 year horizon (Alesina et al., 2003).

As a form of robust check, we supplement our OLS regressions with median regressions. Median regressions estimate conditional median functions rather than the often used conditional mean functions. This regression approach minimizes the absolute deviations and thus provides estimates that are less susceptible to outlier problems compared to mean regressions.

### 3. Results and Discussions

Regressions in Table 2 present results for the association between indices of fractionalization and our outcome variables. Columns 1 to 3 present results for the effect of ethnic fractionalization while columns 4 to 6 present results for linguistic fractionalization.

[Table 2 here]

Quite robustly, results show that the associations between ethnic fractionalization and broadband subscription (column 1), and also linguistic fractionalization and broadband subscription (column 4) are negative. This suggests that higher levels of fractionalization (both ethnic and linguistic) are negatively associated with broadband subscriptions. Specifically, from column 1, we observe that movement from complete ethnic homogeneity to complete ethnic heterogeneity is associated with a decrease of 54 percentage points in the level of broadband subscriptions. Put differently, a standard deviation increase in ethnic fractionalization is associated with a 0.05 standard deviation decline in the level of broadband subscriptions. From column 4, results show that movement from complete linguistic homogeneity to heterogeneity is associated with a decline of 55 percentage points in the level of internet users. A standard deviation increase in ethnic fractionalization is associated with a decline of 0.05 standard deviations in the level of broadband subscriptions.

For regressions explaining mobile subscriptions (columns 2 and 5), while the coefficients of fractionalization are negative, they are statistically insignificant. Thus, results show that there is no significant association between our indices of fractionalization and mobile subscriptions.

Turning to the association between indices of fractionalization and internet users, results are similar to what we observe for broadband subscriptions. From column 3, we find that a transition from complete ethnic homogeneity to complete heterogeneity is associated with a decline of 53 percentage points in the level of internet users. A standard deviation increase in ethnic fractionalization leads to a decline of 0.09 standard deviations in broadband subscriptions. We also find a negative association between linguistic fractionalization and internet users. Specifically, movement from complete linguistic homogeneity to complete heterogeneity is associated with a

decline of 59 percentage points in the level of internet users. A standard deviation increase in linguistic fractionalization is associated with a 0.10 standard deviation decrease in the level of internet users.

Thus, overall, results show that fractionalization (both ethnic and linguistic) hinders internet access and use. A number of potential channels could explain these results. First, it has been argued that higher levels of fractionalization could have negative influences on society. Particularly, highly fractionalized societies often have lower levels of public goods (see, e.g., Muñoz & de Soysa, 2010). Furthermore, evidence suggests that higher level of ethnic fractionalization makes governance difficult and leads to poorer governance qualities (e.g., Alesina & Zhuravskaya, 2011). Consequently the prevalence of dissent in ethnically heterogeneous countries is much higher. Governments may consider such dissents as threats and may respond to such threats with reduced levels of public goods in the form of ICT access. This in the long run affects the access to the internet and subsequently its use.

Another possible explanation for the observed association is the categorization of ethnics which fractionalization induces. Ethnic fractionalization leads to higher levels of discrimination in society which is often characterized by the classification of a segment of society referred to as minorities. This segment are often discriminated against and in most cases are less privileged with regards to internet access and use. For instance, early research conducted by Neu et al. (1999) shows that minorities such as black and non-white Hispanics in the US are less likely to participate in internet activities. This could be due to their inability to afford internet related devices such as computers, given that minorities are often relegated with less opportunity and income.

Another possibility is that certain individuals in ethnically fractionalized societies become increasingly insular in order to protect their national identity. Indeed, evidence from the United States and Britain suggests that some ethnic minorities limit their participation and involvement in wider society. For example, Phillips (2006) argues that British people of South Asian origin, particularly British Muslims, are actively withdrawing from interactions with the wider British society because of fears of rejection, racism, and harassment. Similarly, Ulsaner and Conley (2003) show that strong social ties within minority ethnic Chinese communities in the United States lead them to withdraw from civic engagement within the larger community often because of lack of trust. Overall, these studies show that ethnic differences create and reinforce segregation often fuelled by stereotypes about what different people are like. This study provides evidence which suggest that ethnic fractionalization leads to lower usage of the internet, possibly because it is regarded as the ultimate melting pot, where people from all over the world can get together. Therefore, in societies with a plethora of ethnicities, where ethnic groups are being constantly challenged by other cultural identities, it can make sense to shun the internet in favor of smaller social groups.

Furthermore on the issue of trust, evidence suggests that there is an inverse relationship between fractionalization and generalized trust (see, e.g., Alesina & Zhuravskaya, 2011). Thus, trust is lower in more fractionalized countries. Given that trust is a major component of social capital and social networks, we can expect higher fractionalization to negatively affect internet use. Specifically, the internet is a platform where individuals develop strong social networks but these networks become weaker in with lower levels of trust. Thus, as fractionalization leads to lower levels of trust,

individuals become more cautious of forming or becoming part of social networks, especially via the internet.

#### **4. Robustness Checks**

We provide three extra set of results to examine the robustness of our findings. These analyses involve the use of an alternative dataset for fractionalization, the introduction of an additional control variable and also the use of a different estimation method.

As indicated earlier, we adopt the median regression technique to supplement OLS results. Table 3 presents results for median regressions with bootstrapped standard errors. We find that, quite consistently, the use of different estimation technique does not affect the nature of our results. The association between fractionalization and measures of internet access and use mostly remain the same with slight variations in the magnitude of coefficients. Results in Column 4 show an insignificant coefficient for linguistic fractionalization, and this appears to be the only major variation. Overall, the negative association between fractionalization and internet use and access is robust to estimation type. Given that median regressions are effective in dealing with outlier issues, findings here give us confidence that we are not faced with major outlier issues.

[Table 3 here]

Next we adopt alternative measures of fractionalization to verify that the observed relationship between fractionalization and internet use and access is not driven by our measure of ethnic and linguistic fractionalization. To this end, we draw on different measures of ethnic and linguistic fractionalization developed by Alesina et al. (2003). Alesina et al. (2003) also compute indices of fractionalization which is different from what Alesina and Zhuravskaya (2011) provide. Alesina and Zhuravskaya (2011) collect census information at the sub-national (regional/district) level for countries in the cross-section, and use this information to construct sub-national level indices of fractionalization. They then aggregate the sub-national indices of fractionalization into national-level indices. Alesina et al. (2003) on the other hand, construct their indices directly at the national level.

Results for alternative measures of fractionalization are reported in Table 4. Results here are also largely consistent with the earlier reported negative relationship between fractionalization and our outcome variables. Furthermore, results here show more severe effects of fractionalization on our outcome variables. This is evident given the magnitude of the coefficients that explain the association between fractionalization and internet use and access. We also note that the coefficient in column 2 which was statistically insignificant in Tables 2 now gains significance in Table 4 with the use of the alternative fractionalization measures. Nonetheless, it is apparent that the observed associations between our outcome variables and fractionalization are robust to the measures of fractionalization used.

[Table 4 here]

Lastly, we include an interaction term in our specification to observe if this presents any variations in our results. Specifically, we interact indices of fractionalization with GDP per capita. Results for this specification are presented in Table 5.



[Table 5 here]

Here, we observe that fractionalization (both ethnic and linguistic) loose significance in regressions explaining broadband subscriptions (columns 1 and 4). However, results for the association between internet users and fractionalization are robust to the inclusion of the interaction term, as results consistently show a negative association.

## **5. Summary and Conclusions**

At a first glance, ethnic diversity and the internet appear to be two very divergent subjects. However, a closer examination reveals that individual and group identity are essential factors that affect the use of information technology. In this study, we hypothesize a relationship between internet related outcomes and ethnic diversity measured by indices of ethnic and linguistic fractionalization. We consider three measures of internet access and use namely; number of broadband subscribers, number of mobile phone subscribers and number of internet users. We find evidence of a negative association between ethnic diversity and the internet use.

Internet usage is one aspect of the digital divide, and thus we provide evidence of ethnic fractionalization contributing to the digital divide. Ethnicity and ethnic diversity are social constructs and the evidence provided here lend support to a vast body of existing literature which suggest that social constructs evolve to affect the information age significantly.

Potential channels that explain the effect of fractionalization on internet access and use include trust, governance qualities and discrimination. Fractionalization leads to lower levels of trust and poorer governance qualities. Lower levels of trust negatively affect the establishment and strength of social networks, and this extends to internet use as the internet is a platform used in forging social links. Poorer governance, on the hand, lead to lower public goods (including the internet), and also an unequitable share of public resources. Furthermore, fractionalization leads to higher levels of discriminations which prevent some segment of society from accessing or using the internet.

## References

- Al-Hammadany, F. H., & Heshmati, A. (2011). Determinants of Internet use in Iraq. *International Journal of Communication*, 5, 23.
- Alesina, A., Devleeschauwer, A., Easterly, W., Kurlat, S., & Wacziarg, R. (2003). Fractionalization. *Journal of Economic Growth*, 8(2), 155-194.
- Alesina, A., & Zhuravskaya, E. (2011). Segregation and the Quality of Government in a Cross Section of Countries. *American Economic Review*, 101(5), 1872-1911. doi: 10.1257/aer.101.5.1872
- Banks, J. A. (2001). Cultural diversity and education. *London: Alleyn & Bacon*.
- Bimber, B. (2000). Measuring the gender gap on the Internet. *Social science quarterly*, 868-876.
- Birru, M. S., Monaco, V. M., Charles, L., Drew, H., Njie, V., Bierria, T., . . . Steinman, R. A. (2004). Internet usage by low-literacy adults seeking health information: an observational analysis. *Journal of Medical Internet Research*, 6(3).
- Busselle, R., Reagan, J., Pinkleton, B., & Jackson, K. (1999). Factors affecting Internet use in a saturated-access population. *Telematics and Informatics*, 16(1), 45-58.
- Castelló, A., & Doménech, R. (2002). Human Capital Inequality and Economic Growth: Some New Evidence. *The Economic Journal*, 112(478), C187-C200. doi: 10.1111/1468-0297.00024
- Chen, J., & Fleisher, B. M. (1996). Regional income inequality and economic growth in China. *Journal of Comparative Economics*, 22(2), 141-164.
- Chinn, M. D., & Fairlie, R. W. (2006). The determinants of the global digital divide: a cross-country analysis of computer and internet penetration. *Oxford Economic Papers*. doi: 10.1093/oep/gpl024
- Collier, P. (2000). Ethnicity, Politics and Economic Performance. *Economics & Politics*, 12(3), 225-245. doi: 10.1111/1468-0343.00076
- Consoli, D. (2008). Co-evolution of capabilities and preferences in the adoption of new technologies. *Technology Analysis & Strategic Management*, 20(4), 409-425.
- Coupey, E. (2001). *Marketing and the Internet*: Prentice Hall PTR.
- DiMaggio, P., Hargittai, E., Neuman, W. R., & Robinson, J. P. (2001). Social implications of the Internet. *Annual Review of Sociology*, 307-336.
- Dwyer, S., Mesak, H., & Hsu, M. (2005). An exploratory examination of the influence of national culture on cross-national product diffusion. *Journal of International Marketing*, 13(2), 1-27.
- Edwards, S. M., Mizuno, Y., & La Ferle, C. (2002). Internet diffusion in Japan: Cultural considerations. *Journal of Advertising Research*, 42(2), 65-79.
- Fogel, J. (2002). Internet use for cancer information among racial/ethnic populations and low literacy groups. *Cancer control: journal of the Moffitt Cancer Center*, 10(5 Suppl), 45-51.
- Fox, S., & Livingston, G. (2007). Latinos Online: Hispanics with Lower Levels of Education and English Proficiency Remain Largely Disconnected from the Internet. *Pew Hispanic Center*.
- Gong, W., Li, Z. G., & Stump, R. L. (2007). Global internet use and access: cultural considerations. *Asia Pacific Journal of Marketing and Logistics*, 19(1), 57-74. doi: 10.1108/13555850710720902
- Gurin, P. Y., Dey, E. L., Gurin, G., & Hurtado, S. (2003). How does racial/ethnic diversity promote education? *The Western Journal of Black Studies*.
- Gyimah-Brempong, K. (2002). Corruption, economic growth, and income inequality in Africa. *Economics of Governance*, 3(3), 183-209. doi: 10.1007/s101010200045
- James, M. L., Wotring, C. E., & Forrest, E. J. (1995). An exploratory study of the perceived benefits of electronic bulletin board use and their impact on other communication activities. *Journal of Broadcasting & Electronic Media*, 39(1), 30-50.
- Jiang, P. (2009). Consumer adoption of mobile internet services: An exploratory study. *Journal of Promotion Management*, 15(3), 418-454.

- Joiner, R., Gavin, J., Duffield, J., Brosnan, M., Crook, C., Durndell, A., . . . Lovatt, P. (2005). Gender, Internet identification, and Internet anxiety: Correlates of Internet use. *CyberPsychology & Behavior*, 8(4), 371-378.
- Kshetri, N. B. (2001). Determinants of the locus of global e-commerce. *Electronic Markets*, 11(4), 250-257.
- Kunovich, R. M., & Hodson, R. (2002). Ethnic diversity, segregation, and inequality: A structural model of ethnic prejudice in Bosnia and Croatia. *The Sociological Quarterly*, 43(2), 185-212.
- Kuznets, S. (1955). Economic growth and income inequality. *The American Economic Review*, 1-28.
- Leigh, A. (2006). Trust, Inequality and Ethnic Heterogeneity. *Economic Record*, 82(258), 268-280. doi: 10.1111/j.1475-4932.2006.00339.x
- Li, N., & Kirkup, G. (2007). Gender and cultural differences in Internet use: A study of China and the UK. *Computers & Education*, 48(2), 301-317.
- Lin, C. A. (1998). Exploring personal computer adoption dynamics. *Journal of Broadcasting & Electronic Media*, 42(1), 95-112.
- Muñoz, L. L., & de Soysa, I. (2010). The blog versus big brother: new and old information technology and political repression, 1980–2006. *The International Journal of Human Rights*, 15(8), 1315-1330. doi: 10.1080/13642987.2010.518729
- Neu, C., Anderson, R., & Bikson, T. (1999). Sending Your Government a Message: E-Mail Communication between Citizens and Governments: MR-1095-MF.
- Nunberg, G. (2000). Will the Internet always speak English. *The American Prospect*, 11(10), 27.
- Panizza, U. (2002). Income Inequality and Economic Growth: Evidence from American Data. *Journal of Economic Growth*, 7(1), 25-41. doi: 10.1023/A:1013414509803
- Paul, P. (1996). Marketing on the Internet. *Journal of Consumer Marketing*, 13(4), 27-39.
- Phillips, D. (2006). Parallel lives? Challenging discourses of British Muslim self-segregation. *Environment and Planning D: Society and Space* 24(1), 25 – 40
- Rogers, E. M. (2010). *Diffusion of innovations*: Simon and Schuster.
- Schmar-Dobler, E. (2003). Reading on the Internet: The link between literacy and technology. *Journal of adolescent & adult literacy*, 80-85.
- Seguino, S. (2000). Gender Inequality and Economic Growth: A Cross-Country Analysis. *World Development*, 28(7), 1211-1230. doi: [http://dx.doi.org/10.1016/S0305-750X\(00\)00018-8](http://dx.doi.org/10.1016/S0305-750X(00)00018-8)
- Shaw, L. H., & Gant, L. M. (2002). Users divided? Exploring the gender gap in Internet use. *CyberPsychology & Behavior*, 5(6), 517-527.
- Shin, I. (2012). Income inequality and economic growth. *Economic Modelling*, 29(5), 2049-2057. doi: <http://dx.doi.org/10.1016/j.econmod.2012.02.011>
- Sutton, R. E. (1991). Equity and Computers in the Schools: A Decade of Research. *Review of Educational Research*, 61(4), 475-503. doi: 10.3102/00346543061004475
- Takada, H., & Jain, D. (1991). Cross-national analysis of diffusion of consumer durable goods in Pacific Rim countries. *The Journal of Marketing*, 48-54.
- Uslaner, E. M., & Conley, R. S. (2003). Civic engagement and particularized trust the ties that bind people to their ethnic communities. *American Politics Research*, 31(4), 331-360.
- Volman, M., & van Eck, E. (2001). Gender equity and information technology in education: The second decade. *Review of Educational Research*, 71(4), 613-634.
- Volman, M., van Eck, E., Heemskerk, I., & Kuiper, E. (2005). New technologies, new differences. Gender and ethnic differences in pupils' use of ICT in primary and secondary education. *Computers & Education*, 45(1), 35-55.
- Weiser, E. B. (2000). Gender differences in Internet use patterns and Internet application preferences: A two-sample comparison. *CyberPsychology and Behavior*, 3(2), 167-178.
- Yeniyurt, S., & Townsend, J. D. (2003). Does culture explain acceptance of new products in a country? An empirical investigation. *International Marketing Review*, 20(4), 377-396.
- Zhu, J. J., & He, Z. (2002). Diffusion, use and impact of the Internet in Hong Kong: A chain process model. *Journal of Computer-Mediated Communication*, 7(2), 1-26.

**Table 1 – Description and Summary of Variables**

Variable	Description*	Mean	Median	Std Dev
Ethnic Index 1	Index of Ethnic Fractionalization from Alesina and Zhuravskaya (2011)	0.37	0.32	0.27
Linguistic Index 1	Index of Linguistic Fractionalization from Alesina and Zhuravskaya (2011)	0.36	0.31	0.27
Ethnic Index 2	Index of Ethnic Fractionalization from Alesina et al. (2003)	0.44	0.49	0.26
Linguistic Index 2	Index of Linguistic Fractionalization from Alesina et al. (2003)	0.41	0.41	0.29
Broadband Subscription	Fixed Broadband Subscriptions (per 100 People)	11.16	13.16	3.11
Mobile Subscription	Mobile Cellular Subscription (per 100 People)	3.30	3.74	1.15
Internet Users	Internet Users (per 100 People)	2.17	2.45	1.53
Urbanization	Urban Population	3.91	4.06	0.53
Inequality	GINI Index	3.67	3.59	0.23
Income	GDP Per Capita	8.35	8.43	1.10
Growth	GDP Per Capita Growth Rate	3.21	5.6	0.98
Literacy	Country Literacy rate	3.95	4.31	0.74
Telephone Lines	Number of Telephone Lines	12.89	14.37	2.45
English Language Origin	Dummy for English Speaking Countries	0.25	0	0.43

\*All variables are logged except dummy variables and indices which take values between 0 and 1

**Table 2 – OLS Regressions**

	Fractionalization = Ethnic			Fractionalization = Language		
	Broadband Subscription (1)	Mobile Subscription (2)	Internet Users (3)	Broadband Subscription (4)	Mobile Subscription (5)	Internet Users (6)
Fractionalization	-0.54* (0.32) [-0.05]	-0.19 (0.16) [-0.05]	-0.53* (0.32) [-0.09]	-0.55* (0.31) [-0.05]	-0.16 (0.18) [-0.04]	-0.59* (0.36) [-0.10]
Urbanization	0.80** (0.34) [0.15]	0.83*** (0.29) [0.46]	0.77* (0.40) [0.25]	0.73** (0.36) [0.13]	0.90*** (0.29) [0.48]	0.85** (0.41) [0.27]
Inequality	0.22 (0.58) [0.02]	0.52 (0.51) [0.12]	-0.05 (0.51) [-0.01]	0.50 (0.60) [0.04]	0.57 (0.50) [0.14]	-0.06 (0.53) [-0.01]
Income	0.30* (0.17) [0.12]	0.33*** (0.09) [0.38]	0.23 (0.19) [0.16]	0.33* (0.17) [0.13]	0.31*** (0.08) [0.36]	0.18 (0.18) [0.13]
Literacy	-0.21 (0.24) [-0.06]	0.12 (0.14) [0.10]	0.64*** (0.23) [0.32]	-0.41 (0.26) [-0.12]	0.05 (0.14) [0.04]	0.55** (0.22) [0.28]
Telephone Lines	1.11*** (0.05) [0.79]	0.02 (0.04) [0.05]	0.11** (0.05) [0.14]	1.13*** (0.05) [0.80]	0.04 (0.04) [0.08]	0.14** (0.06) [0.18]
Democracy	-0.00 (0.03) [-0.00]	-0.03 (0.02) [-0.12]	-0.00 (0.03) [-0.00]	0.02 (0.03) [0.02]	-0.03* (0.02) [-0.12]	0.00 (0.03) [0.01]
Growth	0.01 (0.03) [0.01]	0.00 (0.02) [0.01]	0.01 (0.03) [0.01]	-0.01 (0.03) [-0.01]	-0.01 (0.02) [-0.03]	-0.01 (0.03) [-0.01]
English Language Origin	0.29 (0.25) [0.04]	0.23 (0.16) [0.10]	0.26 (0.23) [0.07]	0.11 (0.23) [0.02]	0.19 (0.14) [0.09]	0.30 (0.22) [0.08]
Constant	-9.06*** (2.55)	-5.15** (2.13)	-6.57*** (2.28)	-9.68*** (2.48)	-5.48*** (2.04)	-6.54*** (2.22)
Regional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	85	85	85	85	85	85
R-squared	0.96	0.89	0.88	0.95	0.88	0.87

Robust standard errors adjusted for heteroskedasticity in parentheses

Standardized coefficients in brackets

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 3 - Median Regressions**

	Fractionalization = Ethnic			Fractionalization=Language		
	Broadband Subscription (1)	Mobile Subscription (2)	Internet Users (3)	Broadband Subscription (4)	Mobile Subscription (5)	Internet Users (6)
Fractionalization	-1.09** (0.51)	-0.27 (0.19)	-1.06** (0.53)	-0.80 (0.84)	-0.11 (0.33)	-1.43*** (0.34)
Urbanization	0.51 (0.46)	0.79** (0.31)	0.95* (0.53)	0.82* (0.46)	0.71* (0.37)	1.46** (0.59)
Inequality	-0.01 (0.78)	0.22 (0.46)	0.10 (0.69)	0.31 (0.86)	0.55 (0.57)	-0.03 (0.69)
Income	0.28 (0.28)	0.35** (0.15)	0.30 (0.29)	0.22 (0.27)	0.30*** (0.10)	0.10 (0.28)
Literacy	0.16 (0.27)	0.02 (0.15)	0.52 (0.38)	-0.19 (0.40)	0.14 (0.20)	0.35 (0.33)
Telephone Lines	1.06*** (0.09)	0.05 (0.03)	0.01 (0.06)	1.14*** (0.08)	0.05 (0.03)	0.03 (0.06)
Democracy	-0.04 (0.03)	-0.05*** (0.02)	0.04 (0.04)	-0.03 (0.05)	-0.04 (0.03)	0.05 (0.05)
Growth	0.03 (0.04)	0.03 (0.02)	-0.01 (0.04)	0.02 (0.05)	0.00 (0.03)	-0.04 (0.05)
English Language Origin	0.41 (0.30)	0.25 (0.19)	0.09 (0.42)	0.31 (0.43)	0.08 (0.21)	0.29 (0.29)
Constant	-7.07* (3.69)	-3.83* (1.98)	-6.63* (3.54)	-9.05*** (2.90)	-4.94** (2.15)	-5.96* (3.08)
Regional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	85	85	85	85	85	85

Standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

**Table 4 - Alternative Measures of Fractionalization (OLS Regressions)**

	Fractionalization = Ethnic			Fractionalization=Language		
	Broadband Subscription (1)	Mobile Subscription (2)	Internet Users (3)	Broadband Subscription (4)	Mobile Subscription (5)	Internet Users (6)
Fractionalization	-0.90** (0.44)	-0.33* (0.19)	-0.68* (0.38)	-0.60* (0.31)	-0.20 (0.16)	-0.45** (0.21)
Urbanization	0.99*** (0.32)	0.93*** (0.25)	0.97*** (0.35)	1.02*** (0.33)	0.87*** (0.26)	1.04*** (0.35)
Inequality	0.43 (0.49)	0.57 (0.40)	0.06 (0.44)	0.23 (0.52)	0.59 (0.40)	-0.15 (0.44)
Income	0.17 (0.17)	0.24*** (0.09)	0.08 (0.17)	0.21 (0.17)	0.29*** (0.08)	0.08 (0.17)
Literacy	-0.28 (0.22)	0.12 (0.11)	0.63*** (0.18)	-0.31 (0.23)	0.09 (0.12)	0.64*** (0.19)
Telephone Lines	1.08*** (0.05)	0.01 (0.03)	0.10** (0.04)	1.08*** (0.05)	0.01 (0.03)	0.12** (0.05)
Democracy	0.01 (0.03)	-0.03 (0.02)	0.00 (0.03)	0.02 (0.03)	-0.03 (0.02)	0.02 (0.03)
Growth	0.00 (0.03)	-0.00 (0.02)	0.00 (0.03)	-0.01 (0.03)	0.00 (0.02)	-0.01 (0.03)
English Language Origin	0.21 (0.20)	0.25* (0.13)	0.33 (0.21)	0.29 (0.25)	0.24 (0.15)	0.38* (0.21)
Constant	-8.68*** (2.08)	-4.88*** (1.75)	-6.42*** (2.00)	-8.58*** (2.23)	-5.09*** (1.75)	-6.30*** (2.00)
Regional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	93	93	93	93	93	93
R-squared	0.95	0.88	0.87	0.95	0.88	0.87

Robust standard errors adjusted for heteroskedasticity in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

**Table 5 - Sensitivity to Additional Variables (OLS Regression)**

VARIABLES	Fractionalization = Ethnic			Fractionalization=Language		
	Broadband Subscription (1)	Mobile Subscription (2)	Internet Users (3)	Broadband Subscription (4)	Mobile Subscription (5)	Internet Users (6)
Fractionalization	-0.55 (0.47)	-0.18 (0.17)	-0.68** (0.32)	-0.60 (0.45)	-0.11 (0.21)	-0.77* (0.41)
Urbanization	0.79** (0.34)	0.83*** (0.29)	0.76* (0.40)	0.73** (0.36)	0.91*** (0.29)	0.85** (0.41)
Inequality	0.22 (0.58)	0.52 (0.50)	-0.03 (0.51)	0.53 (0.61)	0.55 (0.51)	0.00 (0.53)
Income	0.30* (0.18)	0.33*** (0.09)	0.23 (0.19)	0.33* (0.17)	0.31*** (0.08)	0.19 (0.18)
Literacy	-0.21 (0.25)	0.13 (0.14)	0.62*** (0.22)	-0.43 (0.27)	0.06 (0.15)	0.52** (0.23)
Telephone Lines	1.11*** (0.05)	0.02 (0.04)	0.10* (0.05)	1.13*** (0.05)	0.04 (0.04)	0.13** (0.06)
Democracy	-0.00 (0.03)	-0.03 (0.02)	-0.00 (0.03)	0.01 (0.03)	-0.03 (0.02)	0.00 (0.03)
Growth	0.01 (0.04)	0.00 (0.02)	-0.02 (0.04)	-0.03 (0.05)	-0.00 (0.03)	-0.04 (0.05)
English Language Origin	0.29 (0.25)	0.23 (0.16)	0.28 (0.23)	0.12 (0.24)	0.19 (0.15)	0.32 (0.22)
Ethnic*Income	0.01 (0.06)	-0.00 (0.04)	0.07 (0.08)			
Linguistic*Income				0.03 (0.07)	-0.02 (0.04)	0.07 (0.09)
Constant	-9.01*** (2.58)	-5.17** (2.22)	-6.31** (2.39)	-9.63*** (2.49)	-5.51*** (2.05)	-6.41*** (2.25)
Regional Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	85	85	85	85	85	85
R-squared	0.96	0.89	0.88	0.95	0.88	0.87

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1