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Social Capital, Happiness and Social Networking Sites.

Surfing Alone: do countries with higher numbers of users in online communities have higher happiness levels?

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Summary

This dissertation work if focused on the effects of social networking sites on social capital and well-being. In particular, the effects of these services are studied on a macro level with a panel dataset of 50 countries over 7 years from 2004 to 2010. Their popularity is measured using new data which is taken from Google services and then compiled and validated; the coefficients turn out to be negative with a 10% increase in their popularity associated with a 0.8% decrease in subjective well-being on average and *ceteris paribus*.

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List of Abbreviations

BE:	between estimator
FE:	fixed effects
LSDV:	least squares dummy variable approach
OLS:	ordinary least squares
RE:	random effects
SC:	social capital
SNS:	social networking site

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Preface

The main purpose of the study is to stimulate the debate on social networking websites and their relationship with social capital and happiness. Despite in recent years these services have been increasing their popularity on the web, reaching hundreds of millions of users, the debate in the literature has only explored their relationships with social capital at micro level.

This study combines both innovative techniques and data with solid econometric methodologies to test at macro level their effect on well-being.

My findings don't want to leave the reader with the wrong impression. Despite the negative results on well-being these services can have positive impacts in many areas. More than anything I call for a re-thinking of their purpose, their aim and role in society.

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I. Introduction

The concept of Social Capital (SC) is receiving great attention from development economics agencies in recent years. Although we still do not have a clear definition and a clear way of measuring, its importance in many areas has led different authors to shape its effects for economic and social outcomes. In one of its most recent definitions the World Bank ("What is Social Capital", 2011) explains it as 'the institutions, relationships, and norms that shape the quality and quantity of a society's social interactions'; in short it's about the value of social networks that are bonding similar people and bridging between diverse people (Dekker 2001).

SC is important in many economic aspects; it helps to fill the gap that many have pointed out about the measurability of well-being. As a matter of fact measures of economic outcomes such as income per capita or expenditure might only partially explain the multidimensionality of well-being. As Sen (1985) points out the use of income per capita reduces well-being to be well-off, in other words to well-having or to having much.

One approach that combines different views is the economics of happiness, a novel view on happiness, subjective well-being, life satisfaction, quality of life and other measure of welfare which typically combines economic techniques with fields such as psychology. Using happiness-related measures, rather than wealth, expenditure or income, highlights the role of non-income measures in a utility maximization context in contrast to conventional economic theories thus providing a broader view on well-being (Graham 2005; McGillivray 2007).

Happiness surveys are today being considered by leaders as an important complementary tool of national income accounts for public policy. Examples are the recent notion of 'general well-being' espoused by David Cameron in Britain ("David Cameron aims to make happiness the new GDP", 2010) and the more recent UN resolution for adopting happiness as a development indicator ("Buthan spreads Happiness to UN", 2011). Happiness is closely related to SC, the latter being a determinant of it with economic well-being, income, employment, health, schooling, relationships and quality of institutions (i.e. democracy and governance).

In his book '**Bowling Alone**: The Collapse and Revival of American Community' Robert Putnam (2000) documents and explains the change in American social life by reviewing trends in social capital and civic engagements such as American's participation in public forums, politics, clubs memberships such as bowling leagues, community associations, religious bodies, unions and professional societies. His finding show that today many Americans are more likely to bowl alone:

> *Television, two-career families, suburban sprawl, generational changes in values--these and other changes in American society have meant that fewer and fewer of us find that the League of Women Voters, or the United Way, or the Shriners, or the monthly bridge club, or even a Sunday picnic with friends fits the way we have come to live. Our growing social-capital deficit threatens educational performance, safe neighbourhoods, equitable tax collection, democratic responsiveness, everyday honesty, and even our health and happiness. (Putnam, 2000:367)*

From that research many others have documented and studied this transformation, attributing at least part of the decline to TV viewing. Time spent watching TV has been growing since 1960 with negative effects on relational activities and life satisfaction (Bruni and Stanca, 2008). Putnam argues that not only TV but also other forms of technology can be detrimental for SC:

> *Electronic technology enables individual tastes to be satisfied more fully, but at the cost of the positive social externalities associated with more primitive forms of entertainment. (Putnam, 1995:75)*

These technologies have been evolving and in recent years our societies are experiencing a new global phenomenon called **Social Media**. Defined as 'a group of Internet-based applications that … allow the creation and exchange of User Generated Content (Kaplan and Haenlein, 2010:61)' social media is a new global revolution affecting both developed and developing world that is turning our everyday communication into an interactive dialogue. The main engine of this revolution have been **Social Networking Sites** (SNSs) and online communities (in general terms) that in the recent years have attracted hundreds of millions of users around the globe being an integral part of user's daily life (boyd and Ellison, 2008). Both teen and adult use of SNSs has risen significantly in the past years (Lenhart et al., 2010) and Facebook, the most popular SNS has recently

reached 750 million users receiving greater attention by media, societies, politics and Governments.

The massive spreading and popularity of these websites has been affecting our society directly and indirectly. While before any analysis it is important to consider that the population using SNSs might not (and probably does not) represents an unbiased sample, the numbers of users, the websites growth, the recent events and news that have been shocking the world make it possible to believe and understand the indisputable effects that this revolution is having today. Middle East and African democracy revolutions are said to be started on these websites. Tunisia, Egypt, Libya rebels revolts against corrupted Governments were organized online, through SNSs such as Facebook and Twitter ("Facebook treads carefully after its vital role in Egypt's anti-Mubarak protests", 2011). Nonetheless these online communities can be powerful if behind them there is a powerful mean of communication; governments of these countries have acknowledged the power of SNSs and have tried to control and influence it, by banning those websites or by shutting down the entire internet ("Libya: How authorities have blocked the story", 2011). This is just one example of the effects that SNSs have on our world today. But these communities are not new, their popularity is.

SC is however a multidimensional concept which can take various forms: notably we can distinguish between bonding, bridging and linking SC. Different types are good for different things and different combinations can have either positive or antisocial effects; for instance excessive bonding SC and scarce bridging will increase in-group solidarity but can decrease the ability of members to trust and cooperate with outsiders.

Is the overall effect of SNSs positive in terms of SC? Are SNSs increasing happiness levels or are they increasing loneliness and perception of others as untrustworthy and unfair? Do countries with higher numbers of users in online communities have higher happiness levels?

Different studies have been exploring the effects of SNSs on SC finding at the micro level increased connections between people with increasing bonding SC but reduced bridging and linking SC (Burke, Marlow and Lento, 2010; Burke et al., 2011; Smith and Giraud-Carrier, 2010). These are connections usually kept in front of a screen in our privacy alone and no matter how many SNS we are part

of or how much time we spend on them, online interactions will never be like having a cup of coffee with someone. If SNSs are increasing bonding SC without helping us to bridge between different networks then they could capture what is known as the **dark side of SC** which in turns decreases happiness.

From **bowling alone** and watching alone (Bruni and Stanca, 2008) our society is today increasingly **surfing alone** in front of computers and websites originally created to help us socialize with friends and new people that instead are decreasing our social capital and life satisfaction.

In order to stimulate a new debate on social networking websites and their relationship with social capital this research is focused on a macro level with a panel dataset of 50 countries from 2004 to 2010 of countries happiness indexes scores from the World Database of Happiness and data on GDP per capita, employment, inflation, education, health, democracy, governance, SC and climate.

Using a new technique and an innovative way to measure the popularity of SNSs by analysing the search volume of particular keywords over the web with online services provided by Google, after compiling and validating the instrument I find a negative impact of SNSs on social capital and subjective well-being. On average a 10% increase in the popularity of SNSs is associated with 0.8% decrease in subjective well-being. Considering the recent years explosion in the popularity of SNSs these results are not derisory.

I.1 Organisation of the study

Section II introduces the literature review of the three concepts here covered: Social Capital, Social Networking Sites and Happiness. Their relationships with each other are discussed, in particular about SC and online social networks. Measurement and determinants of Happiness are further discussed and the main hypotheses of the study are outlined. Section III presents the data used with particular emphasis on the validity and construction of the innovative instrument used to measure the popularity of SNSs. Section IV describes the empirical methodology for the model used in this study, which is the panel approach. Section V presents the main econometric results and Section VI discusses and concludes.

II. Social Capital, Happiness and Social Networking Sites

II.1 What is Social Capital?

'Social Capital' term first appeared in L. J. Hanifan's (1916) article regarding local support for rural schools. He described it as 'those tangible substances [that] count for most in the daily lives of people. (1916:130)' This notion was then developed by Pierre Bourdieu (1986), James S. Coleman (1988) and above all by Robert D. Putnam (1993, 2000) who integrated the concept into development economics debates and led institutions such as the World Bank to focus on it (the World Bank' Social Capital Initiative is one example).

Bordieu defines SC as 'actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition. (1986:249)' His work was extended by Coleman (1988) who defined it in terms of its function by three forms: obligations and expectations, informational channels and social norms and related it to the creation of human capital inside and outside a family.

> *It is not a single entity but a variety of different entities, with two elements in common: they all consist of some aspect of social structures, and they facilitate certain actions of actors-whether persons or corporate actors-within the structure. (Coleman, 1988:98)*

Putnam (1993, 2000) then took the debate at a new level and looked at the association with civic community. According to Putnam (2000) a society can have many virtuous individuals and be poor in SC if networks of reciprocal social relations are not rich. World Bank finally summarize the debate and defines it as 'the rules, norms, obligations, reciprocity and trust embedded in social relations, social structures and society's institutional arrangements which enable members to achieve their individual and community objectives. (Narayan, 1997:50)'

Overall there seem to be two usages of the term Social Capital. The first conceives SC as a quality of groups and includes things such as rule of law, social integration and trust (Putnam 2000); the second refers to SC as the value of an

individual's relationships. It views an individual's position in a social network as determinant of its opportunities and constraints (Wellman 1988; Burt 1992).

II.1.1 Why is Social Capital important?

SC has effects on individual relations with civil society; it describes the pattern and intensity of formal and informal networks among people. The central idea is that 'social networks are a valuable asset (Field, 2008:14)' as they help people to build communities and reduce social costs.

SC is important for children and adolescents in development of their human capital (Coleman 1988); creation of friends and community networks and improvements in social trust reduce crime rates with safer streets; higher levels of SC are also associated with better schools and higher educational achievements, cleaner public spaces, better health, employment outcomes, friendlier people and faster economic development (Putnam 1993; Woolcock 2001). It also increases informal insurance, reduces information imperfections and facilitates the diffusion of innovations therefore contributing to sustainable development. Many of these findings have been confirmed in a number of studies, many relating SC to happiness and well-being.

II.1.2 How do we measure Social Capital?

The common focus on measurement of SC has been on:

-level of trust (for example between neighbours);
-memberships: in clubs, societies and social groups;
-formal and informal networks and social contacts between groups;

Groups can take various forms: can be professional such as business groups of co-workers, geographical like people living in a specific neighbourhood, social such as family and friends or virtual such as the ones generated on SNSs ("Social Capital Guide", 2011). I will focus here on the latter two way of measurement of SC (membership in social groups and social networks) and refer to groups as virtual groups or networks generated over the internet through SNSs.

It is commonly agreed in the literature that networks are central to the concept of SC; we are able to test if there is an association between networks and SC but not that one causes the other. Specifically it is important to study their unique characteristics and not just their overall density; SC is indeed a multi-dimensional concept and it's essential to distinguish between its different types.

Woolcock (2001) defines SC as the norms and networks that facilitate collective action. He distinguishes between **bridging**, **bonding** and **linking** SC. Bonding SC refers to close ties between people such as family, close friends and neighbours; bridging SC refers to more distant ties such as associates and colleagues; and linking SC relates to unlike people outside our community. By describing different types of SC we can identify different types of networks (Putnam 2000; Woolcock 2001). In short if we do not take into account these differences we fall into a trap, the same that led many authors to be blinded into what was happening in the US in the last decade.

Putnam in the book Bowling Alone (2000) showed that there was a significant decline in political participation and active membership in associations such as league team bowling; as a result social capital was weakened; he was the first to discover this decline because he was able to distinguish between exclusive (bonding) and inclusive (bridging) SC. According to Putnam's a community 'requires lots of bridging social capital, not just the bonding variety (2003:3)', the problem is that <u>we can bond but we can't seem to bridge</u>. In his book 'Better Together: Restoring the American Community':

> *Some networks link people who are similar in crucial respects and tend to be inward-looking - bonding social capital. Others encompass different types of people and tend to be outward looking - bridging social capital.*
>
> *....*
>
> *the problem is that bridging social capital is harder to create than bonding social capital... So the kind of social capital that is most essential for healthy public life in an increasingly diverse society like ours in precisely the kind that is hardest to build. (Putnam, 2003:2-3)*

Bonding SC is just telling us about how homogeneous the network of a society is, whereas bridging SC helps to create bridges between heterogeneous networks in a

society. If a network is rich in bonding SC and poor in bridging this could create that isolation that led Americans to 'bowl alone'.

It is therefore important to monitor both types of SC, have the right balance in a society, given that the two types are not mutually exclusive.

Bonding and bridging SC have been measured by the value assigned to social networks among, respectively, homogeneous and heterogeneous groups of people (Putnam 2003). In the context of SNSs these might be contacts between similar people (bonding interactions) and between dissimilar people (bridging interactions).

This study aims to contribute to the literature by outlining a new indicator of Social Capital. If SC is represented by the creation of social networks and relationships between family, friends, neighbours and workers then social networking services (that indeed have been classified as 'online social networks') could be a new indicator of SC. In particular if SNSs are increasing bonding SC without helping us to bridge between different networks then they could capture what it's known to be called as the dark side of social capital.

I will discuss more about SNSs and their relationship with SC in the following sub-sections [2.2 and 2.2.1].

II.1.3 The dark side of Social Capital

Like any other form of capital, SC can be directed toward antisocial purposes; it is then important to valuate if the positive aspects of it exceed its negative effects (Putnam 2000).

In order to analyse its negative effects Putnam recalls the distinction between bridging and bonding and discusses the trade-off between them with a dilemma:

> *Suppose we had only an aluminium magic wand that could create more social capital, but only of a bonding sort. This ... magic wand would bring more blacks and whites to church, but not to the same church, more Hispanics and Anglos to the soccer field, but not to the same soccer field. Should we use it? (Putnam, 2000:362)*

Different types of social capital are good for different things and relevant to different socio-economic outcomes. Bonding SC is for example more important in childhood and old age for health benefits; bridging and linking SC are more important in adult age when people seek for employment ("Social Capital Guide", 2011). According to Putnam, from a collective point of view, the big issues that we face in a society require bridging SC.

In addition, accordingly to Fukuyama (2001) increased in-group solidarity is usually a result of strong bonds within a group, this in turn can decrease the ability of the members to trust and cooperate with outsiders. To put it more simply, and relating it to the main argument, the more our society connects us the more we are encouraged to further connect with our affinity groups: family, close friends, or in general people in our social circle. This strengths our ties reinforcing bonding SC but doesn't create – or even weakens – bridging SC thus reinforcing its dark side.

II.2 Social Networking Websites[1]

'Social Network' phrase refers to a sociological area of work – social networks analysis – which studies social relationships through their social structures.

> *[Individuals are] embedded in webs of connections, and the task of the sociologist is to describe and explain the patterns exhibited in these connections. (Scott, 1988:112)*

Social Networks are social structures made up of individuals – or organizations – called 'nodes', which are tied by one or more specific types of interdependency, such as friendship, common interest, financial exchange, beliefs, knowledge or prestige ("Social Networks", 2011). Networks involve mutual obligations, they are not simple contacts. L.J.Hanifan calls them norms of reciprocity, which facilitate cooperation for mutual benefit and characterize more efficient societies. (Putnam 2000; Hallifan 1916)

In recent years **online social networks** are on the popular consciousness: Facebook, Twitter, Myspace, Orkut, Linkedin and many others online communities are gaining greater and greater attention among the public, politics, media and also academic and industry researchers intrigued by their affordances and reach. Each website is different from the others, but in general they all share their main function, that is to help connecting their members (boyd and Ellison, 2007).

boyd & Ellison (2007) define a SNS as web-based service that allows individuals to (1) construct a public or semi-public profile (2) articulate a list of other users with whom they share a connection (3) view and traverse their list of connections and those made by others within the system (boyd and Ellison, 2007:211).

Some of them support and encourage the maintenance of pre-existing social networks of friends, family and contacts: this is the example of Facebook whose popularity among the others was centred on the peculiarity of connections.

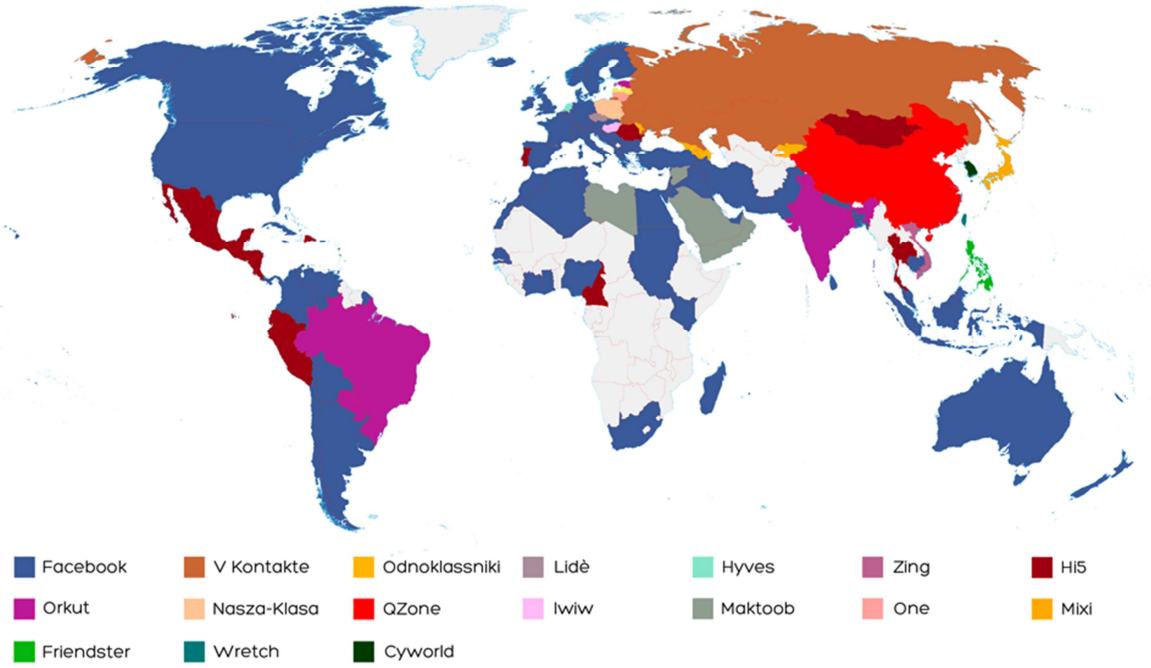
[1] I am using the terms "Social Network Site", "Social Networking Service", "Online Social Network" and "Social Networking Site" interchangeably.

Facebook helps you to find people that you already know, friends in your real life and old connections such as your classmates or old friends.

Others help strangers connect based on shared interests, political views, or activities. This is the case of Twitter, a micro-blogging service that enables users to send and read public text-based posts of up to 140 characters. On Twitter you can 'follow' everyone such as your favourite rock star, politician or celebrity. Others are SNSs like MySpace for music bands[2] or LinkedIn for business-related contacts. (boyd and Ellison, 2007)

From 2003-2004 onward many SNSs were launched; their niche communities expanded and started to grow exponentially creating what has been publically called the Facebook phenomenon or the Facebook effect.

Figure 1 - Most popular SNSs by country (June 2009)



Source – "World Map of Social Networks" (2011). **Notes:** classification is done according to Alexa (alexa.com) and Google Trends for Websites (2011).

[2] MySpace was originally for teenagers and students. It became the main SNS in US in 2006 but then by April 2008 its popularity was overtaken by Facebook. Myspace it's today popular for musicians.

Haythornthwaite (2005) and boyd & Ellison (2007) have pointed out that what makes SNSs unique is not that they allow individuals to meet strangers, but rather that they enable users to articulate and make visible their social networks. Even if some SNSs can help you create connections that would not otherwise be made (bridging SC), at the end that is often not the goal, and these connections are frequently between ties who share some offline connection (bonding SC). And even if this would not be the case for some of them, it is certainly the case for Facebook whose numbers make the others SNSs look small.

Facebook it's indeed the largest online social network; it has recently reached 750 million active users[3] over more than 190 countries and it's available in more than 70 translations. Among them more than 50% log on every day, with more than 60 million status updates per day (a feature which allows users to discuss their thoughts, news, or important information with their friends) and 3 billion of photos uploaded each month. The average users spends 55 minutes per day on the website, is connected to 130 friends and 80 community pages, groups and events (data from facebook.com - "Statistics | Facebook", 2011).

Users on SNSs usually have different ways to communicate, they can share content with friends such as photos, videos, news or links from the web, comment and 'like' these posts, send public and private message each other, chat, play games together etc.

SNSs are today an integral part of user's daily life; for instance 48% of 18 to 34 years olds users check Facebook right when they wake up every day, many of them with mobile devices (the Facebook mobile platform has 250 million twice more active users[4]). This new global revolution is affecting both the developed and developing world with 66% of the global internet population on Facebook and despite this phenomenon was popular among teenagers during the first years the average age of a SNS user it's been constantly growing in the past years (Lenhart et al., 2010). In 2010 the average social network user was 37 with the age group 35-44 dominating as older internet users are even more joining the online conversations. A recent survey found that 48% of young Americans find

[3] An "active user" is defined by Facebook as a user who has visited the website in the last 30 days.
[4] According to Facebook people that use Facebook on their mobile devices are twice more active on Facebook than non-mobile users.

out about news through Facebook and 57% of people talk more online than in real life (data from "Obsessed With Facebook", 2010; "Statistics | Facebook", 2011; "Study: Ages of social network users", 2010).

II.2.1 SNSs and Social Capital

In his analysis of the relationship between technology, mass media and social capital Putnam (2000) noticed how electronic technology allow us to consume the entertainment in private, alone. He documented how newspaper readership had been falling, together with increasing time in TV watching. Even at that early stage he argued that those who relied primarily on the internet for the news were less likely to be civically involved. New mass media were stealing time and encouraging lethargy and passivity.

Today we are facing a similar situation with SNSs. Although their original and primary purpose is to connect us with our friends online and create new connections what is happening is the opposite. Joshua Meyrowitz cited in Putnam (2000) argues:

> *electronic media creates ties ... that compete with those formed through live interaction ... live encounters are certainly more 'special' and provide stronger and deeper relationships, but their relative number is decreasing. (Putnam, 2000:242)*

In other words nothing online will ever be like having a cup of coffee with someone. No matter how long we spend time online chatting and sharing content with our friends these connections will have a lower value than the real ones.

Moreover if these connections mainly reinforce ties that we already have in our real life without creating new ones, if their purpose isn't to bring us outside and have live interactions, if these connections are kept through a computer and consumed in our own privacy alone, then what they could create is increasing loneliness and perception of others as untrustworthy and unfair, hence, reinforce the dark side of SC.

Despite an early study came to opposite conclusions (Ellison, Steinfield and Lampe, 2007) this idea was recently confirmed by a micro-level study on Facebook users finding that those who consume greater levels of contents are

reporting reduced bonding and bridging SC and increased loneliness (Burke, Marlow and Lento, 2010). Same authors of the former study, on a previous study on Facebook users had also found that users were employing Facebook to strength offline ties rather than initiate new connections with new people (Lampe, Ellison, and Steinfield, 2006).

Another similar study found that of three types of social engagement provided by SNSs only one (directed person-to-person exchanges) was associated with increased bridging SC (Burke, Kraut and Marlow, 2011). The same study found lack of connection between Facebook and bonding SC although the previous research found a direct association of directed communication with greater feelings of bonding social capital. Other studies on Twitter have also found that bonding interactions are more likely than bridging interactions. (Smith and Giraud-Carrier, 2010)

Consequently <u>if SNSs are maintaining or increasing bonding SC but not creating bridges between people of different networks then they're part of the dark side of SC that leads to lower happiness and life satisfaction</u>.

II.3 Happiness, measurement and determinants

There is a faster growing idea in the literature that considers happiness as a subjective measure of well-being; [see Veenhoven (2002); Kahneman and Krueger (2006); Diener and Suh (1997)]. The main idea behind happiness measurement is that by definition, happiness is something we have on our mind and hence can be measured using questions f.e. by asking people how much they enjoy their life as a whole.

Examples:

> *How happy would you say you are: very happy, quite happy, not very happy, not at all happy? (World Value Studies)*

> *How satisfied are you with the life you lead? Very satisfied, fairly satisfied, not very satisfied, not at all satisfied? (Euro-barometer surveys)*

A challenge in measuring subjective well-being concerns the sensitivity of survey responses. These could be influenced by the particular momentum, by mood swings or even by the ordering of questions and by their wording. Results could imply meaningful answers (Bertrand & Mulainathan 2001; McGillivray 2007).

The social nature of the survey procedure appears to play a big role and research has found that measured attitudes are quite unstable over time: respondents might be reluctant to admit lack of an attitude or may not really be good at forecasting their behaviour. As a result reported attitudes would be equal to true attitudes plus some error term:

$$A = A^* + \varepsilon$$

Moreover, if the true model is:

$$Y_{it} = \alpha + \beta X_{it} + \gamma A^*_{it} + \delta Z_{it}$$

and we include only the observable characteristics X_{it} and do not consider the unobservable term Z_{it}, the measurement of A it's known to produce an attenuation bias; in this case a survey fixed effect can solve the problem.

Other issue is instead the bias that arises from the correlation of individual characteristics X and Z; in this case the estimated coefficient would not only capture the effect of attitude but also the effects of other variables that influence how the attitude is self-reported (Bertrand and Mulainathan, 2001).

Bertrand & Mulainathan worry on 'attempts to use subjective data as dependent variables because the measurement error appears to correlate with a large set of characteristics and behaviours (2001:71)'. One solution is presented by Campbell, Converse and Rodgers (1976) and discussed by Eid and Diener (2004), Diener (1984) and Veenhoven (1993): information provided by these surveys could be related to changes in the conditions in which people live.

However, despite these problems, Easterlin (2001) concludes that happiness scores are not perfect but do accurately reflect subjective well-being. As Diener has pointed out 'measures seems to contain substantial amounts of valid variance (1984:551)'.

II.3.1 Determinants of Happiness

In the literature many authors have been exploring the determinants of happiness both at micro and macro level. I will focus on studies that have been looking at the macro-determinants of subjective well-being and mention some of the results at micro level as well.

GDP per capita is known to have a nonlinear relation with happiness. This is known as the Easterlin Paradox as he discovered that in a given country people with higher incomes are more likely to report being happy, but rising incomes do not lead to increases in subjective wellbeing (Easterlin 1974). As a matter of fact authors that have tried to capture the non-linearity of GDP have been including it as a logarithm or as linear and quadratic variable.

Unemployment and inflation are usually known to have a negative effect (Di Tella, MacCulloch and Oswald, 2003) although Sanfey & Teksoz (2007) and Perović & Golem (2010) found a positive effect of the latter on happiness. Different authors have been looking at the trade-off between them: in a study across 12 European countries and the US Di Tella, MacCulloch and Oswald (2001) found that the well-being cost of a 1 percentage point increase in the unemployment rate equals the loss brought by an extra 1.66 percentage points in inflation. Wolfers (2003) found that the inflation-unemployment trade-off is closer to five to one; that is, people seem to be extremely averse to unemployment. Another recent study (Blanchflower 2007) also found that unemployment matters more than inflation.

Sanfey and Teksoz (2007) have also included Gini coefficient in order to capture the impact of income inequality on life satisfaction and found both positive and negative relationships in different models. Schwarze & Harpfer (2007) linked life satisfaction data to inequality finding a negative relationship with Gini coefficients. GINI index goes from 0 (perfect equality) to 1 (perfect inequality) therefore an increase in inequality should reduce life satisfaction.

Bjørnskov, Dreher and Fischer (2008) have found non-significance of health measures like life expectancy and fertility. While investigating the effect of government size they found a negative relationship with government consumption spending although other authors - i.e. Kacapyr (2008) - have proved

government spending to be statistically insignificant. He also included two indicators for health, namely the life expectancy and the death rate: both were highly correlated with life satisfaction, the former positively and the latter negatively as one might expect.

Democracy has been found to have a positive impact on life satisfaction although Dorn et al. (2007) argue that studies like Schyns (1998) and Veenhoven (2000) that find positive and significant correlation between the Freedom House Democracy Index and self-reported happiness loose significance when national income levels are controlled for. In general higher degree of democracy in a country should yield political outcomes that are judged more favourably by the people and have a positive impact on well-being.

Institutions and governance are further determinants of well-being. [see, among others, Frey and Stutzer (2000); Helliwell (2003); Ovaska and Takashima (2006)]. There are many reasons for the positive effects of such variables on life satisfaction: services like education, justice or health are regulated and provided by governments and individuals and families are likely to receive higher quality services where the overall quality of the government is higher. The more the quality of the governance and the trust and confidence with which people can rely on government services the higher subjective well-being will be. In general, aspects of good governance such as legal quality, the quality of business regulations and the absence of corruption reduce economic uncertainty. Similarly formal and informal institutions are potentially important for well-being. They affect market transactions, ensure the functioning of administrations and influence citizens interactions and their life satisfactions positively (Bjørnskov, Dreher and Fischer 2008). Kaufmann, Kraay and Mastruzzi (2010), in aggregating governance indicators, identify six dimensions of governance: voice and accountability; political instability and violence; government effectiveness; regulatory quality; rule of law; and control of corruption. Different authors have tested the effects of these indicators on life satisfaction: Helliwell (2003) sums up the six indicators and finds a positive impact. Bjørnskov, Dreher and Fischer (2008) have found instead non significance of many institutional variables and negative impact of governance.

The relationship between happiness and education presents inconclusive results in the literature as well. Frey and Stutzer (2006) found positive impact of low,

middle and high education measures – similar results were found by Oswald (1997); Diener et al. (1999). Hartog and Oosterbeek (1998) found that in Netherlands highly educated people appear to be less happy in comparison to their less educated ones. Inglehart & Klingemann (2000) do not find significant effects of educational proxy variables on life satisfaction and Clark & Oswald (1996) reported life satisfaction levels to be strongly declining in the level of education. Same result was found by Kacapyr (2008): more education leads to dissatisfaction with life.

Last but not least Rehdanz & Maddison (2005) using a panel of 67 countries have demonstrated that climate effects have a powerful effect on self-reported levels of happiness. They found average temperature and latitude to statistically affect happiness. Bjørnskov, Dreher and Fischer (2008) have included variables for climate (average temperature, latitude and longitude) and find significance only for latitude and longitude. Results are mixed here as well. In general latitude shows negative coefficients while mean temperature and mean precipitations have no statistically significant effect on reported life satisfaction (see also Murray, Maddison and Rehdanz, 2011).

To sum up, in order to study the relation between social capital happiness and social networking sites I will construct a panel dataset of 50 countries from 2004 to 2010 of countries happiness indexes scores from the World Database of Happiness and data on GDP per capita, employment, inflation, education, health, democracy, governance, social capital and climate.

As an indicator for social capital I will compile a variable to measure the popularity of SNSs; this will be measured by the search volume of particular keywords over time (validity of this instrument and further discussion about the variable can be found in section III.2 and III.3).

According to my hypothesis SNSs are expected to have a negative impact on subjective well-being because bonding interactions are more likely than bridging interactions. This idea was confirmed by recent studies at micro-level; on the other hand, at a macro level it's difficult to measure bonding/bridging SC and I can only assume they're negative impact is capturing the dark side of SC.

III. Data

The main issue concerning this research has been **data availability** for two main reasons:

Firstly, this study is focusing on the role of SNSs that have been popular only in the latest years across all countries therefore many happiness measures that were not applied recently cannot be used. The most popular SNS, Facebook.com, was created on 2004 in the US but it was only for US college students. It started being an open website from 2006, and it started growing internationally from 2007/08. Before Facebook other SNSs were popular (a few examples: Myspace, Hi5, Fotolog, Orkut and many others) together with instant messaging software (chat services), and this paper is focusing on them as well as on Facebook, to analyse the SNSs growth and impact on social capital and happiness.

By focusing on all the popular SNSs (and not only on Facebook) I'm able to extend the research from 2004 to 2010.

Secondly, there is no clear way of measuring the role of SNSs. Websites usually don't give public access to their usage statistics and on numbers of users and visits; in particular usually no data is available across countries over time. This issue will be later discussed and solved using instruments called Google Trends (2011) and Google insights for Search (2011).

III.1 Data description and analysis

In order to conduct this research I built a panel dataset of 50 countries over 7 years from 2004 to 2010.

The data used:

1. World Database of Happiness
2. Facebook Happiness Index
3. Socio-Economic Indicators from other sources
4. Social networking sites popularity

III.1.1 World Database of Happiness

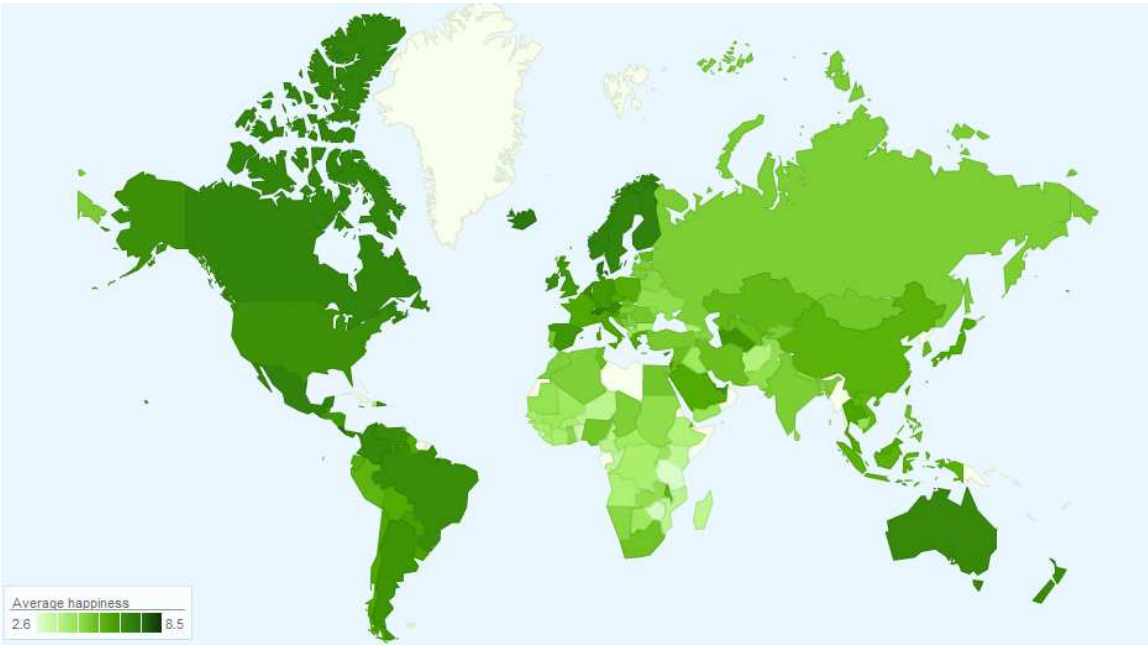
This database is a collection on subjective well-being researches. It collects more than 700 different measures of happiness in more than 1300 studies (Veenhoven 2011). Problem with these different measures is that most of the times they are not comparable (for instance we cannot compare answers to questions like 'In general, how happy would you say you are?' and 'How happy do you feel as you live now?' or answer to the same questions on a different range). Therefore I had to choose just one question across countries.

Unlike resources, evaluated life satisfaction is arguably of 'intrinsic value'; being happy is a momentous achievement in itself (Sen 2008). Since in different cultural backgrounds 'happy' or 'happiness' words have different interpretations, different authors (Kahneman and Krueger, 2006; Ng, 1997; Veenhoven, 2002) have been considered the 'life satisfaction' wording more accurate to measure 'happiness' because words like 'happy' and 'happiness' have different meanings in different cultural backgrounds (Mota and Pereira, 2008). Further the availability of data is greater, thus the question I chose to measure happiness is the so-called 4-step verbal Life Satisfaction:

On the whole how satisfied are you with the life you lead?

4 very satisfied
3 fairly satisfied
2 not very satisfied
1 not at all satisfied

Figure 2 - average happiness 2000-2009



Source – Veenhoven. *Average happiness in 149 nations 2000-2009*. World Database of Happines.

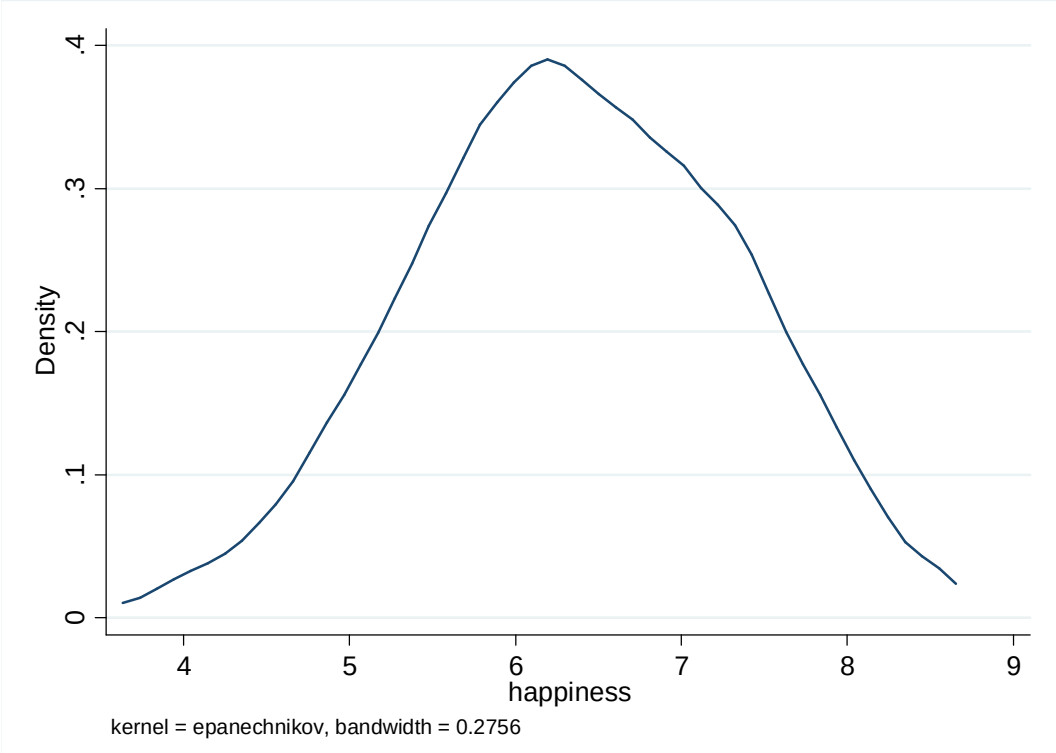
This question has been asked many times in different surveys, mainly in European countries in surveys like the Eurobarometer. This famous survey is held two times per year, thus for some countries the database reports two measures for the same year and I averaged them in order to have a happiness score for each year.

The question can be slightly different in each survey (f.i. 'In general, would you say that you are satisfied with your life?' or 'On the whole, how satisfied are you with your life in general?') although maintaining the same range of responses; in order to make it comparable between nations across time the data, originally on a 0-4 range, were converted on a 0-10 range.[5] (Veenhoven 1993) The variable is

[5] Information on the weights and techniques used for transforming responses to similar questions into comparable scores are also available online in the introductory text section of the World

therefore not ordinal; this allowed me to focus on continuous models. Furthermore the Life-satisfaction measure from this database is well used in continuous models in the literature (see f.e. Rehdanz and Maddison, 2005; Kacapyr, 2008; Bhattacharya, 2010) and a test for normality [Table 2] shows that the variable follows a normal distribution at about 90% confidence level. Figure 3 plots the kernel density distribution.

Figure 3 - Kernel density estimate of the dependent variable



Source - Author's calculation based on World Database of Happiness (Veenhoven 2011)

From the original database I dropped the years before 2004 and left only those countries with observations from 2004 to 2010. I am left with 50 countries and 436 observations of happiness.

Database of Happiness website (worlddatabaseofhappiness.eur.nl) – chapter 7: 'How the data are homogenized'.

List of countries considered in this research:
Argentina, Austria, Belgium, Bolivia, Brazil, Bulgaria, Chile, Colombia, Costa Rica, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, El Salvador, Estonia, Finland, Macedonia, France, Germany, Greece, Guatemala, Honduras, Hungary, Ireland, Italy, Japan, Latvia, Lithuania, Luxembourg, Malta, Mexico, Netherlands, Nicaragua, Panama, Paraguay, Peru, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Turkey, United Kingdom, United States, Uruguay, Venezuela.

This list of countries, although chosen just in terms of data availability includes half developing and half developed countries.[6] However this may not be representative of the world and a closer look shows that these countries are mainly European and South American. The average population goes from less than half million of Malta and Luxembourg to more than 300 million of USA. Moreover, as far as SNSs are concerned, surely some countries are the early adopters of these technologies such as US while some developing countries have experienced this revolution later. These reasons might represent one of the limitations of this study (other limitations are discussed in section VI.1).

As mentioned before, European countries have two observations for each year. In order to construct a panel dataset I took the mean of those measures. The observations are now 284[7]; happiness goes from 3.91 (Bulgaria) to 8.38 (Denmark). [Table 1]

Table 1 - Summary statistics for the dependent variable

	mean	sd	min	max
happiness	6.352518	.9478707	3.91	8.38
N	284			

Source - Author's calculation based on World Database of Happiness (Veenhoven 2011)

[6] Classification of developing and developed economies is done according to the International Monetary Fund's World Economic Outlook Report, April 2010.
[7] Observations should be 350 (50 countries * 7 years) yet for some countries happiness scores are not available for each year.

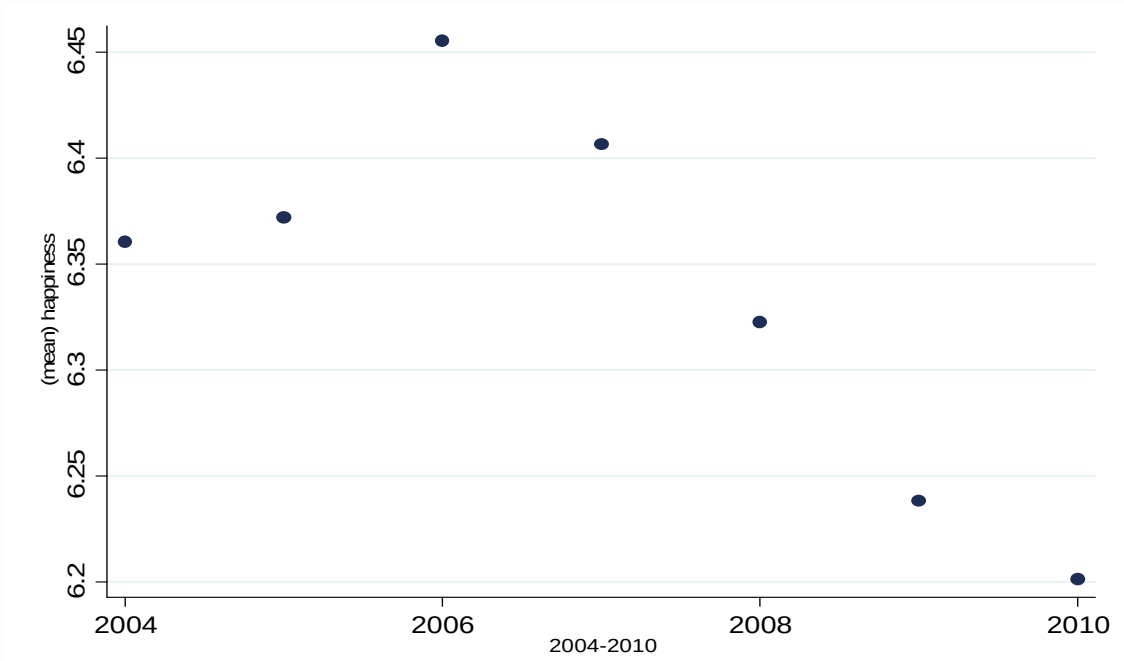
Table 2 - Skewness/Kurtosis tests for normality of the dependent variable

	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
happiness	0.4584	0.0647	3.98	0.1364
N	284			

Source - Author's calculation based on World Database of Happiness (Veenhoven 2011)

Taking the mean value of happiness across countries per year we note that happiness reaches its maximum in 2006 and then falls in the following years reaching a slightly lower value in 2010 than in 2004. With a t-test I reject the null hypothesis of 2004 score = 2010 score. Ha: mean!= 0.159187 - Pr(|T| > |t|) =0.0000

Figure 4 - Mean happiness over time (2004-2010)



Source - Author's estimation based on World Database of Happiness (Veenhoven 2011)

III.1.2 Facebook Happiness Index

Everyday hundreds millions of SNSs users engage with friends by posting status updates, a feature which allows users to discuss their thoughts, news, or important information. This tremendous quantity of information can be used for many purposes: one example is provided by the Facebook Happiness Index (or Gross National Happiness), an analysis of Facebook users' status updates and a new innovative way to measure subjective well-being. The system counts positive and negative words through a specific dictionary for each country; when people in their status updates use more positive words (or fewer negative words) then that day as a whole is counted as happier than usual (Kramer 2010).

Data is available for 22 countries from 2007, daily, up to today. The list of countries is different from the previous one; 15 countries (US, UK, Belgium, Ireland, Austria, Germany, Italy, Netherlands, Argentina, Chile, Colombia, Mexico, Spain, Uruguay, and Venezuela) were matched with the previous list to test if there is any correlation between the two measures of happiness. [Table 3 - (1)]

Table 3 - Correlation between 4-step verbal Life Satisfaction and Facebook happiness index

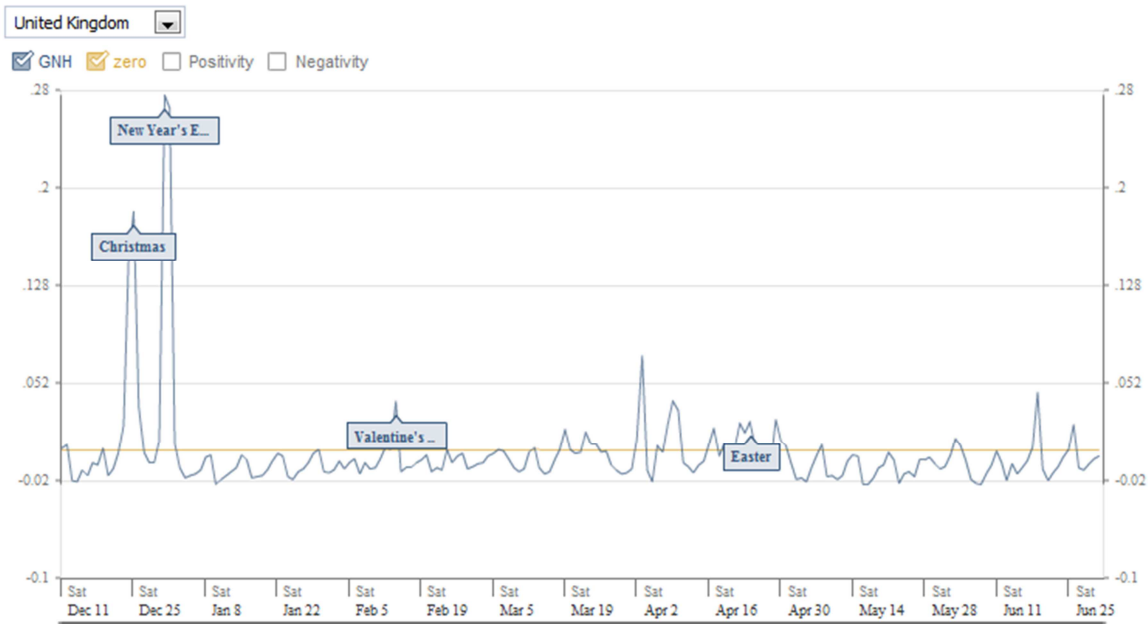
	(1) happiness	(2) happiness
gnh	-0.444	-0.465
Obs	39	39

Sources - Author's calculation based on: "Gross National Happiness", 2011; World Database of Happiness (Veenhoven 2011)

Surprisingly the results show a negative correlation although any pre-analysis and conclusion might be spurious. It is difficult to understand what the Facebook Happiness Index is capturing. At a first glance the negative correlation might tell us that the more people are unhappy the more they want to show the opposite, perhaps because everyone wants to have a nice image with their friends or perhaps because the more a status is funny and happy the more it receives feedback (number of comments or 'like' from friends). There could also be a

negative correlation between the state-level moment expression of positivity in the status update and the overall life satisfaction.

Figure 5 – Facebook Happiness Index – UK example



Source – "Gross National Happiness", 2011; based on Kramer (2010).

As shown in Figure 3, Facebook Happiness Index usually reports huge bumps in happiness during holidays like Christmas, New Year's Eve or Mother's and Father's Day. This is because status updates such as 'Happy Christmas' or 'Happy Thanksgiving' are captured by the index as positive words and during those days people post many greetings. After correcting the data for the holidays the correlation is even more negative. [Table 3 – (2)]

Although deeper analysis is required this index provides an innovative indirect way of measuring well-being that could overcome many of the concerns raised in the literature.[8]

[8] Further analysis with different happiness measures could show different correlations. Also it is important to consider that data is taken daily and I averaged them yearly; it might be necessary to match the month the survey was taken with the average of Facebook happiness scores on that period.

III.1.3 Socio-Economic indicators

Table A1 in Appendix A reports the summary statistics for all the data used. Table A2 presents the summary statistics by year.

For mostly all the explanatory variables the number of observations is 350 (50 countries times 7 years). Gross Domestic Product per capita[9], population, inflation and unemployment rate were taken from the IMF WEO Database (IMF 2011). Human Development Index, Life Expectancy, Education measures and Internet Users were taken from the 2010 Human Development Report (UNDP 2010). The UNDP database is available online from 2005 to 2010; I've integrated the data of 2004 from the different sources the UNDP uses to construct its database, namely the UNESCO Institute for Statistics (UIS 2011) for education measures, World Bank (2010), UNDESA (2009) for life expectancy and the UNDP 2006 Human Development Report which refers to 2004 data.

Three measures of education are reported (UNDP 2010):

1. The expected years of schooling (of children). This represents the number of years of schooling that a child of school entrance age can expect to receive.
2. The UNDP combined gross enrolment ratio in education (both sexes)%. This represents the total enrolment in all three levels of education, regardless of age, expressed as a percentage of the official school-age population for the same level of education.
3. The mean years of schooling. This refers to the average number of years of education received by people ages 25 and older in their lifetime.

The different measures report different correlations with happiness [Table 4]. I will discuss more about education and happiness in the next section.

[9] I also included an alternative measure of GDP based on purchasing-power-parity measured in current international dollar. The two measures showed almost the same correlation with happiness. I chose to use the classic GDP per capita because is well used in the literature (and also has slightly stronger correlation).

Table 4 - Correlation between the dependent variable and education measures

	(1) *exp˙school*	*(2)* *gross˙enrol*	*(3)* *schooling*
Happiness	*.1480706*	*.2607494*	*.0505251*
N	*284*	*284*	*284*

Source: UIS, 2011; Veenhoven, 2011.

Serving as a proxy for health status, I have included the variable life expectancy at birth measured as the number of years a born infant could expect to live if the mortality rate at birth were to stay the same through infant's life (UNDP 2010). The range goes from a minimum of 64.4 years in Bolivia (2004) to a maximum of 83.2 in Japan (2010) with a mean of 76 years. I have also included the HDI values: the min value is 0.520623 in Guatemala (2004) and the max value is 0.920 in USA (2010).

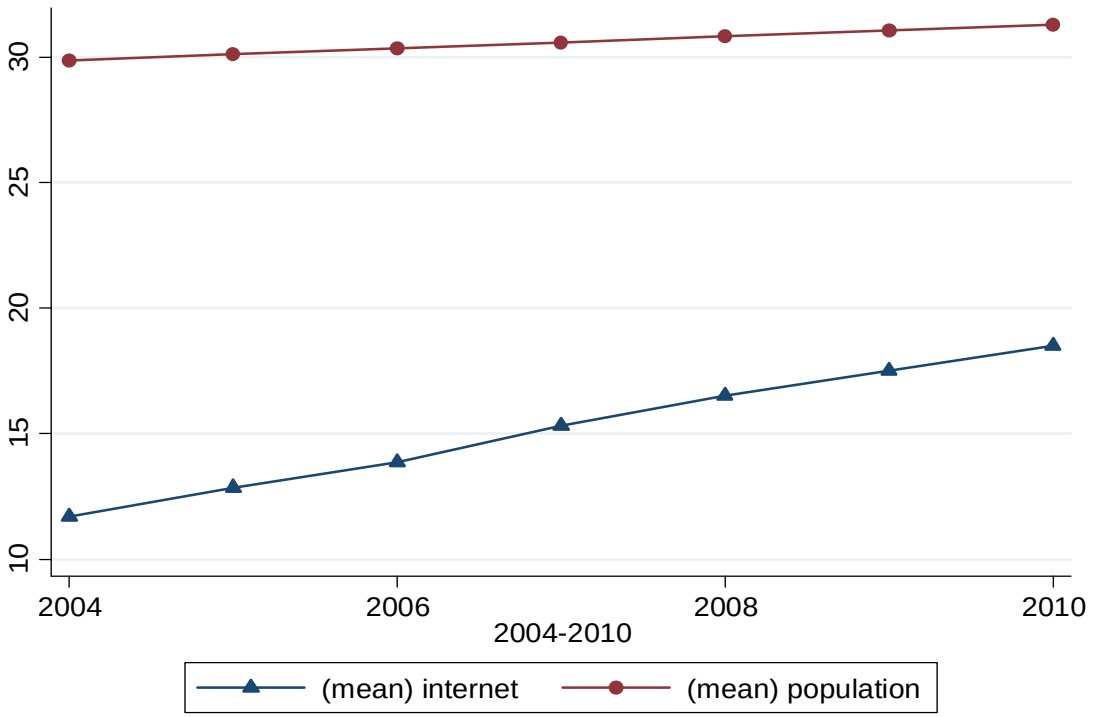
As measure for democracy I chose the Freedom House Democracy Index (Freedom House, 2011). The value for each country is a sum of the scores 'political freedom' and 'civil liberties'. The problem with this index is that is too stable across time, mainly countries don't change their index score between years and the number is also an integer, which presents issues with comparability of countries with the same score (f.i. Argentina, Brazil and Bulgaria have the same score -4- and considering at the same level the democracies in those countries might be too general).

Further measures for Governance and Democracy are taken from the World Governance Indicators (WGI 2010). The six variables have 300 observations because the year 2010 data were not yet available. Each aggregate indicator is drawn on data from different sources and measures a particular aspect of governance (Kaufmann, Kraay and Mastruzzi, 2010).

— VA=Voice and accountability;
— CC=Control of corruption;
— GE=Government effectiveness;
— PV=Political stability and absence of violence;
— RL=Rule of law;
— RQ=Regulatory quality;

Another variable I have included is the number of internet users (per 100 people): the variable is calculated from the two variables 'internet' and 'population'. In [Figure 5] I have used the variable 'internet' measured in millions of users and compared it with the population over time.

Figure 6 - Internet users and population (in million)



Sources - Author's calculation based on IMF (2011); Human Development Report (UNDP 2010)

As we would expect the increase in the number of internet users goes far beyond the increase in the population. The mean number of internet users went from 11.7 million on 2004 to 18.5 million on 2010 and the proportion from 31.80% to 54.61%; some countries doubled their number of internet users (i.e. Argentina or Honduras) some others more than tripled or quadrupled (i.e. Bulgaria or Colombia); in general all the countries increased their number of internet users every year.

I further included a Gini coefficient to measure inequality, data from Eurostat (EU-SILC 2011). Gini index is not calculated yearly in each country thus the observation I was able to retrieve are 158.

I finally included a climate measure that is the average latitude coordinates (CIA 2007).

III.1.4 Social Networking Sites data

As mentioned before I had to develop a measure of SNSs popularity across countries and time because almost no data is available about users, usage or number of visits on a particular site. Users and number of accesses might also have been misleading measures as two times the number of users (or number of accesses) does not necessarily means two times the time spent on a SNS; I refer to the following paragraph where I discuss and validate this instrument.

The instruments that I used are popular websites (google.com and alexa.com) which through some of their services provide useful statistics on websites. Google provides free services to measure the search volume of particular keyword: Google Trends (2011) and Google Insights for Search (2011).

In order to measure how much a website is popular I measure the amount of times it was searched on Google, the more is its search volume (compared to all the searches in that country) the more the website will be popular.

III.2 Validity of SNS instrument

Google is the most popular web search engine. It's today used as the main search engine by around 70% of the internet users. Its market share has been increasing from around 40% in 2004 to more than 90% for some countries in 2010. [10]

When a user looks for something on the web, Google is usually the first place where to start. This can be said for websites, news, or for any kind of information.

As one may think the number of searches on Google might not represent the popularity of a website because if the user already knows the URL he will type it directly into the browser without searching for the keyword. I argue and prove that at a macro level this thinking is wrong.

The more a website is popular the more the word-of-mouth will spread across friends, colleagues, relatives or in general across the web; the more its searches will grow. In the same way the more a place is popular the more will be its presence on the web and the more popular a situation (like going to the cinema) the more will be the search volume for the related keyword ('cinema').

In order to validate these hypotheses I test for correlation of two different situations.

1.

Using the Eurobarometer surveys (SILC 2006) I take the answers from a question asking the number of times the interviewed went to the cinema and test for correlation with the number of searches on Google on 2006 for the keyword 'cinema'[11] for 10 European countries.[12]

[10] As an example, on February 2010 UK Google had 89.67% of the searches, followed by Bing (3.04%) and Yahoo(4.7%). (Hitwise 2011)

[11] The keyword "cinema" was substituted with "kino" for Germany and Austria, "cine" for Spain, "elokuva" for Finland.

[12] Belgium, Denmark, Germany, Spain, France, Italy, Austria, Portugal, Finland, United Kingdom.

Question: Number of times going to the cinema:

1	*none*
2	*1-3 times*
3	*4-6 times*
4	*7-12 times*
5	*more than 12 times*

Table 5 - Summary statistics of data from the Eurobarometer survey question ('Number of times going to the cinema') and Google searches for the keyword 'cinema'

	mean	sd	min	max
cinema	185.82	15.18002	158	206.1
social	47.306	3.976492	41.47	53.78
N	10			

Sources: SILC (2006); Google Trends (2011)

The variable 'cinema' was constructed by computing the weighted averages for the cinema responses; variable 'social' represents the search volume for the keyword 'cinema' on 2006.

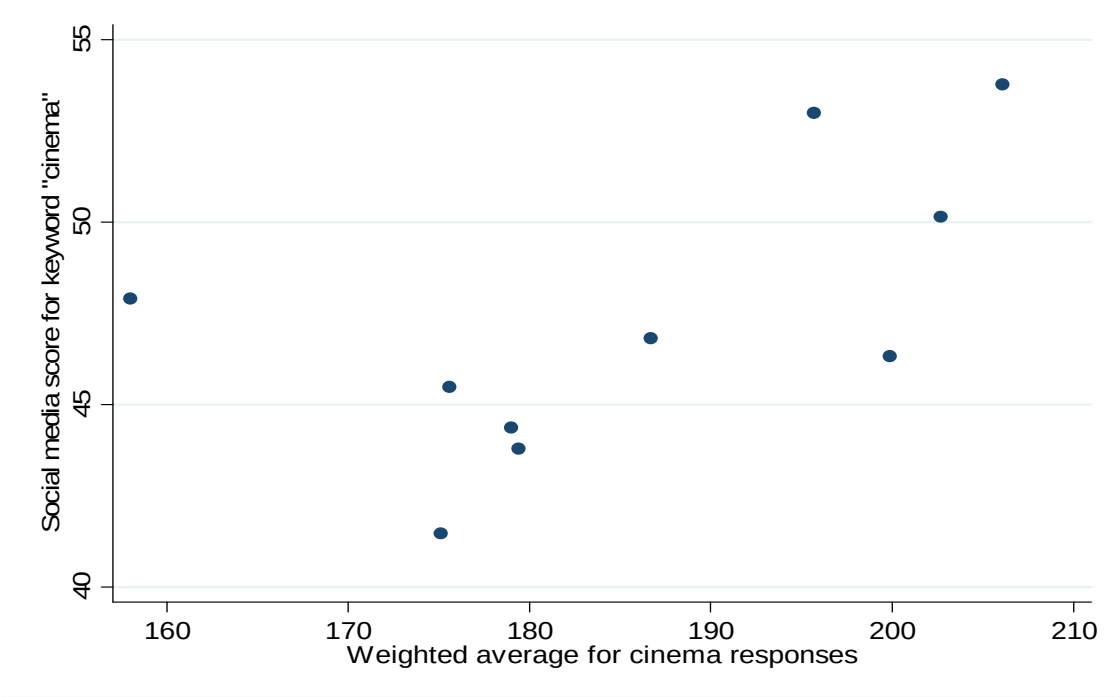
The correlation is strong [Table 6 (1)]. After removing the outlier (Portugal) the correlation goes up to 0.85 (2).

Table 6 - Correlation between social score (Google search volume) and survey responses

	(1) social	(2) social
cinema	.6044202	.8353362
N	10	9

Source: Author's calculation based on "Gross National Happiness" (2011); World Database of Happiness (Veenhoven 2011)

Figure 7 - Correlation between Google searches for the keyword 'cinema' and data from the Eurobarometer survey



Source – Author's calculation based on SILC (2006); Google Trends (2011).

2.

An alternative correlation test was conducted on the Facebook number of users and searches for the keyword 'Facebook'.

Facebook numbers of users were taken from online blogs that have been collecting these numbers across countries over time. As previously mentioned Facebook does not officially provide its number of users by country; these websites use the Facebook advertisement tool, a feature that allows retrieving an estimation of the number of users for each country.[13] The feature doesn't go back in time so it is necessary to repeat the calculation every month (or year) for every country. This is why I was able to find data only for 28 countries from 2008 to 2010.

[13] The feature available online at http://www.facebook.com/ads/create/ shows the estimate of the potential audience of an ad on Facebook. The numbers are not exact as Facebook warns, but do truly estimate the numbers of users.

In [Table 7] are reported the summary statistics for the two variables.

Table 7 - SNS validity test - summary statistics of Facebook numbers of users and Google searches for the keyword 'facebook'

	mean	sd	min	max
social	300.556	524.8917	1.375	2365
facebook	5077032	5616537	51680	2.65e+07
N	84			

Sources - Author's calculation based on Facebook advertisement tool available at http://www.facebook.com/ads/create/ and Google Trends (2011)

Table 8 - Correlation between Google searches for the keyword 'facebook' and Facebook numbers of users

	social
facebook	*.7959544*
N	*84*

Source - Refer to table 7

The correlation between the numbers of Facebook users and searches for the keyword 'facebook' is at about 80% [Table 8]. Therefore, as argued before, the more a SNS increases its numbers of users the more the search volume for the related keyword on Google will increase hence it is reasonable to instrument the popularity of SNSs with their respective searches on Google.

III.3 Construction of SNS variable

Using Google trends (2011), Alexa (alexa.com) and Google Insights for Search (2011) I first retrieved the list of the most popular SNSs for each country; these were chosen in terms of traffic volume and estimated number of visits. I then inserted the name of each SNS into Google trends and downloaded its weekly search volume data from 2004 to 2010.

The list of SNSs keywords: **facebook, twitter, myspace, badoo, linkedin, fotolog, orkut, hi5, chat, messenger, bebo, netlog, tagged, meetup, friendster, studivz.**[14]

To the list of SNSs I added the two keywords 'chat' and 'messenger' that are measuring the online conversations software. 'Messenger' is an abbreviation of the most popular instant messaging programs, such as MSN Messenger, ICQ Messenger and AIM Messenger. Instant messaging (or commonly chat) was the most popular social networking activity before the spread of social networking sites. The use of such software has declined in time as chat systems are now integrated in almost all SNSs.

Example for the keyword 'chat': since I'm considering data from 2004, 1.0 would be the average traffic of 'chat' in January 2004, all the other numbers will be related to January 2004; therefore if in August 2005 the search volume of 'chat' was 0.5 this means approximately half the searches of January for the keyword 'chat'. Since the scale basis (1.0) doesn't change with time, we can look at different time periods, and relate them to each other. ("About Google Trends", 2011)

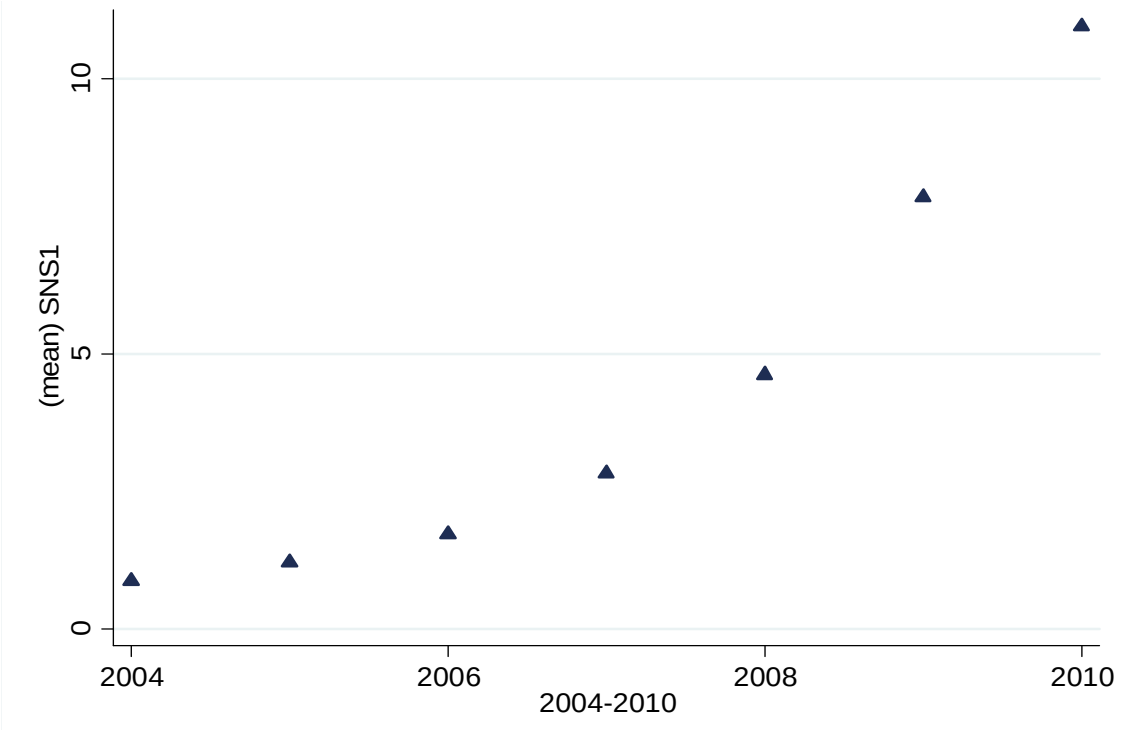
In Appendix D is shown the search term's popularity over time for two example keywords ('facebook' and 'chat').

<u>The variable SNS represents all the searches for social networking sites/activities</u>. The data is scaled to the average traffic of the search keywords on January

[14] The list of the URL of each SNS can be found in Appendix C.

2004.[15] Collapsing the value for each year we can show how social networking sites have been exponentially growing in recent years:

Figure 8 - SNSs growth over time (2004 to 2010)



Source - Author's calculation based on Google Trends (2011)

For some countries the growing in SNSs has been faster than others. In general all the considered countries have experienced a really fast growing in SNSs popularity.

Some might argue that the SNSs included in the variable are too few considering that the list of online communities is updating minute by minute and hundreds of new SNSs are created every month. Although this may underrepresent some niche communities, their effect on the overall SNSs search volume is too small. As far as the results are concerned the inclusion of any other keyword wouldn't change the coefficient by significant amounts. Indeed I have tried to re-build the

[15] Google Trends allows to compare multiple keywords at time using expressions operators like 'and' and 'or'. The exact query that I inserted for each country is the following: 'facebook | twitter | myspace | badoo | linkedin | fotolog | orkut | hi5 | chat | messenger | bebo | netlog | tagged | meetup | friendster | studivz' which allows to retrieve the search volume for all the keywords at once.

variable many times using different list of keywords: results won't change. This is because famous SNSs such as Facebook, MySpace and Hi5 are absorbing almost all the variance in the data. In other words the effect of any omitted SNS is insignificant.

Finally, in order to compare the variable 'SNS' (the sum of all the social network search volumes of a particular country) between different countries I control for the percentage of internet users (variable 'internetper100').

IV. Model

In econometrics a **panel approach** pools together time series and cross-sectional data by following a group of people, firms, countries or regions periodically over a given time span.

In its general form is expressed as:

$$(1)\ y_{it} = \alpha + \beta_{it} + \varepsilon_{it}$$

where $\varepsilon_{it} \sim IID(0, \sigma^2)$

i is the individual dimension $i = 1,2,\ldots\ldots, N$

t is the time dimension $t = 1,2,\ldots\ldots, T$

The popularity of panel data resides in the advantages of their use. First, they offer a solution to the problem of bias caused by unobserved heterogeneity, a common problem in cross-sectional data sets. Second, panel data can show dynamics that are difficult to detect with cross-sectional data. Third, the greater number of data points (N*T observations) reduces collinearity among the explanatory variables and increases the overall efficiency of the estimates. Forth, a greater degree of the heterogeneity of countries (or individual, firms etc.) can be taken into account.[16]
The following models are estimated over i countries and t time periods:

$$(2)\ HAPPINESS_{it} = \alpha + \beta_1 GDPCAP_{it} + \beta_2 \times GDPCAP_{it}^2 + \beta_3 \times INFLATION_{it} + \beta_4 \times UNEMPLOYMENT_{it} + \beta_5 \times LIFEEXP_{it} + \beta_6 \times SCHOOLING_{it} + \beta_7 \times \mathrm{INTERNETPER100}_{it} + \beta_8 \times lnSNS_{it} + \beta_9 \times DEMOCRACY_{it} + \beta_{10} \times LATITUDE_{it} + time\ dummies + \varepsilon_{it}$$

[16] A comprehensive analysis of panel models is in Wooldridge (2002), Hsiao (2003) and Baltagi (2001).

$$(3)\ HAPPINESS_{it} = \alpha + \beta_1 GDPCAP_{it} + \beta_2 \times GDPCAP_{it}^2 + \beta_3 \times INFLATION_{it} + \beta_4 \times UNEMPLOYMENT_{it} + \beta_5 \times LIFEEXP_{it} + \beta_6 \times SCHOOLING_{it} + \beta_7 \times \mathrm{INTERNETPER100}_{it} + \beta_8 \times lnSNS_{it} + \beta_9 \times VA_{it} + \beta_{10} \times CC_{it} + \beta_{11} \times GE_{it} + \beta_{12} \times PV_{it} + \beta_{13} \times RL_{it} + \beta_{14} \times RQ_{it} + \beta_{15} \times LATITUDE_{it} + time\ dummies + \varepsilon_{it}$$

All the explanatory variables are included in their level except for GDP per capita included as linear and quadratic variables in order to capture possible curvatures with respect to the dependent variable; and except for the SNSs variable included as a logarithm in order to be interpreted as percentage changes.

The models are first estimated using a **pooled OLS** technique, which discards temporal and space dimensions by considering intercepts and slope coefficients homogeneous across all N cross-sections and through all T time periods.

$$(4)\ y_{it} = \alpha + X'_{it}\beta + \varepsilon_{it}$$

Fixed and Random effects models are then estimated; they assume the existence of unobserved individual heterogeneity:

$$(5)\ y_{it} = \alpha_i + X'_{it}\beta + \varepsilon_{it}$$

It might be instructive to discuss on the nature of the **omitted factors** that I am not controlling for in this case. There may be country level differences in the use of SNSs, use of internet, or in the share of the population using them. Also the spread of these websites might have been affected by other variables, like the quality of the broadband connections, the access to internet or the language barriers when using them.

The **fixed effects** (FE) model will consider the omitted effects α_i as individual specific but fixed over time. One way of estimating it is the Least Square Dummy Variable approach (LSDV) that includes constant slopes and one intercept for each cross-sectional (group) unit, in our case for each country. The LSDV approach brings explicitly the unobservable effect into the model by considering it as the coefficient of the individual specific dummy variable.

The model in matrix form is:

$$(6)\ y_{it} = e\alpha_i + X_{it}\beta + \varepsilon_{it} \qquad \varepsilon_{it} \sim IID(0, \sigma^2)$$

Where $y_{it}$and ε_{it} are $T \times 1$ vectors, e is a $T \times 1$ vector of ones, X_{it} is a $T \times k$ matrix where k is the number of explanatory variables and α is an unobserved group specific variable assumed to be constant overtime. [17]

The LSDV estimate for the vector $\hat{\beta}$ is defined as:

$$\hat{\beta}_{within} = \left[\sum_{i=1}^{N}(X'_{it}QX_i)\right]^{-1}\left[\sum_{i=1}^{N}(X'_{it}\,Qy_i)\right]$$

Alternatively:

$$(7)\ y_{it} - \overline{y_i} = (x_{it} - \overline{x_i})'\beta + (\varepsilon_{it} - \overline{\varepsilon_i})$$

The FE only uses the temporal or 'within' variation of the data and concentrates on the differences within groups. The estimators are consistent and efficient and the idiosyncratic error terms ε_{it} are homoskedastic and serially uncorrelated.

Another estimator exploits the variation across groups: this is known as the **between estimator** (BE) and takes the average values for each of the separate groups over the time period.

$$(8)\ \overline{y_i} = \alpha_i + \overline{x'_i}\beta + \overline{\varepsilon_i}$$

$$\hat{\beta}_{between} = \left[\sum_{i=1}^{N}(\overline{x_i} - \bar{x})(\overline{x_i} - \bar{x})'\right]^{-1}\left[\sum_{i=1}^{N}(\overline{x_i} - \bar{x})(\overline{y_i} - \bar{x})\right]$$

It basically reduces the panel to a cross section of averages over time and ignores any information within the individual group. The estimator is inconsistent in a FE model and inefficient in a RE model.

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[17] An idempotent transformation is calculated in order to sweep out the individual effects α_i $Q = I_t - \left(\frac{1}{T}\right)ee'$

In the **random effects** (RE) model the individual specific effects α_i are instead treated as purely random across cross sectional units. (Ref to equation n.5)

The composite error term is: $v_{it} = (\alpha_i + e_{it})$

The estimation of this type of model requires implementing the Generalised Least Squares (GLS) procedure.

$$(9) \quad y_{it} - \hat{\lambda}\overline{y_i} = (x_{it} - \hat{\lambda}\overline{x_i})'\beta + (v_{it} - \hat{\lambda}\overline{v_i})$$

$$\text{Where } \hat{\lambda} = 1 - \frac{\sigma_\varepsilon}{\sqrt{\sigma_\varepsilon^2 + \mathrm{T}\sigma_c^2}}$$

RE model measures both the variation over time and over cross sections and is referred as a matrix weighted average of the FE and BE estimators.

V. Results

My findings support a number of results in the empirical literature while refuting others.

I first run 10 mean regressions (**Ordinary Least Squares**) models over different sets of explanatory variables. Results are presented in Appendix B. In [Table B1] I run six regressions to test different variables: HDI in regression (2); inflation, unemployment, life expectancy, democracy and latitude in regression (3); different measures of education in regressions 4-6. In [Table B2] I test the Gini coefficients in regressions (7) and (8) and the variable SNS in regressions 8-10.

The coefficient for the SNS variable is negative and significant in the regressions 8-10; internet users (per 100 people) have instead a positive and significant effect. In these first pooled OLS regressions SNSs have a negative effect on subjective well-being. An increase of the popularity of SNSs by 10% reduces the happiness index of 2.1% in the first model, regression (9) [2.3% in the second model, regression (10)] on average and holding everything else constant; whereas an increase of 10% in the number of internet users is associated with 0.15 (or 15% in the first model) and 0.13 (or 13% in the second model) increase in the happiness index, on average and *ceteris paribus*.

GDPcap and GDPcap^2 have the expected sign and are significant at conventional levels mostly in all the regressions; GDPcap^2 loses its significance when regressed with inequality (Gini coefficient) and indicators of governance. HDI variable is significant and with the expected positive sign. I find some positive and significant impacts of inflation, supporting some findings in the literature while contrasting others; inflation has the negative sign (though insignificant) only when regressed along with inequality.

Like many others I find negative impact of unemployment; coefficients are mostly all significant.

Life expectancy is significant and with the expected sign only in one regression. Other regressions report both positive and negative signs but are insignificant.

Measure of democracy by the Freedom House is negative (democracy index goes from 1 for the most democratic to 10 for the worst democratic) and significant in

almost all the regressions. Governance Indicators are all significant except for the Rule of Law.

As previously mentioned in section III.1.3 I have included three different measures of education (their correlation with the dependent variable was reported in [Table 4]). All three of them are negative and significant in all the regressions in contrast to some studies and supporting others. Coefficients of the other variables don't change much no matter if I use mean years of schooling, expected schooling or gross enrolment. I chose to use the mean years of schooling for the regressions 7-10 (table B2 and next models) only because regressions report higher R^2 and F-test significance.

Latitude is negative and significant in all regressions as expected.

As for the time dummies years 2008, 2009 and 2010 had on average a negative impact on life satisfaction on the first 6 regressions compared to year 2004. 2009 and 2010 lose significance when I control for internet users and SNS or Governance Indicators (only 2008 is significant in two of the 4 regressions).

As previously explained a limitation of the model estimators in this case is that it weights each observation equally; this may be inefficient if the variation either across countries or within countries differs substantially. From the OLS models I chose the last 2 ones [(9) and (10)] and ran panel regressions with LSDV, FE, BE and RE models.

Results are reported in [Table B3 & B4].

For the pooled OLS models the included regressors account for about 53% and 56% of the total variation in the country (or group) averaged happiness index. Pooled OLS models perform better than FE, BE and RE estimations. A Breusch-Pagan Test for heteroskedasticity was conducted on these OLS regressions finding homoscedasticity.[18]

In the **LSDV** columns I have omitted the country dummies for space reasons; an F-test for the joint statistical significance of the fixed effects rejects the overall insignificance.

[18] For regression (9): chi2(1) = 0.60[Prob > chi2 = 0.44] – For regression (10): chi2(1) = 0.00[Prob > chi2 = 0.90]

$$F = \frac{[R^2_{UR} - R^2_R] \div g}{[1 - R^2_{UR}] \div [DF_{UR}]} = \mathrm{F}(49, 219) = 51.65$$ [19]

In contrast to the pooled OLS model, once I control for country-level fixed effects, the time dummy effects become individually statistically significant. All the estimated effects are positive (except for 2005 and 2005 & 2008 in the second model) thus indicating increases in the overall life satisfaction indexes over time relative to the 2004 base.

In the **BE estimator** the year dummies are redundant because the data are now averaged for each of the 50 states over the seven-year period. The use of group (or country) means averages out the influence of cyclical factors. In the first model GDPcap, inflation, schooling and SNS are statistically significant but less well determined than in the case of the pooled OLS estimator. Also their coefficients report higher estimates suggesting that in regard to these measures in particular they contain perhaps much more variation across (or 'between') the states than the other reported factors; unemployment, life expectancy and internet users lose instead statistical significance. Similar results for the second model where coefficients report lower estimates.

I finally turn to the **RE model**. By using the pooled OLS residuals from (1) defined as ehat_{it} I compute a test for the presence of random effects. This is known as the Bresuch-Pagan test for random effects and is computed as:

$$\text{Breusch Pagan LM test} = \frac{\mathrm{NT}}{2\mathrm{T}}\left(\frac{\sum_{i=1}^{N}(\sum_{t=1}^{T}\mathrm{ehat}_{it})^2}{\sum_{i=1}^{N}\sum_{t=1}^{T}\mathrm{ehat}_{it}^2} - 1\right)^2 \sim \chi^2_1$$

The null hypothesis is $H_0: \sigma^2_\alpha = 0$ versus $H_0: \sigma^2_\alpha \neq 0$ where σ^2_α represents the true variance in the random effects.

The test statistic value reports a value of chi2(1) = 430.09 [Prob > chi2 = 0.0000] and chi2(1) = 353.70 [Prob > chi2 = 0.0000] for the second model suggesting that the null hypothesis is decisively rejected in both cases. Thus, random effects are statistically relevant in this application.[20]

[19] For the second model - F(49, 185) = 47.62

[20] Note that this is not a specification test for the random effects model *per se*, instead is a test for whether random effects are present or not.

SNSs are still significant but the coefficient is now lower. A 10% increase in the popularity of SNSs is associated with less than 1% decrease in happiness. The estimated coefficient for life expectancy is now positive and significant. GDPcap and GDPcap^2 are now insignificant along with inflation, democracy, internet and latitude.

The set of six time dummies are jointly statistically insignificant in this model and the resultant Wald chi2(6) = 12.37 [Prob > chi2 = 0.0541] for the first model and chi2(5) = 11.44 [Prob > chi2 = 0.0433] for the second model.

In regard to the governance indicators, the only two measures that achieve statistical significance at a conventional level are regulatory quality and government effectiveness.

On the basis of the various R^2 measures, this models performs worse than the 'within', the 'between' or the overall model in explaining the variation in the different dimensions of the data.

The **Hausman test** is finally implemented to determine the validity of the RE model. The null hypothesis assumes the independence of the random effects from the explanatory variables. The value of the computed Hausman test for the first model is:

chi2(13) = (b-B)'[(V˙b-V˙B)ˆ(-1)](b-B) = 39.79
Prob > chi2 = 0.0001
(V˙b-V˙B is not positive definite)

Under the null hypothesis both estimators are consistent but the random effects estimator would be more efficient. The null hypothesis of the random effects is rejected in this case.

However, the difference between the two variance-covariance matrices is not positive-definite, so the test value is not interpretable. Under such circumstances it is best to use the fixed effects model as the consequences of using the random

effects model when it is inappropriate are considerably graver given the potential for biased estimates.

Whereas for the second model:

chi2(17) = (b-B)'[(V˙b-V˙B)ˆ(-1)](b-B)= -0.19 chi2<0 ==>

Thus the null is not rejected and fixed effects are preferred.

Therefore I find evidence that omitted factors are important, and the fixed effect estimators appear the more appropriate.

A 10% increase in the popularity of SNSs is associated, respectively for the first and second model, with less than 0.7% and 0.85% decrease in subjective well-being. Considering the recent years explosion in the popularity of SNSs these values are not derisory.

Another interesting finding regards the GDPcap coefficients that in the FE models become surprisingly negative and even significant in the first model. This is because of the correlation between GDP per capita and the unobserved time invariant characteristics captured by the FE such as religion, culture or long term economic success which likely positively correlate with GDP per capita.

Democracy index by Freedom House is negative and insignificant supporting previous literature, and from the six governance indicators only regulatory quality stays significant.

Internet users coefficients lose their significance from the pooled OLS whereas the variable for SNSs stays significant and negative in all the regressions.

VI. Discussion and conclusion

VI.1 Discussion and limitations of the study

The negative coefficients of the SNS variable confirm the hypothesis that the overall effect of SNSs reinforces the dark side of SC and lowers life satisfaction.

Yet, as mentioned in section II it is important to study the characteristics of networks that define bonding/bridging types of SC in order to quantify if its positive effects exceed its negative and antisocial outcomes. These ideas were not tested in this study mainly because of data unavailability and time constraints: an analysis of SC types in all the SNSs at macro level would involve access to private information about users' interactions and connections and require much more time for analysis that goes behind this work.

However different studies at micro level have found SNSs to increase more bonding SC than bridging SC (Burke, Marlow and Lento, 2010; Burke et al., 2011; Smith and Giraud-Carrier, 2010) as one might expect following the analysis of the average user. According to Cameron Marlow, a Facebook sociologist, the average man is connected to 120 'friends' on Facebook but interacts regularly with 4 to 7 people. Indeed 'The more "active" or intimate the interaction, the smaller and more stable the group ("Primates on Facebook", 2009)'. Women interact more than men but the numbers of these interactions are too small compared to the connections. This is because characteristics and evolution of famous SNSs help maintain and strength ties that we already have in our life such as friends and family but do not encourage exclusive (bridging) interactions. As a matter of fact we interact more with close friends and this might lower the trust for people not in our social circle.

This might also lead us lose the sight of important news or events as we are interested only in information that comes from our favourite friends. Mark Zuckerberg, founder and CEO of Facebook, cited by David Kirkpatrick in his book The Facebook Effect stated that 'A squirrel dying in front of your house may be more relevant than your interests right now than people dying in Africa (Kirkpatrick, 2010:296)'. The statement was referred to one of the updates on the website that led to the creation of the 'news feed', an aggregator of our close

friend's posts that have been receiving greater feedback, where close friends refers to the people we interact most with by messaging, commenting or visiting each other profiles, i.e. our favourite friends ("New Views for your Home Page", 2009). Updates like this have been lately more frequent: Facebook seems encouraging us to share and interact with just few people probably in response to privacy concerns (see for instance "Facebook Grapples with privacy issues", 2010; "Some quitting Facebook as privacy concerns escalate", 2010) introducing more recently new privacy controls to let users share content with the people they want ("Making It Easier to Share With Who You Want", 2011). The more a post receives feedback the more it has chances of being included in the 'news feed' section, the more the user will have a nice looking profile. This might be supported by the negative correlation found in section III.1.2.

Although other SNSs such as Twitter make users share information with the public, the SNSs aim (or at least the outcome) is not to increase bridges between new people and different networks but more of keeping us on the websites in front of our computers or devices, sadly alone.

The more SNSs will lead us to maintain and strength few ties without helping us to meet new people, to make new connections and friends, and above all to bring us outside to the real world, the more they will be part of the dark side of SC.

It is important to mention that I have analysed here the overall impact of SNSs on subjective well-being; some services may have positive effects, overwhelmed by negative consequences of the others. This might be the case of SNSs like LinkedIn that help create business contacts and find new jobs clearly contributing to the linking SC, the hardest to build. Thus analysis for different types of SNSs might reveal opposite results.

Another, more serious, limitation of the study regards the bias that might arise from the share of the population using SNSs. Young people are the early adopters of these technologies; they represent the majority of users despite in recent years the average age of the SNS user it's been increasing significantly (Lenhart et al., 2010). Yet, after running the same analysis year by year I found similar results for the SNS variable, even for the most recent data on 2010 when older people are joining the online conversation. It is also difficult to analyse the

direction of the bias at this macro level. Again further data and analysis are required in this regard.

VI.2 Conclusion

Online Social Networks are increasingly becoming an important way to interact, share and communicate. Since their initial diffusion in 2004 they've been exponentially growing at very fast rates creating a new revolution and consequent effects on our daily life. These can be positive or negative and touch many socio-economic areas. One of them is without doubt SC, an increasingly common concept that has been measured and studied in many ways and disciplines, many relating it with measures of subjective well-being.

Social Capital has undeniable effects on societies, economies and development. It is critical both at micro and macro level for a sustainable development and economic prosperity. It is the glue that holds all the institutions in a society ("What is Social Capital", 2011). SC has effects on many areas such as health, education, community safety and it's essential to enlarge the understanding of societies and social well-being. (Australian Bureau of Statistics, 2002)

Happiness surveys, life satisfaction and other measures of subjective well-being are increasingly considered by development economics agencies, public leaders, governments and international organizations as new approaches to place side by side to conventional measures of economic outcomes, able to help explain the changes our world is constantly facing. That is why many in the literature have been studying the effects of SC on measure of subjective well-being, exploring new indicators and way of measurement both at micro and macro level.

Following the recent years spreading of social media, online social networks and new technologies this work has attempted to outline a new indicator of SC while studying the relationships between SNSs and happiness.

The study was focused on a macro level with a panel dataset of 50 countries from 2004 to 2010 of happiness measures from the World Database of Happiness as the dependent variable and data on GDP per capita, employment, inflation, education, health, democracy, governance, social capital and climate.

As an indicator for SC a variable to measure the popularity of SNSs was compiled by using the search volumes of particular keywords over time on a popular search engine, Google.

Since recent micro level studies have found that SNSs increase bonding SC without creating the necessary bridges between heterogeneous networks, by turning the analysis to the macro level I'm finding a negative impact of SNSs on SC and life satisfaction. On average and *ceteris paribus* a 10% increase in the popularity of SNSs is associated with 0.8% decrease in subjective well-being.

From bowling alone, the famous title of Robert Putnam's book (2000) documenting the decline in American society's SC of the last decade, this work is proving that today we are increasingly surfing alone on websites that are really powerful in terms of reaching and impact but whose policies and objectives need to be reviewed in order to contribute to a significant increase of the good side of SC, one of the key for economic prosperity and sustainable development.

Appendices

APPENDIX A

Table A1: Summary statistics

Variable	Description	Mean	Sd. Dev.	Min	Max
happiness	Happiness score	6.35	0.95	3.91	8.38
gdpcap	GDP per capita (current US$)	20113.61	19833.93	843.00	119521.30
gdpcapsq	GDP per capita^2	7.97e+08	1.60e+09	710649	1.43e+10
population	Population (millions)	30.60	53.12	0.40	310.00
inflation	Inflation, average consumer prices (%change)	4.54	4.84	-1.71	51.46
unempl	Unemployment, total (% of total labor force)	8.63	4.99	1.87	37.25
life exp	Life expectancy at birth (years)	75.99	3.74	64.40	83.20
school exp.	School life expectancy, primary to tertiary (years)	14.47	1.79	9.86	18.10
gross˙enr	Combined gross enrolment ratio in education (%)	85.32	9.09	67.00	102.80
schooling	Mean years of schooling (of adults)(years)	9.21	1.97	3.60	13.10
hdi	Human Development Index	0.77	0.09	0.52	0.90
internet	Internet Users (millions)	15.18	34.90	0.12	244.90
internetper100	Internet users (per 100 people)	43.59	24.71	2.32	90.72
democracy	Freedom House Democracy Score	3.41	1.87	2.00	10.00
va	Voice & Accountability	71.51	20.44	27.01	100.00
cc	Control of Corruption	65.87	24.78	2.91	100.00
ge	Government Effectiveness	67.73	24.06	12.56	100.00
pv	Political Stability & No Violence	58.50	24.86	3.85	100.00
pl	Rule of Law	63.43	28.30	2.39	100.00
rq	Regulatory Quality	70.57	23.56	3.81	99.51
latitude	Country latitude coordinates	28.94	26.23	-34.00	64.00
gini	Gini coefficient	29.66	4.32	22.70	44.80
lnSNS	Social Networking Sites Searches Score (log)	0.86	1.14	-4.83	3.52
N	350				

Sources: World Database of Happiness - 121C 4-step verbal Life Satisfaction measure (Veenhoven, 2011); IMF World Economic Outlook Database April 2011 (IMF 2011); UNDP Human Development Report 2006-2010 (UNDP 2010); UN DESA (2009); UNESCO Institute for Statistics (UIS 2011); World Bank (2010); Eurostat(EU-SILC (2011); Freedom House democracy index (Freedom House (2011); World Governance Indicators (WGI 2010); CIA (2007); Google Trends (2011)

Table A2: Summary statistics by year

Year = 2004

	Obs	Mean	Std. Dev.	Min	Max
happiness	48	6.36	0.98	3.99	8.23
gdpcap	50	16302.18	16805.55	843.00	74565.39
gdpcapsq	50	5.43e+08	9.56e+08	710649	5.56e+09
population	50	29.88	52.23	0.40	293.39
inflation	50	5.20	7.72	-0.43	51.46
unempl	50	9.76	5.46	3.90	37.16
life˙exp	50	75.25	3.87	64.40	82.03
school exp	50	14.24	1.83	9.86	17.58
gross˙enr	50	84.12	9.85	67.00	101.00
schooling	50	9.05	2.06	3.60	13.10
hdi	50	0.75	0.10	0.52	0.89
internet	50	11.70	30.21	0.12	194.39
internetper100	50	31.80	22.40	2.32	83.89
democracy	50	3.44	1.84	2.00	8.00
va	50	72.87	20.97	29.81	100.00
cc	50	67.01	24.72	4.37	100.00
ge	50	69.07	23.81	13.59	100.00
pv	50	58.39	24.56	3.85	99.04
rl	50	64.54	27.47	9.05	99.05
rq	50	71.35	22.18	11.71	99.02
latitude	50	28.94	26.46	-34.00	64.00
gini	16	29.35	4.49	23.00	37.80
lnSNS	50	-0.35	0.92	-4.83	0.59

Year = 2005

	Obs	Mean	Std. Dev.	Min	Max
happiness	48	6.37	0.91	3.91	8.20
gdpcap	50	17327.78	17517.64	903.92	81163.03
gdpcapsq	50	6.01e+08	1.10e+09	817069.6	6.59e+09
population	50	30.14	52.72	0.40	296.12
inflation	50	4.21	3.35	-0.30	15.96
unempl	50	9.14	5.23	3.59	37.25
life˙exp	50	75.59	3.77	64.70	82.40
school exp	50	14.33	1.87	10.02	17.56
gross˙enr	50	85.08	9.44	67.00	102.80
schooling	50	9.06	2.06	3.60	13.10
hdi	50	0.76	0.10	0.53	0.90
internet	50	12.85	32.17	0.14	206.02
internetper100	50	35.88	23.86	2.57	84.83
democracy	50	3.32	1.80	2.00	8.00
va	50	71.22	21.23	28.85	100.00
cc	50	65.42	25.21	2.91	99.51
ge	50	67.78	24.25	17.96	100.00
pv	50	58.19	24.75	4.81	99.52
rl	50	63.35	27.35	9.05	99.52
rq	50	69.84	23.69	11.71	99.02
latitude	50	28.94	26.46	-34.00	64.00
gini	28	29.44	4.29	23.40	38.10
lnSNS	50	0.00	0.80	-4.31	1.45

Year = 2006

	Obs	Mean	Std. Dev.	Min	Max
happiness	48	6.46	0.87	4.03	8.20
gdpcap	50	18657.59	18664.02	957.42	90198.74
gdpcapsq	50	6.89e+08	1.31e+09	916643.4	8.14e+09
population	50	30.35	53.12	0.41	298.93
inflation	50	4.27	2.96	0.30	13.65
unempl	50	8.35	4.88	3.59	36.03
life˙exp	50	75.81	3.77	65.00	82.50
school exp	50	14.39	1.83	10.07	17.59
gross˙enr	50	85.40	9.14	67.60	101.60
schooling	50	9.12	2.02	3.70	12.90
hdi	50	0.77	0.09	0.54	0.90
internet	50	13.87	33.17	0.15	210.96
internetper100	50	39.68	24.04	2.81	87.76
democracy	50	3.32	1.77	2.00	8.00
va	50	71.58	20.20	32.69	100.00
cc	50	65.74	25.03	5.83	100.00
ge	50	67.50	24.34	15.05	100.00
pv	50	58.87	24.82	7.69	99.52
rl	50	62.93	28.24	6.19	99.52
rq	50	69.78	24.28	10.73	99.51
latitude	50	28.94	26.46	-34.00	64.00
gini	29	30.30	4.98	23.70	44.80
lnSNS	50	0.32	0.60	-0.79	2.11

Year = 2007

	Obs	Mean	Std. Dev.	Min	Max
happiness	49	6.41	0.86	4.34	8.25
gdpcap	50	21606.87	21335.91	1011.97	107099.30
gdpcapsq	50	9.13e+08	1.80e+09	1024091	1.15e+10
population	50	30.60	53.59	0.41	301.90
inflation	50	4.57	3.46	0.00	18.70
unempl	50	7.40	4.73	2.76	34.93
life˙exp	50	76.00	3.78	65.40	82.70
school exp	50	14.47	1.77	10.64	17.86
gross˙enr	50	85.64	8.93	70.10	101.60
schooling	50	9.20	1.98	3.80	12.80
hdi	50	0.77	0.09	0.55	0.90
internet	50	15.32	35.19	0.19	221.96
internetper100	50	43.79	24.01	3.90	86.23
democracy	50	3.34	1.76	2.00	8.00
va	50	71.39	20.17	31.25	100.00
cc	50	65.51	25.08	7.73	100.00
ge	50	67.08	24.57	14.98	99.52
pv	50	58.93	25.62	7.69	99.52
rl	50	62.94	29.09	2.86	100.00
rq	50	70.48	24.43	4.85	99.03
latitude	50	28.94	26.46	-34.00	64.00
gini	28	29.61	4.29	23.20	37.80
lnSNS	50	0.76	0.69	-0.70	2.62

Year = 2008

	Obs	Mean	Std. Dev.	Min	Max
happiness	31	6.32	1.01	4.38	8.17
gdpcap	50	23804.95	22937.85	1124.38	119521.30
gdpcapsq	50	1.08e+09	2.19e+09	1264237	1.43e+10
population	50	30.85	54.04	0.41	304.72
inflation	50	7.35	5.12	1.40	30.37
unempl	50	7.16	4.53	1.87	33.76
life˙exp	50	76.24	3.72	65.70	82.80
school exp	50	14.57	1.76	10.60	17.88
gross˙enr	50	85.64	8.93	70.10	101.60
schooling	50	9.28	1.93	3.90	12.60
hdi	50	0.77	0.09	0.55	0.90
internet	50	16.51	36.77	0.20	230.89
internetper100	50	47.98	24.04	5.30	88.97
democracy	50	3.42	1.82	2.00	8.00
va	50	71.02	20.29	30.29	100.00
cc	50	66.02	24.86	11.59	100.00
ge	50	67.38	24.39	12.56	99.52
pv	50	58.87	25.69	8.13	100.00
rl	50	63.05	29.59	2.39	99.52
rq	50	71.18	23.95	4.83	99.03
latitude	50	28.94	26.46	-34.00	64.00
gini	28	29.49	4.15	23.40	37.70
lnSNS	50	1.28	0.75	-0.41	2.74

Year = 2009

	Obs	Mean	Std. Dev.	Min	Max
happiness	30	6.24	1.04	4.41	8.38
gdpcap	50	21408.13	20478.86	1082.11	106550.80
gdpcapsq	50	8.69e+08	1.74e+09	1170971	1.14e+10
population	50	31.08	54.46	0.42	307.37
inflation	50	2.79	4.27	-1.71	27.08
unempl	50	9.04	4.66	3.20	32.18
life˙exp	50	76.44	3.67	66.00	83.00
school exp	50	14.64	1.77	10.60	18.08
gross˙enr	50	85.70	8.87	70.10	101.60
schooling	50	9.35	1.90	4.00	12.50
hdi	50	0.77	0.09	0.56	0.90
internet	50	17.50	38.22	0.24	240.18
internetper100	50	51.38	23.84	7.30	90.28
democracy	50	3.50	2.03	2.00	9.00
va	50	70.99	20.76	27.01	99.05
cc	50	65.52	24.99	8.10	100.00
ge	50	67.60	24.16	14.29	99.52
pv	50	57.76	24.93	7.08	96.23
rl	50	63.78	29.36	2.83	100.00
rq	50	70.80	23.90	3.81	99.05
latitude	50	28.94	26.46	-34.00	64.00
gini	28	29.40	3.90	22.70	37.40
lnSNS	50	1.79	0.75	0.10	3.36

Year = 2010

	Obs	Mean	Std. Dev.	Min	Max
happiness	30	6.20	1.10	4.12	8.38
gdpcap	50	21687.75	20448.70	1126.55	108831.70
gdpcapsq	50	8.80e+08	1.80e+09	1269113	1.18e+10
population	50	31.30	54.88	0.42	310.00
inflation	50	3.38	4.25	-1.56	28.19
unempl	50	9.54	5.01	3.20	32.18
life˙exp	50	76.62	3.65	66.30	83.20
school exp	50	14.67	1.78	10.60	18.10
gross˙enr	50	85.69	8.87	70.10	101.60
schooling	50	9.43	1.87	4.10	12.40
hdi	50	0.78	0.09	0.56	0.90
internet	50	18.51	39.19	0.26	244.90
internetper100	50	54.61	23.53	10.00	90.72
democracy	50	3.56	2.11	2.00	10.00
va	0	.	.	.	.
cc	0	.	.	.	.
ge	0	.	.	.	.
pv	0	.	.	.	.
rl	0	.	.	.	.
rq	0	.	.	.	.
latitude	50	28.94	26.46	-34.00	64.00
gini	1	36.10	.	36.10	36.10
lnSNS	50	2.19	0.65	0.44	3.52

Sources: please refer to table A1.

APPENDIX B

Table B1: OLS regressions

	(1)	(2)	(3)	(4)	(5)	(6)
GDPcap	4.25 e-5*** (8.12)	†	5.51 e-5*** (6.09)	6.06 e-5*** (6.88)	8.02 e-5*** (8.00)	8.37 e-5 *** (8.47)
GDPcapsq	-1.73 e-10 *** (-2.86)	†	-2.39 e-10 *** (-2.99)	-2.76 e-10 *** (-3.56)	-4.05 e-10 *** (-4.85)	-4.90 e-10 *** (-5.62)
HDI	†	3.401*** (4.57)	†	†	†	†
Inflation	†	0.019 (1.30)	0.043*** (3.67)	0.034*** (2.98)	0.037*** (3.27)	0.032*** (2.88)
Unempl.	†	-0.060*** (-4.78)	-0.018* (-1.67)	-0.020* (-1.92)	-0.016 (-1.56)	-0.012 (-1.19)
Life exp.	†	†	0.001 (0.05)	-0.007 (-0.31)	-0.022 (-1.04)	-0.014 (-0.69)
Democracy	†	†	-0.092*** (-2.93)	-0.132*** (-4.18)	-0.113*** (-3.70)	-0.137*** (-4.45)
Latitude	†	†	-0.012*** (-5.00)	-0.008*** (-3.14)	-0.012*** (-5.31)	-0.011*** (-4.99)
Schooling	†	†	†	-0.144*** (-4.59)	†	†
Gross enrl.	†	†	†	†	-0.034*** (-5.00)	†
School exp.	†	†	†	†	†	-0.219*** (-5.76)
2005	-0.021 (-0.14)	-0.037 (-0.21)	-0.020 (-0.14)	-0.029 (-0.21)	-0.003 (-0.02)	-0.014 (-0.11)
2006	0.020 (0.13)	-0.014 (-0.08)	-0.001 (-0.01)	-0.005 (-0.04)	0.014 (0.10)	0.008 (0.06)
2007	-0.105 (-0.69)	-0.097 (-0.55)	-0.163 (-1.13)	-0.169 (-1.22)	-0.180 (-1.31)	-0.168 (-1.24)
2008	-0.564*** (-3.17)	-0.380* (-1.86)	-0.630*** (-3.76)	-0.605*** (-3.73)	-0.678*** (-4.21)	-0.592*** (-3.73)
2009	-0.531*** (-2.98)	-0.228 (-1.10)	-0.343** (-2.02)	-0.339** (-2.07)	-0.373** (-2.30)	-0.321** (-2.00)
2010	-0.561*** (-3.15)	-0.220 (-1.06)	-0.383** (-2.25)	-0.358** (-2.19)	-0.403** (-2.48)	-0.342** (-2.13)
Constant	5.741*** (46.34)	4.229*** (6.43)	6.094*** (3.75)	7.995*** (4.93)	10.492*** (5.86)	10.189*** (6.02)

Obs.	284	284	284	284	284	284
Adj. R2	0.369	0.170	0.454	0.492	0.498	0.512
F	21.65	7.46	19.09	20.56	21.09	22.22
p	0.00	0.00	0.00	0.00	0.00	0.00
B-P Test χ_1^2	6.47***	0.04	4.78*	0.05	0.24	0.07

Notes: * Significant at the 10% confidence level; ** Significant at the 5% confidence level; *** Significant at the 1% confidence level; † indicates estimation not applicable; t statistics in parentheses. Time dummy for year 2004 is omitted to avoid the dummy trap. B-P denotes the Breusch-Pagan Test for heteroskedasticity. For variables description and sources please refer to Table A1.

Table B2: OLS regressions

	(7)	(8)	(9)	(10)
GDPcap	5.14 e-5 *** (4.37)	3.59 e-5 ** (2.28)	5.12 e-5 *** (4.60)	2.77 e-5 ** (2.36)
GDPcapsq	-1.24 e-10 (-0.61)	1.29 e-10 (0.58)	-2.69 e-10 *** (-3.11)	-1.02 e-10 (-1.10)
Gini	-0.063*** (-5.78)	-0.050*** (-4.45)	†	†
Inflation	†	-0.017 (-0.68)	0.032*** (2.86)	0.039*** (3.50)
Unempl	†	-0.017 (-1.63)	-0.026** (-2.56)	-0.047*** (-3.97)
Democracy	†	-0.058 (-0.81)	-0.077** (-2.24)	†
Schooling	†	-0.124*** (-3.03)	-0.200*** (-6.13)	-0.197*** (-5.98)
Latitude	†	-0.010** (-2.02)	-0.011*** (-4.38)	-0.007** (-2.23)
Internetper100	†	0.010** (2.03)	0.015*** (3.07)	0.013*** (2.64)
lnSNS	†	-0.243*** (-2.66)	-0.209*** (-3.04)	-0.228*** (-3.24)
Life exp.	†	†	0.012 (0.57)	0.049** (2.39)
VA	†	†	†	0.034*** (4.13)
CC	†	†	†	-0.020*** (-2.62)
GE	†	†	†	0.038*** (4.24)
PV	†	†	†	-0.017*** (-3.97)
RL	†	†	†	-0.012 (-1.42)
RQ	†	†	†	-0.013* (-1.85)
2005	†	†	-0.021 (-0.15)	0.033 (0.25)
2006	0.119 (0.88)	0.059 (0.44)	0.007 (0.05)	0.071 (0.50)

2007	-0.091 (-0.67)	-0.082 (-0.57)	-0.097 (-0.62)	0.019 (0.12)
2008	-0.326** (-2.35)	-0.169 (-0.85)	-0.457** (-2.31)	-0.234 (-1.18)
2009	-0.198 (-1.44)	0.067 (0.29)	-0.144 (-0.61)	0.088 (0.37)
2010	†	†	-0.119 (-0.45)	†
Constant	7.062*** (18.98)	8.442*** (16.03)	6.709*** (4.20)	2.904* (1.91)
Observations	150	150	284	254
Adjusted R2	0.691	0.735	0.529	0.557
F	48.68	30.48	20.90	16.91
p	0.00	0.00	0.00	0.00
B-P Testχ_1^2	19.06***	5.28*	0.60	0.01

Notes: * Significant at the 10% confidence level; ** Significant at the 5% confidence level; *** Significant at the 1% confidence level; † indicates estimation not applicable; t statistics in parentheses. Time dummy for year 2004 is omitted to avoid the dummy trap. In columns (7) and (8) year 2005 and 2010 data are not available for the Gini variable; year 2010 is omitted in column (10) to avoid dummy trap. Gini is not included in regressions (9) and (10) because the sample would be too small. Democracy is omitted in regressions (9) and (10) because the effect is captured by the six World Governance Indicators. B-P denotes the Breusch-Pagan Test for heteroskedasticity. For variables description and sources please refer to Table A1.

Table B3: First model panel estimations

	(1) Pooled OLS	(2) LSDV	(3) Fixed Effects	(4) Between Estimates	(5) Random Effects
GDPcap	5.12 e-5 ***	-2.53 e-5*	-2.53 e-5*	8.89 e-5 **	1.63 e-5
	(4.60)	(-1.89)	(-1.89)	(2.70)	(1.60)
GDPcapsq	-2.69 e-10 ***	1.03 e-10	1.03 e-10	-5.75 e-10 **	-7.46 e-11
	(-3.11)	(1.42)	(1.42)	(-2.10)	(-1.19)
Inflation	0.032***	3.23 e-4	3.23 e-4	0.044*	0.006
	(2.86)	(0.05)	(0.05)	(1.75)	(1.09)
Unempl.	-0.026**	-0.036***	-0.036***	-0.015	-0.035***
	(-2.56)	(-4.73)	(-4.73)	(-0.58)	(-4.69)
Life exp.	0.012	-0.007	-0.007	0.002	0.081**
	(0.57)	(-0.11)	(-0.11)	(0.05)	(2.52)
Democracy	-0.077**	-0.036	-0.036	-0.089	-0.028
	(-2.24)	(-0.71)	(-0.71)	(-1.07)	(-0.67)
Schooling	-0.200***	-0.449***	-0.449***	-0.230***	-0.193***
	(-6.13)	(-3.76)	(-3.76)	(-2.86)	(-3.36)
Latitude	-0.011***	†	†	-0.008	0.002
	(-4.38)			(-1.39)	(0.31)
Internetper100	0.015***	-0.004	-0.004	0.003	0.001
	(3.07)	(-1.06)	(-1.06)	(0.25)	(0.26)
lnSNS	-0.209***	-0.068**	-0.068**	-0.580**	-0.087***
	(-3.04)	(-2.03)	(-2.03)	(-2.68)	(-2.58)
2005	-0.021	0.059	0.059	†	-0.011
	(-0.15)	(1.18)	(1.18)		(-0.24)
2006	0.007	0.204***	0.204***	†	0.043
	(0.05)	(2.99)	(2.99)		(0.76)
2007	-0.097	0.285***	0.285***	†	-0.012
	(-0.62)	(2.90)	(2.90)		(-0.17)
2008	-0.457**	0.323**	0.323**	†	-0.147
	(-2.31)	(2.24)	(2.24)		(-1.50)
2009	-0.144	0.413***	0.413***	†	0.018
	(-0.61)	(2.84)	(2.84)		(0.15)
2010	-0.119	0.480***	0.480***	†	0.047
	(-0.45)	(2.91)	(2.91)		(0.36)
Country dummies	†	YES	NO	†	†

Constant	6.709*** (4.20)	12.712** (2.43)	12.068** (2.33)	7.678** (2.04)	2.059 (0.87)
Observations	284	284	284	284	284
Adjusted R2	0.529	0.954	0.048	0.437	0.417
F	20.90	93.36	5.21	5.22	†
p	0.00	0.00	0.00	0.00	†

Notes: * Significant at the 10% confidence level; ** Significant at the 5% confidence level; *** Significant at the 1% confidence level; † indicates estimation not applicable; t statistics in parentheses. Time dummy for year 2004 is omitted to avoid the dummy trap. In columns (2) and (3) latitude is omitted because of collinearity. In the BE estimator (4) the year dummies are redundant because the data are averaged for each of the 50 states over the seven-year period. For variables description and sources please refer to Table A1.

Table B4: Second model panel estimations

	(1) Pooled OLS	(2) LSDV	(3) Fixed Effects	(4) Between Estimates	(5) Random Effects
GDPcap	2.77 e-5 **	-1.76 e-5	-1.76 e-5	5.52 e-5	1.12 e-5
	(2.36)	(-1.28)	(-1.28)	(1.64)	(1.07)
GDPcapsq	-1.02 e-10	9.45 e-11	9.45 e-11	-3.32 e-10	-2.20 e-11
	(-1.10)	(1.24)	(1.24)	(-1.17)	(-0.33)
Inflation	0.039***	0.006	0.006	0.066**	0.009
	(3.50)	(0.85)	(0.85)	(2.55)	(1.57)
Unempl.	-0.047***	-0.043***	-0.043***	-0.042	-0.045***
	(-3.97)	(-4.61)	(-4.61)	(-1.53)	(-5.10)
Life exp.	0.049**	0.047	0.047	0.052	0.083***
	(2.39)	(0.74)	(0.74)	(1.11)	(2.63)
Schooling	-0.197***	-0.334**	-0.334**	-0.218***	-0.177***
	(-5.98)	(-2.27)	(-2.27)	(-2.78)	(-3.08)
Internetper100	0.013***	-0.004	-0.004	0.002	0.001
	(2.64)	(-0.82)	(-0.82)	(0.16)	(0.31)
lnSNS	-0.228***	-0.085**	-0.085**	-0.598**	-0.091***
	(-3.24)	(-2.47)	(-2.47)	(-2.63)	(-2.75)
VA	0.034***	0.005	0.005	0.044*	0.009
	(4.13)	(0.89)	(0.89)	(1.93)	(1.52)
CC	-0.020***	-0.003	-0.003	-0.018	-0.002
	(-2.62)	(-0.61)	(-0.61)	(-0.92)	(-0.41)
GE	0.038***	0.009	0.009	0.056**	0.014**
	(4.24)	(1.46)	(1.46)	(2.53)	(2.32)
PV	-0.017***	-0.001	-0.001	-0.026**	-0.005
	(-3.97)	(-0.35)	(-0.35)	(-2.35)	(-1.59)
RL	-0.012	0.004	0.004	-0.024	0.004
	(-1.42)	(0.65)	(0.65)	(-1.12)	(0.71)
RQ	-0.013*	-0.017***	-0.017***	-0.014	-0.018***
	(-1.85)	(-3.12)	(-3.12)	(-0.78)	(-3.42)
Latitude	-0.007**	†	†	-0.004	0.003
	(-2.23)			(-0.49)	(0.56)
2005	0.033	0.037	0.037	†	-0.002
	(0.25)	(0.74)	(0.74)		(-0.05)
2006	0.071	0.152**	0.152**	†	0.049
	(0.50)	(2.13)	(2.13)		(0.86)

2007	0.019	0.203*	0.203*	†	0.006
	(0.12)	(1.95)	(1.95)		(0.08)
2008	-0.234	0.199	0.199	†	-0.117
	(-1.18)	(1.32)	(1.32)		(-1.17)
2009	0.088	0.330**	0.330**	†	0.057
	(0.37)	(2.16)	(2.16)		(0.48)
Country dummies	†	YES	NO	†	†
Constant	2.904*	6.998	6.868	2.294	1.666
	(1.91)	(1.32)	(1.30)	(0.66)	(0.73)
Observations	254	254	254	254	254
Adjusted R2	0.557	0.959	0.052	0.502	0.476
F	16.91	88.05	4.32	4.29	†
p	0.00	0.00	0.00	0.00	†

Notes: * Significant at the 10% confidence level; ** Significant at the 5% confidence level; *** Significant at the 1% confidence level; † indicates estimation not applicable; t statistics in parentheses. Time dummy for year 2004 is omitted to avoid the dummy trap. Year 2010 data are not available for WGI. In columns (2) and (3) latitude is omitted because of collinearity. In the BE estimator (4) the year dummies are redundant because the data are averaged for each of the 50 states over the seven-year period. For variables description and sources please refer to Table A1.

APPENDIX C

List of Social Network Websites mentioned in the study:

Badoo, http://badoo.com/

Bebo, http://www.bebo.com/

Facebook, http://www.facebook.com

Fotolog, http://www.fotolog.com/

Friendster, http://www.friendster.com/

Hi5, http://hi5.com

Linkedin, http://www.linkedin.com

Meetup, http://www.meetup.com/

MySpace, http://www.myspace.com

Netlog, http://netlog.com

Orkut, http://www.orkut.com/

Studivz, http://www.studivz.net/

Tagged, http://www.tagged.com/

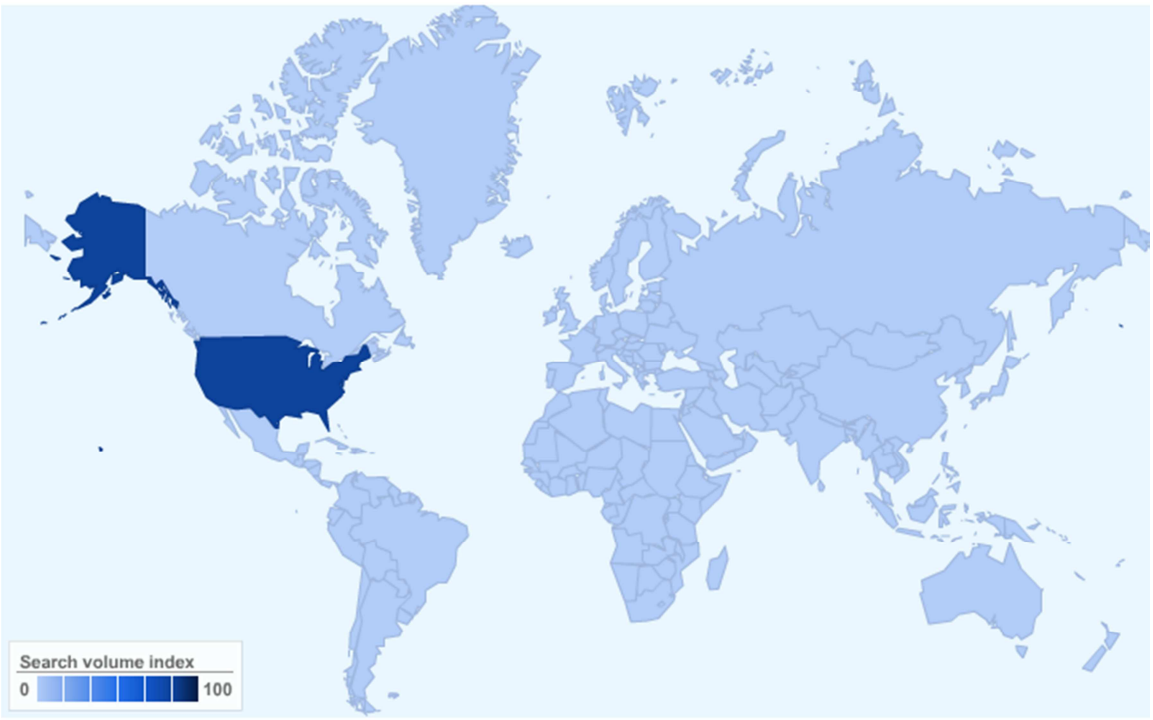
Twitter, http://www.twitter.com

APPENDIX D

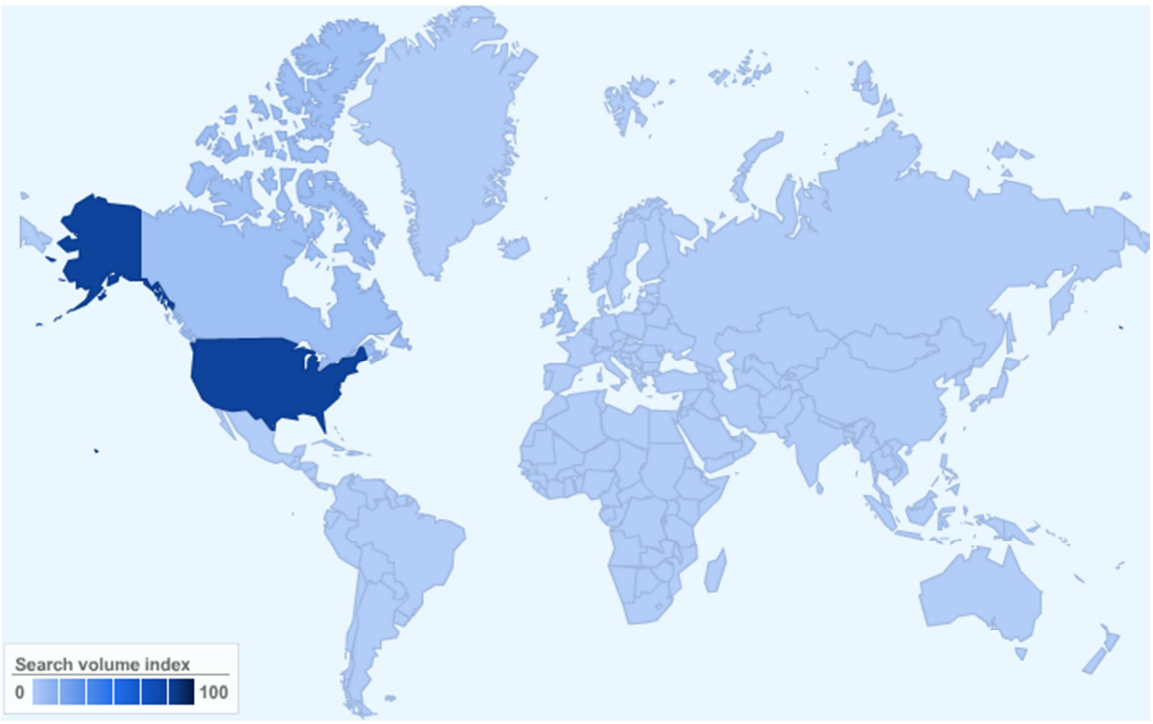
In this appendix I have included some graphs to show the regional interest search volume for two example keywords: 'facebook' and 'chat'. The searches are relative to the total number of searches on Google over time. Here the data is normalized and presented on a 0-100 scale (Google Insights for search, 2011) whereas the SNS variable used in the study uses a fixed scale but with the same data (Google Trends, 2011).

2004-2010 Regional Interest for the keyword 'facebook' on Google

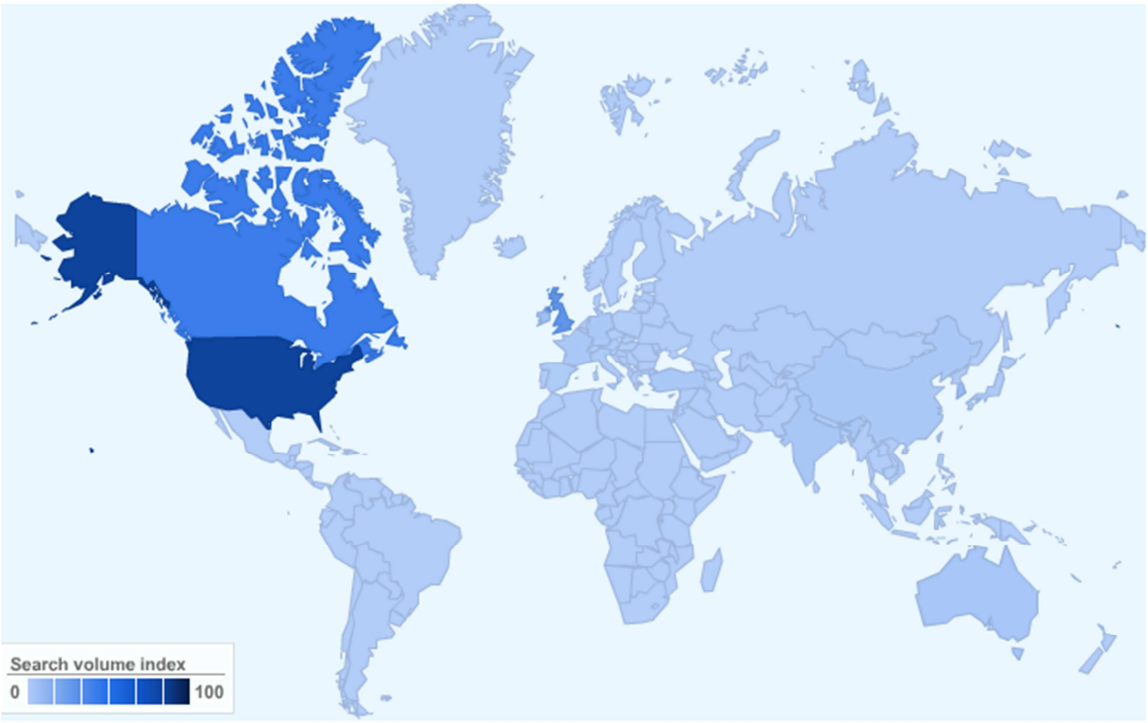
2004



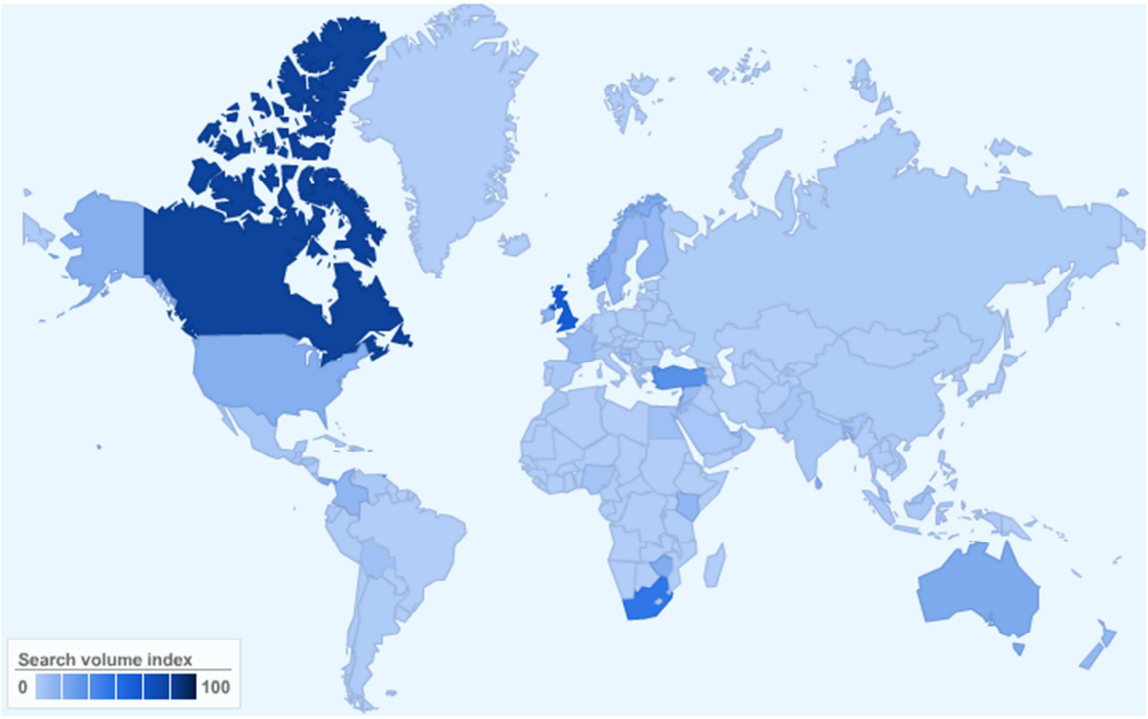
2005



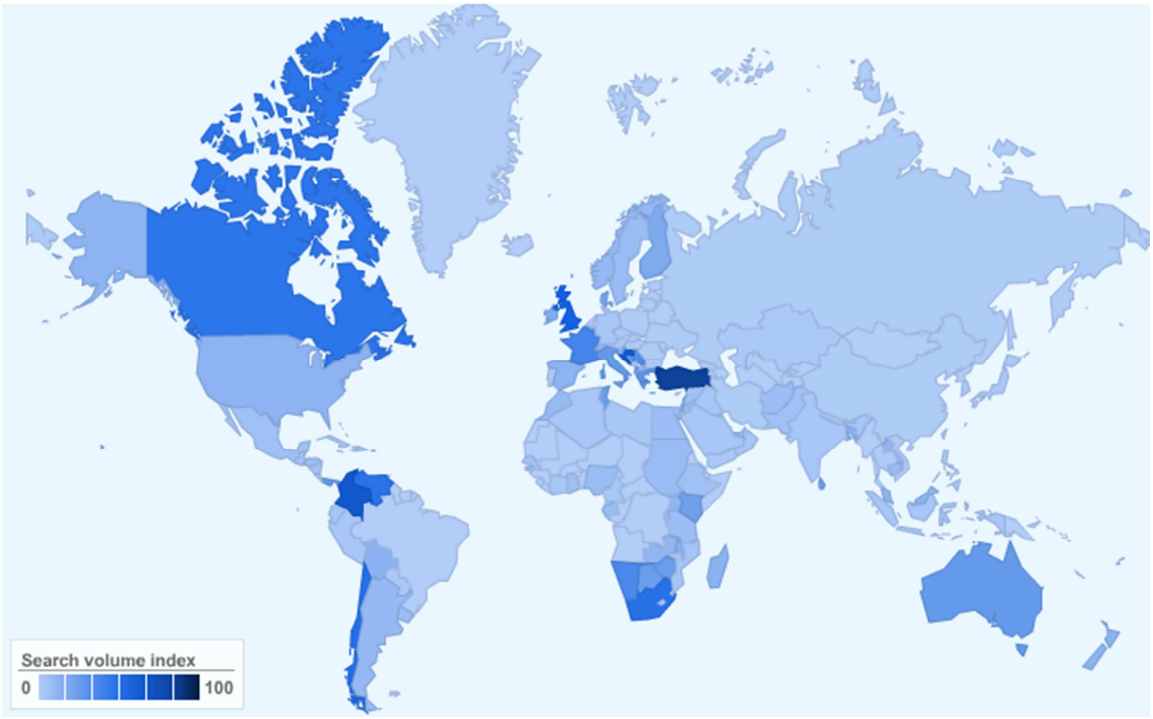
2006



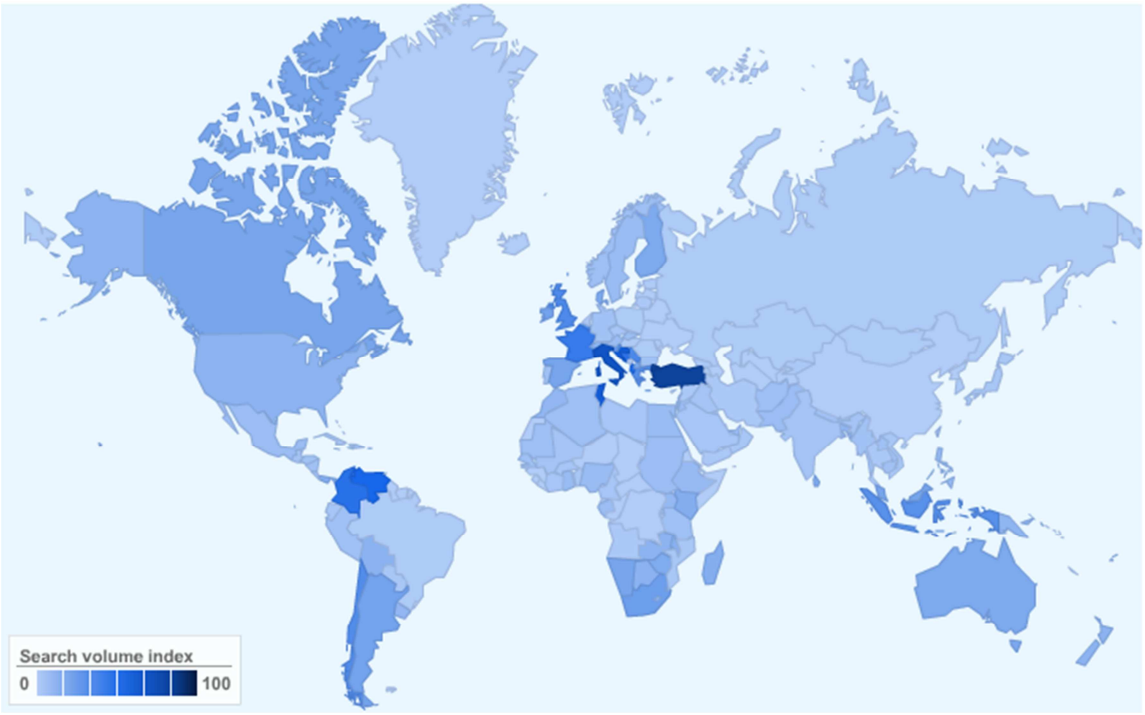
2007



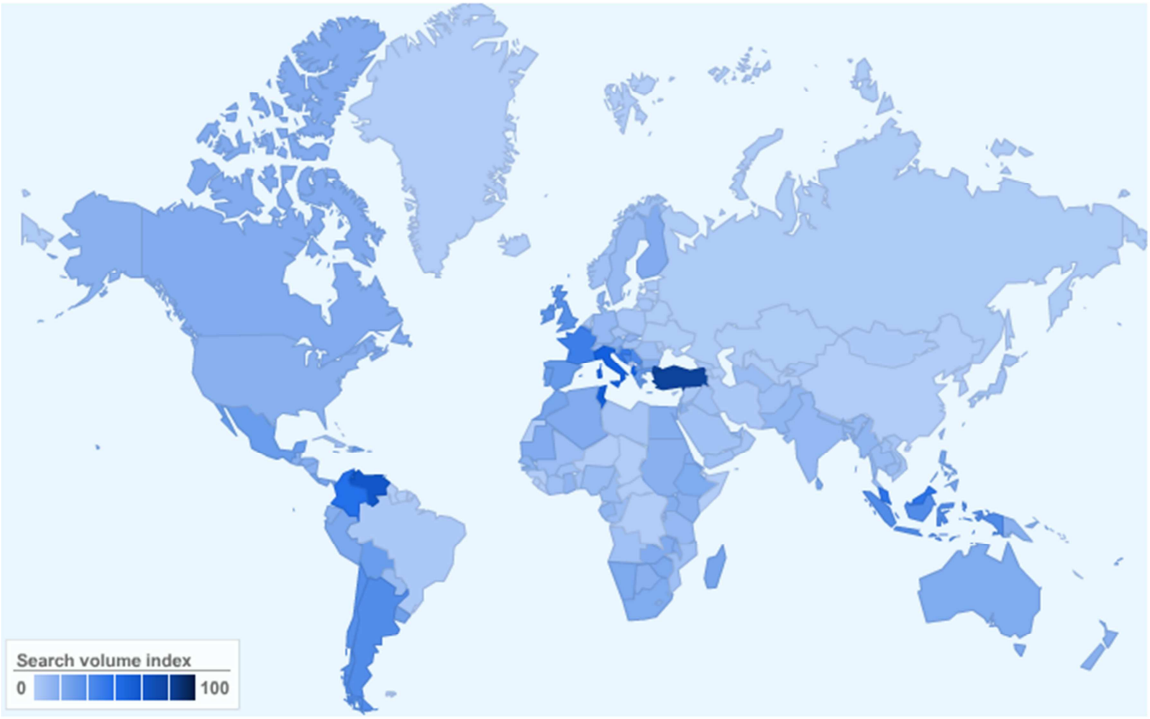
2008



2009

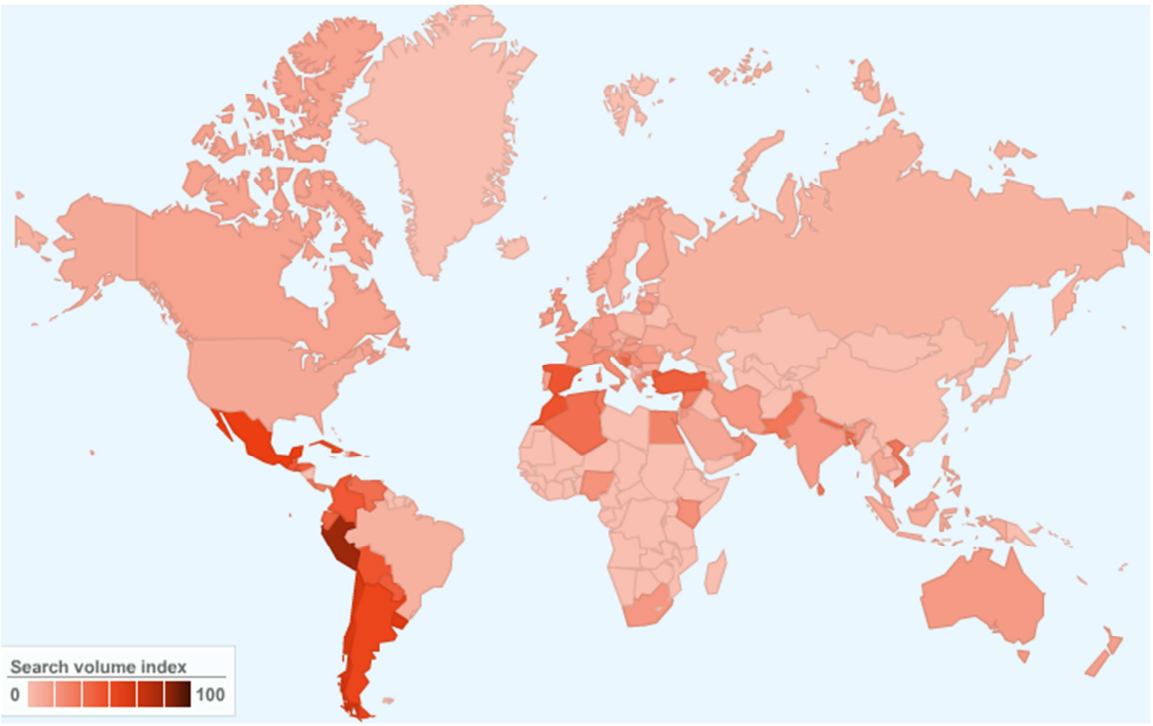


2010

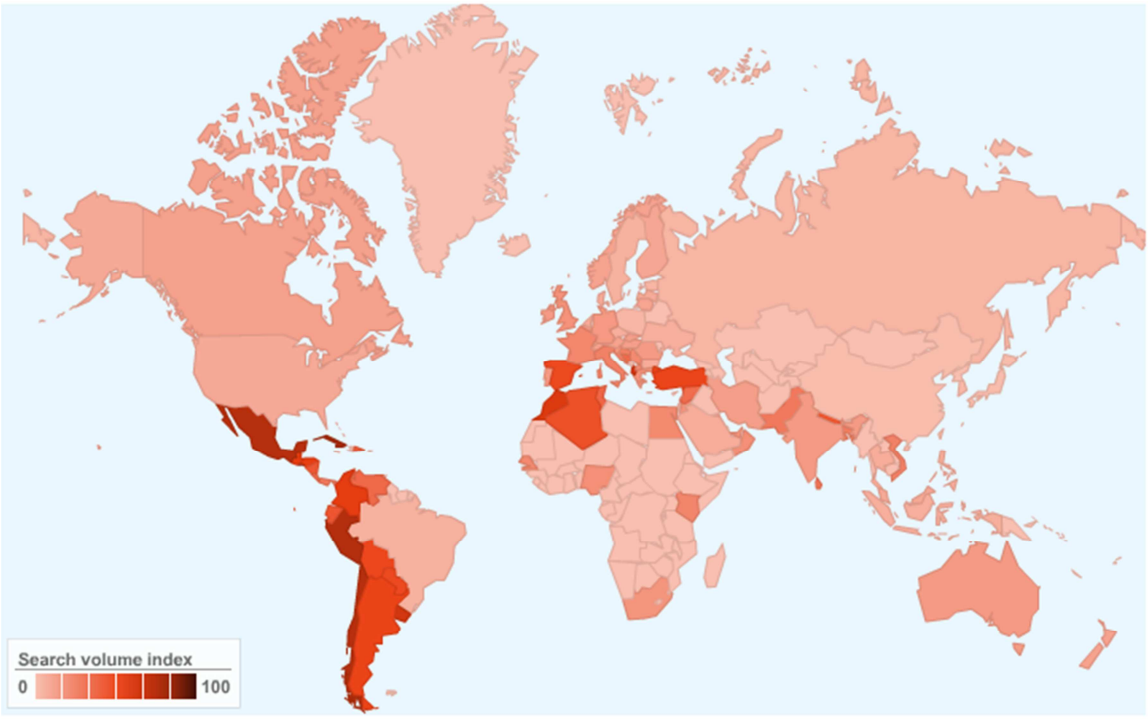


2004-2010 Regional Interest for the keyword 'chat' on Google

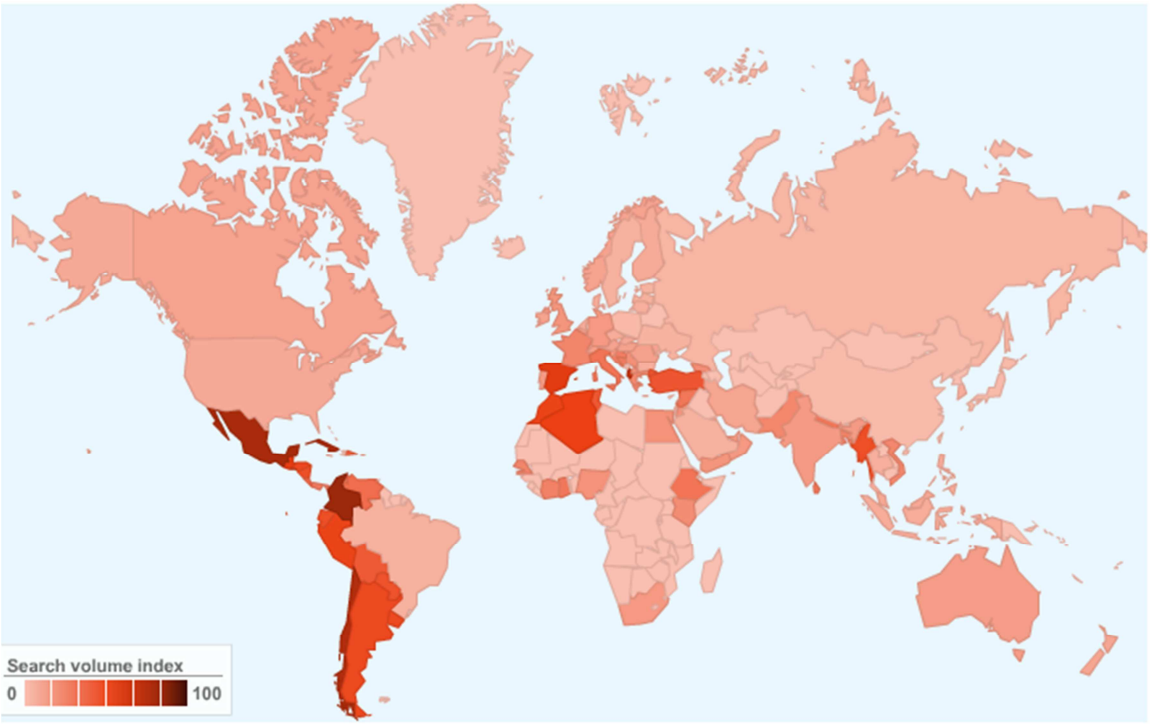
2004



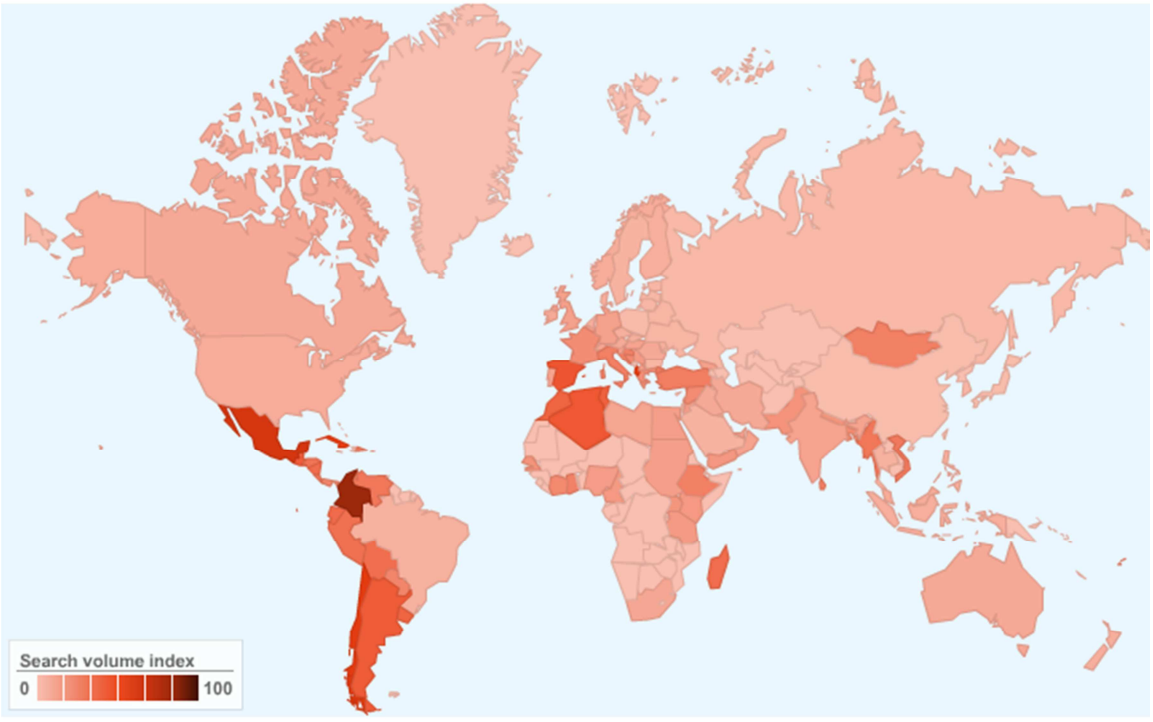
2005



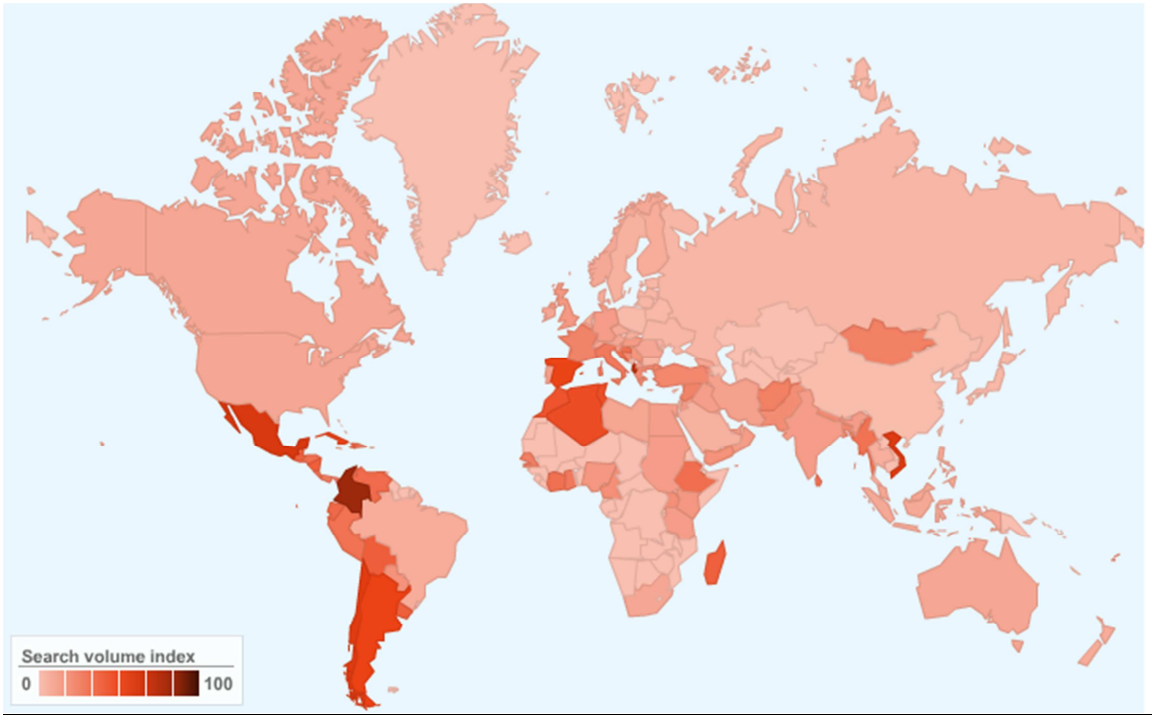
2006



2007



2008



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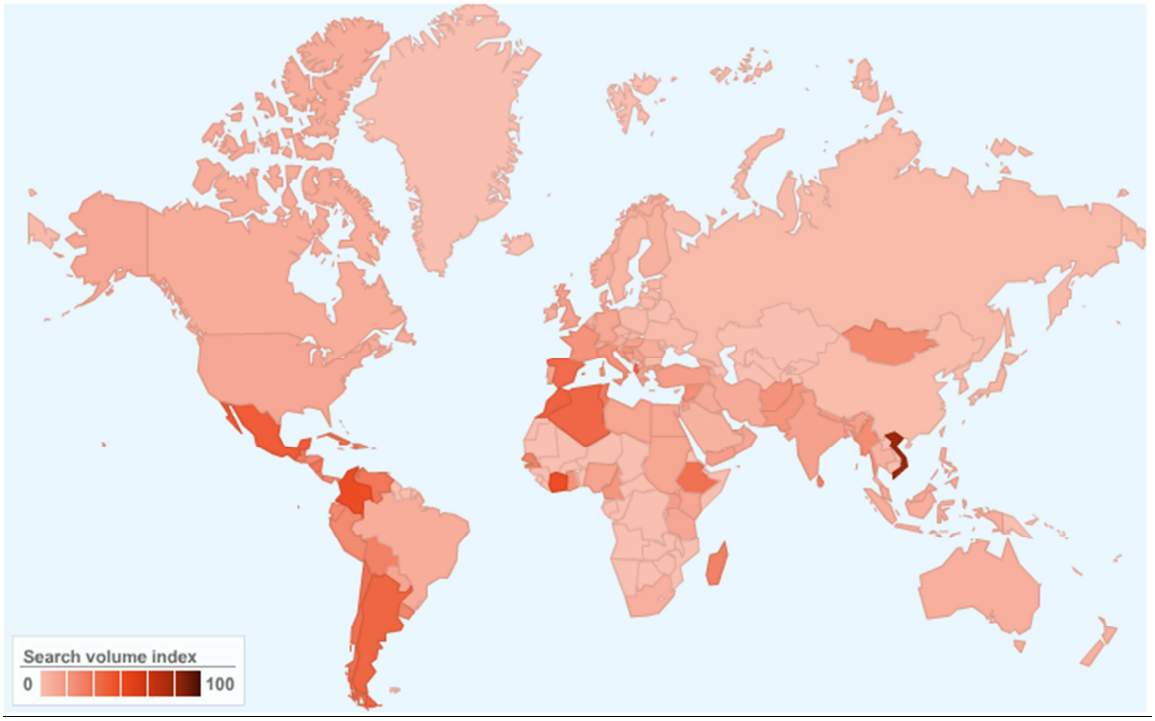
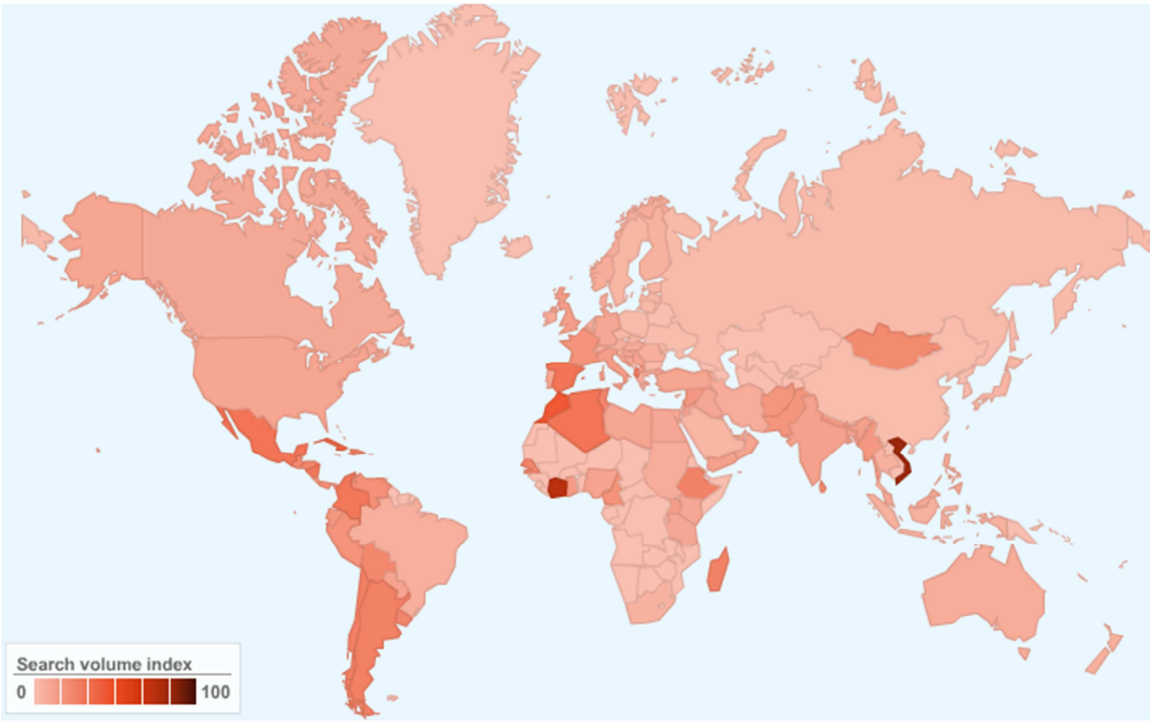


2010



Source – Google Insights for Search (2011).

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