The influence of culture, development aid and temperature on regional incomes

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LIST OF ABBREVIATIONS

AfDB	African Development Bank
DAC	Development Assistance Committee
DHS	Demographic and Health Surveys
EA	Enumeration Area
EVS	European Value Survey
GDP	Gross Domestic Product
GCP	Gross Cell Production
GIS	Geographic Information System
HLA	Human Leukocyte Antigen
NGO	Non-Governmental Organization
ODA	Official Development Assistance
OECD	Organization for Economic Co-operation and Development
p.c.	per capita
PPP	Purchasing Power Parity
RCT	Randomized Control Trials
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Childrens' Emergency Fund
U.S.	United States (of America)
USAID	United States Agency for International Development
USD	United States Dollar
WASH	Water, Sanitation and Hygiene
WVS	World Value Survey

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND AND OVERVIEW

How important are cultural differences for explaining divergent regional development and which cultural features are crucial to grow economically? How can we measure the effectiveness of development projects on a large scale and still account for project and regional specifics in order to derive valuable policy implications for future international collaboration? Are hotter regions particularly prone to adverse effects of temperature on income and to what extent is adaptation to temperature fluctuations relevant and feasible for them?

Even though these three questions seem to be rather unrelated at first sight, they all contribute substantially to explaining regional (i.e., subnational) income differences. Naturally, their explanatory power for diverging regional development forms only part of a larger selection of impact factors, such as differences in geography, infrastructure, trade, productivity or the accumulation of physical and human capital, that recent literature has just started to discuss on a subnational level. On the contribution of culture, development aid and temperature however has not been any or a sufficiently strong focus, even though they exert a very distinct subnational variation and are of fundamental interest for politicians, (private and public) institutions and economists to make informed policy decisions.

Consequently, we dedicate our research to understanding these three factors (culture, development aid and temperature), as they affect regional incomes to a substantial amount and as we are able to considerably contribute and extent existing knowledge and research efforts in this field. Future research should continue to focus on the regional level, because more heterogeneity can be captured and there are many other influence factors for economic development (e.g., trade, infrastructure or human capital) that are characterized by a distinct variation on the subnational level.

As thoroughly and comprehensively analyzed and discussed in Chapters 2, 3 and 4, our research reveals that collectivistic and obedient cultures induce lower regional growth rates which makes strong national institutions inevitable in order to strengthen innovative energies and other crucial factors associated with independent and individualistic cultures; it further gives information on crucial success factors of development projects, which should be initiated with relatively well-educated individuals, in relatively well-developed areas, and with a very clear sector-specific project setup in order to reach aspired targets and to create spill-over effects to other areas; and lastly it takes up the renewed interest in exploring the relationship between temperature and economic growth by finding that hotter regions are not systematically less wealthy but that they have a feasible chance to adapt to temperature differences in order to be at no disadvantage compared to colder regions.

Again, we would like to emphasize that the influences of culture, development programs and temperature are by far not the only aspects to explain regional development. However, we would like to stress their undoubted relevance for economic development, as outlined by various experimental, theoretical and empirical studies in the past.

The Relevance of Culture for Economic Development

Latest since the 1990's, it is beyond question that culture, as a set of *"customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation"* (Guiso et al., 2006, p.23), plays an important role in economic development. These customary beliefs and values shape economic decisions, like the propensity to save or to invest, to contribute to public goods, the attitude towards risk, women's participation in the labor market, fertility rates, the appreciation and pursuit of certain values like thrift, hard work, tolerance or trust etc., which in turn can explain persistent income differences across nations (e.g., Greif, 1994, Landes, 1999, etc.). As a prominent example, Harrison and Huntington (2000) claimed that Ghana and South Korea had very similar starting points in terms of income, production, and foreign aid in the 1960's but as South Korea valued *"thrift, investment, hard work, education, organization and discipline"* (Harrison and Huntington, 2000, p. xiv) they went down in history as the Asian Tiger whereas Ghana's economy stagnated.

Even though many researchers have emphasized the importance of culture for economic development (see Fernández, 2011 or Spolaore and Wacziarg, 2013 for a review of epidemiological and empirical literature), they struggled to find a comprehensive measurement for the abstract concept of culture in order to quantify worldwide cultural distances. Instead they focused on various aspects like trust, social capital, individual responsibility, tolerance, creativity, informal institutions, religiosity etc. which they primarily analyzed on the national level (Alesina and Giuliano, 2015, Algan and Cahuc, 2010, Barro and McCleary, 2003, Beugelsdijk et al., 2004, Bjørnskov and Méon, 2013, Chambers and Hamer, 2012, Chen, 2011, Davis, 2016, Dearmon and Grier, 2009, Dincer and Uslaner, 2010, Florida et al., 2008, Gorodnichenko and Roland, 2011, 2017, Muthukrishna et al., 2020, Roth, 2009, etc.).

One dimension of culture finds particular attention in the literature: *Individualism* and *Collectivism*. First mentioned by Greif (1994), who analyzed two groups of medieval traders in a game-theoretical approach, the two terms were taken up by Hofstede (2001) who developed a measurement for *Individualism* on the country-level and conducted a number of surveys and studies in about 96 countries. He describes *Individualism* as a cultural trait that awards individual accomplishments and encourages the individual to stand out whereas *Collectivism* emphasizes the embeddedness of the individual into a larger group, to which one is supposed to be unconditionally conform, loyal and respectful. Many other authors used this measure for their analyses (see e.g., Ball, 2001, Gorodnichenko and Roland, 2017, Kyriacou, 2016, etc.), or applied related indicators such as the values *Independence* and *Obedience*. Both values are relevant proxies for Hofstede's cultural dimensions. First, because

Hofstede himself defines Individualism as *"the extent to which people feel independent, as opposed to being interdependent as members of larger wholes"* (Hofstede n.d.) and second because they reflect the distance to the ruling power, i.e., both independent and individualistic (obedient and collectivistic) cultures are characterized by a low (high) power distance. Whereas *Obedience* has been mainly explored in economic research efforts (see e.g., Harger and Hall, 2015, Tabellini, 2010), it was the psychological literature that dealt with the relationship between *Independence* and wealth (see e.g., Hofstede, 2001, Kitayama et al., 2010).

Three major caveats of past studies must be mentioned when analyzing the effect of culture on economic growth: first, it is argued that culture might be endogenous to economic development and therefore their causal relationship remains ambiguous. Searching for a suitable instrument, Kashima and Kashima (1998) suggested to consider language patterns, such as the use of 'I' and 'you', expressing an individualistic cultural background, whereas Tabellini (2010) uses historical institutions and literacy rates, and a whole strand of literature is convinced that certain genetic information (e.g., blood types, historical prevalence of diseases or allele types) can isolate the exogenous variation in culture (see e.g., Chiao and Blizinsky, 2010, Fincher et al., 2008, Gorodnichenko and Roland, 2011, 2017, Murray and Schaller, 2010, Nikolaev and Salahodjaev, 2017). It is argued that genetic susceptibility to infectious diseases leads to a more or less prudent behavior when it comes to (new) interactions with other individuals for economic activities and therefore the development of individualistic or collectivistic cultural traits.

Second, it can be expected that culture interacts with institutional quality, and therefore separating their effects on economic growth remains difficult and ambiguous (see e.g., Dearmon and Grier, 2009, Gorodnichenko and Roland, 2011, 2017, or Licht et al., 2007). Consequently, past literature is not able to fully capture potential mediating or substituting effects between culture and institutions, and therefore estimations of the 'pure' impact of norms and values remain controversial;

And third, most studies have based their research on cross-country comparisons which neglects any within-country heterogeneity, makes it difficult to separate culture from any country-specific unobservables, and incorrectly assumes the existence of a unified national culture (see e.g., Bjørnskov, 2007, Dearmon and Grier, 2009, Gorodnichenko and Roland, 2011, 2017, Hofstede, 2001, Licht et al., 2007 or Muthukrishna et al., 2020). Acknowledging the issues of cross-country analysis, a smaller number of studies abandons the national perspective and explores the culture-income relationship within countries (see e.g., Guiso et al. (2016) for Italian regions; Cui (2017) and Shi et al. (2014) for Chinese provinces, Dincer and Uslaner (2010) for U.S. states; Florida and Mellander (2007) for Swedish regions, Tabellini (2010) and Akçomak and ter Weel (2009) for European regions, or Falk et al. (2018) for a global set of 76 countries).

Our research endeavor presented in Chapter 2 aims at contributing to and improving past research by further addressing these three caveats (endogeneity, inseparability from institutions, neglecting within-country heterogeneity) and therefore by estimating the effects of culture on income more precisely.

The Relevance of Development Programs for Economic Development

The effectiveness of foreign aid has been one of the most controversial topics in development economics. A large number of renowned authors, such as William Easterly, Jeffrey Sachs or Joseph Stieglitz, have not achieved an agreement on whether (past) development assistance has helped or harmed the poorest countries in the world. Much attention has been paid to cross-country analyses in order to assess the effects of aid on growth. Asteriou (2009), Fayissa and El-Kaissy (1999), Karras (2006) or Minoiu and Reddy (2010) follow panel approaches with five South Asian countries, with 80 least developed countries, with 71 aid receiving countries and more than 80 developing countries, and find a consistent positive link between aid and long-run economic growth. In addition, they get support from Clemens et al. (2012), Dalgaard et al. (2004), Mekasha and Tarp (2013) and Roodman (2007) who re-analyzed a number of existing aid-growth studies in order to confirm and re-emphasize the positive effects of aid in a very controversial debate on the effectiveness of aid. On the other hand, Burnside and Dollar (2000, 2004), Liew et al. (2012), Malik (2008) and Rajan and Subramanian (2011) show the exact opposite, i.e., that developing countries (especially in Africa) were not able to benefit from large aid inflows (especially in environments of bad policies), but instead suffer from dependency on the money from donor countries, corruption and other side effects (such as currency overvaluation) of international aid (see also Easterly (2003) or Moyo (2010) for the adverse effects of aid on economic growth).

Amongst the numerous efforts that evaluated the effectiveness of development aid in general, the analysis of water and sanitation issues as well as their effects on health have been particularly well-discussed in the literature, as they are considered to be major contributors to poverty and social and economic inequalities (UNESCO (2019)). Bhalotra et al. (2017) analyze how water disinfection programs in Mexico can lead to a substantial improvement of mortality rates; Boone et al. (2011), Gross et al. (2017), Ilahi and Grimard (2000), Koolwal and van de Walle (2013) and Sorenson et al. (2011) examine the impact of distance to water sources on adults (women in particular) and children in Madagascar, Benin, Pakistan and across various developing countries; Bendavid and Bhattacharya (2014), Botting et al. (2010), Gopalan and Rajan (2016), Kotsadam et al. (2018) and Wayland (2017) find a strong correlation between aid disbursements (and proximity to aid projects) and access to safe water, sanitation facilities infant mortality and life expectancy across a number of recipient countries; whereas Duflo et al. (2015) present the successful installation of integrated water and sanitation improvement programs in rural India to significantly reduce diarrhea, Dwivedi et al. (2018) confirm Duflo’s experimental results empirically by showing that unsafe stool disposal is one of the main factors for under-five mortality among children in rural India; Zhang (2012) investigates the effects of water quality improvement programs in rural China and finds that as a consequence the incidence of related illnesses can be significantly decreased.

When it comes to the evaluation of development aid and its effectiveness, we must point to two shortcomings of past literature. First, many authors have focused on consolidated national aid flows and their effects on various poverty indicators, instead of conducting evaluations of specific agencies, such as the World Bank who is by far the largest financier of development aid (Federal Ministry for Economic Cooperation and Development Germany, 2019). Even though a few researchers attended to independently examining the activities of e.g., the World Bank, they focused on geopolitical aspects rather than project effectiveness (see e.g., Dreher et al., 2013; Dollar and Svensson, 2000; Kaufmann and Wang, 1995 or Isham and Kaufmann, 1999, etc.).

Second, there exists a *"lack of systematic studies of aid effectiveness [...] below the country-level"* (Kotsadam et al., 2018, p.59). Field research and experiments, can help to fill this knowledge gap as they are able to take all project-specific circumstances into account and therefore can guide policy interventions appropriately. Most prominent representatives are Randomized Control Trials (RCT), emphasized by Banerjee and Duflo (2012), that randomly allocate individuals to a treatment (e.g., a development intervention) and a non-treatment group and that compare the respective effects on both treated and non-treated individuals. While this approach is able to reveal causal relationships and to make a point on the effectiveness of treatments, RCTs are not suitable for (ex post) evaluating development projects on a larger scale as they are very expensive and work-intensive. In addition, they have limited external validity, i.e., what works well in one environment does not need to work in another. As a solution, quasi-experimental approaches to assess the effects of aid on subnational development through the use of geocoded aid data, have recently been introduced to the literature. Although these approaches lack several advantages of field research, they also base their findings on statistically comparing the effect of a treatment on treated and non-treated individuals and on controlling for a large number of unobserved factors that potentially distorted previous results. In contrast to RCTs, this is possible for a large number of individuals irrespective of geographic location, political borders, number or type of treatments, etc. Prominent examples for this new approach are Kotsadam et al. (2018), Odokonyero et al. (2018), Marty et al. (2017), and De and Becker (2015) who find that geographical proximity to active health aid reduces infant mortality in Nigeria, productivity losses due to diseases in Uganda and Malaria prevalence, disease severity and diarrhea incidences in Malawi.

Our research presented in Chapter 3 takes up this geocode-based evaluation approach, which includes the benefits of experiment-based evaluations of development projects, but significantly extend it by considering the effects of development projects on worldwide individuals.

The Relevance of Temperature for Economic Development

Is temperature central to understanding economic development and to explaining persistent differences in income? On one hand, after a comprehensive historical review, Acemoglu and Robinson (2012) conclude that neither geography (such as temperature, climate, resources, etc.) nor culture (defined by values, norms, attitudes or religion) are the main reasons for divergent economic development. Instead, it is the lack of inclusive political and economic institutions that hindered necessary investments, an accountable and responsive government, an efficient allocation of resources, the incentivization and remuneration of innovations, and the broad-based participation of individuals in economic opportunities and education. Therefore, many African nations did not fail to catch up because they suffer from hot temperatures and its consequences (e.g., tropical diseases, lower human productivity, agricultural losses, etc.) but because they were unable to install the *right* set of institutions.

On the other hand, there are various other researcher who are convinced that hotter temperatures are in fact leading to systematically weaker economic performances. Their major assumptions behind this hypothesis, pointed out by authors such as Easterly and Levine (2003), Gallup et al. (1999, 2001), Field (1992), Mendelsohn et al. (2001) or Wyon et al. (2020), comprise the negative effect of temperature on agricultural production, especially through water scarcity or plant infestations, on human productivity and labor performance (already Montesquieu argued that *"the excess of heat enervates the body, and renders men so slothful and dispirited"* (Montesquieu, 1750, p.343)), on crime and social unrest, on the prevalence of tropical diseases and its vectors (Malaria, Ebola, Dengue fever, etc.), which leads to an increase in days of absence from work or school, and on the historical emergency of inclusive and high-quality economic and political institutions as European settlements were discouraged (due to difficult agricultural production, diseases, etc.).

In contrast to Acemoglu and Robinson (2012), the cross-country literature agrees almost with one voice upon this clear negative relationship between temperature and economic output, but with a large span in their quantitative findings (see Carleton and Hsiang, 2016, Dell et al., 2014, Fankhauser, 1994, or Hsiang, 2016 for a detailed overview on climate-economy literature, methods and data). For a large number of country samples across the world, renowned authors such as Dell et al. (2009), Hsiang (2010), Burke et al. (2015, 2018), Lanzafame (2014) or Schlenker and Lobell (2010) predict a drop in economic income of between 8.5% and 25%, a 2.5% drop in industrial production, and a drop of 8% to 22% drop in agricultural output (depending on the prevailing crop production) with every degree increase in national average temperature.

Nevertheless, various authors point to the fact, that the previously found negative effect of temperature on economic output is not universally valid, but that at least three restrictions have to be considered when analyzing this relationship.

First, subsequent research from Burke et al. (2015, 2018), Deryugina and Hsiang (2014), Nordhaus (2006) or Zhao et al. (2018) provide evidence that the relationship between temperature and economic performance (in terms of labor supply and productivity or crop yields) might not be linear, i.e., that increases in temperature can be beneficial or at least non-harmful when they occur at the lower end of the temperature scale. Mentioned authors place this threshold for decreasing productivity beyond 12 to 16 degrees, meaning that colder countries can actually profit from small increases in temperature.

Second, wealthy populations might be unaffected by temperature, whereas poor countries are particularly prone to its adverse effects on economic performance. Dell et al. (2012) for instance show a 1.3 percentage points drop in growth per 1 degree rise in temperature in poor countries, due to negative effects on agricultural and industrial output and political stability. This is in accordance with Moore and Diaz (2015) and Zhao et al. (2018) who also find that the adverse effects of temperature on economic performance are more relevant for the poorer parts of the world. Despite a high correlation of low income countries and agricultural production or the prevalence of tropical diseases, authors such as Acemoglu and Robinson (2012) argue that it is mainly their (institutional) inability to adapt to climate change and in particular increases in temperature. Dell et al. (2009) predict that at least half of the negative impact of temperature on income is eliminated through adaptation in the long-run. And also Carleton and Hsiang (2016) describe persisting adaptation gaps across countries that are responsible for the fact that current climate conditions still have an important impact on shaping modern societies.

Third, aggregation to the country-level might not be sufficient to capture the effect of temperature on income, as we observe large within-country temperature differences of more than 20 degrees (e.g., United States, China, India, Russia or Canada) and consequently also a large spread between subnational incomes. Several recent studies account for within-country heterogeneity, by re-assessing the effect of temperature, measured on region-, county- or grid-cell-level, on subnational economic activity. Predictions for the decrease in economic income range between 0.15 and 3% (Dell et al., 2009, Deryugina and Hsiang, 2014, Nordhaus, 2006) for every one degree increase in temperature, which is substantially lower than evidence from the cross-country literature.

With our analysis in Chapter 4, we allow for more nuanced insights into the temperature-income discussion by exploring the temperature-income relationship for a large number of world-wide subnational regions.

1.2 FOCUSING ON REGIONS: MOTIVATION AND RESEARCH POTENTIAL

Throughout the last decades research in the field of development economics has been strongly characterized by cross-country studies i.e., the comparison of nationally aggregated or nationally tracked variables across two or more countries. Prominent representatives focused on the exploration of differences in national endowments regarding *institutions* (Acemoglu et al., 2001, Acemoglu and Robinson, 2012 or Knack and Keefer, 1995), *geography* (Bloom and Sachs, 1998, Easterly and Levine, 2003 or Gallup et al., 1999), *foreign direct investments* and *trade* (Alesina et al., 2000 or Balasubramanyam et al., 1996), *political stability* and *good governance* (Alesina et al., 1996 or Kaufmann and Kraay, 2011), *public expenditure* and *infrastructure* (Aschauer, 1989, Devarajan et al., 1996 or Easterly and Rebelo, 1993) and *human capital* (Barro, 1991 or Castelló and Doménech, 2002). Surely, this listing covers only a very small percentage of well-published cross-country efforts, but it illustrates that research in the field of development economics (and others) has long been relying on the comparison of countries when analyzing determinants of growth or persistent income differences.

While it is reasonable to cross-nationally compare variables that are collated by national statistical offices (because they are of particular interest for national governments), it is less plausible for variables that are characterized by a strong subnational variation. Results from Easterly et al. (2016) suggest that many of the determinants of long-run growth are influenced by the variation of institutions, history, geography or culture on the subnational (or supra-national) level. They also state that researchers and policy makers overstated the importance of the national state for long-run economic growth, as at least half of the variation in growth happens at the supra- or subnational level. In addition, Levine and Zervos (1993) state that national indicators are often measured inconsistently and inaccurately and therefore it seems erroneous to include a random number of (very different) countries into the same regression analysis. This is particularly fatal as national external shocks may have substantially influenced economic activity, but are not accounted for when averaging the effects over a large number of countries and over several decades. Other methodological, conceptual and statistical problems include causality issues, aggregation of data and the derivation of reliable inferences from regression coefficients (see Levine and Renelt, 1991).

This critique is in accordance with a growing strand of literature addressing the relationship between subnational factors and economic outcomes: Acemoglu and Dell (2010) propose differences in productive efficiency attributed to local institutions and policies; Tabellini (2010) finds a causal effect between regional traits of culture on European economic income; Putterman and Weil (2010) stress the importance of subnational migration flows, as early settlements influenced agricultural cultivation and emergency of organized states; Dell et al. (2009) explores the negative relationship between temperature and subnational incomes in the Americas; Gennaioli et al. (2013) points to the crucial importance of human capital in accounting for worldwide regional income differences; Mitton (2016) finds high explanatory power of geographical (e.g., ocean access or natural resources) and institutional factors for subnational per capita income; and Henderson et al. (2017) analyzes the role of trade (among others) for the subnational distribution of worldwide income. Again, this selection constitutes only a small extract of studies that deal with influence factors for regional economic development. Nevertheless, only few attempts consider worldwide regions, but instead focus on within-country (e.g., China or the United States) or within-region (e.g., European Union) comparisons.

Exploring and comparing subnational differences when explaining diverging economic performances bears several advantages and avoids conceptual and methodological problems of cross-country studies: first, technological or institutional history, which clearly determines today's development outcomes, does not necessarily correspond with current national borders. The sovereign territory of many countries has changed significantly throughout the centuries due to wars, colonial rules or migration and a cross-country comparison seems susceptible to interpretation errors. In addition, Alesina et al. (2011) find that the presence of artificial borders (e.g., drawn by colonial masters or war profiteers) are correlated with several measures of political and economic success. Second, looking at the subnational level, we can re-run standard cross-country regressions but include country fixed-effects which are holding constant anything that is unique for a specific country such as institutions, policies, history, etc. Thereby, we not only exploit subnational heterogeneity but also account for any country-specific unobservables that might be relevant for the research objective and mitigate the risk of omitted variable bias. There is a third side effect that comes from analyzing the development of subnational regions. Through restraining from artificially aggregating variables that are characterized by a strong subnational variation to the country-level, we are much closer to capturing the actual state of welfare of the individual and therefore to approaching an important epistemological target of development economics.

In this thesis, we focus on three relevant impact factors of economic development as we believe they would strongly benefit from a re-evaluation from a regional perspective due to their pronounced national variation: culture, development aid and temperature.

The Influence of the Cultural Values Independence and Obedience on Regional Incomes

Culture matters for economic development. A large strand of research finds strong empirical evidence for this statement by comparing culture and economic development across countries (see e.g., Bjørnskov, 2007, Dearmon and Grier, 2009, Gorodnichenko and Roland, 2011, 2017, Hofstede, 2001 or Licht et al., 2007). Considerations to take up this well-discussed culture-income relationship and re-analyze it on the regional level, are based on the concern that culture can hardly be unified across an entire nation. Countries are often subject to migration, arbitrary drawing of boundaries (colonial history), different cultural influences from adjacent states, shifting national boundaries after wars (East and West Germany), etc., and therefore we must assume that we are dealing with a subnational mélange of different cultures or simply with heterogeneity among individuals rather than with *one* unified national culture. This in turn, can explain why regional differences in economic growth continue to exist, despite the presence of nationally unified institutions, legal and education systems, administrations, etc.

A very prominently discussed example is the divergent economic development in Northern and Southern Italy. Authors such as Banfield (1958) and Putnam (1994) trace differences in civic, social and economic behavior back to distant historical and traditional backgrounds. This is in line with Ichino and Maggi (1999) who find a significantly higher prevalence of shirking (i.e., absenteeism and misconduct) at the Southern branches of a large Italian bank. The authors attribute this behavioral difference to individual backgrounds that are typical for Italians born and raised in the Mezzogiorno. Comparing these observations with actual data from the World Value Survey, the largest survey-based research project on values and beliefs, we discover that there is indeed a huge gap between cultural values and beliefs of individuals living in Northern and Southern Italy between 1980 and 2010: people from the North place a 12% higher importance on the value Independence and a 30% lower importance on the value

Obedience; they are also 55% more trusting than the people from Southern Italy. Even though this is just a small extract of a whole range of values and culture can certainly not fully explain a per capita income gap of 63%, it seems inappropriate to ignore or neglect these regional differences when explaining diverging economic development in Italy.

In Chapter 2 we present our attempt to account for regional differences in the cultural values *Independence* and *Obedience*, but go well beyond the 20 regions of Italy. We compare a set of 1,204 (subnational) regions across the world and estimate to what extent cultural differences can explain diverging regional economic development when other regional (population, religious shares, education, geographic characteristics, etc.) and national (institutions and country-specific unobservables) influence factors are accounted for. Herewith, we not only conduct a comprehensive and much more granular analysis of the culture-income relationship, but also provide a solid starting point for future research that aims at analyzing other cultural aspects on the regional level.

Evaluating Water- and Health-Related Development Projects

Our motivation to re-analyze the effectiveness of development aid on a subnational level follows two main considerations: first, funds allocated to development aid have reached remarkable levels. The World Bank alone has dedicated around 269 billion USD to 2,681 projects in 17,555 locations in 132 countries (World Bank Maps, 2020). It is no wonder that assessing the effectiveness of foreign aid has been in focus of numerous research efforts in the past. Nevertheless, they have failed to come to an agreement on whether foreign aid is ultimately helpful to tackle the world’s most pressing issues, such as poverty, malnutrition, infant mortality, etc. A serious shortcoming to past evaluation attempts has been that they are based on nationally aggregated aid flows, which cannot be adequate to evaluate the effect of development projects on the living situation of individuals spread over an entire country. For instance, browsing the map of World Bank projects in Nigeria (World Bank Maps, 2020), it appears that Nigeria has a relatively high density of projects (between 200 and 249 active and closed projects) compared with other African countries. However, having a closer look at the subnational allocation of projects, it emerges that there is only one region (Kaduna state) that is characterized by a large number of projects (approximately 53 to 66 projects), whereas in almost all other states on average only 13-26 projects were conducted. Making generalized points on the effectiveness of World Bank projects in Nigeria does certainly not capture the fact that only few people had frequent and extensive access to the Bank’s services whereas others had no or much fewer exposure.

Second, it is crucially important to account for regional specifics as they can capture the rationale behind the subnational allocation (or accumulation) of projects. As pointed out by Alesina and Dollar (2000) foreign aid *“is dictated as much by political and strategic considerations, as by the economic needs and policy performance of the recipients”* (Alesina and Dollar, 2000, p.33). We know from subnational allocation procedures of e.g., the World Bank that regional projects are planned by the respective national line ministries, locally staffed World Bank employees and other stakeholders, that make need-based decisions but also might be distracted by public and private interests, by ease of implementation and accessibility (good infrastructure or good experiences with past projects in a certain area) etc. Therefore, evaluating development aid on a national level and across countries and not account for subnational specifics (including allocation considerations), cannot paint a proper picture of its effectiveness.

Not only do we extend past cross-country research on aid effectiveness with our analysis from Chapter 3 with a new subnational perspective and the employment of subnational fixed effects. But also we present a new micro(/individual)-based approach to evaluate projects on a very large scale, that can easily be extended to any development agency, aid sector or target group, and that captures many advantages of experimental studies but in addition is inexpensive and externally valid.

The Link between Regional Temperature and Regional Incomes

There is a large strand of cross-country literature, aiming at explaining differences in income with differences in temperature, that finds a convincing evidence for a negative relationship. This is in line with very recent discussions on the harmful consequences of rises in temperature for the global economy. Researchers across the globe are searching for the *right* temperature thresholds in order to specify policy targets and to contain negative effects for worldwide economic activities.

Our main motivation for re-analyzing the temperature-growth relationship lies in extending the national evidence for the role of temperature on income from a new perspective. We follow Acemoglu and Robinson (2012)'s reasoning and hypothesize that average national temperature is indeed not sufficient for explaining differences in national income. However, observing a large spread of temperatures within countries, we would like to re-assess whether regional temperature differences might bridge the gap between findings of past research on the temperature-income relationship.

Whereas the national level seems to be a reasonable aggregation unit for tracking economic variables, it is certainly not adequate to capture large variations in temperature or other climatic indicators. Nordhaus clearly states that *"for many countries, averages of most geographic variables (such as temperature or distance from seacoast) cover such a huge area that they are virtually meaningless"* (Nordhaus, 2006, p.3511). For instance, within-country temperature differences in the year 2010 lay at 27 degrees in the United States, 26 degrees in India, 24 degrees in Russia or China and 20 degrees in Canada, whereas their average national temperature (11, 23, 2, 11 and -1 degree, respectively) completely neglects this strong variation. A preliminary deep-dive and comparison of the United States and Canada, two neighboring countries on the same continent with comparable national per capita income, reveals that the richest region in Canada and the second richest region in the U.S., both with per capita income of 56.000 USD, had average temperatures of -14 degrees and +13 degrees. Despite the same regional income level, this span of 27 degrees is more than twice the span between their national averages and a strong example for Acemoglu and Robinson (2012)'s hypothesis that temperature is indeed neglectable for explaining income differences. Obviously, a much larger comparison is needed in order to make valuable conclusions but the example clarifies that analyzing temperature on the subnational level paints a much more precise picture of the relationship between temperature and income.

We are convinced that our analysis presented in Chapter 4 constitutes as valuable extension to past research as it systematically accounts for this regional heterogeneity for a large set of regions. In addition, it addresses various nuances of the temperature-income relationship, such as non-linearity or the particular consequences for poor countries, that have been highlighted by past literature.

1.3 NON-TECHNICAL OVERVIEW

How important are cultural differences for explaining divergent regional development and which cultural features are crucial to grow economically? How can we measure the effectiveness of development projects on a large scale and still account for project and regional specifics in order to derive valuable policy implications for future international collaboration? Are hotter regions particularly prone to adverse effects of temperature on income and to what extent is adaptation to temperature fluctuations relevant and feasible for them? These leading questions will be analyzed in a technical and detailed manner in Chapters 2, 3 and 4 and form part of better understanding regional incomes and growth differences. Here, we provide a non-technical overview with basic concepts and methodologies, research ideas and main results in the following.

The Influence of the Cultural Values Independence and Obedience on Regional Incomes[1]

The idea that culture is one of the driving forces behind economic development goes back to at least Max Weber (around 1900) who saw a close relationship between the protestant ethic and the emergence of capitalism. Since then economists were eager to uncover the dynamics behind cultural imprints and economic behavior such as the propensity to save, to invest, to innovate, to give to charity, to contribute to public goods etc. However, given that many countries experienced displacements of national borders (e.g., separation and reunion of West and East Germany, collapse of the USSR and formation of Modern Russia), drawing of artificial colonial or postwar borders (e.g., former African colonies) or large migration flows (e.g., United States and Canada), we must assume that a unified national culture does not exist and that all existing countries are multinational and multicultural states. Through a more granular geographical focus, we directly connect to very recent research on the psychological traits of individuals across countries (e.g., Muthukrishna et al., 2020) but extend the argument to the subnational level, where empirical evidence is still scare.

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[1] Some results of this chapter have been published in *Papers in Regional Science* (see Greßer and Stadelmann, 2019).

In Chapter 2, we revisit the culture-income discussion from a regional (subnational) perspective. In order to capture the crucial cultural traits, that matter most for economic growth, we get orientation from past research endeavors, initiated by Hofstede (2001) and then followed by a large number of authors, that focused on the following two opposing cultural characteristics: *Individualism*, linked to personal independence and accomplishments, to discoveries and innovation, and therefore considered as a positive driver of economic development; and *Collectivism*, characterized by a strong embeddedness into a group of individuals, by loyalty and obedience to existing hierarchies, and tendentially negatively related to economic development. Findings of previous literature are based on cross-country evidence, which methodologically assumes the existence of a unified national culture and therefore encounters issues of omitted variable bias and endogeneity. Can we confirm the previously found positive (negative) link between individualistic and independent (collectivistic and obedient) cultural characteristics and economic development, if we account for existing subnational cultural differences and separate them from various country- and time-specific factors (such as national institutions)?

In an extensive effort, we combine regional economic data on per capita income with information on regional cultural preferences from the World and European Value Surveys, which give information on the importance of *Independence* and *Obedience* (derived from mentioned qualities that parents like to teach their children). Both culture-specific factors mattered for explaining national differences in economic growth and capture core concepts of commonly used measures for culture in the cross-country literature (i.e., *Individualism* and *Collectivism*). Adding various geographic, religious, educational and institutional variables, we were able to create a comprehensive dataset that describes important characteristics of 1,204 regions from 66 countries between 1980 and 2010. We employ a conventional empirical regression control approach that predicts regional per capita income from regional cultural differences. Through the application of fixed effects we are able to account for any country and time-specific heterogeneity.

In fact, our results provide strong support for the findings of cross-country studies and reveal a very consistent and robust positive (negative) link between *Independence* (*Obedience*) and regional incomes. In addition, our results are much more precise as our data allows us to exploit within-country-year variation, to separate the effects of regional culture from national institutions, to mitigate previous issues of omitted variable bias by including a large number of control variables and to introduce a regional instrument to further tackle endogeneity/causality problems. A large array of baseline and robustness tests can be summarized into the following three conclusions:

- In a stringent empirical setting, with country-time fixed effects and a large number of control variables, a 10-percentage point increase in the regional appreciation of the value *Independence* (*Obedience*) leads to a 1.4% increase (1.2% decrease) of regional per capita income. This effect and roughly also its magnitude stays constant, even if we exclude regions with a relatively low number of respondents, if we include region fixed effects, if we create year and 10-year-period subsamples, if we restrict our geographical focus to continents, OECD countries, Eurostat countries, regions with a Christian majority, etc.;

- In the presence of strong national institutions (proxied by *Government Effectiveness, Rule of Law* and *Absence of Corruption*) the positive (negative) influence of *Independence* (*Obedience*) is weakened. This is indicative for a strong moderating power of national institutions, which can act as substitutes for regional culture, especially in centralized state systems (characterized by a lack of decentralized institutions common in federal state systems);
- Despite the inclusion of an empirical instrument, reflecting the genetic distance to the United Kingdom (leading the country list of very individualistic nations), we cannot rule out reversed causality between regional culture and regional incomes. Even though endogeneity tests suggest that our instrument is somehow valid, we end up with mostly insignificant results.

Evaluating Water- and Health-Related Development Projects[2]

According to the OECD (2019) Official Development Assistance (ODA) from the 30 members of the Development Assistance Committee (DAC) accounted for 153 billion USD in 2018, which constitutes around 0.31% of their combined gross national income. Given this magnitude, it is no wonder that a still growing strand of literature is interested in its effectiveness. But neither macro-level studies (most of them national or cross-country) nor micro-based approaches, most popular representatives have been Randomized Control Trials (RCT) emphasized by Banerjee and Duflo (2012), fail to agree on whether development aid is serving its ultimate purposes. Particular interest lies in the effectiveness of investments in Water, Sanitation and Health (WASH), as these factors are considered to be main determinants of decreasing mortality rates and global inequality (Jeuland et al., 2013).

Is there a way to measure the effectiveness of development projects in the WASH sector without aggregating its effects to the national level but finding consistent results for a large data basis that are able to give valuable policy implications? Our major contribution lies in presenting a geocode-based approach, which is able to ex-post measure the effects of development projects on worldwide individuals. We believe to have found a suitable but inexpensive approach that can be replicated for an infinite number of projects (independent of their sector and institution). Thereby, we can bring observational data very close to an experimental design, but simultaneously compare a large number of projects, which enables us to replicate existing studies, re-evaluate their findings and give a more consistent answer to the question on whether development aid is effective or not.

In order to illustrate our approach, we consider geocoded worldwide development projects from the World Bank and combine them with likewise geocoded information on the quality of drinking water, the time to get to the closest drinking water source, the quality of toilet facilities and the number of

[2] A modified version of this chapter is currently revised for the *Journal of Development Studies* (July 2020). It is also available as an *AidData* working paper (see Greßer and Stadelmann, 2020).

deceased children from close to two million individuals (originating from Demographic and Health Surveys (DHS)). Individuals are aggregated to the cluster-level which is a very small subnational geographical unit. We employ a conventional regression control approach with fixed effects estimation techniques in order to account for cluster- and time-specific heterogeneity. In the intention to compare individual quality of living with and without the World Bank being present (treatment vs. control group), we come very close to an experimental research design.

The analysis reveals a significantly positive impact of the World Bank on our four water- and health-related indicators for live quality. Depending on the model specification (we conduct a large number of tests with data and methodological refinements) we observe that the mere presence of the World Bank results in:

- a one to six minutes reduction in time that the average individual in a cluster needs to spend in order to reach the next drinking water source. In addition, results suggest that the highest reduction is realized within the first (couple of) World Bank project(s) and can only be replicated to a smaller extend by follow-up projects. We find an even stronger reduction if the target sector of the specific World Bank project lies in the field of water and sanitation and if the average individual is relatively well-educated and living in a low-income country;
- a one to 14 percent improvement of the quality of drinking water, which seems to be dependent on the continuous presence and maintenance of the World Bank. Its measures seem to particularly work well in clusters with a relatively high development state (approximated by nightlight intensity). Same holds for the quality of toilet facilities, which are improved by between two and 12% if individuals have access to ongoing World Bank projects (and situated in a relatively high developed cluster);
- a significant reduction of the number of deceased children between 0.01 and 0.13, which is particularly strong in a setting where we look at water-related projects only. This potentially leads to the conclusion that water-related (deadly) illnesses such as diarrhea can be reduced by World Bank activities. Results suggest that a constant presence of the World Bank is beneficial for the preservation of this improvement.

The Link between Regional Temperature and Regional Incomes[3]

A large body of cross-country research agrees upon the negative effect that higher temperatures exert on economic performance. Dell et al. (2009) for instance, predict a 8.5% drop in national income with every degree increase in temperature for the year 2000. Burke et al. (2015, 2018) go well beyond Dell's prediction and estimate a decrease in global income by about 15-25% until 2100 if targets of global warming are not reached. If higher temperatures are indeed responsible for lower economic growth, how can these forecasts relate to exceptionally hot regions such as Abu Dhabi in the United

[3] A modified version of this chapter is currently revised for a special issue of *Economic Policy* on the Economics of Climate Change (July 2020). It is also available as a *CREMA* working paper (see Greßer, Meierrieks, and Stadelmann, 2020).

Arab Emirates or the Northern Territory in Australia that are also among the richest regions in the world? Is it necessary to analyze the temperature-income relationship on the subnational level in order to derive convincing results that are so urgently needed in today's climate debate?

Considering the spread of temperature and income within countries (e.g., average temperature of Russian regions ranges between -13 and +11 degrees, whereas average annual per capita income ranges between 2,000 and 50,000 USD) we believe it is inevitable to take the debate on the effects of temperature on income to the regional level (or even beyond). In Chapter 4 we present the comparison of several thousand subnational units and consequently explore this regional heterogeneity, which the cross-country literature was unable to account for. Not only do we present results for the effect of regional temperature on four different measures for regional per capita income, but we do also reduce the risk of omitted variable bias by accounting for any (potentially unobservable) country specifics. In addition, we re-analyze the assumption that the relation between temperature and income is non-linear (i.e., that a certain increase of temperature can also be beneficial) and that the negative effect of higher temperatures is particularly severe in poorer areas, as they fail to adapt adequately.

We explore the relationship between income and temperature on the subnational level by employing data from two distinct data sources. Gennaioli et al. (2014) collected data from national and regional statistical offices and created a dataset that contains economic (e.g., regional per capita GDP) as well as geographical variables (e.g., average regional temperature between 1950 and 2000) for 1,542 states and provinces spread across 83 countries. Due to the fact that Gennaioli et al. (2014) data lacks regional information from Africa, we create two cross-sections from all available Demographic and Health Surveys for the years 2005 and 2015. All surveys provide cluster-specific (i.e., between 14,130 and 15,533 small geographical units) information for e.g., temperature, precipitation or frost days, whereas only the year 2005 and 2015 contain data on gross cell production and nightlights, respectively, which we use to approximate subnational per capita income. In a standard Ordinary Least Square regression framework, we estimate the effect of temperature on four different measures for regional per capita income, regional per capita GDP, regional growth of per capita GDP, cluster nightlights and cluster gross cell production.

Even though correlations between regional temperature and (proxies for) regional incomes indicate a clear negative effect, empirical results suggest the absence of any systematic link between them. This implies that, in contrast to the cross-country literature, we cannot confirm that regions (within a country) are *per se* wealthier (poorer) only because they are colder (hotter). In more detail, our results show that

- there is hardly any link between average temperature between 1950 and 2000 and regional per capita GDP, as coefficients tend to be insignificant (only one very parsimonious empirical setting reveals a 2.5% drop in GDP if temperature raises by one degree); in addition, we receive no indication that poorer regions or regions with a low educational standard experience a particularly pronounced disadvantage from higher temperatures;

- nightlights in 2015 are 18-40% higher if the average temperature in a cluster increases by one degree; this positive effect is more pronounced in summer than in winter, whereas strong temperature fluctuations are generally harmful; findings tend to be less distinct in relatively poor clusters (i.e., below average nightlights);
- temperature is rather unimportant for the regional growth of per capita GDP and gross cell production as related specifications reveal particularly ambiguous results;
- for all measures of income we find no clear indication for a non-linear relation with temperature.

1.4 NOTES TO THE READER

This doctoral thesis presents three different research efforts to explain divergent regional economic development. The design of this book is to contribute to the broader discussions on the influence of culture, development aid and temperature on subnational development. Even though, all three empirical studies have the regional perspective as common theme they are designed as standalone article-like papers. Modified versions of the papers, that form the basis of Chapters 2-4, have been presented at both local and international conferences. In addition, Chapter 2 *('The Influence of the Cultural Values Independence and Obedience on Regional Incomes: Econometric Evidence'*) was published at *Papers in Regional Science* in March 2019[4]. Chapter 3 (*'Evaluating water- and health-related development projects: A cross-project and micro-based approach'*) was published at the *Journal of Development Studies* in December 2020[5]. An earlier version is available as an *AidData* Working Paper published in 2020[6]. Finally, a modified version of Chapter 4 (*'The Link between Regional Temperature and Regional Incomes: Econometric Evidence with Sub-National Data'*) is now accepted for publication in a special issue of *Economic Policy* on the economics of climate change (expected publication date in April 2021). An earlier working paper is available at CREMA since April 2020[7]. The above mentioned chapters in this book include additional material and are more extensive than their respective candidates that are already published.

[4] Greßer, Christina, and David Stadelmann. 2019. 'The Influence of the Cultural Values Independence and Obedience on Regional Incomes: Econometric Evidence.' Papers in Regional Science 98 (5): 2047–73.

[5] Greßer, Christina, and David Stadelmann. 2020b. "Evaluating Water- and Health-Related Development Projects: A Cross-Project and Micro-Based Approach." The Journal of Development Studies 0 (0): 1–19.

[6] Greßer, Christina, and David Stadelmann. 2020a. 'Evaluating Water- and Health Related Development Projects: A Cross-Project and Microbased Approach.' AidData Working Paper 98. Williamsburg: AidData at William & Mary.

[7] Greßer, Christina, Daniel Meierrieks, and David Stadelmann. 2020. 'The Link between Regional Temperature and Regional Income: Econometric Evidence with Sub-National Data.' 2020–01. CREMA Working Paper Series. Center for Research in Economics, Management and the Arts (CREMA).

CHAPTER 2 THE INFLUENCE OF THE CULTURAL VALUES INDEPENDENCE AND OBEDIENCE ON REGIONAL INCOMES

ABSTRACT[8]

Employing subnational panel data for 1,204 regions from 1980 to 2010, we show that *regional* appreciation of the cultural value Independence has a positive and statistically significant association with *regional* per capita income, whereas the value Obedience exerts a negative effect. Our data allow us to exploit within-country-year variation by including country-time fixed effects to mitigate issues of omitted variable bias which are usually present when analyzing cross-national data. A large array of robustness tests supports an effect of cultural values on regional per capita income. Interacting regional culture with national institutions reveals that stronger national institutions moderate the impact of the regional cultural values.

JEL-Classification: O18, O40, P50

Keywords: Regional culture; regional development; subnational panel data; institutions.

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A modified version of this article has been published at *Papers in Regional Science* (see Greßer and Stadelmann, 2019).

2.1 INTRODUCTION

Culture is commonly regarded as customary beliefs and values that societies transmit from generation to generation (see e.g., Gorodnichenko and Roland, 2011, 2017, Greif, 1994, Landes, 1999, Spolaore and Wacziarg, 2013 for a review). Particularly, the cultural values independence and individualism have been linked to increases in income per capita across countries. Such values put emphasis on personal freedom and achievement. Conversely, cultural values related to obedience, collectivism or conformity to a group seem to be, if anything, negatively related to economic development (see e.g., Alesina and Giuliano, 2015, Fernandez, 2011, Hofstede, 2001). To gauge the relationship between culture and economic development, researchers have largely been constrained to data at the national level. This raises the difficulty of separating culture from unobservable country-specific characteristics, such as political institutions or history (see e.g., Dearmon and Grier, 2009, Licht et al., 2007).

We contribute to the existing literature by investigating the link between culture and income per capita at the *regional* (i.e., subnational) level instead of analyzing the cross-country (i.e., national) level. In particular, we analyze the *regional* representation of the cultural values *Independence* and *Obedience*, which have been shown to matter in the cross-country literature, to explain regional income differences (see e.g., Harger and Hall, 2015, Hofstede, 1984, Kitayama et al., 2010, Tabellini, 2010)[9]. Independence and Obedience capture concepts of culture and serve as relevant proxies to connect to previous research efforts and to extend the literature from the national to the regional level. Gathering regional cultural data for 1,204 regions in 66 countries and merging this data to existing information on regional incomes (subnational GDP per capita) for the period between 1980 and 2010 allows us to account for country-time specific unobservables with fixed effects when investigating the relationship between culture and economic development, i.e., we can account for anything that is unique for a specific nation and time period (e.g., Spain in 2000). The panel structure of our dataset even allows us to account for region-specific fixed effects, i.e., we can investigate the effect of *changes* in regional culture over time on changes in regional incomes. This approach reduces bias resulting from omitted variables which ultimately could not be avoided in cross-country research. Thereby, it contributes to overcoming relevant endogeneity issues in the literature. Moreover, we also attempt to introduce a regional instrumental variable that measures the genetic distance to Great Britain to address potential remaining endogeneity concerns (see e.g., Chiao and Blizinsky, 2010, Gorodnichenko and Roland, 2011, 2017, Way and

[9] The influence of independence and obedience has not been discussed extensively in the literature of culture on economic growth. Whereas obedience is used in a few economic research efforts (see e.g., Harger and Hall, 2015, Tabellini, 2010), the wealth-independence relationship is mainly explored by the psychological literature (see e.g., Hofstede, 2001, Kitayama et al., 2010). Nevertheless, both variables are linked to Hofstede's cultural dimensions of individualism and collectivism through the distance to the ruling power (independent cultures are characterized by low power distance/individualism, whereas obedient cultures reflect high power distance/collectivism). Both individualism and collectivism have been shown to be highly relevant in the growth literature (see e.g., Alesina and Giuliano, 2015, Ball, 2001, Guiso et al., 2006, Kaasa et al., 2014, Kyriacou, 2016). We explore whether independence and obedience yield similar results and extend the analysis to the regional level.

Lieberman, 2010 for cross-country evidence with a similar instrument). Finally, our subnational data allows us to explore moderating effects of national institutions[10] on how regional culture affects regional incomes[11].

Recent studies (see e.g., Cui, 2017, Dincer and Uslaner, 2010, Guiso et al., 2016, Tabellini, 2010) hypothesize that a unified national culture is inexistent in most countries. Moreover, past changes of country borders (e.g., East and West Germany, former Yugoslavia, etc.) further complicate the conceptualization of a measure for *national* culture as previously done by the literature. Thus, our analysis of *regional* data contributes to existing knowledge by providing a more comprehensive understanding of the relationship between regional culture and economic development within regions, instead of focusing on countries only.

Our empirical results show a statistically significant and positive (negative) relationship between the regional appreciation of the cultural value *Independence* (*Obedience*) and regional per capita income. Thus, our results provide complementary support for existing cross-country studies which investigate proxies for national culture and economic development. We also show that the link between regional culture and regional incomes per capita is economically relevant. Importantly, the implied relationship holds when accounting for country-time fixed effects and a number of other relevant *regional* control variables (including regional human capital, religion and trust), i.e., omitted variable issues are unlikely to drive our results. Robustness tests tend to support the link between culture and economic development even when regional fixed effects are introduced. Evidence from instrumental variable regressions suggest a marginal causal effect of the cultural appreciation of *Independence* on regional per capita income, though the effects are statistically less robust mainly due to data availability issues which systematically decrease the number of regions that we can investigate. Interestingly, strong national institutions such as the rule of law or high government effectiveness systematically moderate the positive (negative) impact of *Independence* (*Obedience*) on regional incomes, i.e., in countries with stronger national institutions, cultural values matter less for per capita incomes. Thus, regional culture and national institutions seem to act as substitutes. Our analysis and data provide new insights to the existing literature and potential avenues for future research.

The remainder of this paper is organized as follows: Section 2.2 presents the related literature and Section 2.3 describes our data and methodology. Results are presented in Section 2.4 and Section 2.5 offers concluding remarks.

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[10] We will use three indicators from the World Development Indicators (Rule of Law, Absence of Corruption, Government Effectiveness). For simplicity, we refer to them as measures of national institutions. These indicators correlate well with other measures of institutions commonly used in the literature (such as measures for executive constrains or protection of property rights).

[11] Such moderating effects of institutions are relevant due to strong correlations between culture and national institutions (see e.g., Dearmon and Grier, 2009, Licht et al., 2007). Tabellini (2010) even argues that culture and institutions cannot be handled separately as both shape behavior.

2.2 LITERATURE REVIEW

Our paper relates to and extends the existing literature on culture and economic development which has mostly focused on differences between nations. The topic came into more prominent focus when Greif (1994) and Landes (1999) argued for a fundamental role of culture on economic growth. By comparing cultural groups in selected countries and their historic economic development, the authors attested selected cultural characteristics to tip the scale towards successful or unsuccessful development. Subsequent studies broadly support their conclusions that particular cultural values related to independence, individualism, valuing achievements by social status rewards, personal freedom etc. positively impact the long-term growth of countries (see e.g., Alesina and Giuliano, 2015, Davis, 2016, Fernandez, 2011, Gorodnichenko and Roland, 2011, 2017, Guiso et al., 2006, Hofstede, 2001). More individualistic countries have been suggested to bring out more innovations and an efficient public sector. On the other hand, the cross-country literature argues that values such as obedience, collectivism, high in-group pressure, etc. may favor corruption and nepotism, leading to lower growth and lower incomes per capita in the long-run, but the association between culture and corruption is still an open research question (see e.g., Ball, 2001, Chambers and Hamer, 2012, Kyriacou, 2016, Debski et al., 2018). It is argued that cultural values are rigid and dependent on the individual's geographical origin, which might be one reason for persistent income differences despite countless policy efforts (Alesina et al., 2013, Nunn and Wantchekon, 2011, Nunn, 2012).

We consider the *regional* (i.e., subnational) appreciation of the value *Independence* to capture the idea of an independent and individualistic society which has been found to positively impact economic growth. The positive relationship between average levels of individualism and wealth has been investigated and the existing findings have been reinforced by the literature, mainly in the field of psychology (see e.g., Georgas et al., 2004, Grossmann and Varnum, 2015, Hofstede, 1984, Kitayama et al., 2010). Whereas the economic literature has not yet discussed independence as such (due to data availability in cross-country research, they focused on related values such as individualism or trust), the value obedience gained attention when Harger and Hall (2015) or Tabellini (2010) found a robustly negative link between obedient cultures and economic development. This paper re-opens the discussion on the influence of independence on economic development and considerably extends the existing literature on the value obedience by providing a regional analysis.

To address endogeneity issues between culture and development, the literature suggested instruments at the national level such as language patterns (Kashima and Kashima, 1998), religious compositions (La Porta et al., 1998) or historical institutions and literacy rates (Tabellini, 2010). Recently, particular attention was given to instruments that are based on genetic information (e.g., blood types, frequency of selected genes or allele types or historical prevalence of infectious diseases). It is argued that certain genetic predispositions (inherited from parents to their children) lead to the adaption of different cultural values affecting economic behavior (see e.g., Chiao and Blizinsky, 2010, Fincher et al., 2008, Gorodnichenko and Roland, 2011, 2017, Murray and Schaller, 2010, Nikolaev and Salahodjaev, 2017). Inspired by the proposed instrument, we try to construct a similar genetic instrument. This is possible only for a limited number of regions (though a relevant one in comparison to the number of countries usually analyzed). As we use regional instead of national data, endogeneity concerns linked to omitted variable bias of the cross-country literature can be systematically reduced as we can include country-time fixed effects in our setting.

A small number of studies tries to avoid the caveats of cross-country studies and explores the relationship between cultural measures and income *within* countries. The results are intriguing and show that belief in one's own ability and independence to complete tasks enhances civic capital in Italian regions (see e.g., Guiso et al., 2016); that trust/social capital positively impacts economic development in U.S. states and Chinese provinces (see e.g., Cui, 2017, Dincer and Uslaner, 2010); that Protestantism (as a proxy for Christian commercial culture) promotes development of Chinese provinces and prefectures during 1978 to 2008 (see e.g., Shi et al., 2014); that tolerance and openness affect the distribution of human capital and technology and therefore the attraction of talent in Swedish regions (see e.g., Florida and Mellander, 2007). However, these articles usually focus on a single country only. As an exception, Falk et al. (2018) use global data with stated preferences of more than 80,000 individuals, to explore both the variation across and within countries. All the literature focusing on the effects of cultural differences within countries highlights that within-country heterogeneity is large, a fact that the cross-country literature cannot account for. We extend this literature by analyzing a large number of regions in numerous countries.

More closely linked to our endeavor are a limited number of studies which analyze European regions and focus on cultural indicators such as social capital, trust, and obedience, among others (see e.g., Akçomak and ter Weel, 2009, Beugelsdijk et al., 2004, Forte et al., 2015, Kaasa et al., 2014, Schneider et al., 2000, Tabellini, 2010)[12]. These studies tend to find weaker effects of culture on economic growth than what was found by the cross-country literature. Our contribution lies in the investigation of a significantly larger number of regions (between 10 to 20 times as many) from countries across the world, which find themselves in different states of economic development and institutional settings.

Given potential associations between national institutions and culture, a closer look at the mediating effects of institutional environments is required. From the literature, we may expect an interaction between national institutions and cultural traits (see e.g., Acemoglu et al., 2001, Dearmon and Grier, 2009, Hall and Jones, 1999, Licht et al., 2007). As implied by Gorodnichenko and Roland (2011, 2017) and Tabellini (2010), exploring mediating effects of institutional quality (e.g., *Government Effectiveness*, *Rule of Law* and *Absence of Corruption*) could improve the understanding how culture

[12] In same order as listed in the main text, the authors include a maximum of 102, 54, 85, 78, 58 and 69 regions.

affects income. We follow this line of research and investigate the mediating role of institutions by analyzing interactions between national institutions and regional culture.

2.3 DATA AND METHODOLOGY

2.3.1 Data and matching

In a large data effort, we aggregate and merge three existing data sources to obtain a new dataset containing cultural and economic variables for 1,204 regions over a time span of 1980 to 2010. The two main data sources for cultural variables are the World Value Survey[13] and European Value Survey[14]. Regarding economic variables, we employ a recent dataset established by Gennaioli et al. (2014) on regions around the world.

Similar to the established literature, we use questions from the World and European Value Surveys (WVS and EVS) to measure relevant aspects of cultural values. The two surveys report individual answers to a set of questions in more than 80 countries and within six time waves (starting 1981 and ending 2014). Regarding the choice of questions, we follow Gorodnichenko and Roland (2011, 2017), Tabellini (2010), Kaasa et al. (2014), and Harper (2004). The mention of *Independence* as an important quality is taken as an indicator for individuals who also value achievement, individualism, and self-assertion. On the other hand, the mention of *Obedience* as a cultural value rather represents conformity to a group which supports a collectivistic cultural understanding[15].

In the cross-country literature, individual responses to WVS or the EVS questions are aggregated by forming means across individuals to obtain country level average values (see e.g., Gorodnichenko and Roland, 2011, 2017, Guiso et al., 2011, Tabellini, 2008). The survey respondents can, however, not only be allocated to a country but to a specific *region* within a country. Thus, instead of aggregating responses at the country level, our approach consists of aggregating cultural values and other covariates (such as trust, religious affiliation, etc.) at the *regional* level but otherwise following the same procedures as the cross-country literature, i.e., we calculate regional averages for the individually expressed values *Independence* and *Obedience* such that we obtain average expressions of these cultural variables at the regional level. Altogether, we obtain data for 2,537 regions that are reported in the WVS/EVS. We note that the number of survey respondents per region can in some cases be comparatively low and representativeness of the individual responses at the regional level is assured at the national level only. We investigate both these issues in an array of robustness tests. Regarding the representativeness of the sample of regional respondents, we also compare it with available information on regional population

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[13] See World Values Survey Association, JDSystems Data Archive (2015).

[14] See GESIS Leibniz Institut für Sozialwissenschaften (2015).

[15] The survey question is: 'Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important? *Independence*, *Obedience* (and others).' Mentioned = 1; Not mentioned = 0

data for 138 European regions in 2000 and 145 European regions in 2010 from Eurostat (2018) (see **Table 1**) and find that the sample's distribution in terms of age groups, gender and employment tends to be comparable to the actual population. Comparable data is more difficult to gather for other subnational regions around the world such that we cannot perform this comparison for the whole world.

Table 1: *Comparison of Eurostat data and EVS survey data for selected population characteristics*

			EVS Surveys				
			% of pop				
	% of pop	with a job	between 15-24 years	between 25-34 years	between 35-44 years	between 45-54 years	between 55-64 years
2000							
Male	0.46	0.58					
Female	0.54	0.43					
Total			0.21	0.16	0.20	0.22	0.21
2010							
Male	0.45	0.57					
Female	0.55	0.47					
Total			0.24	0.19	0.20	0.20	0.17
			Eurostat				
2000							
Male	0.50	0.65					
Female	0.50	0.49					
Total			0.19	0.21	0.21	0.19	0.15
2010							
Male	0.50	0.69					
Female	0.50	0.57					
Total			0.18	0.20	0.22	0.22	0.19

Note: The table shows population characteristics (gender, employment, age groups) in order to compare their distribution within European regions. Distributions are calculated for 138 regions in 2000 and 145 regions in 2010 from a dataset comprising 'A' matched regions from Gennaioli et al. (2014) and the European Value Survey and the same regions in the Eurostat Data bank.

Moreover, regression results also remain comparatively robust if we only focus on regions where population characteristics of the respondents do not deviate from the regional population data provided by Eurostat by more than 5% (see **Table 4** for these tests). We provide information on the number of respondents for each region in **Table 29**. We systematically test whether our results are driven by regions where we only have a low number of observations and find that this is not the case.

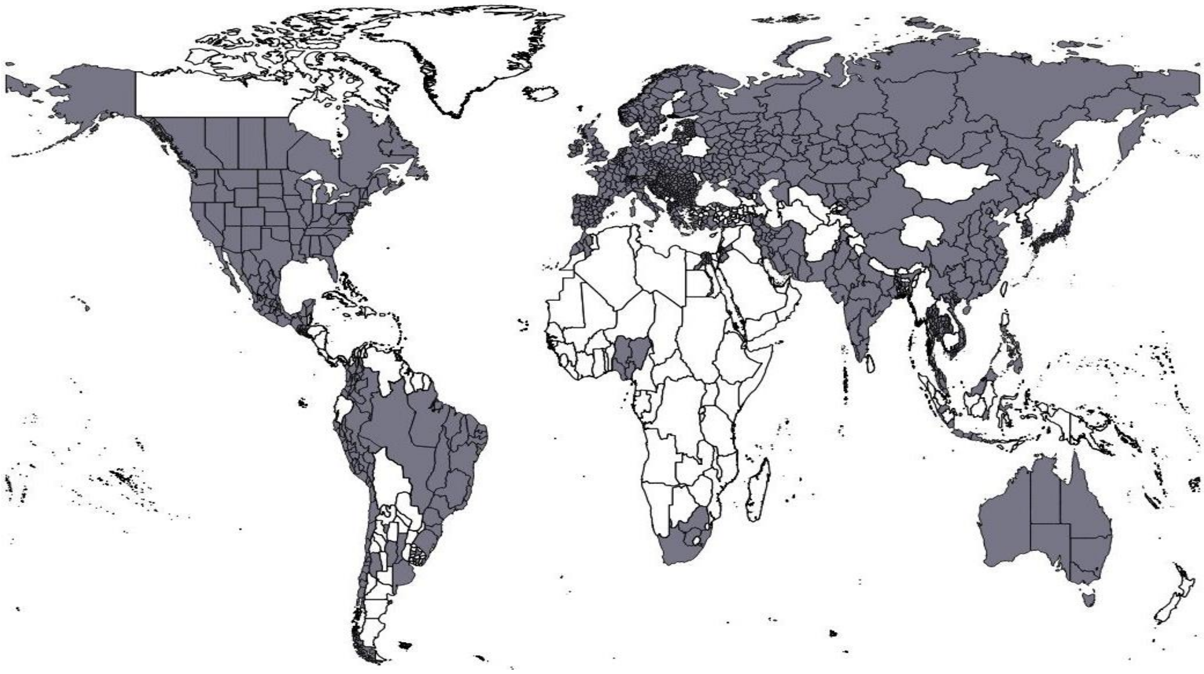
In order to test the effect of culture on income (measured in terms of regional GDP per capita), we need to combine our measures of regional culture from the WVS and EVS with regional data on GDP and further regional control variables. Gennaioli et al. (2014) have created a dataset that contains information on GDP for over 1,527 regions (mainly states and provinces) in over 80 countries. Matching the Gennaioli et al. (2014) regions with the regions that are reported in the World and European Value Surveys yields a consistent dataset of 1,204 regions in 66 countries over a period from 1980 to 2010 and a total of 3,030 observations[16]. This matching process was done mainly manually and relied on geographical software where possible. In the matching process, we ensure that the largest possible number of WVS/EVS regions is matched to regions for which income data is available, i.e., we match the cultural data to the income data from Gennaioli et al. (2014). Matching is performed based on geographical boundaries. In few cases, the WVS/EVS regions are geographically smaller or larger than the regions employed by Gennaioli et al. (2014) so that final boundaries overlap. We grade our matches according to six quality levels which range between an exact match (quality mapping A), an aggregation of smaller WVS/EVS regions to larger regions where income is available (quality mappings B and C), an aggregation of larger WVS/EVS regions to smaller regions where income is available (quality mappings D and E) to matches based on an individual informed case by case assessment (quality mapping F). This procedure solves the induced trade-offs when matching several datasets with (partly) non-fully identical entities. Employing quality levels allows us to match all available data and test the robustness of the results when only analyzing precise geographical matches. This allows other researchers to employ our matching procedure and to explore other aspects of culture and income or human capital accumulation[17]. The quality grades are reported in **Table 8** in the Appendix. They are employed in several robustness tests in **Table 3** and **Table 4**, which all yield very similar results.

Figure 1 shows the map of regions included in our dataset. Noticeably, almost all Asian, South American, and Oceanian regions as well as all regions from North America and Europe are included in the sample, although Africa remains under-represented.

[16] Due to a restriction regarding the overlap of available years in both datasets, we allow for a maximum time lag of (minus) 10 years in order to be able to match a high number of regions precisely. By doing so, we also reduce the risk of endogeneity as we regress past cultural values on today's GDP. Alternatively, we provide robustness tests for a reduced time lag (2 years only) as well as for averaged data over three 10-year-periods (to reduce the number of missing years between survey waves) which yield similar results (**Table 3** and **Table 4**). Detailed information on available years, matched regions and quality grades can be found in **Table 28**, **Table 29**and **Table 30**.

[17] To further insure consistency, we also had student research assistants perform the matching independently and their results were cross-checked. This process did not lead to any matching changes for quality grade A and only to small differences with respect to the other quality grades. Empirical results for the link between culture and income at the regional level showed only small quantitative differences when different matches are used.

Figure 1: Map of included regions (grey-shaded)



In our empirical analysis, we control for a comprehensive list of regional-level variables which we also constructed from the WVS/EVS, obtained from Gennaioli et al. (2014) or derived with geographical information system software (see ArcGIS, 2017 or Jetter et al., 2017). We wish to briefly explain the intuition for the major control variables. Substantial cross-country literature, such as Barro (1991), de la Fuente and Doménech (2006) or Cohen and Soto (2007), points to the role of education, which could affect culture and regional income levels at the same time. Carmignani (2015), Gennaioli et al. (2014), Mitton (2016), Dell et al. (2009), or Warner (2002) find geographic variables, such as temperature, latitude or ocean access, to be predictors for income levels. Bloom and Sachs (1998), Gennaioli et al. (2013), and Jetter et al. (2017) support the predictive power of the distance to the coast and the population density. Moreover, we account for the level of trust[18] as well as religious denomination (regional percentage of Christians, Muslims, Hindus, Buddhists, atheists and others) as both factors are related to culture and find support in the literature to affect income (see e.g., Knack and Keefer, 1997, Whiteley, 2000, Guiso et al., 2009, Barro and McCleary, 2003, 2006).

Although culture is often argued to be exogenous and we lag our cultural variables, we also attempt to provide an instrument for cultural values based on genetic information. Similar to the literature, we assume that individuals who are genetically susceptible to infectious and chronical illnesses tend to develop cultural coping strategies, such as ethnocentrism or skepticism. These strategies are supposed to work against the development of cultural values like individualism or independence (see

[18] Survey question: 'Would you say that most people can be trusted?' Yes = 1; No = 0

e.g., Chiao and Blizinsky, 2010, Fincher et al., 2008, Gorodnichenko and Roland, 2011, 2017, Murray and Schaller, 2010, Nikolaev and Salahodjaev, 2017, Spolaore and Wacziarg, 2009)[19].

Finally, we gather national level data on institutional quality to investigate moderating effects of institutions and regional culture (see e.g., Dearmon and Grier, 2009, Gorodnichenko and Roland, 2011, 2017, Tabellini, 2010). In particular, we rely on three measures for the quality of institutions (*Government Effectiveness*, *Rule of Law* and *Absence of Corruption)* from the World Development Indicators (2017).

Further descriptions, descriptive statistics and data sources of all our variables can be found in **Table 9** in the Appendix.

2.3.2 Empirical methodology

We aim to analyze whether regions where inhabitants on average highly appreciate the cultural value *Independence* have a higher regional GDP per capita while regions that value *Obedience* are less wealthy. Our empirical strategy starts with a conventional regression control framework to predict the logarithm of regional GDP per capita. However, contrary to cross-country analyses, our setting allows us to analyze the link between *regional* cultural values and *regional* GDP per capita. Due to the regional focus, we can account for country-, time-, and country-time-specific heterogeneity by including a set of fixed effects. Our initial estimation equation to explain GDP per capita in region r of country i at time t is specified as follows

$$Ln(\text{GDP per capita})_{r,i,t} = \beta(Culture)_{r,i,t} + \boldsymbol{X_{r,i,t}}\gamma + \omega_i + \lambda_t + \mu_{i,t} + \epsilon_{r,i,t} \tag{1}$$

where $\boldsymbol{X_{r,i,t}}$ represents the vector of control variables discussed above. ω_i, λ_t, and $\mu_{i,t}$ introduce country, time, and country-time fixed effects, respectively. $\epsilon_{r,i,t}$ is an error term. Country fixed effects account for any country-specific unobservables (e.g., Argentina's colonial history), time fixed effects account for contemporary global phenomena, and in specifications with country-time fixed effects we control for everything that is specific in a given country and time period (e.g., German rule of law in the 2000-2010 period)[20].

Although culture is supposed to be exogenous and relatively persistent, we observe some variation over time in the extent of our cultural measures *Independence* and *Obedience* at the regional level. This variation allows us to augment our estimation equation by regional fixed effects in further empirical tests. By accounting for regional and time fixed effects, we evaluate the robustness of the link between culture and income per capita. Moreover, we implement an instrumental variable approach to try to deal

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19 Please find more information in **Exhibit 1** in the Supplementary Material.

20 Following Abadie et al. (2017) and Cameron and Miller (2015), we usually estimate robust standard errors clustered at the regional level.

with potential remaining endogeneity issues (mainly reverse causality) which are not captured by our fixed effects approach.

We also explore interactions with national institutions to investigate moderating effects of national institutions on the relationship between regional culture and regional GDP. Our estimation equation to investigate moderating effects is specified as follows

$$Ln(GDP\ per\ capita)_{r,i,t} = \beta_1 (Culture)_{r,i,t} + \beta_2 \left(Rule\ of\ Law^{21}\right)_{i,t} +$$

$$+ \beta_3 (Culture)_{r,i,t} \cdot (Rule\ of\ Law)_{i,t} + \boldsymbol{X_{r,i,t}} \gamma + \omega_i + \lambda_t + \epsilon_{r,i,t} \quad (2)$$

where the interaction term β_3 captures whether a strong *Rule of Law* moderates the effect of regional culture on income per capita. Apart from analyzing interactions between culture and the *Rule of Law*, we also investigate other proxies for the quality of institutions, in particular *Absence of Corruption* and *Government Effectiveness*. These institutional variables correlate with other institutional measures (see e.g., Ang et. al, 2018). As institutions are nation-specific, we do not include country-time fixed effects in this specification but only country and time fixed effects. We hypothesize that stronger national institutions reduce the absolute influence of culture on income, i.e., in countries with strong institutions, culture plays a smaller role. Significant results for β_3 can be interpreted as evidence that culture and institutions function as substitutes. To the best of our knowledge, this is the first paper that explores the moderating effects of national institutions on the effect that regional cultural values have on regional incomes per capita.

2.4 THE LINK BETWEEN REGIONAL CULTURE AND REGIONAL INCOMES

Figure 2 provides a central motivation for our regional analysis. It presents the relationship between our two cultural variables *Independence* and *Obedience* and the regional log GDP per capita for the whole sample of 3,002 regional observations. We observe that *Independence* is positively related to income, whereas *Obedience* shows a negative correlation[22]. Thus, the broad insight of the existing literature analyzing differences between countries carries on to the regional level.

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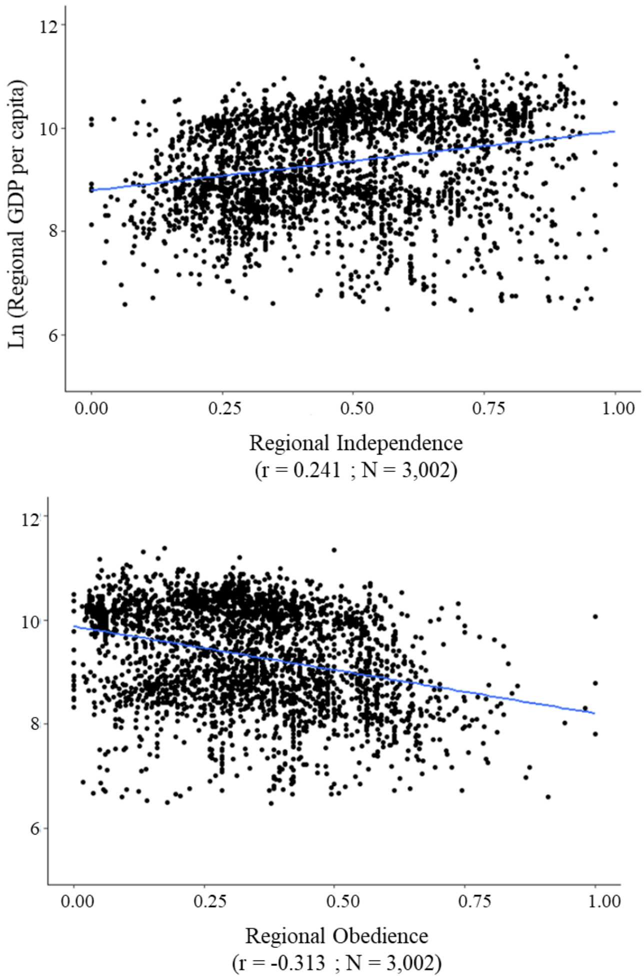
[21] We will use *Absence of Corruption* and *Government Effectiveness* as additional variables for the quality of institutions from the World Development Indicators.

[22] *Independence* and *Obedience* themselves are negatively correlated such that regions who value *Independence* tend to value *Obedience* less (r = -0.35).

__Figure 2:__ The link between regional incomes per capita and regional cultural values



Note: Scatterplots summarize all available observations per region between 1980 and 2010.

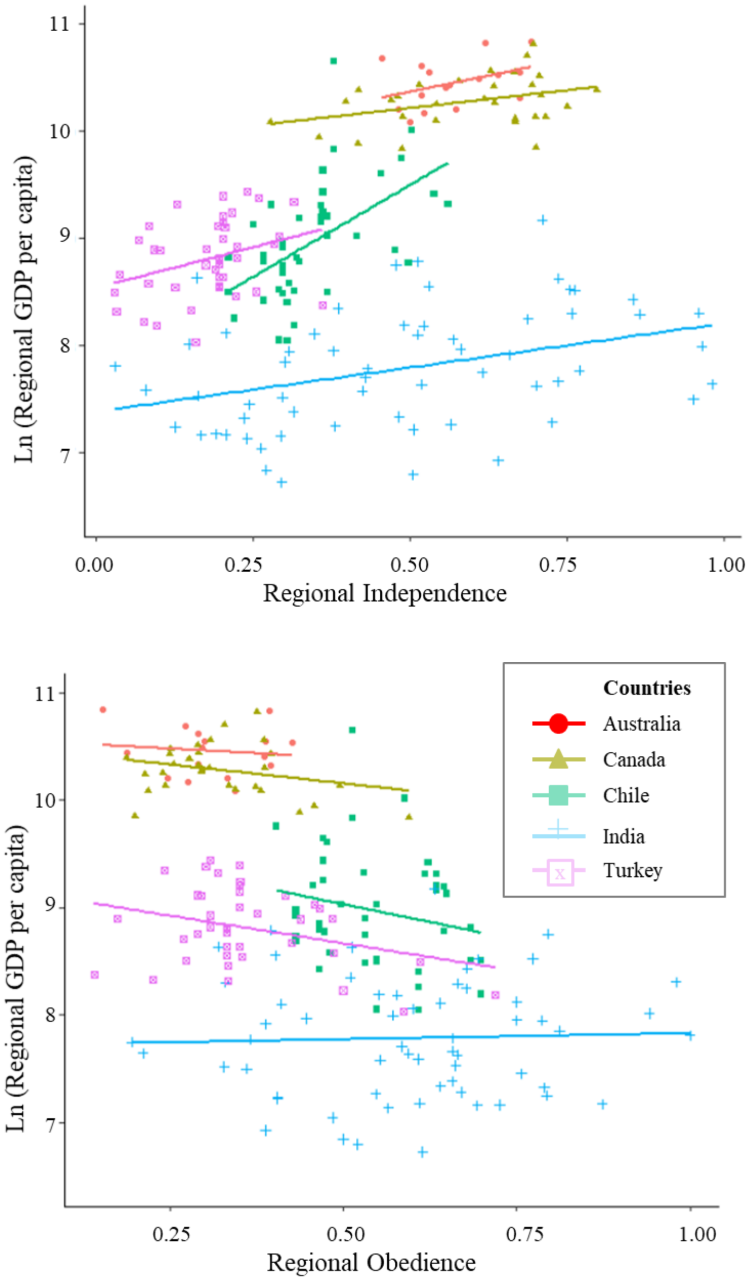
It is interesting and relevant to note that there is a large heterogeneity regarding these cultural values and regional incomes per capita *within* countries too. In **Figure 3**, we illustrate this heterogeneity for several countries from different continents (Australia, Canada, Chile, India, Turkey). The scatterplots highlight the extent of within-country heterogeneity and the positive (negative) link between *Independence* (*Obedience*) and incomes within countries.

Employing regional data allows us to investigate within-country heterogeneity of culture and income which cross-country research on the topic was unable to exploit. Take India as a case in point which is known to be a culturally diverse country: between Indian regions, incomes per capita differ by over two log points, and cultural values differ to a larger degree. Taking an average national value for culture in India neglects this heterogeneity[23]. A similar pattern can also be observed for other countries and even in countries with a supposedly more unified culture (such as Turkey), but we still observe non-

[23] Of course, one could argue that cultural values are also different when comparing different municipalities within a region in India. While this is true, we consider the focus on regions a significant improvement in comparison to the cross-country literature. Arguably, for less populous countries with many regions, cultural differences between municipalities within regions should be relatively small.

negligible differences in cultural values. Likewise to cross-country analyses, we still face the fact that our regions vary in size (population or area) and in levels of development. Our approach precisely allows us to control for more heterogeneity than the cross-country literature as we can account for country-time fixed effects[24], i.e., a regional analysis allows further insights than focusing on the national level only.

Figure 3: *Heterogeneity within countries and links between regional incomes per capita and regional cultural values for selected countries*



Note: Scatterplots summarize all available observations per region between 1980 and 2010 for countries Australia, Canada, Chile, India and Turkey.

[24] We are facing robust results even when we weight our cultural variables with regional population or income or when looking at specific years or continents individually.

2.4.1 Main Econometric results

In **Table 2**, we present results of our main estimation equation (1). We systematically find a positive and statistically significant link between the cultural value *Independence* (specifications 1-4) and regional GDP per capita. *Obedience*, on the other hand, always shows a negative and statistically significant association with regional incomes per capita (specifications 5-8).

In columns (1) and (5), we account for country, time, and country-time fixed effects but do not include any control variables[25]. This setting captures all national and time specific factors which could influence the link between culture and regional incomes per capita. The fact that both cultural variables stay significant after the implementation of our fixed effects strategy suggests that *regional* culture may exert an effect on regional GDP which is independent of any potential concept of *national* culture. National culture and changes in national culture are by construction fully captured by our fixed effects strategy. The magnitude of the link suggests that a 10-percentage point increase in the share of respondents that value *Independence* increases regional GDP per capita by more than 5 percent. Similarly, though with a negative sign, a 10-percentage point increase in the share of respondents that value *Obedience* decreases regional GDP per capita by about 6 percent.

We account for an initial set of regional covariates in specifications (2) and (6). Here, we mainly include geographical control variables such as latitude, measures for distance to coast, risk of malaria, population density, etc. After controlling for these variables which may potentially influence culture and regional GDP, we still find a statistically significant coefficient for regional cultural values. The magnitude is slightly smaller than without controls but still of economic relevance.

While control variables beyond geographic variables are hard to obtain, we made an effort and gathered regional education levels, trust and religious affiliations which we merge to our dataset. Such variables could affect regional GDP and regional cultural values at the same time, introducing a potential omitted variable bias in past estimations even when introducing fixed effects. To investigate whether the control of such regional covariates affects the relationship between culture and regional incomes, we include them in specifications (3) and (7). Again, we observe that the association between culture and regional incomes is statistically significant, although the magnitude of the effect becomes smaller once more.

[25] All results remain statistically robust when including country or time fixed effects only.

Table 2: *Baseline regressions for the effect of Independence and Obedience with a full and a reduced set of controls on regional per capita income*

Dependent variable: ln(Regional GDP per capita)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Independence	0.534***	0.361***	0.142**	0.134**				
	(0.083)	(0.072)	(0.069)	(0.067)				
Obedience					-0.616***	-0.384***	-0.124*	-0.119*
					(0.083)	(0.069)	(0.064)	(0.063)
Latitude		0.019***	0.015***	0.014***		0.018***	0.015***	0.014***
		(0.005)	(0.004)	(0.003)		(0.005)	(0.004)	(0.003)
Inverse distance to coast		0.151	-0.194			0.11	-0.202	
		(0.248)	(0.219)			(0.248)	(0.218)	
Malaria ecology		0.052***	0.029**	0.032**		0.049***	0.028**	0.031**
		(0.014)	(0.013)	(0.013)		(0.014)	(0.013)	(0.013)
Ln(Oil Gas Production)		2.05	2.132			1.958	2.054	
		(2.53)	(2.141)			(2.575)	(2.166)	
Ln(Pop density)		0.033***	-0.006			0.034***	-0.005	
		(0.012)	(0.011)			(0.012)	(0.011)	
Capital in region		0.504***	0.266***	0.255***		0.497***	0.264***	0.254***
		(0.046)	(0.046)	(0.043)		(0.046)	(0.045)	(0.042)
Temperature		-0.007	0.003			-0.006	0.003	
		(0.005)	(0.004)			(0.005)	(0.004)	
Landlockedregion		-0.151***	-0.103***	-0.094***		-0.155***	-0.105***	-0.096***
		(0.025)	(0.021)	(0.021)		(0.025)	(0.022)	(0.021)
Length coast		0.00003**	0.00002*	0.00002**		0.00003**	0.00002*	0.00002**
		(0.00001)	(0.00001)	(0.00001)		(0.00001)	(0.00001)	(0.00001)
Border to other regions		-0.073**	-0.069**	-0.031		-0.076**	-0.070**	-0.032*
		(0.033)	(0.029)	(0.019)		(0.034)	(0.029)	(0.019)
No countryborders		0.023	0.027			0.023	0.027	

		(0.021)	(0.017)			(0.021)	(0.017)	
Years education			0.256***	0.254***			0.257***	0.255***
			(0.017)	(0.017)			(0.017)	(0.017)
Trust			0.005				0.016	
			(0.07)				(0.07)	
Christian			-0.046				-0.053	
			(0.093)				(0.092)	
Muslim			-0.300*	-0.262			-0.280*	-0.240
			(0.173)	(0.168)			(0.17)	(0.165)
Hindu			-0.224				-0.236	
			(0.452)				(0.459)	
Buddhist			1.138***	1.116***			1.103***	1.083***
			(0.333)	(0.325)			(0.33)	(0.322)
Noreligion			0.274***	0.273***			0.260***	0.262***
			(0.074)	(0.075)			(0.073)	(0.074)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
Country-Time FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	3,002	3,001	2,290	2,290	3,002	3,001	2,290	2,290
R^2	0.876	0.909	0.942	0.942	0.877	0.909	0.942	0.942
Residual Std. Error	0.346 (df=2,817)	0.297 (df=2,806)	0.236 (df=2,135)	0.237 (df=2,143)	0.344 (df=2,817)	0.296 (df=2,806)	0.236 (df=2,135)	0.237 (df=2,143)
F Statistic	108.5***	144.8***	224.9***	236.5***	109.5***	145.1***	224.9***	236.4***

Note: The regressions estimate the effect of culture (Independence, Obedience) on logarithmized regional GDP p.c. for the full dataset including all control variables (1-3) and (5-7) and a reduced set with significant control variables only (4) and (8) i.e. without inverse distance to coast, Ln(Oil Gas Production), logarithmized population density, Temperature, the number of borders to other countries, percentage of trusting people, Christians and Hindus; and country, time, and country-time fixed effects. Robust clustered standard error estimates (Region-level) are presented below the coefficients. Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01; Other religion is the omitted category.

We consider specifications (3) and (7) the most stringent and conservative setting. In this setting, we predict that an increase of the regional share of people who appreciate the cultural value *Independence* by 10-percentage points raises regional GDP per capita by about 1.4 percent, while a similar increase in the regional share of people who value *Obedience* is associated with a decrease in regional GDP per capita by about 1.2 percent[26].

We also provide estimations for specifications where we exclude statistically insignificant controls to ensure that our results are not driven by them. These results are presented in specifications (4) and (8). Again, both regional cultural variables show the now common relationship with incomes per capita at the regional level.

The R^2 in all our specifications suggests a good predictive quality of our estimation model and this type of analysis. The country, time, and country-time fixed effects take out most of the variation in regional GDP per capita and additional controls explain a relatively small fraction of the remaining variation.

Our results are consistent with the cross-country evidence from Gorodnichenko and Roland (2017), who find a robust positive although slightly smaller effect of Hofstede's individualism index on income per worker, and from Tabellini (2010), who finds a consistently negative impact of *Obedience* on yearly growth. Thus, our baseline results suggest that cultural variables matter for income per capita and that existing cross-country results carry on to the regional level. This is relevant because if we had found that culture at the regional level was irrelevant for incomes per capita, the potential generalizability of the existing cross-country literature would have to be questioned to a relevant degree. At the same time the above results suggest that regional culture matters independently of any potential concept of national culture.

2.4.2 Robustness tests

Table 3 investigates the robustness of our main results along several dimensions for the cultural value *Independence* in panel (a) and the cultural value *Obedience* in panel (b)[27].

[26] These results support the view that *Obedience* is the opposite of *Independence* as it roughly affects income to the same extent but in different directions.

[27] We outline the set of fixed effects at the top of the table which are employed in panel (a) and (b) to facilitate the overview.

Table 3: *Robustness tests for the effect of Independence (panel a) and Obedience (panel b) on regional per capita income*

	(1) Resp. > 50	(2) Resp > 50	(3) Regional FE	(4) Regional FE	(5) Instrument	(6) Instrument	(7) 10-year-periods	(8) 10-year-periods	(9) Quality mapping: A,B,C	(10) Quality mapping: A,B,C
Country FE	YES	YES	NO	NO	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country-Time FE	YES	YES	NO	NO	YES	YES	YES	YES	YES	YES
Region FE	NO	NO	YES	YES	NO	NO	NO	NO	NO	NO
Control set 1	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Control set 2	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Panel (a): Independence										
Independence	0.811***	0.195**	0.135***	0.200***	-4.422	3.367*	0.598***	0.164*	0.405***	0.124
	(0.116)	(0.087)	(0.042)	(0.051)	(10.082)	(1.857)	(0.103)	(0.089)	(0.096)	(0.092)
Observations	2,368	1,865	3,002	2,290	539	438	2,201	1,800	1,425	952
R^2	0.882	0.948	0.985	0.988	0.711	0.913	0.882	0.944	0.887	0.949
Residual Std. Error	0.350 (df=2,185)	0.230 (df=1,711)	0.151 (df=1,780)	0.139 (df=1,285)	0.606 (df=394)	0.337 (df=308)	0.349 (df=2,070)	0.241 (df=1,673)	0.340 (df=1,264)	0.232 (df=816)
F Statistic (1)-(4); Wald test (5)-(6)	89.7***	203.6***	96.58***	104.4***	8.23***	26.3***	118.6***	221.8***	61.94***	112.7***
Weak instruments					0.257	0.554				
Wu-Hausman Test					0.014*	0.148				

Panel (b): Obedience

Obedience	-0.954***	-0.202**	0.046	0.087	-3.871	9.080	-0.801***	-0.143*	-0.485***	-0.070
	(0.130)	(0.093)	(0.054)	(0.063)	(8.594)	(12.596)	(0.103)	(0.082)	(0.100)	(0.081)
Observations	2,368	1,865	3,002	2,290	539	438	2,201	1,800	1,425	952
R^2	0.883	0.948	0.985	0.988	0.837	0.927	0.884	0.943	0.888	0.949
Residual Std. Error	0.348 (df=2,185)	0.230 (df=1,711)	0.152 (df=1,780)	0.141 (df=1,285)	0.454 (df=394)	0.310 (df=383)	0.346 (df=2,070)	0.241 (df=1,673)	0.339 (df=1,264)	0.233 (df=816)
F Statistic (1)-(4); Wald test (5)-(6)	90.91***	203.7***	95.56***	102.2***	14.65***	31.53***	121.1***	221.7***	62.46***	112.4***
Weak instruments					0.062*	0.0357*				
Wu-Hausman Test					0.003**	0.173				

Note: The regressions estimate the effect of culture (Independence, Obedience) on logarithmized regional GDP p.c. for (1-2) a data subsample with respondents per regions >50 including all control variables and country, time, and country-time fixed effects, (3-4) regressions with regional and time fixed effects, (5-6) 2SLS regressions with logarithmized genetic distance to the South East of the United Kingdom (Ln(Genetic distance B*27)) as instrument including all control variables and country, time, and country-time fixed effects, (7-8) a data sample with three 10 year averages (1980-1990; 1991-2000; 2001-2010) and (9-10) a data subsample with quality mappings A, B, C including all control variables and country, time, and country-time fixed effects. Robust clustered standard error estimates (Region-level) are presented below the coefficients. Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01; Control variables set 1 includes the following covariates: Latitude, Inverse distance to coast, Malaria ecology, Ln(Oil Gas Production), Ln(Pop density), Capital in region, Temperature, Landlockedregion, Length coast, Border to other regions and the number of borders to other countries. Control variables set 2 includes the following covariates: Years education, Trust, Christian, Muslim, Hindu, Buddhist, No religion and other religion (omitted category). Endogeneity tests (Weak instrument and Wu-Hausman) are given for specifications without fixed effects and without clustered standard errors.

Firstly, we consider a subsample that includes data for those regions where the number of respondents is above 50 in specifications (1) with all fixed effects but without controls and in specification (2) with all fixed effects and all covariates. While any threshold is to some degree arbitrary, we choose a threshold of 50 respondents as this assures a (subjectively and statistically) relevant number of interviewed individuals as well as a sufficiently large sample for our analysis. Indeed, approximately 80% of the original sample contains more than 50 respondents per region. This approach also reduces the potential risk of distortion by outliers and may help improve the representativeness of our samples. Regarding our results, the cultural value *Independence* remains a positive and statistically significant predictor for regional GDP per capita, while the cultural value *Obedience* is negatively associated with regional GDP per capita. Quantitatively, the magnitude of the link between culture and income grows stronger compared to the results in **Table 2** which raises our confidence that our results are not an artifact of issues of representativeness. Adding to this issue, we will provide further evidence (see **Table 4**) that our results are overall robust towards the variation of the 50-respondents-threshold and other quality checks regarding the data. We first set the threshold to regions with at least 100 (approx. 60% of the original sample remain) and then 150 (approx. 45% of the original sample remain) respondents. Secondly, we specify a ratio of respondents to regional population exceeding 0.01% as a further test. Moreover, **Table 4** also shows that results remain valid for further variations of data matching qualities (employing data with matching quality A and data with matching quality D, E, F separately).

In specifications (3) and (4) of **Table 3**, we turn to a highly conservative setting by employing region fixed effects and year fixed effects instead of country-time fixed effects. The inclusion of region fixed effects takes out time-invariant across-region variation such that we only exploit changes in regional culture over time. This approach further mitigates the risk of omitted variable bias to a substantial degree. The set of control variables naturally excludes time-invariant regional variables (e.g., distance to coast) when we estimate with region fixed effects. The empirical results reveal again a comparatively robust relationship between regional *Independence* and regional incomes per capita. An increase in the share of people who value *Independence* over time by ten percentage points is linked to an increase in regional GDP by 1.3 to 2%.[28] *Obedience* meanwhile loses its statistical significance.

We show results of our second stage instrumental variable estimations in specifications (5) and (6) using genetic distance as an instrument. Our instrument follows Gorodnichenko and Roland (2011, 2017) and measures the genetic distance in terms of the allele frequency HLA-B*27. The cross-country literature has shown allele frequency to be a relevant instrument and also suggested that culture is exogenous to income per capita. We provide a discussion of this instrumental variable strategy in **Exhibit 1** in the Supplementary Material. Unfortunately, the instrument is only available for 191 regions

[28] However, since aggregate psychological traits are rather slow-moving factors, the model might identify sampling variation instead of actual structural changes in such traits. Given a large number of robustness tests (including 10-year-averages, that potentially take out a lot of the variation) and that we matched economic and cultural data with a time lag of up to ten years, we minimized that risk to a certain extent.

due to data restrictions. Thus, we observe a substantial reduction in observations below 20% of the original number. While endogeneity tests suggest some explanatory power of the instrument for the variable *Obedience*, it is at best a weak instrument for *Independence* (results for the first-stage regression show a significant coefficient in the presence of all covariates). The coefficients of the second stage regressions tend to show that the effects are insignificant when employing the IV strategy for the reduced sample. Thus, although our cultural variables are lagged, we would like to mention the caveat that we cannot fully exclude a potential reverse causality in our previous findings following standard econometric procedures[29]. Moreover, despite the theoretic evidence for the suitability of genetic distance as an instrument for the influence of culture on income, we can hardly confirm it empirically[30]. We note again that it is particularly difficult to find a suitable instrument for culture, especially when analyzing culture at the regional level. Moreover, we point to the large literature which treats culture as exogenous and provides evidence for this assumption.

As EVS/WVS survey data is reported in six time waves only and we face many missing years, we also provide results for three ten-year periods, where we average survey data for these three decades (7-8). The association between culture and regional incomes per capita remains robust and their magnitude changes to a marginal degree.

Finally, we exclude regions with a potentially less reliable data matching quality level i.e., we use a sample of mapping grades A to C only (see **Table 8**). Even though the number of observations decreases, we can still observe the previously found impact of *Independence* and *Obedience* in specification (9), which is still robust with control set I but becomes statistically insignificant at conventional levels once control set II is added (specification 10).

Our analysis involves an intense data effort regarding matching regions at the geographical level. To systematically investigate the robustness of our main results, we offer a large array of further robustness tests which we describe in **Table 4**. With small exceptions, the results support the previously found association between regional cultural values and regional incomes per capita especially in the absence of control set II which yields few of our specifications statistically significant at conventional levels.

Table 4 briefly describes the performed tests and gives the respective number of observations (for regressions without control variables as adding controls reduces the sample to some extent). It also

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[29] The relationship between our cultural variables and incomes per capita remains overall robust when we investigate the subsample of 191 regions but do not employ our instrument. Thus, it is likely that the instrument employed in the cross-country literature cannot be extended to the regional level.

[30] The HLA-type B*27 might not be adequate to capture the required genetic information in order to depict a comprehensive picture of genetic differences. Even though endogeneity tests suggest some relevance of our instrument we observe no correlation with our endogenous variables. Potentially, this might be due to the low number of observations, or a biased set of allele data caused by non-randomly selected individuals. In general, it remains demanding to use genetic differences as an instrument for personal traits in the regional population, given the variation in our data.

provides two regression results (one without and the other with all covariates) for each of our two cultural variables when country-time fixed effects are employed.

We briefly describe the main results here: Firstly, we provide two tests (1-2) in order to account for the regional heterogeneity and weight our cultural variables with regional population and income to ensure that our results are not driven by very small or poor regions (and vice versa). Results confirm our baseline regressions and support the positive influence of *Independence* and negative influence of *Obedience* for our total of 1,204 regions. Secondly, we further investigate the issue of representability of our data. Consequently, we complement and confirm our previous robustness checks with data subsamples of regions with quality mapping A and D, E and F as well as for data subsamples that show a relatively high number of respondents compared to regional populations (3-7).

As stated earlier, we find that the sample's distribution in terms of age groups, gender, and employment is broadly comparable to the actual population reported for around 140 European regions in 2000 and 2010 (see **Table 1**) for which we can make direct comparisons. Assuming that this holds for all available survey years, we run our baseline regressions for the entire set of European regions available in EVS and Eurostat (8), as well as for three subsets containing regions where the distribution of regional survey characteristics deviates by a maximum of 5% from the distribution in the total population (9-11). Results confirm the positive (negative) link between *Independence* (*Obedience*) and regional incomes but are sensitive to the inclusion of control variables which is most likely due to a significant drop in observations.

Table 4: *Summary of robustness tests for the effect of Independence and Obedience on regional per capita income*

	Test	Description	Regions	Results for Independence		Results for Obedience	
			Number (Observations)	**(1) FE and no controls**	**(2) FE and all controls**	**(1) FE and no controls**	**(2) FE and all controls**
(1)	Weighted culture	Cultural variables are weighted with the inverse of the logarithm of the regional population	1,204 (3,002)	**Confirmed** with the exception that Independence turns insignificant as soon as one adds control set II		**Confirmed**	
				*4.521 (1.084)****	*1.132 (0.990)*	*-8.994 (1.139)****	*-1.827 (0.885)**
(2)	Weighted culture	Cultural variables are weighted with the inverse of the logarithm of the national population	1,204 (3,002)	**Confirmed**		**Confirmed**	
				*9.483 (1.437)****	*2.471 (1.215)**	*-10.765 (1.395)****	*-2.131 (1.075)**
(3)	Regions with quality mapping A	Baseline regressions for Gennaioli et al. (2014) regions that were matched with WVS/EVS regions with mapping quality A	572 (1,166)	**Confirmed** with the exception that Independence turns insignificant as soon as one adds control set II		**Confirmed** with the exception that Obedience turns insignificant as soon as one adds control set II	
				*0.366 (0.093)****	*0.112 (0.071)*	*-0.439 (-0.099)****	*-0.061 (0.069)*
(4)	Regions with quality mapping D, E, F	Baseline regressions for Gennaioli et al. (2014) regions that were matched with WVS/EVS regions with mapping quality D, E, F	794 (1,577)	**Confirmed**		**Confirmed** with the exception that Obedience turns insignificant as soon as one adds control set II	
				*0.845 (0.144)****	*0.253 (0.110)**	*-0.841 (0.135)****	*-0.132 (0.102)*
(5)	Regions with large number of respondents	Baseline regressions for regions with a relatively high ratio of respondents (0.01% of regional population)	798 (1,471)	**Confirmed**		**Confirmed**	
				*0.876 (0.135)****	*0.307 (0.137)**	*-0.940 (0.129)****	*-0.304 (0.102)***

(6)	Regions with large number of respondents	Baseline regressions for regions that report at least 100 respondents	910 (1,815)	**Confirmed**		**Confirmed**	
				*1.084 (0.141)****	*0.210 (0.122)**	*-1.496 (0.188)****	*-0.241 (0.145)**
(7)	Regions with large number of respondents	Baseline regressions for regions that report at least 150 respondents	762 (1,364)	**Confirmed** with the exception that Independence turns insignificant as soon as one adds control set II		**Confirmed**	
				*1.236 (0.181)****	*0.151 (0.145)*	*-1.790 (0.246)****	*-0.348 (0.190)**
(8)	Regions available in Eurostat database	Baseline regressions for all survey regions (quality mapping A) that are available in Eurostat database	168 (557)	**Confirmed** with the exception that Independence turns insignificant as soon as one adds control set I		**Confirmed** with the exception that Obedience turns insignificant as soon as one adds control set II	
				*0.496 (0.171)****	*-0.010 (0.106)*	*-0.466 (0.159)****	*-0.098 (0.097)*
(9)	Regions available in Eurostat database	Baseline regressions for survey regions (quality mapping A) that are available in Eurostat database and that have a comparable gender distribution (i.e. +-5%)	117 (391)	**Confirmed** with the exception that Independence turns insignificant as soon as one adds control set I		**Confirmed** with the exception that Obedience turns insignificant as soon as one adds control set I	
				*0.529 (0.214)***	*0.014 (0.128)*	*-0.575 (0.210)****	*-0.109 (0.119)*
(10)	Regions available in Eurostat database	Baseline regressions for survey regions (quality mapping A) that are available in Eurostat database and that have a comparable employment ratio (i.e. +-5%)	48 (166)	**Not confirmed**		**Confirmed**	
				0.635 (0.443)	*0.390 (0.329)*	*-0.745 (0.322)***	*-0.413 (0.211)**

(11)	Regions available in Eurostat database	Baseline regressions for survey regions (quality mapping A) that are available in Eurostat database and that have a comparable share of people between 15 and 24 years (i.e. +-5%)	97 (314)	**Confirmed** with the exception that Independence turns insignificant as soon as one adds control set I		**Confirmed** with the exception that Obedience turns insignificant as soon as one adds control set I	
				*0.485 (0.263)**	*-0.078 (0.135)*	*-0.493 (0.264)**	*-0.132 (0.136)*
(12)	Regions with available instrument	Baseline regressions for regions where the instrument (logarithmized distance of B*27 allele to South East of United Kingdom) is available	191 (539)	**Confirmed** with the exception that Independence turns insignificant as soon as one adds control set II		**Confirmed** with the exception that Obedience turns insignificant as soon as one adds control set II	
				*0.940 (0.343)***	*0.066 (0.245)*	*-1.052 (0.321)***	*-0.192 (0.179)*
(13)	OECD regions	Baseline regressions for a subsample of OECD regions	526 (1,711)	**Confirmed**		**Confirmed** with the exception that Obedience turns insignificant as soon as one adds control set II	
				*0.598 (0.103)****	*0.170 (0.062)***	*-0.484 (0.090)****	*-0.099 (0.061)*
(14)	Christian regions	Baseline regressions for a subsample of regions with at least 50% Christians	554 (1,338)	**Confirmed**		**Confirmed** with the exception that Obedience turns insignificant as soon as one adds control set II	
				*0.576 (0.130)****	*0.120 (0.072)**	*-0.510 (0.103)****	*-0.066 (0.064)*
(15)	Regions without the capital city	Baseline regressions for a subsample of regions that do not contain the national capital	1,137 (2,829)	**Confirmed**		**Confirmed** with the exception that Obedience turns insignificant as soon as one adds control set II	
				*0.369 (0.074)****	*0.152 (0.072)**	*-0.442 (0.073)****	*-0.104 (0.064)*

(16)	Regions in Asia	Baseline regressions for a subsample of regions in Asia	344 (733)	**Confirmed** with the exception that Independence turns insignificant as soon as one adds control set II		**Confirmed** with the exception that Obedience turns insignificant as soon as one adds control set II	
				*0.520 (0.177)***	*0.008 (0.180)*	*-0.698 (0.228)***	*-0.276 (0.180)*
(17)	Regions in Europe	Baseline regressions for a subsample of regions in Europe	607 (1,630)	**Confirmed**		**Confirmed** with the exception that Obedience turns insignificant as soon as one adds control set II	
				*0.499 (0.100)****	*0.159 (0.087)**	*-0.559 (0.084)****	*-0.073 (0.060)*
(18)	Results for the year 2010	Baseline regressions for the year 2010	817 (817)	Partly confirmed; even though results stay robust with control set I only, one yields a negative (non-significant) impact of Independence on regional GDP		**Confirmed** with the exception that Obedience turns insignificant as soon as one adds control set II	
				*0.521 (0.144)****	*-0.136 (0.175)*	*-0.924 (0.178)****	*-0.110 (0.202)*
(19)	Results for the year 2000	Baseline regressions for the year 2000	721 (721)	**Confirmed**		Partly confirmed; results turn insignificant as soon as control set I is added and one yields a positive (non-significant) impact of Obedience on regional GDP in specification (2)	
				*0.655 (0.156)****	*0.294 (0.125)**	*-0.421 (0.149)***	*0.026 (0.115)*

(20)	Matched regions with a reduced timelag	Baseline regressions for a subsample of Gennaioli et al. (2014) regions that were matched with WVS/EVS regions with a maximum timelag of 2 years (instead of 10 years in all other regressions)	934 (2,048)	**Confirmed** with the exception that Independence turns insignificant as soon as one adds control set II		**Confirmed** with the exception that Obedience turns insignificant as soon as one adds control set II	
				*0.414 (0.098)****	*0.082 (0.073)*	*-0.565 (0.089)****	*-0.106 (0.074)*

Note: The regressions estimate the effect of culture (Independence, Obedience) on logarithmized regional GDP p.c. for a number of robustness checks including country, time, and country-time fixed effects and robust clustered standard error estimates (Region-level); Coefficients (Std. Errors) for specifications without controls are reported in columns (1), whereas coefficients (Std. errors) for specifications with all control variables (Set I and II) are reported in columns (2); Control variable set I includes the following covariates: Latitude, Inverse distance to coast, Malaria ecology, Ln(Oil Gas Production), Ln(Pop density), Capital in region, Temperature, Landlockedregion, Length coast, Border to other regions and the number of borders to other countries; Control variable set II includes the following covariates: Years education, Trust, Christian, Muslim, Hindu, Buddhist, No religion and other religion (omitted category).

In specification (12) we provide evidence that regions where the instrument for genetic distance is available, confirm the previously stated association between culture and income. We are looking at various data subsamples that represent regional specifics and that might reveal a potentially interesting variation of cultural values: OECD countries; regions with a share of Christians exceeding 50%; regions not containing the national capital; Asian regions and European regions (13-17). We also account for the bias of very different time periods (previously we were looking at a time span from 1980 to 2010) and consider results for the year 2010 and 2000 separately (18-19). In addition, when matching our two datasets, we reduce our originally permitted time lag of ten years to two years only which yields us with even more accurate results although for a significantly smaller dataset (20). All these tests provide further evidence regarding the existence of a non-negligible positive link between the cultural value *Independence* and regional incomes per capita while the link between the cultural value *Obedience* and regional incomes per capita is negative.

2.4.3 Moderating national institutions

The difficulty of separating the effects of national institutions from those of national culture have been highlighted in the literature (see e.g., Dearmon and Grier, 2009, Gorodnichenko and Roland, 2011, 2017, Licht et al., 2007). Diverse attempts to disentangle the two factors have not yet led to a comprehensive and consistent answer whether culture affects institutions or vice versa. Our data indicates a correlation of approximately 0.3 between our two regional cultural factors and three different measures for the national institutional quality (*Government Effectiveness, Rule of Law* and *Absence of Corruption*). Particularly, regarding corruption some literature suggests that a corruption-prone culture which is predominantly found in regions with a tendency to appreciate *Obedience* (see e.g., Ball, 2001, Chambers and Hamer, 2012, Kyriacou, 2016) will influence the power or even existence of an anti-corruption policy and vice versa. Our data does not allow us to investigate potentially causal links between culture and diverse institutional variables including corruption. However, employing regional culture and including country and time fixed effects contributes to solving the challenge of capturing the effect of national institutions over time and of separating it from the effects of regional culture. Moreover, we can take a fresh look at potential moderating links between culture and institutions. The relevant research question here is whether regional cultural variables have the potential to affect links between national institutions and income. To do so, we perform a more refined analysis with our regional data to investigate the interaction effects between regional culture and national institutions which the previous literature was unable to do. In **Table 5**, we estimate equation (2) to explore the moderating role of three measures for institutional quality (*Government Effectiveness, Rule of Law* and *Absence of Corruption*) on the influence of regional culture on regional GDP per capita.

The coefficients of all national institutional variables show a positive influence of institutions on regional GDP in all specifications, even when controlling for country and time fixed effects[31]. Moreover, we also observe that the regional cultural values of *Independence* and *Obedience* remain statistically relevant, although they become less robust when adding controls for human capital and religion (control set II).

We are particularly interested in the interaction terms between national institutions and regional culture. The interaction terms reveal that national institutions have a relevant moderating power on the influence of regional culture on regional GDP per capita. The significant interaction terms with *Independence* show a negative sign, meaning that the overall positive influence of *Independence* is reduced in the presence of strong institutions, i.e., higher *Government Effectiveness*, higher *Rule of Law* or higher *Absence of Corruption* at the national level reduces the influence of regional culture on regional GDP. Similarly, the negative effect of *Obedience* is weakened by strong institutions, which is expressed by the positive sign of the interaction terms with *Rule of Law* and *Absence of Corruption*.

These results support the view that national institutions and cultural values act as substitutes, i.e., with strong institutions, culture is less important while in nations with weak institutions, cultural traits matter more for economic development. This interpretation is consistent with results from Knack and Keefer (1997) who find that the effect of trust is lower in countries with high institutional quality. It also supports findings by Ahlerup et al. (2009) who argue that culture is more important in countries with low institutional quality.

[31] Note that when estimating with country-time fixed effects as in previous estimations, national institutions cannot be included as a control variable due to perfect collinearity.

Table 5: *The moderating role of national institutions (Government Effectiveness, Rule of Law, Absence of Corruption) for the effect of Independence and Obedience on regional per capita income*

Dependent variable: ln(Regional GDP per capita)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Control variables set 1	NO	YES	YES	NO	YES	YES	NO	YES	YES
Control variables set 2	NO	NO	YES	NO	NO	YES	NO	NO	YES
					Panel (a): Independence				
Independence	0.712***	0.565***	0.006	0.811***	0.648***	-0.018	0.735***	0.609***	0.116
	(0.167)	(0.142)	(0.171)	(0.183)	(0.158)	(0.185)	(0.158)	(0.136)	(0.162)
Government Effectiveness	1.664***	1.675***	1.182***						
	(0.173)	(0.149)	(0.245)						
Independence x Government Effectiveness	-0.562**	-0.532**	0.242						
	(0.241)	(0.218)	(0.256)						
Rule of Law				1.871***	1.830***	0.920***			
				(0.26)	(0.216)	(0.341)			
Independence x Rule of Law				-0.593**	-0.531**	0.332			
				(0.254)	(0.234)	(0.275)			
Absence of Corruption							1.740***	1.803***	1.058***
							(0.219)	(0.184)	(0.329)
Independence x Absence of Corruption							-0.625**	-0.641***	0.074
							(0.245)	(0.226)	(0.259)
Observations	2,132	2,132	1,424	2,132	2,132	1,424	2,132	2,132	1,424
R^2	0.864	0.9	0.936	0.863	0.899	0.936	0.862	0.899	0.936
Residual Std. Error	0.369 (df=2,052)	0.317 (df=2,041)	0.259 (df=1,343)	0.37 (df=2,052)	0.318 (df=2,041)	0.26 (df=1,343)	0.371 (df=2,052)	0.319 (df=2,041)	0.26 (df=1,343)
F Statistic	164.5***	204.1***	247.5***	163.9***	202.8***	245***	162.9***	201.6***	244.7***

Panel (b): Obedience									
Obedience	-0.670***	-0.431***	-0.184	-0.976***	-0.656***	-0.251	-0.896***	-0.628***	-0.302
	(0.182)	(0.161)	(0.191)	(0.202)	(0.181)	(0.203)	(0.185)	(0.165)	(0.186)
Government Effectiveness	1.652***	1.559***	1.435***						
	(0.186)	(0.154)	(0.191)						
Obedience x Government Effectiveness	0.146	0.156	0.002						
	(0.28)	(0.25)	(0.279)						
Rule of Law				1.642***	1.568***	1.086***			
				(0.257)	(0.218)	(0.355)			
Obedience x Rule of Law				0.742**	0.589**	0.123			
				(0.294)	(0.267)	(0.289)			
Absence of Corruption							1.306***	1.316***	1.179***
							(0.205)	(0.175)	(0.275)
Obedience x Absence of Corruption							0.847***	0.787***	0.309
							(0.3)	(0.28)	(0.293)
Observations	2,132	2,132	1,424	2,132	2,132	1,424	2132	2132	1424
R^2	0.865	0.9	0.937	0.864	0.899	0.936	0.863	0.898	0.936
Residual Std. Error	0.368 (df=2,052)	0.317 (df=2,041)	0.258 (df=1,343)	0.369 (df=2,052)	0.319 (df=2,041)	0.26 (df=1,343)	0.37 (df=2,052)	0.32 (df=2,041)	0.26 (df=1,343)
F Statistic	165.7***	203.7***	247.7***	164.7***	201.8***	244.8***	163.4***	200.6***	244.9***

Note: The regressions estimate the effect of regional culture (Independence, Obedience) on logarithmized regional GDP p.c. in regressions with national institutions (Government Effectiveness, Rule of Law, Control of Corruption) as well as their interaction with culture, including all control variables and country and time fixed effects. Robust clustered standard error estimates (Region-level) are presented below the coefficients. Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01; Control variables set 1 includes the following covariates: Latitude, Inverse distance to coast, Malaria ecology, Ln(Oil Gas Production), Ln(Pop density), Capital in region, Temperature, Landlockedregion, Length coast, Border to other regions and the number of borders to other countries. Control variables set 2 includes the following covariates: Years education, Trust, Christian, Muslim, Hindu, Buddhist, No religion and other religion (omitted category).

We further explore such interactions between regional culture and national institutions in **Table 6** and **Table 7**. In particular, we extract countries with a federal system of government from our sample (Forum of Federations, 2007) and rerun the regressions of **Table 5** for federal and centralized state systems. National institutions still have a strong effect on regional incomes in centralized state systems but lose their moderating role for regional culture. This is suggestive for the view that regional culture is more important in centralized states where regional culture can substitute the role of inexistent regional institutions. This contrasts with countries under a federal system as they are to some extent also characterized by more decentralized institutions that might themselves act as substitutes for regional culture[32].

Altogether, our results suggest that national institutions have a moderating effect on the link between regional culture and regional incomes per capita, which is consistent with the view that culture and institutions can act as substitutes.

[32] Unfortunately, we cannot explore potential moderating effects of regional institutions further as such data is not available to the best of our knowledge. Exploring such interactions could be an interesting avenue for future research.

Table 6: *The moderating role of institutions (Government Effectiveness, Rule of Law, Absence of Corruption) on Independence and Obedience for a subsample of countries with a federal state system*

Dependent variable: ln(Regional GDP per capita)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Control variables set 1	NO	YES	YES	NO	YES	YES	NO	YES	YES
Control variables set 2	NO	NO	YES	NO	NO	YES	NO	NO	YES
					Panel (a): Independence				
Independence	0.690*	0.725**	0.637*	1.219***	1.129***	0.591	1.034***	1.034***	0.653*
	(0.38)	(0.329)	(0.366)	(0.401)	(0.328)	(0.415)	(0.34)	(0.29)	(0.362)
Government Effectiveness	1.847***	1.864***	-0.091						
	(0.268)	(0.223)	(0.542)						
Independence x Government Effectiveness	-0.595	-0.735*	-0.294						
	(0.463)	(0.416)	(0.494)						
Rule of Law				2.113***	2.237***	0.765			
				(0.45)	(0.353)	(0.55)			
Independence x Rule of Law				-1.148**	-1.069**	-0.265			
				(0.484)	(0.417)	(0.571)			
Absence of Corruption							2.617***	3.075***	-0.494
							(0.574)	(0.476)	(0.738)
Independence x Absence of Corruption							-1.165***	-1.272***	-0.33
							(0.447)	(0.396)	(0.552)
Observations	684	684	518	684	684	518	684	684	518
R^2	0.847	0.89	0.914	0.846	0.889	0.914	0.843	0.887	0.914
Residual Std. Error	0.37 (df=659)	0.317 (df=648)	0.265 (df=480)	0.372 (df=659)	0.318 (df=648)	0.265 (df=480)	0.375 (df=659)	0.321 (df=648)	0.265 (df=480)
F Statistic	152***	149.5***	138***	150.8***	148.5***	138.4***	147.7***	145***	138.3***

				Panel (b): Obedience					
Obedience	-0.332	0.194	-0.156	-0.518	0.173	-0.282	-0.333	0.141	-0.118
	(0.474)	(0.383)	(0.408)	(0.505)	(0.419)	(0.429)	(0.427)	(0.355)	(0.394)
Government Effectiveness	2.024***	2.053***	0.411						
	(0.332)	(0.274)	(0.481)						
Obedience x Government Effectiveness	0.033	-0.414	0.157						
	(0.588)	(0.489)	(0.491)						
Rule of Law				1.970***	2.182***	0.879			
				(0.518)	(0.421)	(0.584)			
Obedience x Rule of Law				0.375	-0.313	0.317			
				(0.611)	(0.516)	(0.526)			
Absence of Corruption							2.382***	2.712***	0.009
							(0.534)	(0.478)	(0.566)
Obedience x Absence of Corruption							0.349	-0.066	0.135
							(0.588)	(0.506)	(0.541)
Observations	684	684	518	684	684	518	684	684	518
R^2	0.846	0.888	0.912	0.842	0.885	0.912	0.839	0.883	0.912
Residual Std. Error	0.372 (df=659)	0.319 (df=648)	0.268 (df=480)	0.377 (df=659)	0.324 (df=648)	0.268 (df=480)	0.38 (df=659)	0.327 (df=648)	0.269 (df=480)
F Statistic	150.8***	147.1***	134.5***	145.8***	142.3***	135.1***	143.1***	139.6***	134.3***

Note: The regressions estimate the effect of regional culture (Independence, Obedience) on logarithmized regional GDP p.c. in regressions with national institutions (Government Effectiveness, Rule of Law, Control of Corruption) as well as their interaction with culture for a subset of federalist countries, including all control variables and country and time fixed effects. Robust clustered standard error estimates (Region-level) are presented below the coefficients. Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01; Control variables set 1 includes the following covariates: Latitude, Inverse distance to coast, Malaria ecology, Ln(Oil Gas Production), Ln(Pop density), Capital in region, Temperature, Landlockedregion, Length coast, Border to other regions and the number of borders to other countries. Control variables set 2 includes the following covariates: Years education, Trust, Christian, Muslim, Hindu, Buddhist, No religion and other religion (omitted category).

Table 7: *The moderating role of institutions (Government Effectiveness, Rule of Law, Absence of Corruption) on Independence and Obedience for a subsample of countries with a centralized state system*

Dependent variable: ln(Regional GDP per capita)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Control variables set 1	NO	YES	YES	NO	YES	YES	NO	YES	YES
Control variables set 2	NO	NO	YES	NO	NO	YES	NO	NO	YES
					Panel (a): Independence				
Independence	0.635***	0.496***	0.096	0.631***	0.499***	0.005	0.553***	0.431***	0.085
	(0.198)	(0.167)	(0.214)	(0.217)	(0.189)	(0.224)	(0.186)	(0.16)	(0.201)
Government Effectiveness	1.833***	1.778***	2.200***						
	(0.266)	(0.23)	(0.392)						
Independence x Government Effectiveness	-0.333	-0.409	-0.004						
	(0.342)	(0.317)	(0.341)						
Rule of Law				1.648***	1.542***	1.300***			
				(0.321)	(0.276)	(0.475)			
Independence x Rule of Law				-0.284	-0.365	0.205			
				(0.343)	(0.323)	(0.334)			
Absence of Corruption							1.493***	1.510***	1.424***
							(0.256)	(0.226)	(0.524)
Independence x Absence of Corruption							-0.18	-0.312	0.006
							(0.342)	(0.331)	(0.342)
Observations	1,448	1,448	906	1,448	1,448	906	1,448	1,448	906
R^2	0.856	0.9	0.945	0.856	0.899	0.944	0.856	0.899	0.944
Residual Std. Error	0.369 (df=1,388)	0.309 (df=1,377)	0.244 (df=840)	0.369 (df=1,388)	0.31 (df=1,377)	0.246 (df=840)	0.369 (df=1,388)	0.31 (df=1,377)	0.246 (df=840)
F Statistic	140.1***	176.3***	224***	139.6***	175.4***	219.6***	139.7***	175.9***	219.7***

	Panel (b): Obedience								
Obedience	-0.627***	-0.537***	-0.184	-0.987***	-0.783***	-0.291	-0.999***	-0.823***	-0.408*
	(0.206)	(0.184)	(0.226)	(0.235)	(0.215)	(0.24)	(0.206)	(0.188)	(0.217)
Government Effectiveness	1.665***	1.412***	2.186***						
	(0.273)	(0.216)	(0.328)						
Obedience x Government Effectiveness	-0.259	0.254	-0.046						
	(0.403)	(0.344)	(0.393)						
Rule of Law				1.539***	1.288***	1.537***			
				(0.278)	(0.23)	(0.432)			
Obedience x Rule of Law				0.525	0.713*	0.117			
				(0.409)	(0.368)	(0.382)			
Absence of Corruption							1.207***	1.054***	1.478***
							(0.243)	(0.204)	(0.463)
Obedience x Absence of Corruption							0.757*	1.067***	0.484
							(0.4)	(0.378)	(0.394)
Observations	1,448	1,448	906	1,448	1,448	906	1,448	1,448	906
R^2	0.859	0.9	0.946	0.859	0.9	0.945	0.859	0.901	0.945
Residual Std. Error	0.365 (df=1,388)	0.308 (df=1,377)	0.243 (df=840)	0.365 (df=1,388)	0.308 (df=1,377)	0.245 (df=840)	0.365 (df=1,388)	0.308 (df=1,377)	0.245 (df=840)
F Statistic	142.9***	177.5***	225.1***	143.2***	177.6***	221***	143.2***	178.4***	221.5***

Note: The regressions estimate the effect of regional culture (Independence, Obedience) on logarithmized regional GDP p.c. in regressions with national institutions (Government Effectiveness, Rule of Law, Control of Corruption) as well as their interaction with culture for a subset of centralized countries, including all control variables and country and time fixed effects. Robust clustered standard error estimates (Region-level) are presented below the coefficients. Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01; Control variables set 1 includes the following covariates: Latitude, Inverse distance to coast, Malaria ecology, Ln(Oil Gas Production), Ln(Pop density), Capital in region, Temperature, Landlockedregion, Length coast, Border to other regions and the number of borders to other countries. Control variables set 2 includes the following covariates: Years education, Trust, Christian, Muslim, Hindu, Buddhist, No religion and other religion (omitted category).

2.5 CONCLUDING REMARKS

This paper complements the literature on the relationship between culture and economic development in two new ways: First, we shift the view from the potential effects of a national culture on national GDP to the regional (subnational) level by composing a new dataset that contains 1,204 regions. This allows us to analyze the impact of *regional* cultural variables on *regional* incomes per capita. Empirically, we can control for country-, time- and country-time-specific effects to tackle an important number of endogeneity concerns. According to the best of our knowledge, this is the first contribution that does so for a large set of different regions around the world. We show that intra-country heterogeneity in culture and incomes is relevant and that regional cultural values of *Independence* and *Obedience* are robustly associated with regional incomes.

Second, our data allows us to address the relationship between culture and national institutions, which has been a major concern in past research efforts. Our findings suggest that national institutions have the potential to moderate the influence of regional cultural variables. In countries with strong national institutions, e.g., a high rule of law, the link between regional culture and regional incomes is weaker such that culture and institutions can be seen as substitutes.

We conduct a large set of checks to ensure the robustness of our main insights. Particularly, we investigate the robustness to different subsamples and try to address the likelihood of remaining potential endogeneity concerns in our estimates. Most of our results are statistically robust, but limitations remain which we would like to outline for future research efforts. Our approach allows us to account for country-time fixed effects and regional fixed effects (in robustness tests) to overcome omitted variable issues present in the cross-country literature but, of course, some issues stemming from potentially unobserved *regional* covariates might still be present. In that sense, our analysis is an improvement in comparison to the existing literature, but it requires to be extended by collecting additional time-variant control variables at the regional level beyond the effort that we have already made. For example, our dataset lacks information on migration within countries. Migration affects the composition of the population within regions and thereby potentially the shares of people holding certain cultural values. Although there are theoretically appealing suggestions for instruments for culture based on genetic distance, these instruments do not seem to perform particularly well empirically, and from a strict econometric viewpoint, one instrument can at most be used for one cultural variable[33]. The performance of genetic distance for regional culture might be seen as mediocre to a certain degree. Culture itself is, of course, also a fluid concept which depends on individual interpretation of the questions asked in surveys. Muthukrishna et al. (2020) argue that psychological data are dominated by samples drawn from Western,

[33] This is an issue which is not sufficiently discussed in the literature according to our view (see e.g., Gorodnichenko and Roland, 2017)

educated, industrialized, rich, and democratic (WEIRD) nations, which limits the comparability of survey answers across the world.

We employ *Independence* and *Obedience* as our cultural proxies. They are supposedly related to individualism (valuing achievements) and collectivism (conformity to a group), respectively. However, it is not yet entirely clear how diverse measures of culture relate to each other, and most of them are based on stated values. More generally speaking, there might be a significant (regional) difference in the interpretation of the values *Independence* and *Obedience*. Exploring such differences in interpretation might be a promising avenue for future research. We also suggest that future research should explore which other aspects of culture (norms, beliefs) are most favorable for economic development. We provide detailed information of matching regional data in **Table 30** which should facilitate the exploration of other aspects of culture to future researchers. Thus, we propose to look more often at regional differences, as within-country variation turns out to be relatively important.

Regarding policy consequences, our results suggest that certain regional cultural characteristics are potentially favorable for regional economic prosperity. At the same time, our results point to the importance of favorable national institutions for development and their interaction with culture.

Table 8: *Data matching quality levels*

Variable	Description	Example
A	Region name in Gennaioli et al. (2014) exactly corresponds to WVS/EVS region.	Gennaioli et al. (2014): Tirana; WVS: AL: Tirana
B	Region name in Gennaioli et al. (2014) is a very close approximation to WVS/EVS region. OR: Region in one dataset contains an additional smaller (in terms of population) region that is not included in the region of the other dataset.	Gennaioli et al. (2014): Distrito Federal; WVS: MX: Zona metropolitana OR: Gennaioli et al. (2014): Ankara and Kirikkale; WVS: TR: Ankara (center)
C	Region in Gennaioli et al. (2014) is higher aggregated than the WVS/EVS region. Several WVS/EVS were summarized in order to exactly match the corresponding Gennaioli et al. (2014) region.	Gennaioli et al. (2014): Prov. Brabant; EVS: BE: Vlaams Brabant, BE: Waals-Brabant
D	See C, but summarized regions in WVS/EVS lack one or more region(s) in order to fully represent the corresponding Gennaioli et al. (2014) region.	Gennaioli et al. (2014): Jylland; EVS: DK: Danmark - Midtjylland, DK: Danmark - Nordjylland
E	Region in WVS/EVS is higher aggregated than the Gennaioli et al. (2014) region. WVS/EVS data for one region is (fully) allocated to several regions in Gennaioli et al. (2014) as both dataset report an an official regional division.	Gennaioli et al. (2014): Arizona, Colorado, Montana, Nevada, New Mexico, Utah, Wyoming; WVS: US: Rocky Mountain States
F	See E, but WVS/EVS report an unofficial regional division and therefore fail to fully represent one or more Gennaioli et al. (2014) region(s).	Gennaioli et al. (2014): Berat; Elbasan; Durres; WVS: AL: Center

Table 9: *Descriptive statistics*

Variable	**Description**	**Median**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Obs**	**Source**	**Corr w/ Ln (GDPregion)**
Ln(GDPregion)	Logarithm of the gross domestic product per capita in a region (in constant 2005 PPP US$).	8.85	8.87	1.18	5.24	12.02	7,493	Gennaioli et al. (2014)	1.00
Independence	Percentage of respondents in a region that mention “independence” as an important quality for children (Survey variable: A029).	0.46	0.47	0.20	0	1	3,002	WVS (2015); EVS (2015)	0.24
Obedience	Percentage of respondents in a region that mention “obedience” as an important quality for children (Survey variable: A042).	0.32	0.33	0.18	0	1	3,002	WVS (2015); EVS (2015)	-0.31
Trust (control set 2)	Percentage of respondents in a region that generally trust other people (Survey variable: A165).	0.29	0.31	0.17	0	1	3,022	WVS (2015); EVS (2015)	0.30
Christian (control set 2)	Percentage of respondents in a region that reported "Christian" as their religious denomination (answers include "Catholic: doesn't follow rules", "Christian", "Christian Fellowship", "Christian Reform", "Greek Catholic", "Other: Christian com", "Protestant", "Roman Catholic") (Survey variable: F025).	0.40	0.39	0.36	0	1	3,026	WVS (2015); EVS (2015)	0.37
Muslim (control set 2)	Percentage of respondents in a region that reported "Muslim" as their religious denomination (Survey variable: F025).	0.00	0.07	0.21	0	1	3,026	WVS (2015); EVS (2015)	-0.33
Noreligion (control set 2)	Percentage of respondents in a region that reported "No religion" as their religious denomination (Survey variable: F025).	0.02	0.15	0.22	0	1	3,026	WVS (2015); EVS (2015)	0.09

Hindu (control set 2)	Percentage of respondents in a region that reported "Hindu" as their religious denomination (Survey variable: F025).	0.00	0.02	0.11	0	1	3,026	WVS (2015); EVS (2015)	-0.24
Buddhist (control set 2)	Percentage of respondents in a region that reported "Buddhist" as their religious denomination (Survey variable: F025).	0.00	0.06	0.18	0	1	3,026	WVS (2015); EVS (2015)	0.00
Otherrel (control set 2)	Percentage of respondents in a region that reported a religious denomination other than Christian, Muslim, Buddhist, Hindu or no religion (e.g., Confucianism, Zionist, Taoist, Anglican, not availabel etc.) (Survey variable: F025).	0.18	0.32	0.33	0	1	3,026	WVS (2015); EVS (2015)	-0.17
Government Effectiveness	The index captures the "perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies." The index originally ranged between -2.5 and +2.5, with higher values indicating stronger governance performance, but was normed to range from 0 to 1.	0.38	0.45	0.26	0	1	4,056	World Bank (2017)	0.77

Rule of Law	The index captures the “perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence”. The index originally ranged between -2.5 and +2.5, with higher values indicating stronger governance performance, but was normed to range from 0 to 1.	0.42	0.49	0.27	0	1	4,056	World Bank (2017)	0.73
Absence of Corruption	The index captures the "perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests." The index originally ranged between -2.5 and +2.5, with higher values indicating stronger governance performance, but was normed to range from 0 to 1.	0.31	0.41	0.26	0	1	4,056	World Bank (2017)	0.75
Ln(Genetic distance B*27)	The variable captures the (logarithmized) genetic distance to the South West of the United Kingdom in terms of the regional allele frequency B*27. The variable is calculated by substracting the allele frequency of B*27 in the South West of the UK from the allele frequency B*27 in any given region. The distance is given as non-negative values (modulus |x|).	-3.28	-3.51	0.74	-6.91	-2	1,147	González-Galarza et al. (2015)	-0.08
Latitude (control set 1)	Latitude of the centroid of each region calculated in ArcGIS.	37.53	33.53	16.70	0.02	69.95	7,493	Gennaioli et al. (2014)	0.57

Inverse distance to coast (control set 1)	The ratio of 1 over 1 plus the region's average distance to the nearest coastline in thousands of kilometres. Higher values for this variable indicate that a region is closer to the coast, smaller values indicate larger average distances to the coast. Gennaioli et al. (2014) create an equal distance projection of the Collins-Bartholomew World Digital Map and a map of the coastlines. With these two maps Gennaioli et al. (2014a) create a raster with the distance to the nearest coastline of each cell in a given region. In order to obtain the average distance to the nearest coastline, the authors sum the distance to the nearest coastline of all cells within each region and divide that sum by the number of cells in the region.	0.01	0.03	0.05	0.00	0.65	7,493	Gennaioli et al. (2014)	0.10
Malaria ecology (control set 1)	The “malaria ecology” index of Kiszewski et al. (2004) measures the risk of being infected by Malaria. The index variable ranges from 0 to 39 with higher values indicating a higher risk and thus less Malaria stability. The index takes into account both climatic factors and the dominant vector species to give an overall measure of the component of malaria variation that is exogenous to human intervention. The index is calculated for grid squares of one half degree longitude by one half degree latitude. Regional averages are calculated via ArcGIS.	0.01	1.23	2.96	0.00	28.68	7,493	Gennaioli et al. (2014)	-0.44

Ln(Oil Gas Production) (control set 1)	(Logarithmized) cumulative oil, gas and liquid natural gas production from the time production began to 2000. Oil and liquid natural gas were collected in millions of barrels. Gas was collected in billions of cubic feet and divided by 6 to convert to millions of barrels of oil equivalents.	0.00	0.00	0.01	0.00	0.12	7,493	Gennaioli et al. (2014)	0.11
Ln(Pop density) (control set 1)	Logarithm of the population density which is measured as people per square kilometres in a region.	4.20	4.14	1.69	-4.06	10.06	7,493	Gennaioli et al. (2014)	0.06
Capital in region (control set 1)	Dummy variable that is equal to 1 if the region contains a national capital city, 0 otherwise.	0.00	0.05	0.22	0	1	7,493	Gennaioli et al. (2014)	0.11
Years education (control set 2)	Average years of schooling from primary school onwards for the population aged 15 years or older in a region.	7.74	7.55	3.14	0.67	13.76	5,198	Gennaioli et al. (2014)	0.76
Temperature (control set 1)	Monthly average of daily mean temperature (Celsius) averaged across all data points within the subnational region.	12.66	14.32	8.26	-14.49	28.19	1,016	Gennaioli et al. (2014)	-0.48
1/Ln_regpop	Inverse of the logarithm of the population in a region.	0.07	0.07	0.00	0.05	0.11	7,493	Gennaioli et al. (2014)	0.04
1/Ln_natpop	Inverse of the logarithm of the population in a country.	0.06	0.06	0.00	0.05	0.07	7,493	Gennaioli et al. (2014)	0.05
Landlocked-region (control set 1)	Dummy variable that is equal to 1 if the region is landlocked, 0 otherwise.	1	0.57	0.50	0	1	7,493	ArcGIS	-0.18
Length coast (control set 1)	Length of coast in km.	0	405	3,431	0	103,225	7,490	ArcGIS	0.09
Border to other regions (control set 1)	Dummy variable that is equal to 1 if the region has a border to another region in a neighboring country, 0 otherwise.	0	0.45	0.50	0	1	7,490	ArcGIS	-0.12

No countryborders (control set 1)	Number of borders to other countries incl. a region's own country border.	1	1.60	0.86	0	8.00	7,490	ArcGIS	-0.13

CHAPTER 3 EVALUATING WATER- AND HEALTH-RELATED DEVELOPMENT PROJECTS: A CROSS-PROJECT AND MICRO-BASED APPROACH

ABSTRACT[34]

We present a micro-based approach to evaluate the effect of water- and health-related development projects which can complement established evaluation methods. We collect information from 1.8 million individuals from DHS clusters (Demographic and Health Surveys) in 38 developing economies between 1986 and 2017. By geocodes, we combine cluster information with over 14,000 subnational projects from the World Bank. We then investigate the impact of the projects employing fixed effects estimation techniques. Our findings indicate that the time to gather water and child mortality tend to decrease when projects are realized. The quality of drinking water and sanitation facilities are also positively affected by projects. Our data allows us to account for cluster heterogeneity, which is a significant extension to the cross-country literature. Various robustness checks, covering data and methodological refinements, support our main findings.

JEL-Classification: O10; O22; R11

Keywords: Evaluation; development projects; drinking water; sanitation; child mortality

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A modified version of this article has been published at the *Journal of Development Studies* (see Greßer and Stadelmann, 2020b). An earlier version is also available as an *AidData* working paper (see Greßer and Stadelmann, 2020a).

3.1 INTRODUCTION

More than 2 billion people live with high water stress and about 4 billion people suffer from severe water scarcity at least one month per year (UNESCO, 2019). Access to clean water is often considered a priority when it comes to development. Improved sanitation and improved drinking water are argued to have a global average benefit-cost ratio of 5.5 and 2.0 respectively (see e.g., Hutton, 2013, Whittington et al., 2012). The poor in South Asia and Sub-Saharan Africa may particularly benefit from investments in Water, Sanitation and Health (WASH) as they can lead to declining mortality and gains towards global equity (see e.g., Jeuland et al., 2013). Support for WASH from international institutions and development agencies gains importance. We suggest a new cross-project and micro-based approach to evaluate WASH project's effectiveness and investigate mediating factors for their success or failure.

Macro-level studies (mostly cross-country) have analyzed the effectiveness of aid on growth and economic outcomes.[35] A growing literature turns away from the macro-perspective and follows a micro-based approach to evaluate development interventions (Cameron et al., 2016). Economists such as Esther Duflo and Abhijit Banerjee (e.g., in Banerjee and Duflo, 2012, Duflo et al., 2013) are agents for this micro-based approach and for randomized control trials (RCT)[36] to identify causal effects and assess the effectiveness of development projects. Nevertheless, it has been criticized that findings of RCTs have limited external validity (even if single projects are successful, this does not ensure success on the macro-level, in other countries, etc.) and unless large sums are invested, the approach is hardly scalable (e.g., Deaton, 2010 and Deaton and Cartwright, 2018). While long-term follow-ups of RCTs are possible (see e.g., Baird et al., 2016 or Bouguen et al., 2019), such studies involve considerable expenses and challenges.

We present an approach that allows ex-post evaluations of multiple development projects worldwide from a micro perspective which can serve as a complement to standard RCTs and other evaluation approaches. We follow research efforts that investigated the effectiveness of development work in the WASH sector where data is reasonably good and readily available (Botting et al., 2010, Gopalan and Rajan, 2016, Wayland, 2017, Wolf, 2007) and focus on the effect of development projects on the following four indicators: access to and quality of drinking water, toilet types and child mortality. We investigate the impact of projects on welfare of individuals from across the world. This allows us to account for regional heterogeneity and it highlights that our evaluation approach is scalable. To elaborate our approach, we use data from the World Bank[37] and combine it with data from various Demographic

[35] This literature offers contradicting results (see the literature review below and the meta-studies by Doucouliagos and Paldam, 2009, Mekasha and Tarp, 2013).

[36] Its principle consists in randomly assigning individuals to a treatment and a control group, which guarantees that unobservable characteristics are not reflected in the assignment and therefore any differences can be attributed to the impact of the treatment.

[37] We use geocoded data from World Bank projects, due to the institution's importance and its publicly available and transparent project descriptions. We do not aim to evaluate the World Bank as such.

and Health Surveys by geocode references. Thereby, we link World Bank projects with welfare outcomes of individuals in the vicinity of such projects and compare these individuals to others that could not have profited from them. We obtain a dataset that contains information on water and health-related questions for 1.8 million individuals from 38 countries. One third of these individuals had access to the services of 14,301 World Bank projects.[38] To our knowledge our dataset is the largest ever employed to evaluate effects of multiple development projects on individual welfare. Our approach can be extended to other agencies and national programs.

The structure of our dataset allows us to account for time invariant unobservables with fixed effects at the level of clusters, which are a small geographical unit of a few square kilometers from the Demographic and Health Surveys. This fixed effects approach reduces bias resulting from omitted variable bias, which could not be avoided in cross-country or even cross-regional studies.

Our empirical results suggest that the current and sector-independent presence of the World Bank through its projects has a negative and statistically significant effect on the time that individuals need to walk to the next drinking water source as well as the mortality of children in comparison to individuals that did not live in the vicinity of such projects. Projects also have a positive impact on the quality of drinking water and the quality of toilet facilities. Effects are stronger for World Bank projects which specifically target the water and sanitation sector. All results are robust to fixed effects strategies and various robustness tests. Regarding mechanisms, World Bank projects are more effective in relatively high developed clusters with well-educated individuals living in low-income countries. However, projects might lack sustainability as the effect of past projects is mostly dominated by the effect of current projects[39].

The remainder of this paper is organized as follows: Section 3.2 presents the related literature, Section 3.3 describes data and methodology, Section 3.4 lists all results of baseline regressions and robustness tests as well as mechanisms and Section 3.5 offers concluding remarks.

3.2 LITERATURE REVIEW

By combining data from the World Bank and Demographic and Health Surveys, we are able to provide a new cross-project and micro-based evaluation approach for numerous development projects

[38] Projects are counted by a unique identification number, which is a reference to the project type as well as the region it is conducted in. In most cases a project is planned to be conducted in a number of subnational regions, whereas every regional project (even though the setup is identical) has its own ID.

[39] As the correlation between past and current projects is approximately 0.34, we need to assume that this result is partly driven by the fact that current projects can be (to some extent) predicted from past projects i.e., the World Bank does not intentionally diversify regionally in every wave of new project allocation.

in different countries. Regarding our application, we extend the existing literature on the evaluation of development projects, in the field of water, sanitation and child health.

The UNESCO 2019 World Water Development Report states that *"access to water supply and sanitation services are essential to overcoming poverty and addressing various other social and economic inequities"* (UNESCO, 2019, p.201). The World Health Organization and UNICEF (2017) suggest that severe economic damage due to health problems can be caused by a lack of safely managed drinking water services (for 29% of the global population) and safely managed sanitation services (39% of global population). A large array of studies have analyzed the effects of water and sanitation quality as well as their reachability on health indicators, such as diarrhea or maternal mortality (e.g., Benova et al., 2014, Norman et al., 2010, Wang and Hunter, 2010). Often, evidence is derived within regions or countries (Bhalotra et al. (2017) for Mexico; Boone et al. (2011) for Madagascar; Duflo et al. (2015) and Dwivedi et al. (2018) for India; Gross et al. (2017) for rural Benin; Koolwal and van de Walle (2013) for a range of developing countries; Zhang (2012) for rural China). Special attention was attracted by the economic effects of a reduction in water collection time on women (e.g., Gross et al., 2017, Ilahi and Grimard, 2000, Koolwal and van de Walle, 2013, Ray, 2007, Sorenson et al., 2011). Given past research efforts, recent meta studies still suggests a higher tendency of water sources in low-income countries and rural areas to contain fecal contamination (see the review by Bain et al., 2014) but a substantially lower risk of diarrheal morbidity if interventions promote point-of-use filters, high-quality piped water to premises, sewer connections or hand-washing with soap (see the reviews by Wolf et al., 2014, 2018).

Potentially due to financial, political or institutional insufficiencies in low-income countries, non-governmental organizations as well as supra-national organizations gain importance. Edwards (2015) and Quibria (2014) provide comprehensive overviews of literature dealing with the effectiveness of development aid in general. Studies are split over their findings on whether aid is effective (e.g., Asteriou, 2009, Clemens et al., 2012, Dalgaard et al., 2004, Fayissa and El-Kaissy, 1999, Karras, 2006, Kotsadam et al., 2018, Mekasha and Tarp, 2013, Minoiu and Reddy, 2010, Roodman, 2007, etc.), ineffective (Burnside and Dollar, 2000, 2004, Easterly, 2003, Liew et al., 2012, Malik, 2008, Moyo, 2010, Rajan and Subramanian, 2008, etc.) or irrelevant (Bhattarai, 2016, C.-J. Dalgaard and Hansen, 2001, Doucouliagos and Paldam, 2009, Ekanayake and Chatrna, 2010, Hansen and Tarp, 2001, etc.) for long-term growth. In response to such ambiguous results, Banerjee and Duflo (2012) emphasized the need to conduct randomized control trials (RCTs) to evaluate the effectiveness of specific policy and development interventions. They state that RCTs provide valuable information that can guide reforms and aid programs as they take all project-specific circumstances into account. Due to limited external validity, project success cannot be guaranteed if circumstances change. Moreover, it is expensive and for the case of past projects impossible to evaluate development projects on a larger scale with RCTs. Thus, alternative evaluation methods are relevant. We suggest an alternative approach between macro evaluations and RCTs, which is informed and inspired by the latter.

Amongst the vast literature on the evaluation of aid in general, there are various efforts that assess sector-specific aid, such as improvements in the WASH sector, on a cross-project basis: Botting et al. (2010) find that access to safe water is 4 to 18 times more likely in countries that receive higher Official Development Assistance (ODA); Hopewell and Graham (2014) find that 60-80% of the targeted 31 cities in Sub-Sahara Africa experienced an increasing access to improved water supply and improved sanitation; results from Wayland (2017) indicate that households located near WASH aid projects are significantly more likely to use improved sources of drinking water and sanitation and are therefore exposed to a lower risk of water-related illnesses; Salami et al. (2014) stress the importance of development aid (from the African Development Bank (AfDB)) for the provision of water and sanitation facilities for Kenya, Burkina Faso, Madagascar and Uganda; results from Gopalan and Rajan (2016) suggest that development aid produces a positive effect on improved access to water supply and sanitation; and Wolf (2007) finds a positive association between aid volatility and outcomes in water and sanitation. Rutstein (2000), Woldemicael (2000), Gunther and Fink (2010), Fink et al. (2011), and Ezeh et al. (2014) find a negative association between the quality of sanitation and water facilities and the mortality of children. The results from Kotsadam et al. (2018) or Bendavid and Bhattacharya (2014) indicate that geographical proximity to active health aid reduces infant mortality and increases life expectancy. Among others, Kremer et al. (2011) and Njuguna (2019) argue that health effects can be realized through investments in spring protection and sanitation facilities in Kenya. We focus on development projects financed by the World Bank and on outcomes related to the WASH sector.

The World Bank, being the largest financier of development aid,[40] and its projects were evaluated by few independent impact evaluations:[41] Dreher et al. (2013) examine the ex-post performance ratings of (politically motivated) World Bank projects; Dollar and Svensson (2000) analyze the causes of success or failure of adjustment programs, using a new database on 220 reform programs; Kaufmann and Wang (1995) investigate the relationship between economy-wide policies and the performance of investment projects in education and health sectors; Isham and Kaufmann (1999) test how country characteristics and policies affect World Bank-funded investment productivity; Kareiva et al. (2008) evaluate biodiversity-focused World Bank projects with regards to poverty reduction and private sector development; Newman et al. (2002) conducted an impact evaluation of small-scale rural infrastructure projects in health, water, and education financed by the Bolivian Social Investment Fund; Wagstaff and Yu (2007) and Zhang (2012) investigate the effect of a health reform in China and of a major water quality improvement program in rural China on the health of adults and children. By combining information on World Bank projects with individual responses to water- and health-related questions

[40] See Federal Ministry for Economic Cooperation and Development Germany (2019)

[41] The World Bank Group itself has an independent evaluation function, which assesses the performance of the institution's policies, projects and processes (IEG Methodology, 2019). Most certainly, this body has more insights into projects than the external observer, nevertheless we believe in the benefits of a purely independent view from an outside perspective.

from worldwide Demographic and Health Surveys (DHS), we contribute to better understanding whether projects were successful or not.[42]

3.3 DATA AND METHODOLOGY

3.3.1 Data and Matching

We combine data from various Demographic and Health Surveys (DHS) with World Bank projects based on the geographical proximity of their latitudinal and longitudinal coordinates, i.e., we perform matching by geocodes.

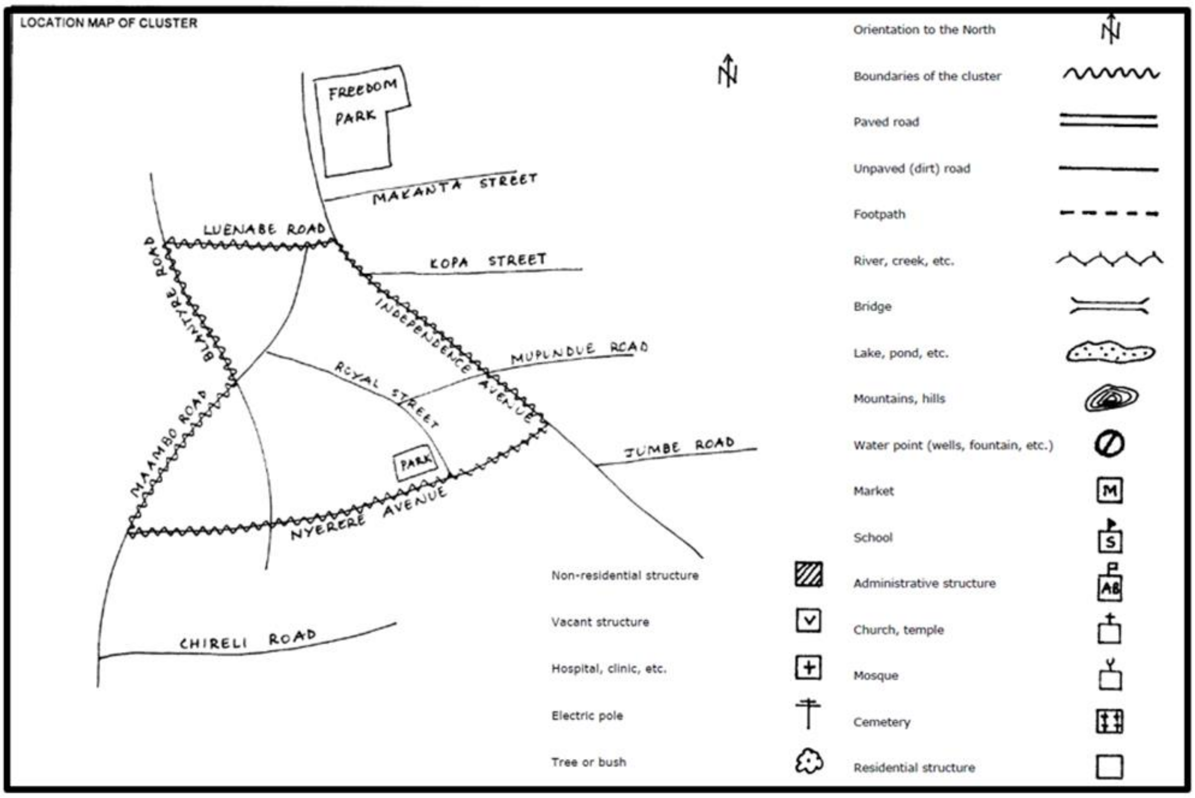
The DHS program is implemented by ICF International and is mainly funded by the *United States Agency for International Development* (USAID). Since 1984 it collects nationally-representative household survey data through more than 400 surveys, in more than 90 countries. Usually, sample size per country and year lies between 5,000 and 30,000 respondents and surveys are conducted about every 5 years to allow comparisons over time (see ICF International (2019b) for more information). Their surveys are complemented with a variety of geographic information from the *Geographic Information System* (GIS), which makes it possible to merge DHS data with other datasets.

For our analysis we use existing DHS grouping of individual respondents into geographical clusters, which are a representative selection of (segments of large) *Enumeration Areas* (EA), a statistical unit created as a counting unit for a census.[43] **Figure 4** presents an exemplary cluster in Mali taken from the DHS Sampling Manual (ICF International, 2012).

[42] The DHS data is frequently used to analyze health- and water-related questions. E.g., Capuno et al. (2015), Fotso et al. (2007), Doherty et al. (2016), Liwin and Houle (2019), Harttgen et al. (2019), Li et al. (2019) and Wang (2002) look at child mortality in the Philippines, South Africa, Ethiopia, Sierra Leone, Asian and Sub-Saharan countries, African countries and low-income countries.

[43] The use of DHS clusters and the individual level data therein distinguishes our approach from a recent working paper focusing on geographic grid cells and the link of World Bank activity on nightlights within these cells (see Bitzer and Goeren, 2018).

Figure 4: *Location map of an exemplary cluster in Mali*



For every survey year, DHS selects a number of EAs by probability proportional to size and a number of households by equal probability systematic sampling (see ICF International (2012) for more information). Clusters are consecutively numbered, and their center is indicated through the specification of latitude and longitude.[44] Due to changing EAs or reasons to protect the privacy of respondents (e.g., displacement of up to 10 km; see ICF International (2019a)) cluster coordinates might deviate from the coordinates of the respective cluster in the first survey year.[45] The selection process of clusters and households by the DHS allows for a theoretically non-biased statistical analysis and the DHS provides arguably one of the largest, thoroughly conducted surveys in the field of demographics and health. We will employ data of about 1.8 million individual answers from 153 surveys in 38 countries.

The focus of our analysis is on the effectiveness of World Bank projects regarding individual welfare in a certain geographic area. Similar to the literature, we use the following four dependent variables to evaluate the effectiveness of World Bank projects. Firstly, we have created an index variable

[44] For instance, in the case of Senegal, DHS conducted nine surveys between 1992 and 2016. The country is separated into a maximum of 14 gapless and non-overlapping regions (which resemble Senegal's current political regions) and further divided into 258 to 428 clusters for which between 6,310 and 19,441 interviews were conducted. On average this corresponds to around 50 respondents per cluster.

[45] Details and discussion of the panel structure of the DHS data, can be found in Exhibit 2. In a robustness check we create a cluster sub-sample that allows for a maximum latitude deviation of 10% to account for such changes in EAs.

called *Quality of drinking water* which recodes individual qualitative responses to the question ‘What is your main source of drinking water’ into numerical values reflecting the quality of drinking water. It ranges between 1 and 5.[46] *Quality of drinking water* is positively correlated (0.29) with a composite for nightlights, which can be seen as a proxy for the development state of the area (see e.g., Henderson et al., 2012). We also capture individual responses to the question ‘How many minutes does it take you to get to the water source for drinking water?’, called *Time to water*. Thirdly, we introduce another index variable called *Type of toilet*, which is also recoded from a qualitative description of the used toilet facility into numeric values ranging from 0 to 5.[47] Lastly, we want to explore the effect of the presence of the World Bank on child health. We employ a variable called *Deceased children* that summarizes answers to the following question related to child mortality: ‘How many of your own children (boys and girls) have died?’.

In addition to our four dependent variables we add various control variables linked to geographic conditions (such as rainfall, temperature, distance to rivers/sea and borders, droughts, malaria prevalence, nightlight composite and a dummy for whether the cluster is considered to be urban or rural), population, average education level and age, religious shares and the relation to and gender of the household head. Further data descriptions, descriptive statistics and sources can be found in **Table 18** and **Table 31** in the Appendix and in the Supplementary Material.

For our analysis we use individual data for countries, for which we found ongoing or past World Bank activities and where we have at least two DHS survey years available. We end up with data for 38 countries, 20 of them are lower-income, 13 are lower-middle income and 5 are upper-middle-income countries according to the World Bank classification, from 153 surveys, containing 1,793,783 individual responses to water and health specific questions.

We merge individual responses from the DHS with data on World Bank projects between 1986 and 2017[48] based on respective geocodes available in both datasets. In order to match every World Bank project with at least one DHS selected cluster, we allow for small deviations in their latitude and longitude coordinates.[49] **Figure 5** depicts an illustrative example for the matching procedure for one of

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[46] For instance, rainwater is of low quality (integer equals 1) and improved drinking water that is piped into the dwelling is of high quality (integer equals 5).

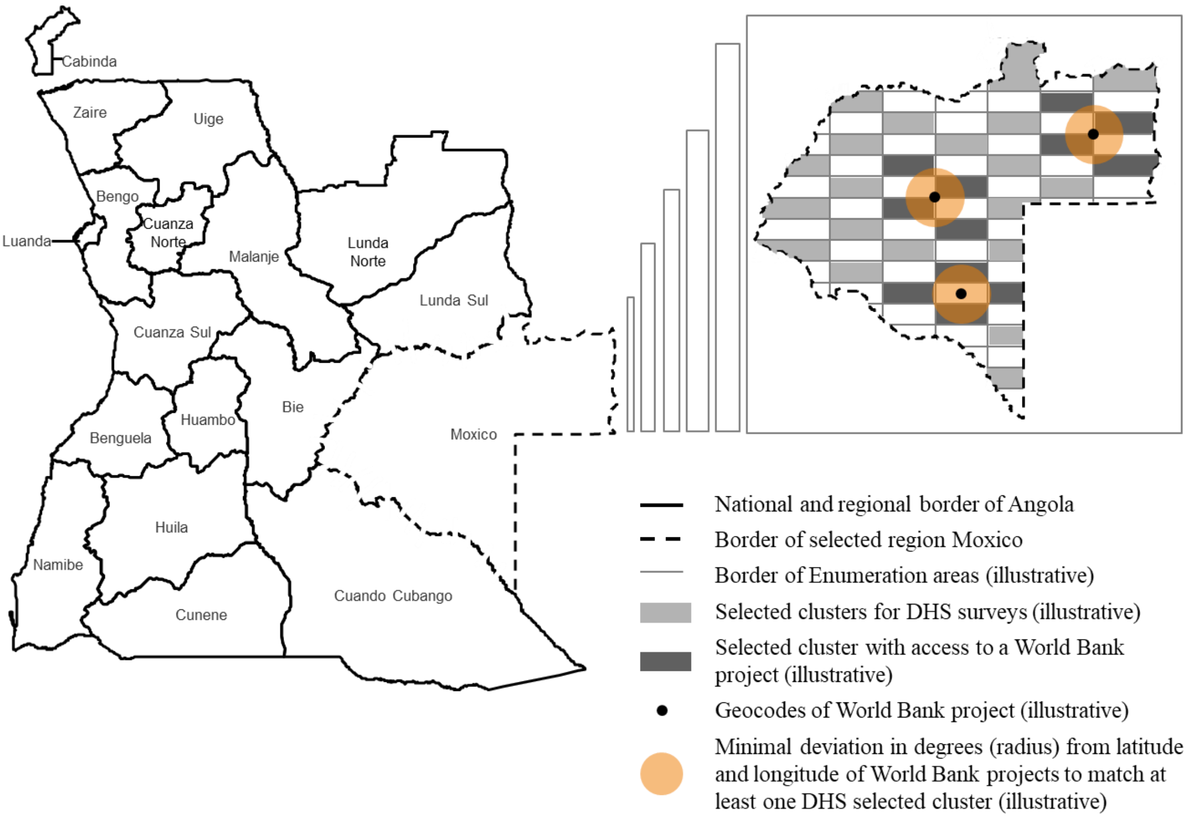
[47] Similarly to *Quality of drinking water*, a qualitative description of the toilet facility was transformed into a numeric value, for example a flush toilet takes a value of 5.

[48] The database contains information on project sector, status, lending instrument, start and end date, board approval date etc. It also lists the exact project location i.e., country, region and geocodes. Regional projects are planned by the respective national line ministries, with support from World Bank task team leaders and other stakeholders. Projects are then signed off by the national ministry of finance and the World Bank. Geographic spillovers over administrative regions may occur. Our matching procedure is based on geocodes and not on administrative borders. More information can be found at World Bank (2018) or at World Bank (2013).

[49] Further details and discussion of the matching procedure can be found in Exhibit 3. Differences start from 0.05 degrees and gradually increase in 0.01 steps until at least one match is obtained. A 0.05 degree change in latitude always corresponds to a change of 5.6 km. Depending on the latitude, a 0.05 degree change of longitude corresponds to a change of 0 to 5.6km.

the 18 regions in Angola in the survey year 2015, with support of DHS Data and ICF International (2012). In the exemplary region Moxico, DHS selected 32 clusters and we identified twelve clusters to have access to one of the three currently present World Bank projects.

Figure 5: *Illustrative mapping example for clusters in Moxico (Angola) and World Bank projects*



In the example we were able to identify 12 clusters to have access to one of the three World Bank projects at that time. Clusters with access to World Bank projects will serve as the treated group while the remainder serves as the non-treated group. Performing our geographic based matching, we can analyze 14,301 ongoing and 4,231 past World Bank projects on welfare of individuals within DHS clusters.

We code a dummy variable whether a World Bank project is currently running in a cluster, i.e., whether it is ongoing and started at least one year before a survey was conducted, such that an individual could benefit from it. For further investigations we code past World Bank projects i.e., projects that have ended at the latest in the same year than the respective survey in the cluster. By this, we find that on average 26% of our respondents had access to ongoing projects and about 8% to past projects. Further, we distinguish between projects in the water sector and all other sectors (such as infrastructure, health, energy etc.).[50] Lastly, we not only track the presence of a project (dummy variable), but also the number

[50] Usually, World Bank budgets are not 100% dedicated to a single sector. We therefore choose the sector with the highest percentage for our classification (find further details on sector allocation in **Table 32Table 32** in the Supplementary Material).

of ongoing and past projects, their budgets in U.S. Dollars[51] and the number of years that lie between the completion of a past project and the respective survey. All data can be requested from the authors and will be made available online once the paper is published.

3.3.2 Identification Strategy

We analyze whether an individual, living in a geographic DHS cluster that is close to a World Bank project, experiences improvements in the access to and the quality of drinking water, in sanitation facilities and in child mortality, compared to an individual not living in the vicinity of a World Bank project.

Given our data, the empirical strategy is straightforward and employs a conventional regression control approach. Our baseline setting allows us to account for cluster- and time-specific heterogeneity by the inclusion of corresponding fixed effects. Our estimation equation to predict LIFE_QUALITY[52] of individual *i* in cluster *c* at time *t* is specified as follows:

$$(\text{LIFE\_QUALITY})_{i,\text{c},t} = \beta(WBcurrent)_{\text{c},t} + \gamma \boldsymbol{X}_{\boldsymbol{i},\mathbf{c},\boldsymbol{t}} + \omega_c + \pi_t + \epsilon_{i,\text{c},t} \qquad (1)$$

where *WBcurrent* is a dummy variable, which is 1 if individual *i* was interviewed in a cluster which is in the vicinity of an ongoing World Bank project and 0 if not. $\boldsymbol{X}_{\boldsymbol{i,c,t}}$ represents the vector of control variables and ω_c and π_t introduce cluster and time fixed effects, respectively. Cluster fixed effects account for any constant cluster-specific unobservables (e.g., cluster-specific culture that promotes business acumen, strong village leaders promoting development rather than nepotism etc.) whereas time fixed effects account for contemporary global phenomena. As clusters are nested within countries, cluster fixed effects capture automatically all country-specific time-invariant variables. As such, we are able to identify the effect of World Bank projects by comparing the *ceteris-paribus* situation before and after the project. Basically, we have a *Diff-in-Diff* setting which analyses the differential effect of a treatment (i.e., World Bank project) on a treatment group (i.e., access to World Bank project) versus a control group (i.e., no access to World Bank project). We use a large amount of observational study data with the intention to complement experimental research. $\epsilon_{i,c,t}$ is an error term.[53]

3.4 THE INFLUENCE OF WORLD BANK PROJECTS ON INDIVIDUAL WELFARE

3.4.1 Main Empirical Results

Table 10 presents the results for equation (1) regarding the effect of current World Bank projects on the water collection time, the quality of drinking water, the type of toilets and the number of deceased

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[51] The World Bank reports budgets on country-level only. Therefore, we need to assume that the budget is split equally among regions, which leaves us with a low variation.

[52] LIFE_QUALITY is either time to water, quality of drinking water, quality of toilets or the number of deceased children.

[53] If not indicated differently, we apply robust standard errors clustered at the (geographical) cluster level.

children, separately. We always account for a full set of fixed effects to exclude the influence of potential cluster- or time-specific effects.

In regressions without control variables (specifications (1), (3), (5), (7)) we find that the presence of a World Bank project reduces the average walking time to the next drinking water source by 5 minutes and the average number of deceased children by 0.1. In addition, the presence of a World Bank project improves the quality of drinking water as well as the type of toilet that is being used by around 0.5 to 0.6 points (which reflects an increase of about 10%). In all specifications the coefficients of interest are statistically significant. Thus, our results suggest that the presence of a World Bank project positively affects the quality of life of near-by individuals in comparison to an individual in a control cluster which did not see any World Bank project.

In specifications (2), (4), (6) and (8) we account for a set of geography-, religion- and household-specific control variables which are increasing the explanatory power of our model. The intention of their inclusion is to further reduce potential omitted variable bias. We are aware that some of our controls may be seen as endogenous such as, for example night time luminosity as a proxy for economic activity or malaria. Still, we think that reporting these correlations and including a large set of controls is of value to the reader. Reassuringly, results are robust with or without the inclusion of controls as well as when different subsets of controls are included (results not shown). We face a reduction of observations, as not all control variables are available for all individuals. Our main findings remain statistically significant with somewhat smaller magnitudes. We observe that World Bank projects contribute to a reduction of time to water (3 minutes) and deceased children[54] (0.02 children) and an increase of the quality of drinking water (0.11) and the type of toilet (0.06).

[54] It might be that the variable includes children that have died decades ago, when the World Bank hadn't even started to fund such projects. We tested our results for different age subsamples (11-25; 26-35; 36-45; older than 45). We do not expect younger generations (younger than 35) to have lost children decades ago, but still observe a significant effect of World Bank projects on the number of deceased children if no further covariates are included (potentially because they significantly reduce the number of observations).

Table 10: *Baseline regressions for the effect of current World Bank projects on time to water, quality of drinking water, type of toilet and number of deceased children when accounting for cluster and time fixed effects and control variables*

Dependent variable	(1) Time to water	(2) Time to water	(3) Quality of drinking water	(4) Quality of drinking water	(5) Type of toilet	(6) Type of toilet	(7) Deceased children	(8) Deceased children
Current World Bank Project Dummy	**-4.810*****	**-2.962*****	**0.596*****	**0.114*****	**0.533*****	**0.056***	**-0.107*****	**-0.017****
	(0.297)	**(0.716)**	**(0.018)**	**(0.033)**	**(0.016)**	**(0.031)**	**(0.004)**	**(0.007)**
Nightlights_Composite		-0.128**		0.033***		0.021***		-0.003***
		(0.061)		(0.003)		(0.004)		(0.001)
Pop		0.000		0.00000***		0.00000***		-0.00000***
		(0.000)		(0.000)		(0.000)		(0.000)
Pop_density		0.0002**		-0.00001***		0.00002***		-0.00000*
		(0.0001)		(0.000)		(0.00001)		(0.000)
Drought_Episodes		-0.079		-0.001		0.009*		0.002*
		(0.139)		(0.006)		(0.005)		(0.001)
Malaria_2000_2015		-2.918**		-0.09		0.212***		-0.014
		(1.322)		(0.067)		(0.05)		(0.011)
Proximity_to_National_ Borders		0.000		-0.00000**		0.000		-0.00000***
		(0.000)		(0.000)		(0.000)		(0.000)
Proximity_to_Water		0.000		-0.00000***		-0.00000***		0.00000***
		(0.000)		(0.000)		(0.000)		(0.000)
Rainfall_1985_2015		-0.001		-0.0003***		0.0001***		-0.00002**
		(0.001)		(0.00004)		(0.00004)		(0.00001)
Jan_Dec_Temp		0.667***		0.036***		-0.041***		0.004**
		(0.134)		(0.007)		(0.006)		(0.001)
Urban		-7.248***		1.275***		0.932***		-0.148***
		(0.625)		(0.037)		(0.034)		(0.007)
Years_educ		0.115***		0.007***		0.012***		-0.014***
		(0.034)		(0.001)		(0.001)		(0.001)
Age		-0.008		0.002***		0.005***		0.032***

		(0.007)		(0.0003)		(0.0003)		(0.0003)
Relation_Household_head		-0.048*		0.008***		0.022***		0.002***
		(0.028)		(0.001)		(0.001)		(0.0004)
Gender_household_head		-0.417**		-0.037***		0.073***		0.028***
		(0.172)		(0.006)		(0.007)		(0.003)
Christian		1.042***		-0.055***		-0.049***		0.029***
		(0.325)		(0.011)		(0.01)		(0.005)
Muslim		0.156		0.026		0.008		0.089***
		(0.445)		(0.018)		(0.018)		(0.007)
No_religion		1.717**		-0.275***		-0.436***		0.084***
		(0.808)		(0.033)		(0.03)		(0.013)
Traditional		1.787*		-0.245***		-0.457***		0.158***
		(0.958)		(0.045)		(0.051)		(0.029)
Cluster FE	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,368,255	244,498	1,596,132	284,508	1,742,308	293,810	1,793,783	301,728
R^2	0.329	0.374	0.459	0.585	0.417	0.444	0.091	0.228
Residual Std. Error	25.406 (df= 1,338,244)	27.836 (df= 235,659)	1.184 (df= 1,562,440)	1.027 (df= 275,419)	1.334 (df= 1,708,031)	1.115 (df= 284,715)	0.845 (df= 1,759,504)	0.657 (df= 292,631)
F Statistic	21.83***	15.95***	39.29***	42.79***	35.69***	25.04***	5.128***	9.508***

Note: The regressions estimate the effect of the existence of a current World Bank Project on four dependent variables: time to water, quality of drinking water, type of toilet, deceased children. Regressions are run with the full dataset without and with the full set of control variables as well as cluster and time fixed effects. Robust clustered standard error estimates (Cluster-level) are presented below the coefficients. The omitted category for the religious denomination is "Other". Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

Given our evaluation approach and the size of our dataset, we briefly refer to some potentially interesting covariates. There are a few covariates that seem to have a significant influence on our variables in question: nightlights composite seems to be an indicator for the development status of the cluster, as higher nightlights reduce time to water and the number of deceased children and it increases the quality of drinking water and the type of toilet. Similar correlations hold for individuals living in urban areas. Higher malaria prevalence (linked to humidity of the area), lower average yearly temperature and a male head of the household (potentially linked to a higher income) are related to a lower walking time to the next drinking water source. Higher education is negatively related to the number of diseased children and positively related to the quality of drinking water and the type of toilet, pointing to potential selection effects of the educated. Religious affiliations of the questioned individuals show associations with all four dependent variables.

In addition to the presence of a World Bank project (indicated by a dummy variable), we conduct the same set of regressions as in **Table 10** for the number of current World Bank projects instead of the pure presence of one or more projects. **Table 11** shows that the number of projects has a statistically significant effect on the quality of life of individuals. For every additional project in the cluster, time to water is reduced by 1 minute, the quality of drinking water and the quality of toilet is increased by 0.16 and the number of deceased children is reduced by 0.03 when no additional controls apart from fixed effects are added. The case with control variables still shows significant results (except for child mortality) but with smaller magnitudes. Thus, more projects are associated with higher outcomes. The reduced magnitude of the coefficients in comparison to **Table 10** suggests that not only the number of projects is of relevance but potentially the pure presence of the World Bank with one project can help to induce positive effects. Under the assumption that our fixed effects strategy captures all relevant confounding factors, World Bank projects causally affect the time to water sources, the quality of drinking water and the type of toilets, while there is no statistically significant relationship with the number of deceased children once additional controls are included.

Table 11: *Baseline regressions for the effect of the number of World Bank projects on time to water, quality of drinking water, type of toilet and number of deceased children when accounting for cluster and time fixed effects and control variables*

Dependent variable	(1) Time to water	(2) Time to water	(3) Quality of drinking water	(4) Quality of drinking water	(5) Type of toilet	(6) Type of toilet	(7) Deceased children	(8) Deceased children
No of Current World Bank Projects	**-1.043*** (0.079)**	**-0.760*** (0.231)**	**0.164*** (0.006)**	**0.037*** (0.012)**	**0.164*** (0.005)**	**0.031*** (0.012)**	**-0.027*** (0.001)**	**0.001 (0.003)**
Nightlights_Composite		-0.114* (0.062)		0.032*** (0.003)		0.020*** (0.004)		-0.003*** (0.001)
Pop		0.000 (0.000)		0.00000*** (0.000)		0.00000*** (0.000)		-0.00000*** (0.000)
Pop_density		0.0002** (0.0001)		-0.00001*** (0.000)		0.00002*** (0.00001)		-0.00000* (0.000)
Drought_Episodes		-0.098 (0.138)		-0.0001 (0.006)		0.009* (0.005)		0.002* (0.001)
Malaria_2000_2015		-2.889** (1.318)		-0.094 (0.067)		0.207*** (0.049)		-0.014 (0.011)
Proximity_to_ National_Borders		0.000 (0.000)		-0.00000** (0.000)		0.000 (0.000)		-0.00000*** (0.000)
Proximity_to_Water		0.000 (0.000)		-0.00000*** (0.000)		-0.00000** (0.000)		0.00000*** (0.000)
Rainfall_1985_2015		-0.001 (0.001)		-0.0003*** (0.00004)		0.0001*** (0.00004)		-0.00002*** (0.00001)
Jan_Dec_Temp		0.685*** (0.134)		0.035*** (0.007)		-0.042*** (0.006)		0.004** (0.001)
Urban		-7.647*** (0.611)		1.287*** (0.036)		0.931*** (0.034)		-0.153*** (0.007)
Years_educ		0.116*** (0.034)		0.007*** (0.001)		0.012*** (0.001)		-0.014*** (0.001)

Age		-0.008		0.002***		0.005***		0.032***
		(0.007)		(0.0003)		(0.0003)		(0.0003)
Relation_Household_head		-0.049*		0.008***		0.022***		0.002***
		(0.029)		(0.001)		(0.001)		(0.0004)
Gender_household_head		-0.415**		-0.037***		0.073***		0.028***
		(0.172)		(0.006)		(0.007)		(0.003)
Christian		1.050***		-0.055***		-0.049***		0.029***
		(0.326)		(0.011)		(0.01)		(0.005)
Muslim		0.154		0.026		0.008		0.089***
		(0.445)		(0.018)		(0.018)		(0.007)
No_religion		1.717**		-0.275***		-0.436***		0.084***
		(0.807)		(0.033)		(0.03)		(0.013)
Traditional		1.833*		-0.246***		-0.457***		0.158***
		(0.954)		(0.044)		(0.051)		(0.029)
Cluster FE	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,368,255	244,498	1,596,132	284,508	1,742,308	293,810	1,793,783	301,728
R^2	0.328	0.374	0.457	0.585	0.418	0.445	0.090	0.228
Residual Std. Error	25.423 (df= 1,338,244)	27.841 (df= 235,658)	1.186 (df= 1,562,440)	1.027 (df= 275,419)	1.334 (df= 1,708,031)	1.115 (df= 284,715)	0.845 (df= 1,759,504)	0.657 (df= 292,631)
F Statistic	21.74***	15.93***	38.99***	42.77***	35.78***	25.05***	5.104***	9.506***

Note: The regressions estimate the effect of the number of current World Bank Projects on four dependent variables: time to water, quality of drinking water, type of toilet, deceased children. Regressions are run with the full dataset without and with the full set of control variables as well as cluster and time fixed effects. Robust clustered standard error estimates (Cluster-level) are presented below the coefficients. The omitted category for the religious denomination is "Other". Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

Our main results are largely consistent with the literature (see e.g., Botting et al., 2010, Gopalan and Rajan, 2016 and Wayland, 2017 who all run country-level analyses for individual instead of cluster level analyses[55]). We systematically extend and refine existing analyses and show that past results are upheld in a more conservative setting at cluster-level with a large set of fixed effects.

For now, we looked at all World Bank projects – independent of their target sector e.g., water and sanitation, infrastructure, health, etc. The fact that our findings are sector-independent suggests that the pure presence and visibility of the World Bank in certain clusters may have spillover effects on the four water and health related indicators we are interested in.

3.4.2 Robustness Tests

In **Table 12** we present the results for different robustness tests. They provide overall support for the previously found links between the presence of the World Bank and our four dependent variables for individual welfare, although statistical significance is in some cases not achieved when additional covariates are entered next to the fixed effects.

From survey year to survey year clusters do not have precisely the same latitude and longitude in some instances which might affect the precision of our matching procedure. Such deviations tend to be small and can be associated with changes in subnational administration units or the protection of the privacy[56] of respondents and household members by DHS. For a first robustness test presented in row (1), we create a subsample that contains only those clusters that deviate to a maximum of 10% from the latitude of the first survey year. Our results are robust for this reduced set of comparable clusters with a small decrease of magnitude for the case without controls (1) and an even smaller change in coefficients for the case with controls (2).

Next, we substitute the cluster fixed effects with administrative region-time (row 2) and country-time (row 3) fixed effects, respectively. The empirical results reveal again a robust negative relationship between World Bank projects and time to water and number of deceased children and a positive relationship with quality of drinking water and type of toilet. Quantitatively, coefficients tend to be slightly reduced in the setting with region-time fixed effects but increased in the setting with country-time fixed effects.

In row (4), we are looking at the influence of the target sector the World Bank operates in. All previous results have shown that any project, independent of its sector, has an effect on individual welfare. We now investigate if this holds when investigating only water related projects (e.g., building

[55] The country-level perspective of these studies limits their observations to a few hundred. Due to our cluster focus we are able to include close to 2 million observations which is a multiple of several thousands.

[56] Through the displacement of EAs in urban areas by up to two kilometers and up to five kilometers for rural EAs, with one percent of randomly selected rural clusters displaced by a distance of up to ten kilometers, DHS ensures that neither the individual nor the household can be identified.

reservoir dam, installing sewage systems etc.). Coefficients are statistically significant in estimations without additional controls. The effect of water projects in regressions without controls is higher than in our baseline regressions. Thus, World Bank projects seem to achieve their aims.[57]

We also explore whether results vary if we consider answers of female respondents only (row 5). The literature argues that women often tend to be a target group and therefore might benefit more from water-related development projects. We are looking at surveys that questioned only women, assuming that the effect of projects for female respondents might be higher, especially for the variable time to water (e.g., Gross et al., 2017, Ilahi and Grimard, 2000, Koolwal and van de Walle, 2013, Ray, 2007, Sorenson et al., 2011). We observe a relevant drop in the number of observations, as the DHS data does not provide gender information on a respondent's basis. Instead, we can distinguish only between the fact that the survey targets both sexes (dummy equals 0) or women only (dummy equals 1). Our previous results emerge in cases without additional control variables. Thus, our results do not allow us to conclude that women or men profit more from World Bank projects. Lastly, we add a linear and a quadratic time trend to our regression (consequently dropping time fixed effects) and receive again support of our baseline results with only minor changes in coefficients for our four dependent variables. In addition, we have three observations: first, in the presence of all control variables, the reduction in time to water through World Bank intervention is even higher (by 1.12 minutes) with the passing of time. However, indicated by a significantly positive quadratic time trend (0.02), this reinforcing effect occurs only for a few years and is weakened or even reversed afterwards. The same logic holds for the improvement of toilet facilities, with a positive coefficient of the linear time trend (0.03) and a negative quadratic time trend (-0.001); second, independent of the inclusion of control variables, we observe that the positive effect of World Bank projects on the quality of drinking water is weakened over time (between 0.01 and 0.04). Our results suggest that this relation is non-linear, as indicated by a significantly positive coefficient of between 0.001 and 0.002 for the quadratic time trend; and third, regarding the number of deceased children, we obtain ambiguous results for the effect of time, as we observe a changing sign for the linear trend (from -0.007 to 0.005), but a consistently negative coefficient of the quadratic term (-0.0001 and -0.0004).

In a similar manner, we provide the same robustness tests for the number of current World Bank projects presented in

Table 13. In most cases we see the results of our baseline regressions with the full dataset (**Table 11**) confirmed, with only a few previously significant results to be sensitive towards the inclusion of control variables. In case (1), where we excluded clusters with a large deviation in latitude and longitude over time, we observe that improvements of the reachability and quality of drinking water, the quality

[57] If we add both dummies to the specification (i.e., any World Bank project and water related World Bank project) our results for water projects remain robust with slightly lower coefficients. In almost all cases (except for the specification with time to water and all controls) this effect is dominated by the effect of any World Bank project.

of toilet facilities and the number of deceased children are slightly smaller than depicted in **Table 11** (especially in specifications without further covariates). The same holds for case (2) with the substitution of cluster and time fixed effects with region-time fixed effects. The substitution with country-time fixed effects (case (3)) on the other hand leads to an increase in the coefficient’s magnitude, which could be due to the less stringent estimation setting. In case (4) we focus on the impact of the number of World Bank projects in the field of water and sanitation and similarly to regressions with the respective dummy variable (reflecting the presence of a currently ongoing World Bank project) we observe an even stronger improvement of the four variables in question. Considering surveys with female respondents only (case (5)) we find that results of specifications without controls are very similar to corresponding results in **Table 11**. However, after the inclusion of further covariates we end up with insignificant results, which might be due to the considerable drop in observations. Lastly, we include a linear and quadratic time trend (case (6)) but see no noteworthy changes in coefficients.

Table 12: *Robustness tests for the effect of current World Bank projects on four selected water and health indicators*

	Test	Description	Variable	Results for Current World Bank (Water) Project Dummy	
				(1) **FE and no controls**	**(2)** **FE and all controls**
(1)	Comparable Clusters	Some cluster's latitude and longitude (e.g., cluster number 1 in Egypt) show a significant deviation from the latitude and longitude reported in the first survey year (due to change of borders, protection of exact individual's location etc.). We create a subsample with clusters that deviate to a maximum of 10% from the first survey year in order to have a set of comparable clusters and conduct baseline regressions with cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed** *-3.296*** (0.415)* 895,014	*-2.812** (1.217)* 143,255
			Quality of drinking water	**Confirmed** *0.496*** (0.024)* 1,062,392	*0.084* (0.048)* 164,609
			Type of toilet	**Confirmed** for the case without controls *0.481*** (0.023)* 1,166,117	*0.042 (0.044)* 169,372
			Deceased children	**Confirmed** *-0.101*** (0.005)* 1,200,319	*-0.026*** (0.010)* 173,530
(2)	Region-time fixed effects	We conduct baseline regressions with region-time fixed effects and clustered standard errors on region-level.	Time to water	**Confirmed** *-3.549*** (0.498)* 1,368,255	*-3.120*** (0.664)* 244,498
			Quality of drinking water	**Confirmed** *0.423*** (0.027)* 1,596,132	*0.147*** (0.039)* 284,508
			Type of toilet	**Confirmed** *0.389*** (0.027)* 1,742,308	*0.052* (0.028)* 293,810
			Deceased children	**Confirmed** *-0.069*** (0.006)* 1,793,783	*-0.014*** (0.004)* 301,728

(3)	Country-time fixed effects	We conduct baseline regressions with country-time fixed effects and clustered standard errors on country-level.	Time to water	**Confirmed** *-5.015*** (1.085)* 1,368,255	*-2.894*** (0.923)* 244,498
			Quality of drinking water	**Confirmed** *0.669*** (0.071)* 1,596,132	*0.166*** (0.058)* 284,508
			Type of toilet	**Confirmed** *0.599*** (0.062)* 1,742,308	*0.070* (0.038)* 293,810
			Deceased children	**Confirmed** *-0.109*** (0.013)* 1,793,783	*-0.014*** (0.005)* 301,728
(4)	Water World Bank Projects	Previous regressions consider the sector-independent presence of a World Bank project. Here, we conduct baseline regressions with current World Bank projects in the field of water, sanitation and sewage. We include cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed** *-5.605*** (0.428)* 1,368,255	*-5.609*** (0.930)* 244,498
			Quality of drinking water	**Confirmed** for the case without controls *0.624*** (0.028)* 1,596,132	*0.009 (0.045)* 284,508
			Type of toilet	**Confirmed** for the case without controls *0.525*** (0.026)* 1,742,308	*-0.037 (0.046)* 293,810
			Deceased children	**Confirmed** for the case without controls *-0.115*** (0.006)* 1,793,783	*-0.010 (0.010)* 301,728

(5)	Women	We create a subsample with surveys that report answers of female interviewees only and conduct baseline regressions with cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed** for the case without controls *-2.721*** (0.611)* 296,306	 *-1.370 (2.785)* 32,598
			Quality of drinking water	**Confirmed** for the case without controls *0.484*** (0.048)* 426,161	 *-0.007 (0.092)* 50,251
			Type of toilet	**Confirmed** for the case without controls *0.438*** (0.040)* 467,137	 *0.107 (0.074)* 52,215
			Deceased children	**Confirmed** for the case without controls *-0.063*** (0.008)* 481,511	 *-0.019 (0.016)* 53,132
(6)	Time trends	We conduct baseline regressions with linear and squared time trends (without time fixed effects).	Time to water	**Confirmed** *-4.779*** (0.293)* 1,368,255	 *-3.806*** (0.721)* 244,498
			Quality of drinking water	**Confirmed** *0.577*** (0.018)* 1,596,132	 *0.158*** (0.032)* 284,508
			Type of toilet	**Confirmed** *0.509*** (0.016)* 1,742,308	 *0.054* (0.031)* 293,810
			Deceased children	**Confirmed** *-0.105*** (0.004)* 1,793,783	 *-0.013* (0.007)* 301,728

Note: The regressions estimate the effect of the existence of a current World Bank (water) project on four dependent variables (time to water, quality of drinking water, type of toilet, deceased children) for a number of robustness checks including fixed effects and robust clustered standard error estimates; Coefficients (Clustered Std. Errors) for specifications without controls are reported in columns (1), whereas coefficients (Clustered Std. errors) for specifications with all control variables are reported in columns (2); The number of observations is listed below the respective coefficient (Clustered Std. Error). Control variables are: Nightlights_Composite, Pop, Pop_density, Drought_Episodes, Malaria_2000_2015, Proximity_to_National_Borders, Proximity_to_Water, Rainfall_1985_2015, Jan_Dec_Temp, Urban, Years_educ, Age, Relation_Household_head, Gender_household_head, Christian, Muslim, No_religion, Traditional. The omitted category for the religious denomination is "Other". Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

Table 13: *Robustness tests for the effect of the number of current World Bank projects on four selected water and health indicators*

	Test	Description	Variable	Results for Number of Current World Bank (Water) Projects	
				(1) FE and no controls	**(2) FE and all controls**
(1)	Comparable Clusters	Some cluster's latitude and longitude (e.g., cluster number 1 in Egypt) show a significant deviation from the latitude and longitude reported in the first survey year (due to change of borders, protection of exact individual's location etc.). We create a subsample with clusters that deviate to a maximum of 10% from the first survey year in order to have a set of comparable clusters and conduct baseline regressions with cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed** *-0.573*** (0.082)* 895,014	*-0.746* (0.399)* 143,255
			Quality of drinking water	**Confirmed** *0.109*** (0.006)* 1,062,392	*0.030** (0.016)* 164,609
			Type of toilet	**Confirmed** *0.122*** (0.006)* 1,166,117	*0.029* (0.016)* 169,372
			Deceased children	**Confirmed** for the case without controls *-0.019*** (0.001)* 1,200,319	*-0.003 (0.004)* 173,530
(2)	Region-time fixed effects	We conduct baseline regressions with region-time fixed effects and clustered standard errors on region-level.	Time to water	**Confirmed** *-0.857*** (0.198)* 1,368,255	*-0.745** (0.337)* 244,498
			Quality of drinking water	**Confirmed** *0.123*** (0.016)* 1,596,132	*0.047*** (0.014)* 284,508
			Type of toilet	**Confirmed** *0.122*** (0.013)* 1,742,308	*0.028*** (0.016)* 293,810
			Deceased children	**Confirmed** for the case without controls *-0.018*** (0.003)* 1,793,783	*-0.00005 (0.002)* 301,728

(3)	Country-time fixed effects	We conduct baseline regressions with country-time fixed effects and clustered standard errors on country-level.	Time to water	**Confirmed** for the case without controls *-1.195*** (0.388)* *-0.618 (0.497)* 1,368,255 244,498
			Quality of drinking water	**Confirmed** *0.196*** (0.038)* *0.054*** (0.016)* 1,596,132 284,508
			Type of toilet	**Confirmed** *0.191*** (0.024)* *0.038** (0.018)* 1,742,308 293,810
			Deceased children	**Confirmed** for the case without controls *-0.030*** (0.005)* *-0.001 (0.002)* 1,793,783 301,728
(4)	Water World Bank Projects	Previous regressions consider the sector-independent presence of a World Bank project. Here, we conduct baseline regressions with current World Bank projects in the field of water, sanitation and sewage. We include cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed** *-2.320*** (0.208)* *-2.848*** (0.549)* 1,368,255 244,498
			Quality of drinking water	**Confirmed** for the case without controls *0.275*** (0.014)* *0.011 (0.022)* 1,596,132 284,508
			Type of toilet	**Confirmed** for the case without controls *0.262*** (0.012)* *-0.035 (0.023)* 1,742,308 293,810
			Deceased children	**Confirmed** for the case without controls *-0.045*** (0.002)* *-0.003 (0.006)* 1,793,783 301,728

(5)	Women	We create a subsample with with surveys that report answers of female interviewees only and conduct baseline regressions with cluster fixed effects and clustered standard errors on cluster-level.		**Confirmed** for the case without controls	
			Time to water	*-1.370*** (0.306)*	*-0.554 (0.944)*
				296,306	32,598
				Confirmed for the case without controls	
			Quality of drinking water	*0.169*** (0.014)*	*-0.013 (0.027)*
				426,161	50,251
				Confirmed for the case without controls	
			Type of toilet	*0.162*** (0.013)*	*0.038 (0.028)*
				467,137	52,215
				Confirmed for the case without controls	
			Deceased children	*-0.019*** (0.003)*	*0.004 (0.006)*
				481,511	53,132
(6)	Time trends	We conduct baseline regressions with linear and squared time trends (without time fixed effects).		**Confirmed**	
			Time to water	*-1.042*** (0.080)*	*-1.020*** (0.244)*
				1,368,255	244,498
				Confirmed	
			Quality of drinking water	*0.160*** (0.006)*	*0.045*** (0.011)*
				1,596,132	284,508
				Confirmed for the case without controls	
			Type of toilet	*0.157*** (0.005)*	*0.019 (0.012)*
				1,742,308	293,810
				Confirmed for the case without controls	
			Deceased children	*-0.026*** (0.001)*	*0.002 (0.003)*
				1,793,783	301,728

Note: The regressions estimate the effect of the number of current World Bank (water) projects on four dependent variables (time to water, quality of drinking water, type of toilet, deceased children) for a number of robustness checks including fixed effects and robust clustered standard error estimates; Coefficients (Clustered Std. Errors) for specifications without controls are reported in columns (1), whereas coefficients (Clustered Std. errors) for specifications with all control variables are reported in columns (2); The number of observations is listed below the respective coefficient (Clustered Std. Error). Control variables are: Nightlights_Composite, Pop, Pop_density, Drought_Episodes, Malaria_2000_2015, Proximity_to_National_Borders, Proximity_to_Water, Rainfall_1985_2015, Jan_Dec_Temp, Urban, Years_educ, Age, Relation_Household_head, Gender_household_head, Christian, Muslim, No_religion, Traditional. The omitted category for the religious denomination is "Other". Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

3.4.3 Mechanisms

Mediation effects of education and economic activity

Past literature has outlined that the effectiveness of aid is dependent on the general state of development in the considered area (see e.g., Burnside and Dollar, 2000, Collier and Dollar, 2002, Chauvet and Guillaumont, 2003, etc.). Assuming that the effectiveness of World Bank projects is also dependent on the state of development, we explore potential mediating effects of three different development indicators (education, nightlights and income) in **Table 14**. We start by separating our sample into highly educated individuals (years of schooling equal or above sample mean) and individuals with low education in rows (1) and (2) of **Table 14** respectively. All previous results emerge for individuals with low and high education. Comparing the coefficients suggests that individuals with a higher education may benefit more from World Bank projects as they tend to have significantly shorter ways to the next drinking water source than less educated individuals. For the other three variables, quality of drinking water, type of toilet and number of deceased children, we find no tangible difference, whereas results for the latter are mostly insignificant in the presence of control variables.

Next, we explore whether World Bank projects are more beneficial for individuals living in clusters with a high (equal or above sample median) or a low nightlights composite in rows (3) and (4), respectively. We see a tendency for all our four variables, that World Bank projects tend to be more successful in 'brighter' clusters.

Previous results are also confirmed when we go from the development state of clusters (expressed in terms of nightlights) to the development state of countries and distinguish between low- and middle-income countries (rows 5 and 6). In all regressions without controls we find higher coefficients for individuals living in low income countries, indicating that projects can have a bigger effect in those countries.

Table 14: *First mechanism testing the effect of current World Bank projects on four selected water and health indicators for clusters in different development states (expressed in terms of education, nightlights and income)*

Test		Description	Variable	Results for Current World Bank Project Dummy	
				(1) FE and no controls	**(2) FE and all controls**
(1)	High education	We create a subsample with individuals that have years of schooling equal to or above the mean for the entire sample and conduct baseline regressions with cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed**	
				*-5.851*** (0.415)*	*-3.071*** (0.880)*
				408,493	109,593
			Quality of drinking water	**Confirmed**	
				*0.586*** (0.021)*	*0.106*** (0.039)*
				469,265	129,501
			Type of toilet	**Confirmed** for the case without controls	
				*0.422*** (0.017)*	*0.059 (0.037)*
				519,513	134,329
			Deceased children	**Confirmed** for the case without controls	
				*-0.052*** (0.004)*	*-0.006 (0.009)*
				536,597	137,991
(2)	Low education	We create a subsample with individuals that have year's of schooling below the mean for the entire sample and conduct baseline regressions with cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed**	
				*-4.944*** (0.291)*	*-2.664*** (0.740)*
				529,181	134,905
			Quality of drinking water	**Confirmed**	
				*0.608*** (0.020)*	*0.115*** (0.035)*
				598,501	155,007
			Type of toilet	**Confirmed**	
				*0.483*** (0.018)*	*0.048 (0.032)*
				676,336	159,481
			Deceased children	**Confirmed**	
				*-0.065*** (0.003)*	*-0.030*** (0.008)*
				699,450	163,737

(3)	High nightlights	We create a subsample with individuals that have a nightlights composite equal to or above the mean for the entire sample and conduct baseline regressions with cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed** for the case with controls *-2.590*** (0.405)* 577,233	 *-1.980 (1.259)* 110,688
			Quality of drinking water	**Confirmed** *0.322*** (0.025)* 727,862	 *0.141** (0.066)* 130,383
			Type of toilet	**Confirmed** *0.364*** (0.025)* 818,599	 *0.163** (0.071)* 137,853
			Deceased children	**Confirmed** for the case with controls *-0.049*** (0.005)* 845,622	 *-0.015 (0.013)* 141,703
(4)	Low nightlights	We create a subsample with individuals that have a nightlights composite below the mean for the entire sample and conduct baseline regressions with cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed** *-2.272*** (0.651)* 695,428	 *-2.453* (1.440)* 133,810
			Quality of drinking water	**Confirmed** for the case without controls *0.108*** (0.030)* 781,702	 *0.072 (0.058)* 154,125
			Type of toilet	**Confirmed** for the case without controls *0.103*** (0.026)* 824,080	 *-0.022 (0.045)* 155,957
			Deceased children	**Confirmed** *-0.036*** (0.008)* 845,626	 *-0.023* (0.013)* 160,025

(5)	Lower middle income and higher middle income	We create a subsample with countries that are classified as lower-middle or higher-middle-income-countries and conduct baseline regressions with cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed** *-3.435*** (0.617)* 424,488	 *-2.056* (1.132)* 90,869
			Quality of drinking water	**Confirmed** *0.427*** (0.028)* 527,653	 *0.271*** (0.072)* 92,670
			Type of toilet	**Confirmed** *0.513*** (0.031)* 616,716	 *0.308*** (0.072)* 100,262
			Deceased children	**Confirmed** for the case without controls *-0.079*** (0.007)* 635,145	 *-0.006 (0.013)* 103,134
(6)	Low-income countries	We create a subsample with countries that are classified as low-income-countries and conduct baseline regressions with cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed** *-5.366*** (0.371)* 801,309	 *-3.348*** (0.908)* 153,629
			Quality of drinking water	**Confirmed** for the case without controls *0.692*** (0.023)* 920,341	 *0.031 (0.036)* 191,838
			Type of toilet	**Confirmed** for the case without controls *0.557*** (0.019)* 935,642	 *-0.009 (0.029)* 193,548
			Deceased children	**Confirmed** *-0.126*** (0.005)* 961,519	 *-0.022*** (0.008)* 198,594

Note: The regressions estimate the effect of the existence of a current World Bank project on four dependent variables (time to water, quality of drinking water, type of toilet, deceased children) for a number of subsets including fixed effects and robust clustered standard error estimates; Coefficients (Clustered Std. Errors) for specifications without controls are reported in columns (1), whereas coefficients (Clustered Std. errors) for specifications with all control variables are reported in columns (2); The number of observations is listed below the respective coefficient (Clustered Std. Error). Control variables are: Nightlights_Composite, Pop, Pop_density, Drought_Episodes, Malaria_2000_2015, Proximity_to_National_Borders, Proximity_to_Water, Rainfall_1985_2015, Jan_Dec_Temp, Urban, Years_educ, Age, Relation_Household_head, Gender_household_head, Christian, Muslim, No_religion, Traditional. The omitted category for the religious denomination is "Other". Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

Table 15: *First mechanism testing the effect of the number of current World Bank projects on four selected water and health indicators for clusters in different development states (expressed in terms of education, nightlights and income)*

	Test	Description	Variable	Results for Number of Current World Bank Projects	
				(1) **FE and no controls**	**(2)** **FE and all controls**
(1)	High education	We create a subsample with individuals that have years of schooling equal to or above the mean for the entire sample and conduct baseline regressions with cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed**	
				*-1.169*** (0.090)*	*-0.912*** (0.287)*
				408,493	109,593
			Quality of drinking water	**Confirmed**	
				*0.153*** (0.007)*	*0.031** (0.014)*
				469,265	129,501
			Type of toilet	**Confirmed**	
				*0.128*** (0.005)*	*0.025* (0.014)*
				519,513	134,329
			Deceased children	**Confirmed** for the case without controls	
				*-0.013*** (0.001)*	*0.002 (0.003)*
				536,597	137,991
(2)	Low education	We create a subsample with individuals that have years of schooling below the mean for the entire sample and conduct baseline regressions with cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed**	
				*-1.014*** (0.074)*	*-0.599** (0.240)*
				529,181	134,905
			Quality of drinking water	**Confirmed**	
				*0.150*** (0.007)*	*0.040*** (0.012)*
				598,501	155,007
			Type of toilet	**Confirmed**	
				*0.143*** (0.005)*	*0.036*** (0.013)*
				676,336	159,481
			Deceased children	**Confirmed** for the case without controls	
				*-0.015*** (0.001)*	*-0.002 (0.003)*
				699,450	163,737

(3)	High nightlights	We create a subsample with individuals that have a nightlights composite equal to or above the median for the entire sample and conduct baseline regressions with cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed** *-0.474*** (0.072)* 577,233	*-0.698* (0.358)* 110,688
			Quality of drinking water	**Confirmed** *0.086*** (0.005)* 727,862	*0.042*** (0.016)* 130,383
			Type of toilet	**Confirmed** *0.107*** (0.006)* 818,599	*0.061*** (0.018)* 137,853
			Deceased children	**Confirmed** for the case with controls *-0.010*** (0.001)* 845,622	*-0.004 (0.004)* 141,703
(4)	Low nightlights	We create a subsample with individuals that have a nightlights composite below the median for the entire sample and conduct baseline regressions with cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed** for the case without controls *-0.761*** (0.288)* 695,428	*-0.555 (0.731)* 133,810
			Quality of drinking water	**Confirmed** for the case without controls *0.045*** (0.016)* 781,702	*0.007 (0.033)* 154,125
			Type of toilet	**Confirmed** for the case without controls *0.054*** (0.014)* 824,080	*-0.016 (0.025)* 155,957
			Deceased children	**Confirmed** for the case without controls *-0.009** (0.004)* 845,626	*-0.006 (0.007)* 160,025

(5)	Lower middle income and higher middle income	We create a subsample with countries that are classified as lower-middle or higher-middle-income-countries and conduct baseline regressions with cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed**	
				*-0.762*** (0.111)*	*-0.680* (0.358)*
				424,488	90,869
			Quality of drinking water	**Confirmed**	
				*0.113*** (0.008)*	*0.052** (0.024)*
				527,653	92,670
			Type of toilet	**Confirmed**	
				*0.156*** (0.010)*	*0.056** (0.024)*
				616,716	100,262
			Deceased children	**Confirmed** for the case without controls	
				*-0.017*** (0.002)*	*0.006 (0.005)*
				635,145	103,134
(6)	Low-income countries	We create a subsample with countries that are classified as low-income-countries and conduct baseline regressions with cluster fixed effects and clustered standard errors on cluster-level.	Time to water	**Confirmed**	
				*-1.315*** (0.122)*	*-0.680** (0.312)*
				801,309	153,629
			Quality of drinking water	**Confirmed**	
				*0.219*** (0.010)*	*0.027** (0.013)*
				920,341	191,838
			Type of toilet	**Confirmed**	
				*0.192*** (0.006)*	*0.035*** (0.013)*
				935,642	193,548
			Deceased children	**Confirmed**	
				*-0.035*** (0.002)*	*-0.006* (0.003)*
				961,519	198,594

Note: The regressions estimate the effect of the number of current World Bank projects on four dependent variables (time to water, quality of drinking water, type of toilet, deceased children) for a number of robustness checks including fixed effects and robust clustered standard error estimates; Coefficients (Clustered Std. Errors) for specifications without controls are reported in columns (1), whereas coefficients (Clustered Std. errors) for specifications with all control variables are reported in columns (2); The number of observations is listed below the respective coefficient (Clustered Std. Error). Control variables are: Nightlights_Composite, Pop, Pop_density, Drought_Episodes, Malaria_2000_2015, Proximity_to_National_Borders, Proximity_to_Water, Rainfall_1985_2015, Jan_Dec_Temp, Urban, Years_educ, Age, Relation_Household_head, Gender_household_head, Christian, Muslim, No_religion, Traditional. The omitted category for the religious denomination is "Other". Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

Table 15 reveals results for the varying intensity of the World Bank, reflected by the number of currently ongoing projects, in clusters of different development states. However, unlike in regressions with the dummy variable *Current World Bank projects*, we get more ambiguous results. First, we observe that the number of projects seems to be equally important (or unimportant) for environments with high or low education. Second, in clusters with a high nightlights intensity we see that the effect of a higher number of projects is approximately twice as strong for the variables *Type of toilet* and *Quality of drinking water* (in specifications without controls). The opposite is true for improvements in *Time to Water*, which seems to be more susceptible to a higher number of projects in clusters with low nightlights. Third, we see a tendency that more projects in low-income countries can achieve higher improvements in water-, sanitation- and health-related indicators than a higher number of projects in lower and higher middle income countries (again, only in specifications without control variables).

Persistent effects of World Bank projects

In a second mechanism we explore the relevance of already completed World Bank projects, i.e., projects that ended at the latest in the year of the respective DHS survey. We augment our estimation equation as follows:

$$(\text{LIFE\_QUALITY})_{i,\text{c},t} = \beta_1(WBcurrent)_{i,\text{c},t} + \beta_2(WBpast)_{i,\text{c},t} + + \beta_3(WBcurrent)_{i,\text{c},t} \cdot (WBpast)_{i,\text{c},t} + \gamma\boldsymbol{X_{i,\text{c},t}} + \omega_c + \pi_t + \epsilon_{i,\text{c},t} \qquad (2)$$

with β_2 capturing the lasting effect of past projects. β_3 is an interaction term between current and past projects and reflects whether current projects have an even larger effect if there already has been a past project in the same geographic area.

Thereby, we investigate whether the quality of life of individuals is rather influenced in the short-term (i.e., the effect of an ongoing project is dominant), in the long-term (i.e., the effect occurs a few years after a project was completed) or in circumstances where a past project is followed up by a new project. The interest lies in contributing to the question of the sustainability of development projects (see e.g., Gary and Maurel, 2015, Easterly, 2014, Moyo, 2010). Note that potential effects of past projects can hardly be uncovered through standard field experiments.

Table 16: *Second mechanism testing the effect of current and past World Bank projects on four selected water and health indicators*

Dependent variable	(1) Time to water	(2) Time to water	(3) Time to water	(4) Time to water	(5) Quality of drinking water	(6) Quality of drinking water	(7) Quality of drinking water	(8) Quality of drinking water
Past World Bank Projects Dummy	-4.478***	-5.868***	-4.986***	-2.159	0.421***	0.047	-0.001	0.081
	(0.437)	(1.011)	(1.002)	(2.098)	-0.028	-0.051	(0.054)	(0.128)
Current World Bank Projects Dummy			-2.099***	-1.862**			0.114***	0.121***
			(0.717)	(0.741)			(0.035)	(0.036)
Current World Bank Projects Dummy x Past World Bank Projects Dummy				-3.455				-0.104
				(2.267)				(0.137)
Cluster FE	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
Control variables	NO	YES	YES	YES	NO	YES	YES	YES
Observations	1,368,255	244,498	244,498	244,498	1,596,132	284,508	284,508	284,508
R^2	0.327	0.375	0.375	0.375	0.449	0.585	0.585	0.585
Residual Std. Error	25.43 (df= 1,338,244)	27.83 (df= 235,659)	27.83 (df= 235,658)	27.83 (df= 235,657)	1.20 (df= 1,562,440)	1.03 (df= 275,419)	1.03 (df= 275,418)	1.03 (df= 275,417)
F Statistic	21.7***	15.96***	15.98***	15.98***	37.74***	42.73***	42.78***	42.78***

Note: The regressions estimate the effect of the existence and the number of a past and a current World Bank Project (and their interaction) on four dependent variables: time to water, quality of drinking water, type of toilet, deceased children. Regressions are run with the full dataset without and with the full set of control variables as well as cluster and time fixed effects. Robust clustered standard error estimates (Cluster-level) are presented below the coefficients. Control variables are: Nightlights_Composite, Pop, Pop_density, Drought_Episodes, Malaria_2000_2015, Proximity_to_National_Borders, Proximity_to_Water, Rainfall_1985_2015, Jan_Dec_Temp, Urban, Years_educ, Age, Relation_Household_head, Gender_household_head, Christian, Muslim, No_religion, Traditional. The omitted category for the religious denomination is "Other". Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

Dependent variable	(9) Type of toilet	(10) Type of toilet	(11) Type of toilet	(12) Type of toilet	(13) Deceased children	(14) Deceased children	(15) Deceased children	(16) Deceased children
Past World Bank Projects Dummy	0.393***	-0.055	-0.083*	-0.034	-0.091***	0.001	0.008	-0.002
	(0.024)	(0.045)	(0.047)	(0.083)	(0.005)	(0.011)	(0.011)	(0.023)
Current World Bank Projects Dummy			0.068**	0.072**			-0.018***	-0.019***
			(0.032)	(0.034)			(0.007)	(0.007)
Current World Bank Projects Dummy x Past World Bank Projects Dummy				-0.062				0.013
				(0.096)				(0.025)
Cluster FE	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
Control variables	NO	YES	YES	YES	NO	YES	YES	YES
Observations	1,742,308	293,810	293,810	293,810	1,793,783	301,728	301,728	301,728
R^2	0.411	0.444	0.444	0.444	0.090	0.228	0.228	0.228
Residual Std. Error	1.34 (df= 170,8031)	1.12 (df= 284,715)	1.12 (df= 284,714)	1.12 (df= 284,713)	0.85 (df= 1,759,504)	0.66 (df= 292,631)	0.66 (df= 292,630)	0.66 (df= 292,629)
F Statistic	34.71***	25.04***	25.05***	25.05***	5.068***	9.506***	9.507***	9.506***

Note: The regressions estimate the effect of the existence and the number of a past and a current World Bank Project (and their interaction) on four dependent variables: time to water, quality of drinking water, type of toilet, deceased children. Regressions are run with the full dataset without and with the full set of control variables as well as cluster and time fixed effects. Robust clustered standard error estimates (Cluster-level) are presented below the coefficients. Control variables are: Nightlights_Composite, Pop, Pop_density, Drought_Episodes, Malaria_2000_2015, Proximity_to_National_Borders, Proximity_to_Water, Rainfall_1985_2015, Jan_Dec_Temp, Urban, Years_educ, Age, Relation_Household_head, Gender_household_head, Christian, Muslim, No_religion, Traditional. The omitted category for the religious denomination is "Other". Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

Table 16 summarizes the results for four different specifications for each of our dependent variables. Columns (1), (5), (9) and (13) show regressions for the dummy variable for past projects without any covariates and without the control for current projects. Coefficients for past projects have the same sign as coefficients for current projects in earlier specifications. They suggest a statistically significant effect of past projects on our four indicators. However, except for the variable time to water, all coefficients reflecting the influence of past World Bank projects lose their significance as soon as control variables are included (columns (2), (6), (10) and (14)). Columns (3), (7), (11) and (15) now also add the dummy variable current projects. Current projects have a statistically significant effect on our welfare indicators but now the coefficient for past projects becomes statistically insignificant in most cases. Only the variable time to water seems to benefit from current and past projects, whereas the latter's effect is twice as strong. The remaining columns show the results for the interaction term between current and past projects, which is never statistically significant. Current World Bank projects continue to exert a positive and statistically significant influence on individual welfare, i.e., current projects decrease the time to water, increase the quality of drinking water, improve the reported toilet type and decrease child mortality.

Overall, the results in **Table 16** suggest that effects of past projects are likely to subside over time. Only current projects seem to have an effect on individual welfare. Consequently, the long-term sustainable effects of World Bank projects might be questioned. The World Bank also tends to fund the same sub-regions where they have observed satisfying impact, great need, reliable staff, etc. A correlation coefficient between past and current projects of 0.34 supports this assumption.

3.4.4 Discussion and Caveats

By combining World Bank data with information from the DHS, we are able to analyze a large number of development projects over time and investigate their potential to affect individual outcomes. Cluster fixed effects and the addition of control variables allow us to tackle relevant empirical issue in the literature and our approach serves as an inexpensive complement to the experimental evaluation of single development projects.

Our paper makes a contribution in setting up matched geocoded data on a large scale. Aggregation of data used by other approaches can bias results, so the opportunity to assess impacts at the highly disaggregated (local) level is a plus relative to country-level studies or cross-country analysis. Moreover, we pool data on many projects across many locations and, thus, can potentially make more generalizable statements.

As mentioned above, DHS perturbs the locations to improve anonymity of the data. This is a well-documented procedure. We account for larger perturbations in robustness tests.

The geocoded nature of the data may also provide an opportunity to study geographic spillovers which would be a future research endeavor that we do not follow due to space constraints. However such a study would be a natural extension to our setting and may further help to account for the fact that World Bank projects are implemented in different locations due to diverse factors. While fixed effects allow to account for some of these factors, projects are also allocated due to policy considerations. Moreover, World Bank projects might lead to other World Bank or NGO projects that happen at the same time in the same location. As common in the literature, we cannot account for all NGO projects that could happen in the vicinity of our treated clusters as NGO projects are not systematically geocoded at the present time. If World Bank projects tend to congregate, i.e., the same places that have WASH projects also tend to have health projects, our results could overstate potential gains. We note that our baseline results are significant when specifically focusing on WASH projects and when analyzing any type of World Bank project.

Our cross-project, micro-based evaluation approach follows a bottom-up perspective and tries to bring observational data as closely to an experimentally inspired setting as possible. It allows to investigate a large number of projects ex-post using readily available information. It is easily extendable to other settings. Importantly, our data cannot only be used to complement RCTs but also to complement and re-evaluate qualitative studies by investigating projects within specific countries where reports exist. We provide such an evaluation below as an example.

3.4.5 Complementing Existing Evidence from World Bank Reports

Doing our evaluations ex-post, we can also compare our results with analyses of a specific country and compare it with the project evaluation performed by the World Bank itself in a number of cases. Thereby our broad quantitative approach may also enrich more qualitative reports and evaluations. We perform one such country specific evaluation and comparison below as an illustration.

We choose Senegal, as it passed through the highest number of DHS surveys, each with a large number of respondents, and as it was a popular target of World Bank water projects. To be concrete, our analysis for Senegal estimates the effect of eight different World Bank water projects[58] on the answers from more than 100,000 individuals collected by nine DHS rounds. **Table 17** shows us similar results to our baseline regressions from **Table 10** for regressions without control variables.

Results are sensitive towards the inclusion of covariates and turn insignificant. Nevertheless, they suggest a certain level of effectiveness of World Bank projects. Comparing these quantitative results with the corresponding reports[59] from the World Bank for their own water projects, we find an accordance between both. We would like to outline three projects.[60]

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[58] Three projects had a second phase with additional financing (recorded under a different project ID).

[59] World Bank project reports can be accessed by entering the respective project IDs at the 'Documents & Reports' webpage of the World Bank (World Bank (2020)).

[60] The five other World Bank projects in the water sector are assumed to have a more indirect impact on our target variables and are therefore not described in this paper: 'Senegal River Basin Multi-purpose Water Resources Development Project' (P093826), 'Stormwater Management and Climate Change Adaptation Project' (P122841 and P152150 for additional

Firstly, the ‘Water and Sanitation Millennium Project’ (P109986), which aims at (among others) facilitating the rehabilitation of boreholes, water storage facilities, and pumping equipment. The World Bank evaluated the project as highly satisfactory as 654,520 people directly benefitted and the targets of increasing the number of people with access to improved water sources and households with new water and sewerage connections were surpassed.

Secondly, the ‘Senegal Urban Water and Sanitation Project’ (P150351 and P162537 for additional financing) encompassed the improvement of water services and access to safe drinking water, the rehabilitation of water infrastructure, the increased access to improved sanitation and sewerage services and the institutional strengthening and project management. It was rated as satisfactory, as the targets for new piped household water connections and for the number of people in urban areas with access to improved water sources were met, but it failed to provide the targeted number of people with access to enhanced water supply services, the targeted water production and water storage capacity and the targeted construction of new household sewer connections.

financing), ‘Building Resilience through Innovation, Communication and Knowledge Services’ (P130888), ‘Senegal River Basin Climate Change Resilience Development Project’ (P131323 and P131353 for additional financing), and ‘Senegal River Basin Integrated Water Resources Management Project’ (P153863).

Table 17: *Baseline regressions for the effect of current World Bank projects on time to water, quality of drinking water, type of toilet and number of deceased children for Senegal*

Dependent variable	(1) Time to water	(2) Time to water	(3) Quality of drinking water	(4) Quality of drinking water
Current World Bank Project Dummy	**-3.796*** (1.028)**	**-0.221 (1.759)**	**0.306*** (0.055)**	**-0.027 (0.081)**
Cluster FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES
Control variables	NO	YES	NO	YES
Observations	96,636	9,914	125,741	18,271
R^2	0.104	0.274	0.211	0.563
Residual Std. Error	31.55 (df= 96,200)	21.66 (df= 9,512)	1.29 (df= 125,304)	0.95 (df= 17,859)
F Statistic	25.7***	8.954***	77.08***	56.04***

Dependent variable	(5) Type of toilet	(6) Type of toilet	(7) Deceased children	(8) Deceased children
Current World Bank Project Dummy	**0.625*** (0.050)**	**-0.067 (0.086)**	**-0.110*** (0.009)**	**-0.004 (0.012)**
Cluster FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES
Control variables	NO	YES	NO	YES
Observations	129,714	18,756	134,314	19,372
R^2	0.158	0.359	0.036	0.172
Residual Std. Error	1.58 (df= 129,277)	1.24 (df= 18,344)	0.81 (df= 133,877)	0.41 (df= 18,960)
F Statistic	55.48***	25.04***	11.43***	9.615***

Note: The regressions estimate the effect of the existence of a current World Bank Project in Senegal on four dependent variables: time to water, quality of drinking water, type of toilet, deceased children. Regressions are run with the data for Senegal without and with the full set of control variables as well as cluster and time fixed effects. Robust clustered standard error estimates (Cluster-level) are presented below the coefficients. Control variables are: Nightlights_Composite, Pop, Pop_density, Drought_Episodes, Malaria_2000_2015, Proximity_to_National_Borders, Proximity_to_Water, Rainfall_1985_2015, Jan_Dec_Temp, Urban, Years_educ, Age, Relation_Household_head, Gender_household_head, Christian, Muslim, No_religion, Traditional. The omitted category for the religious denomination is "Other". Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

Thirdly, the ‘Senegal Rural Water and Sanitation Project’ (P164262) aimed at improving rural water supply, water services and access as well as sanitation and the adequate disposal of wastewater and sludge. Alike the ‘Senegal Urban Water and Sanitation Project’ it was rated satisfactory as more progress is needed to reach targets for improved community water points, piped water systems with chlorination devices, for bacterial standards in water sample tests and for household latrines and sewer connections. As in the Bank’s goal attainment reports, our analysis would concur that there is a positive impact of the World Bank on water access, water quality and sanitation facilities.

3.5 CONCLUDING REMARKS

This paper suggests a micro-based approach to evaluate the effect of water- and health-related development projects. We extracted around 1.8 million responses from 153 Demographic and Health Surveys on distance to drinking water and its quality, toilet types and the number of deceased children. Through a geocode-matching, we combine these data with the presence of World Bank projects. Thereby, we obtain a new dataset which allows us to investigate the relevance of World Bank projects on individual welfare. Our setting allows us to employ fixed effects strategies to account for unobserved heterogeneity. Thus, we can evaluate whether individual welfare within the same cluster of the DHS where a project took place improved over time in comparison to a control cluster with no project.

Our results suggest that the presence of the World Bank and the number of projects are improving water and health indicators. The results are robust towards changes in the estimation equation and data refinements. Our fixed effects account for all time-invariant variation across clusters. However, we also find that only current World Bank projects seem to systematically influence outcomes, highlighting the importance of analyzing the long-term sustainability in future studies which can be done using our approach. In addition, our results suggest that projects are generally more successful in relatively well-developed areas (but located in low-income countries) and in environments with better educated individuals. Future research may investigate whether different project targets and project setups yield different results by investigating the effect of specific projects or types of projects. Finally, we believe that also different target groups benefit differently from development projects.

Our research effort encompasses a new approach for micro-based ex-post evaluation of specific projects employing individual level data. Our approach might serve as an alternative to standard macro-level cross-country studies. At the same time it serves as a complement to standard RCTs. By matching readily available survey data with information on development projects through geocodes, we can evaluate a large number of projects ex-post and at low costs.[61] While the precision of such an evaluation is potentially lower than a specifically targeted RCT for a single project, the possibility to investigate a large number of development projects ex-post may make our approach attractive for other researchers who wish to complement the insights of field experiments and explore the long-term impacts of projects.

[61] Assuming that a standard RCT in a developing country costs only USD 50.000, investigating 14,301 ongoing World Bank projects would have cost USD 715 million. The costs of our approach comprised only the salary of a PhD student for a year which would have occurred in any case.

Table 18: *Descriptive statistics*

Variable	Description	Median	Mean	Std. Dev.	Min	Max	Obs	Source
Quality of drinking water	Main source of drinking water for household members. Variable was recoded from a qualitative description into numeric values ranging from 1.1 (e.g., river, canal) to 5.4 (e.g., piped water into dwelling). The integer captures the quality of drinking water and the first decimal number captures how easily this source can be reached.	4.0	3.5	1.6	1.0	5.0	1,596,132	DHS
Time to water	Time taken to get to the source of drinking water (in minutes).	1.0	13.6	30.7	0.0	995.0	1,368,255	DHS
Type of toilet	Type of toilet facility in the household. Variable was recoded from a qualitative description into numeric values ranging from 0 (e.g., no facility) to 5.4 (e.g., flush to piped sewer system), capturing the quality of the toilet facility and its reachability.	3.0	2.8	1.7	0.0	5.0	1,742,308	DHS
Deceased children	Total number of sons and daughters who have died.	0.0	0.4	0.9	0.0	20.0	1,793,783	DHS
Current World Bank Project Dummy	Dummy variable equals 1 if individuals in the respective cluster have access to the services of any ongoing World Bank project; 0 otherwise (requirement: project is running for at least 1 year before the survey was conducted).	0.0	0.3	0.4	0	1	1,793,783	own calc. (WB; DHS)

Number of Current World Bank Projects	Number of ongoing World Bank projects to which the individuals in the respective cluster have access.	0.0	0.6	1.5	0.0	27.3	1,793,783	own calc. (WB; DHS)
Current World Bank Water Project Dummy	Dummy variable equals 1 if individuals in the respective cluster have access to the services of an ongoing World Bank Water project; 0 otherwise (requirement: project is running for at least 1 year before the survey was conducted).	0.0	0.1	0.3	0	1	1,793,783	own calc. (WB; DHS)
Number of Current World Bank Water Projects	Number of ongoing World Bank Water projects to which the individuals in the respective cluster have access.	0.0	0.1	0.6	0.0	11.0	1,793,783	own calc. (WB; DHS)
Past World Bank Project Dummy	Dummy variable equals 1 if individuals in the respective cluster have access to the services of any past World Bank project; 0 otherwise (requirement: project is completed at the latest in the same year the respective survey was conducted).	0.0	0.1	0.3	0	1	1,793,783	own calc. (WB; DHS)
Number of Past World Bank Projects	Number of ongoing World Bank projects to which the individuals in the respective cluster have access.	0.0	0.1	0.7	0.0	26.6	1,793,783	own calc. (WB; DHS)
Rainfall_1985_2015	The average annual rainfall (in millimeters per year) within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster. The data is averaged for 1985, 1990, 1995, 2000, 2005, 2010 and 2015.	1,068	1,156	754	0.0	5,263	1,669,102	DHS
Drought_Episodes	The average number of drought episodes (categorized between 1 (low) and 10 (high)) for the areas within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster.	5.0	5.1	3.4	0.0	35.0	1,256,872	DHS

Jan_Dec_Temp	The average monthly temperature (in degree Celsius) within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster for the months January to December. The data was averaged for the respective year.	24.5	282	7,916	-1.9	1,317,091	1,655,272	DHS
Proximity_to_Water	The geodesic distance to either a lake or the coastline.	72,881	113,803	113,172	0	702,150	1,692,667	DHS
Proximity_to_ National_ Borders	The geodesic distance to the nearest international borders.	41,052	70,801	79,453	0	594,383	1,692,667	DHS
Malaria_2000_2015	The average parasite rate of plasmodium falciparum in children between the ages of 2 and 10 years within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster. The data is averaged for 2000, 2005, 2010 and 2015 and ranges between 0 and 1.	0.0	0.2	0.4	0.0	1.0	1,099,719	DHS
Nightlights_ Composite	The average nighttime luminosity (in hours) of the area within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster.	0.1	5.0	13.4	0.0	140.9	1,691,248	DHS
Urban	Dummy variable equals 1 if place of household residence was qualified as urban; 0 if rural.	0.0	0.4	0.5	0	1	1,785,184	DHS
Pop	The average number of individuals living within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster in 2005, 2010, 2015.	34,522	95,586	194,267	0	6,407,341	1,689,641	DHS
Pop_density	The average number of people in 2000, 2005, 2010, 2015 in clusters whose centroid falls within a radius of 10 km (for rural points) or 2 km (for urban points). That average was then divided by the area of those clusters.	56	1,030	3,579	0	59,298	1,163,962	DHS

Years_educ	Highest year of education gives the years of education completed.	4.0	4.2	2.4	0.0	19.0	1,236,047	DHS
Age	Age of interviewed individual at the time of the survey.	28.0	29.1	9.6	11.0	64.0	1,793,783	DHS
Christian	Dummy variable equals 1 if interviewed person states to be a Christian; 0 otherwise.	0.0	0.4	0.5	0	1	1,524,191	DHS
Muslim	Dummy variable equals 1 if interviewed person states to be a Muslim; 0 otherwise.	0.0	0.4	0.5	0	1	1,524,191	DHS
No_religion	Dummy variable equals 1 if interviewed person states to be an atheist; 0 otherwise.	0.0	0.0	0.2	0	1	1,524,191	DHS
Traditional	Dummy variable equals 1 if interviewed person states to be a traditionalist; 0 otherwise.	0.0	0.0	0.1	0	1	1,524,191	DHS
Other	Dummy variable equals 1 if interviewed person states to be none of the before stated religion (e.g., Buddhist, Jewish etc.); 0 otherwise.	0.0	0.2	0.4	0	1	1,524,191	DHS
Relation_Household_head	Relationship to the head of the household ranging between 1 (head) and 14 (not related at all, e.g. maid).	2.0	3.6	3.0	1.0	14.0	1,785,042	DHS
Gender_household_head	Dummy variable equals 1 if household head is a man; 0 otherwise.	1.0	0.8	0.4	0	1	1,785,180	DHS

CHAPTER 4 THE LINK BETWEEN REGIONAL TEMPERATURE AND REGIONAL INCOMES

ABSTRACT[62]

We study the effect of temperature on economic development on the subnational level, employing cross-sectional data for up to 15,533 subnational units from two distinct sources. In contrast to the existing cross-country literature on the temperature-income relationship, our setting allows us to exploit subnational heterogeneity through the inclusion of country fixed effects and mitigate omitted variable bias. We find no negative relationship between regional temperature and four different measures of economic development (per capita GDP, growth of per capita GDP, nightlights and gross cell production). We also test whether temperature is non-linearly related to income (with hotter regions being potentially particularly prone to adverse effects of temperature on income) but find no evidence in favor of such a relationship. Finally, we examine whether the effect of temperature on economic development is especially pronounced in poorer regions (e.g., due to weaker adaptation), but find no robust evidence for this proposition. In sum, our findings suggest that adaptation to temperature differences could be feasible and relevant.

JEL-Classification: Q54; Q56; R11

Keywords: Regional temperature; regional incomes; subnational data; non-linearity

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4.1 INTRODUCTION

The role of climate change and related temperature increases for economic development has received renewed attention in the cross-country literature in recent years (e.g., Burke et al., 2015, 2018, Dell et al., 2009, 2012, Lanzafame, 2014). Numerous studies find significant negative effects of higher temperature on income. Furthermore, some contributions to the literature suggest a non-linear, inverted-U relationship between income and temperature, meaning that colder countries (with average yearly temperatures of up to 13-16 degrees) might benefit from increasing temperatures, while hotter countries tend to lose (e.g., Burke et al., 2015[63], 2018, Deryugina and Hsiang, 2014, Nordhaus, 2006, Zhao et al., 2018). Finally, relatively poorer countries could suffer more from higher temperatures, partly due to being located in hotter parts of the world and partly due to fewer (financial) means to adapt to temperature alterations (e.g., Dell et al., 2012, Moore and Diaz, 2015, Zhao et al., 2018).

Our contribution to the recent literature on the temperature-income relationship is three-fold. First, we correlate *subnational data* on temperature with subnational data on economic variables (e.g., regional GDP per capita). We gathered two datasets on climatic and economic indicators for a large number of world-wide regions. Depending on the variables in use, we are able to include between 1,542 to 15,533 subnational units, which cover mainly developed (data from Gennaioli et al. (2014) from 1950 to 2010) as well as developing countries (data from Demographic and Health Surveys (DHS) with data on cells for 2005 and 2015) from all continents. Both datasets allow us to account for the within-country heterogeneity in temperatures and incomes, an aspect that is by construction neglected when only taking a cross-country perspective.[64]

Second, the use of regional data allows us to account for country fixed effects, thereby holding constant everything that is specific to a country such as country-specific policies, institutions, colonial history or aspects of culture. Thereby, we are able to draw conclusions on the relationship between regional temperature and regional incomes while accounting for relevant other influences. In particular, the relationship between temperatures and incomes could be affected by adaptation possibilities which, in turn, might be driven by country-specific effects that we account for.

Third, we explore the effect of temperature on four different measures for subnational incomes: regional GDP per capita, growth of GDP per capita from 1950 to 2010, *gross cell production* within a DHS cluster, as well as *nightlights* within a DHS cluster.

[63] Even though Burke et al. (2015) also use micro-level data to fit their response functions, they report most findings on the country-level, which is why we cited them together with other cross-country studies.

[64] For example, in Russia we have a spread of 5,000 miles in distance, of 24 degrees in average temperature (between Republic of Sakha and Krasnodar Region) and of 47,265 USD in per capita income (between Republic of Ingushetia and Tyumen Region) according to our data.

While countries are the most common units for analyzing the link between temperatures and economic development (e.g., Burke et al., 2015, 2018, Dell et al., 2009, 2012), some literature has explored within-country variation. Nordhaus (2006) relies on the G-Econ database employing proxies of economic activity[65] for all large countries measured at a 1° latitude by 1° longitude scale. Other literature focuses on the link between temperature for regions but is mainly limited to the United States (see e.g., Colacito et al., 2019, Dell et al., 2009, Deryugina and Hsiang, 2014) and recently China (see Li et al., 2019). In contrast to them, our analysis is global. Most closely related to us is Zhao et al. (2018) who consider grid cells and data across different continents but rely again on the G-Econ database developed by Nordhaus (2006). Instead of grid cells, we employ meaningful subnational administrative regions and typical economic indicators such as regional GDP per capita as reported by the national statistical offices and we employ data based on surveys from the DHS.[66] Thereby, our regional setting is directly comparable to the cross-country literature which focusses on national GDP per capita.

Using data for 1,542 subnational administrative regions from different continents (data gathered by Gennaioli et al. (2014)) yields no systematic relationship between temperature and regional GDP per capita as well as between temperature and GDP growth.[67] There is also no systematic difference in the effect of temperature on regional economic development between rich and poor regions. Furthermore, we find no systematic evidence for any inverted-U relationship between regional temperature and income as well as growth. Employing data from the Demographic and Health Surveys, we find, if anything, a positive (though usually statistically insignificant) relationship between temperature and *nightlights* within a DHS cluster. The relationship between temperature and *gross cell production* within a DHS cluster is, if anything, slightly negative, with no difference between rich and poor regions. There is again no evidence for an inverted-U relationship between temperature and *nightlights* nor for temperature and *gross cell production*. A series of extensions and sensitivity checks (e.g., including maximum and minimum temperatures) support our interpretations as our results continue to yield zero effects of temperatures on different regional income measures.

The remainder of this paper is structured as follows. Section 4.2 provides theoretical considerations and a literature review. Section 4.3 describes data sources and our empirical methodology. Section 4.4 presents our results and offers interpretations. We conclude with Section 4.5.

[65] Nordhaus (2006) data covers 25,572 terrestrial grid cells and includes several measures of economic activity such as proxies for income by industry, employment by industry, urban and rural population or employment.

[66] Moreover, we employ DHS data to analyze enumeration areas, called clusters, and explore the commonly used proxies for economic activity such as *gross cell production* and *nightlights*.

[67] Potential effect sizes are small and comparatively precisely estimated, which may point to the absence of any (generalized) adverse effects of regional temperature.

4.2 THEORETICAL CONSIDERATIONS AND LITERATURE REVIEW

4.2.1 Theoretical Considerations

Recently, there has been renewed interest in exploring the relationship between temperature and economic indicators such as per capita GDP or growth, which has been driven by evidence for anthropogenic climate change (e.g., Carleton and Hsiang, 2016, Dell et al., 2014). There are different pathways through which higher temperatures may be detrimental to economic development (e.g., Burke et al., 2015, Easterly and Levine, 2003, Gallup et al., 1999):

1. Higher temperatures adversely affect agricultural production, e.g., by contributing to water stress or the spread of plant pests. Especially when economies are poor and dependent on agriculture, such adverse effects may hurt overall economic development.

2. Higher temperatures may affect human productivity in general. For instance, with higher temperatures it becomes more exhaustive for the human body to regulate its temperature. Increased heat stress in turn will adversely affect labor performance and productivity. The adverse effects of heat stress may also be felt in non-agrarian sectors of the economies.

3. Higher temperatures may also contribute to the spread of debilitating diseases (e.g., Malaria, Dengue fever) by facilitating the spread of disease vectors (e.g., mosquitos). These diseases will adversely affect the accumulation of human capital (e.g., by contributing to school absenteeism or permanent mental or physical disability), which in turn will discourage economic development.

4. Higher temperatures may also have long-run effects on political and economic institutions by affecting the modes of agricultural production (e.g., family vs. plantation farming) and the suitability of land for foreign settlers due to the incidence of specific diseases. For instance, especially debilitating diseases may have prevented the spread of inclusive institutions (e.g., sound property rights) by discouraging European settlements in many parts of the world and instead given rise to more extractive modes of production (e.g., the use of forced labor) and more extractive economic and political institutions. Extractive institutions (e.g., weak property rights, a weak rule of law) in turn are anticipated to discourage innovation and investment, thus leading to lower levels of economic development compared to economies that enjoy more inclusive economic and political institutions.

4.2.2 Country Level Evidence

The relationship between temperature and income is usually investigated at the country level. For instance, Dell et al. (2009) find a negative relationship between income per capita and temperature; countries in the year 2000 experience a drop in income of 8.5% with every degree increase in temperature. Hsiang (2010) comes to a similar conclusion, finding that a temporary one degree increase in surface temperature is associated with a contemporaneous 2.5% reduction in non-agricultural production output for 28 countries in the Caribbean and Central America. For more than 160 countries, Burke et al. (2015, 2018) project a reduction in global income by 15-25% in 2100 if global warming continues to be unmitigated. Lanzafame (2014) investigates the short- and long-term effect of weather shocks on income of 36 African countries, finding that African economies are damaged by such shocks. Schlenker and Lobell (2010) report a negative association between temperature and agricultural output in Sub-Saharan African countries.

4.2.3 Evidence at the Sub-National Level

Within-country differences in incomes can be substantial (e.g. Acemoglu and Dell, 2010). By construction, cross-country studies cannot systematically investigate the within-country heterogeneity regarding temperature and economic development. Some recent studies have started to re-analyze the income-temperature relationship by using county or (geographical) grid cell level data. Nordhaus (2006) analyzes 25,572 grid cells (on a 1° latitude by 1° longitude scale) and finds a 0.9-3% decrease in economic activity (depending on the specific proxy of economic activity) due to temperature rises. Dell et al. (2009) find that a one degree rise in temperature is related to a 1.2-1.9% decline in municipal income for 7,684 municipalities in 12 countries in the Americas; interestingly, their results also suggest that the within-country cross-sectional correlation is substantially weaker than any cross-country correlation.[68] Zhao et al. (2018) analyze 10,597 global grid cells using data from Nordhaus (2006) and find a weak negative association between temperature and economic activity. Focusing only on China, Li et al. (2019) consider data from 31 Chinese provinces, finding that temperature exerts both positive and negative effects on economic growth depending on the level of average temperature. A similar result is obtained by Deryugina and Hsiang (2014) who focus on the United States. Finally, Colacito et al. (2019) suggest that a rise in the average summer temperature in the United States leads to a reduction in the annual state growth rate of 0.15 to 0.25 percentage points.

4.2.4 Non-Linear Effects

The literature provides some evidence in favor of a non-linear relationship between temperature and income. Two cross-country studies by Burke et al. (2015, 2018) examine this non-linearity for more than 160 countries and find the relationship to be concave, with productivity being highest at approximately 13 degrees and strongly declining at higher temperatures. This is in line with Deryugina and Hsiang (2014), Nordhaus (2006) and Zhao et al. (2018) who find evidence in favor of an inverted U-shape with a maximum at about 15, 12 and 16 degrees, respectively. Li et al. (2019) places the ‘beneficial’ temperature threshold at 23.37 degrees, meaning that almost all Chinese provinces could experience positive effects from rising temperatures. Schlenker and Lobell (2010) also find a strong non-linear relationship between temperatures and corn, soybean, and cotton yields. On the other hand, Dell et al. (2009, 2012) and Lanzafame (2014) find little or no evidence that the relationship between income and temperature is non-linear.

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[68] Acemoglu and Dell (2010) highlight that the magnitude of the link between temperature and income in Dell et al. (2009), cannot explain the full spatial variation in the data such that there is significant scope for other factors, too.

4.2.5 Adaptation

A concern of the existing literature is the rate of adaptation to climate change. This rate has to be considered when estimating the potentially negative consequences of temperature increases (e.g., Moore and Diaz, 2015). Indeed, Dell et al. (2009) suggest that approximately half of the negative effect of temperature increase on income is eliminated through adaptation in the long-run. According to Dell et al. (2012), the main factor governing adaptation and thus accounting for the amount of economic damage due to rising temperatures is a country's income level. Here, poorer countries are expected to see lower rates of adaptation (e.g., in terms of using better machinery to compensate for reduced crop yields) and may thus experience stronger adverse economic effects. Indeed, several studies distinguish between rich and poor countries or regions and find that the negative effect of temperature tends to be more relevant for poor areas (Dell et al., 2012, Zhao et al., 2018). Burke et al. (2015, 2018), on the other hand, find no difference in the effect of temperature on income in rich and poor countries, respectively.

4.3 DATA AND EMPIRICAL STRATEGY

4.3.1 Data

We employ two distinct datasets that allow us to estimate the link between *regional* temperatures on measures of *regional* economic development. Temperature as well as GDP per capita at the regional level and regional growth of GDP per capita from 1950 to 2010 are drawn from Gennaioli et al. (2014), while further climate data as well as *gross cell production* and *nightlights* come from the Demographic and Health Surveys (DHS). Further descriptions, descriptive statistics and data sources of all our data can be found in **Table 26** in the Appendix.

First, we use a dataset collected by Gennaioli et al. (2014) that contains economic as well as geographic variables for 1,542 regions (mainly administrative units such as states and provinces) in 83 countries around the world. As for the GDP per capita and GDP per capita growth data at the subnational level, Gennaioli et al. (2014) collect data from national/regional statistical offices between 1950 and 2010. The sample covers more than 90% of the world's GDP and includes a large number of countries and regions from Asia, South America, Oceania, North America and Europe. African regions are under-represented due to data constrains; they represent about 4% of all regions in the dataset. In total, we have approximately 9,500 data points available when using the Gennaioli et al. (2014) dataset.

The dataset includes a variable measuring regional temperature, obtained from the WorldClim database. This variable indicates the average temperature per region between 1950 and 2000. Thereby, we follow Dell et al. (2009) who also use temperature data that is averaged over the 1950-2000 period.[69] Consequently, our analysis explores whether relatively warmer regions are more or less wealthy than

[69] Cross-country studies have usually yearly or five-yearly average temperature data available (e.g., Burke et al., 2015, 2018). Grid cell approaches explore a shorter time horizon (e.g., Nordhaus, 2006, Zhao et al., 2018).

relatively colder regions, controlling for country fixed effects and other characteristics. We start exploring the full panel dataset and then construct seven cross-sections for the years 1950, 1960, 1970, 1980, 1990, 2000 and 2010 to compare the effects of different temperature levels on regional GDP over time. This allows us to draw potential insights regarding adaptation to hotter temperatures: if comparatively warmer subnational regions within a country are equally rich as medium or colder regions, adaptation to hotter or colder temperatures might be possible within reasonable time frames.

Second, we also employ a dataset comprised of DHS data. The DHS program primarily collects representative household survey data in the field of demographics and health in more than 90 countries; to date there are approximately 400 surveys available. The program is implemented by ICF International and is mainly funded by the United States Agency for International Development, which allows DHS to conduct national surveys at least every five years with an average sample size of between 5,000 to 30,000 respondents (see ICF International (2019) for more information). DHS covers a large number of African countries which constitutes a valuable supplement to the Gennaioli et al. (2014) dataset. DHS survey data contains a variety of geographic information which are obtained from the Geographic Information System (GIS). In particular, we have temperature, precipitation, frost days, wet days, etc. available. This information is available for small geographical units called clusters.[70]

GDP data does not exist on the cluster-level, therefore, we use two alternative variables to capture average income of a cluster: *nightlights* which is the average nighttime luminosity of the area (composite cloud-free radiance values) available for 2015 and *gross cell production* (GCP) which is the average Purchasing Power Parity (PPP) in 2005 US dollars for the 2 km (urban) or 10 km (rural) buffers surrounding the DHS survey cluster (see DHS Sampling Manual at ICF International (2012)). We thus have available two separate cross-sectional samples for 2005 with 31 surveys and 14,130 cluster-level observations and for 2015 with 37 surveys and 15,533 cluster-level observations.[71]

4.3.2 Empirical Strategy

Our cross-sectional databases from Gennaioli et al. (2014) and DHS (2005, 2015) allow us to examine whether warmer regions (clusters) tend to be less or more wealthy than their colder counterparts. Our empirical strategy follows a regression approach common in the literature. Using Gennaioli et al. (2014) data, our first equation to estimate regional GDP per capita in region *r* of country *i* at time *t* is specified as follows:

$$Ln(GDP\ per\ capita)_{r,i,t} = \beta(Temperature)_{r,i} + \omega_i + \lambda_t + \epsilon_{r,i,t} \tag{1}$$

[70] Clusters are a representative selection of *Enumeration Areas*, a statistical unit for population census (see ICF International (2012) for the selection process of *Enumeration Areas*, clusters and households by DHS).

[71] To get a high number of observations we included surveys that were conducted three years before or after 2005 and 2015, respectively. There was always only one survey per country.

where ω_i and λ_t are country and time fixed effects and $\epsilon_{r,i,t}$ is an error term[72]. Country fixed effects account for any country-specific and time-invariant unobservables such us colonial history, national institutions etc. They can be employed because we analyze *regional* temperature and *regional* incomes. Time fixed effects capture contemporary global phenomena. As our regional temperature variable is time-invariant, this setting does not capture changes in regional GDP per capita over time. To analyze how regional temperature affects regional GDP per capita at different time periods (decades) we also estimate a sequence of seemingly unrelated regressions in sensitivity tests below, among other tests.

Most recent studies of the temperature-income relationship employ fixed effects strategies, while the use of further control variables is rare (e.g., Burke et al., 2015, 2018, Deryugina and Hsiang, 2014, Li et al., 2019).[73] In particular, the recent literature does not systematically take account of changes in property rights, democracy, international trade patterns, social and demographic variables, education, disease etc. While aware of the shortcomings, we follow the literature for our main results and proceed to run parsimonious models that do not include further controls in the baseline estimations. It might be argued that such a parsimonious strategy gives any potential relationship between regional temperature and income a comparatively high chance to emerge. If regions within the same country follow a similar development trajectory as the country as a whole, we would expect fundamental differences due to climatic conditions that persist over longer time periods to emerge as a potentially relevant explanatory variable. For example, if higher temperatures were linked to the spread of diseases, not accounting for the disease environment overemphasizes the link between temperature and income. Indeed, previous studies that account for additional covariates usually found limited effects of temperature or related variables on GDP per capita or growth in cross-country regressions (e.g., Acemoglu et al., 2001; Rodrik et al., 2004; Sala-I-Martin et al., 2004). In an attempt to further explore such matters too, we include several regional and national control variables to our baseline regressions and discover that the effect of temperature is rather sensitive towards their inclusion (**Table 24**).

In a second model, we replace regional per capita GDP by the per capita GDP growth rate between the first and the last available regional GDP entry recorded. Our panel data turns into a cross-section with the following estimation equation:

$$GDPgrowth_{r,i} = \beta(Temperature)_{r,i} + \omega_i + \epsilon_{r,i,t} \tag{2}$$

[72] If not indicated differently, we apply robust standard errors clustered at the country-level. Following Cameron and Miller (2015) we cluster standard errors at the country-level as observations regarding temperature within countries are not independently and identically distributed. We assume that even though, regression model errors are independent across countries they are correlated within countries.

[73] There are a few exceptions: Dell et al. (2009) use a set of geographic variables such as distance to coast; Hsiang (2010) controls for cyclone activities; Zhao et al. (2018) uses a set of economic and geographic controls such as population growth or precipitation; and Nordhaus (2006) uses mean distance from coast, mean elevation, and absolute value of latitude.

Similarly, we employ country fixed effects in a regression setting for the DHS data samples. We predict *nightlights* and *gross cell production* of region *r* in country *i* in year 2015 and 2005 by employing the following equations:

$$nightlights_{r,i,2015} = \beta(Temperature)_{r,i,2015} + \omega_i + \epsilon_{r,i,2015} \quad (3)$$

$$gross\ cell\ production_{r,i,2005} = \beta(Temperature)_{r,i,2005} + \omega_i + \epsilon_{r,i,2005} \quad (4)$$

Following the literature (e.g., Burke et al., 2015, 2018, Dell et al., 2009, 2012, Lanzafame, 2014), we expect the temperature-income relationship to be negative in models (1) to (4), i.e., we expect hotter regions to be less wealthy.

To account for adaptation effects and further exploit regional heterogeneity, we estimate additional models that include an interaction term with the dummy variable *Poor* that equals 1 if a region's income is below the average of the full sample and 0 otherwise (see also Dell et al., 2012, Zhao et al., 2018 for similar approaches). According to the literature, we hypothesize that the potential negative effect of temperature on income (β_2) is stronger in relatively poorer regions due to weaker adaptation.

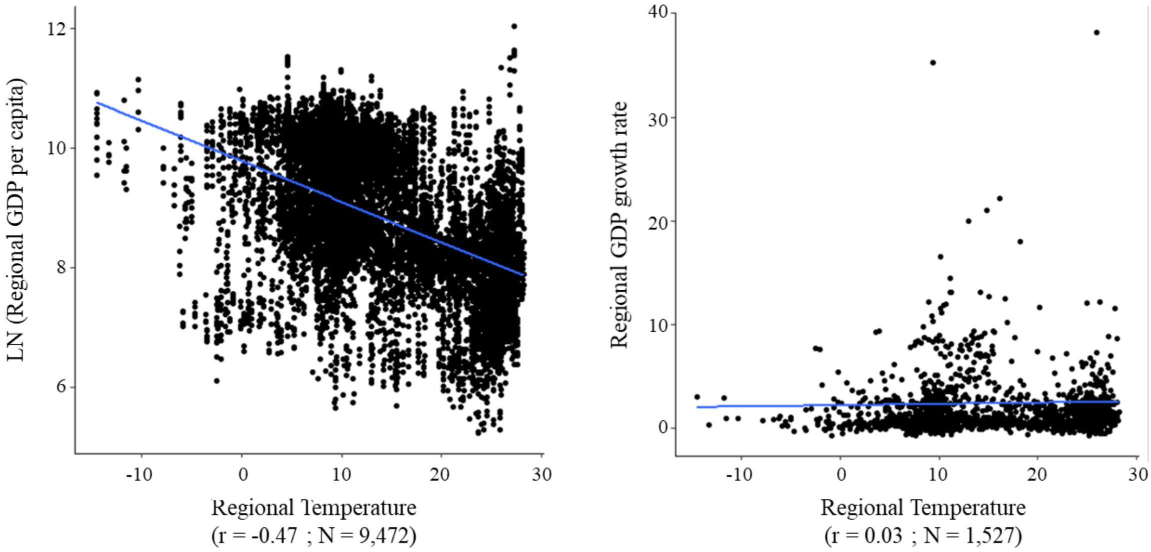
Finally, to consider potential non-linearities in the temperature-income relationship (where the adverse effect of higher temperatures may be particularly pronounced in hotter regions), we add a squared temperature to all our models. Here, we follow Burke et al. (2015, 2018), Deryugina and Hsiang (2014) and Nordhaus (2006).

4.4 THE LINK BETWEEN REGIONAL TEMPERATURE AND REGIONAL INCOMES

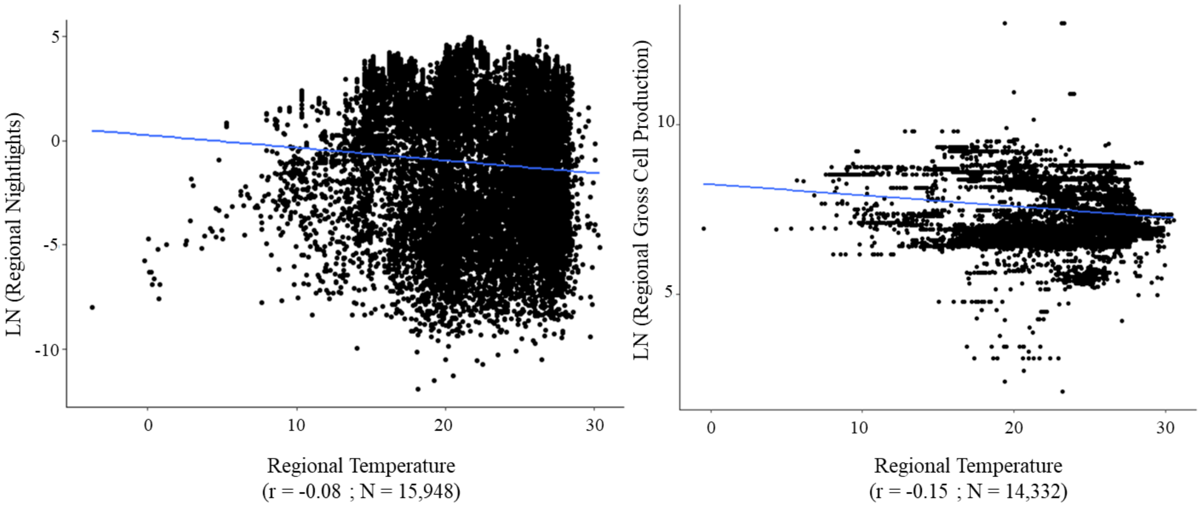
4.4.1 Correlations

Figure 6 shows the relationship between temperature and our four dependent variables: regional log GDP per capita, regional GDP per capita growth rate, regional log *nightlights* and regional log *gross cell production.*

Figure 6: *The link between regional incomes and regional temperature*



Note: Scatterplots summarize all available GPD p.c. observations and growth rates per region between 1950 and 2010 in Gennaioli et al. (2014).

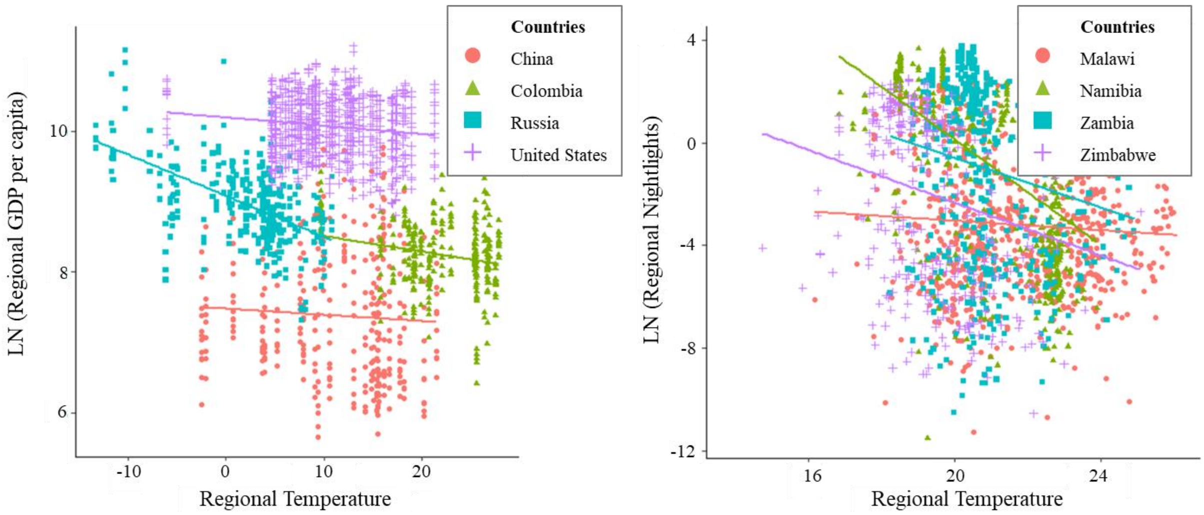


Note: Scatterplots summarize all available Nightlights observations in 2015 and Gross Cell Production observations in 2005 from DHS.

Except for regional growth rates (where correlation is close to zero), we observe a negative relationship between temperature and income, i.e., hotter regions tend to be less wealthy. This is consistent with insights from the existing cross-country literature (e.g., Burke et al., 2015, 2018, Dell et al., 2009, 2012). However, **Figure 6** highlights that there is substantial variation in temperature and each of the regional outcome measures. Indeed, the richest region in our dataset (Abu Dhabi in the United Arab Emirates) is also among the hottest, with an average temperature of 27.3°C. Moreover, some exceptionally cold regions such as the Tyumen region in Russia or the Yukon Territory in Canada are among the richest regions in the world. Similarly, some regions seem to have exceptionally high growth rates or very low nightlight intensity. As a sensitivity test, we eliminate such potential outliers[74] from the analysis (results are presented in (**Table 25**). In any event, heterogeneity within countries matters substantially and alongside country specific characteristics.

The large heterogeneity within countries highlights the relevance of our analysis as an important extension to the existing cross-country literature. **Figure 7** emphasizes this heterogeneity in selected countries for (the log of) regional *GDP per capita* (China, Colombia, Russia and United States) and (the log of) *nightlights* (Malawi, Namibia, Zambia, Zimbabwe).[75] In all cases we observe a substantial spread of income and temperature, given that all countries are of considerable size and therefore cover various climatic zones and, potentially, exhibit different levels of economic development between regions. Take Russia for instance: West and East are separated by more than 5,000 miles. Average yearly regional temperature ranges from -13 degrees (Republic of Sakha) to +11 degrees (Krasnodar Region), whereas per capita income ranges from 2,025 USD (Republic of Ingushetia) to 49,290 USD (Tyumen region).

Figure 7: *Heterogeneity within countries and links between regional incomes/nightlights and temperature for selected countries*



Note: Scatterplots summarize all available GPD p.c. observations (1950-2010) and Nightlights observations (2015) per region for selected countries.

In sum, regions or clusters within a country can be relatively hot or cold and relatively poor or rich. The variation is substantial. By using national averages only, the cross-country literature cannot account for this considerable spread, meaning that an adverse relationship between temperature and income at the country level may be due to this rather high level of aggregation. Meanwhile, our regional approach allows us to investigate any potentially highly relevant within-country heterogeneity, while

[74] Outliers are selected by plotting distribution curves and eliminating isolated regions that represent very high values of our four dependent variables.

[75] Note that Gennaioli et al. (2014) and DHS (2005, 2015) have a different regional focus (developed vs. developing countries).

also being able to account for country specific characteristics with country fixed effects. Thereby it naturally extends and complements the existing literature.

4.4.2 Main Econometric Results

Table 19 shows the relationship between regional temperature on regional per capita income (specifications (1)-(4)) and its growth rate between the first and the last available GDP p.c. data point available (specifications (5)-(8)). We now always account for country heterogeneity by including country fixed effects, which capture all national characteristics that could influence the relationship between temperature and income. Time fixed effects can only be applied when regional incomes shows variation over time (specifications (1)-(4)). In specifications on growth (columns (5)-(8)), meanwhile, we just have one observation per region.

In the parsimonious specification (1), the coefficient for the relationship between temperature and log regional GDP p.c. is negative, close to zero (with a point estimate of -0.004) and statistically insignificant at conventional levels. Thus, accounting for country specific heterogeneity, there is no systematic link between regional temperature and regional incomes. Given that the coefficient estimate is small and the standard error estimate is not unreasonably large, the specification tends to provide evidence of absence of any link between regional temperature and regional incomes. Put differently, regions within a country are not systematically wealthier or poorer only because they are colder or hotter. In specification (5) we investigate the link between regional temperature and regional growth when controlling for country fixed effects. Here, we again observe no clear relationship between the two variables. We also note that the addition of regional temperature to the model does not improve the overall fit of the model, i.e., when estimating a pure fixed effects model without any controls the R^2 is 0.86 when regional GDP is the dependent variable and 0.62 when growth is the dependent variable. Including regional temperature increases R^2 by 0.0002 and 0.0019, respectively. This is suggestive that regional temperature tends to have a comparatively small explanatory power for GDP and growth.

In a second step, we include a dummy variable called *Poor* for whether a region is below the sample average of regional GDP per capita (dummy equals 1) or above (dummy equals 0). We then interact this dummy variable with temperature to explore whether the effect of temperature on GDP per capita or growth is more relevant in poorer regions. The variable *Poor* itself must have a significantly negative coefficient when explaining regional GDP per capita. A positive coefficient in the growth regressions would be consistent with conditional convergence. We observe a significant drop in regional GDP per capita by 61% and a statistically insignificant increase in growth if the region is poor. Temperature continues to have no effect on regional incomes, independent of whether the region is considered poor or rich (specification (2)). The interaction term is positive and statistically significant in specification (6) i.e., growth tends to be higher in poorer and warmer regions when differentiating between poor and rich regions.

Potential effects of temperature on income might be non-linear, following an inverted U-shape. For instance, Burke et al. (2018) and Zhao et al. (2018) find that economic growth is concave in temperature, meaning that cooler regions might actually benefit from a rise in temperature (e.g., as agricultural productivity improves), while already warmer regions lose. In contrast to this literature, specification (3) tends to show a U-shape when employing regional data, suggesting that the negative effect of temperature on income is reversed when the average annual temperature exceeds 13°. Interpreting these results, we must keep in mind that regions from Gennaioli et al. (2014) in general are relatively cool with an average annual temperature of about 14 degrees; for instance, many African regions, which may have driven previous results due to their dependence on agriculture, are not included in this sample (however they are included in the DHS samples below). Moreover, there are numerous hot regions in the sample which, at the same time, have high incomes.

A large strand of the literature points to the role of education in economic development, with higher levels of education being conducive to economic progress (e.g., Barro, 1991, Bowles, 1972, Mincer, 1974). We include years of education in our regression and interact it with temperature, too. This allows us to explore whether temperature has weaker effects on income in relatively well-educated regions; potentially, assuming that education is more positively correlated with adaptation, this allows regions with high education levels to maintain their income levels. However, while years of education have a strong and statistically significant effect on regional GDP per capita (with every additional year of schooling raising GDP p.c. by 24% (specification (4)), we find that its effect is independent of temperature. Again, for regional growth we find no effect of temperature (specification (8)).

The results of **Table 19** show that the findings of past literature (see e.g., Burke et al., 2015, 2018, Dell et al., 2009, 2012, or Lanzafame, 2014) are not that robust when transferred to the regional level. Controlling for country specific heterogeneity, there is no support for the view that warmer regions are systematically poorer than colder regions. The estimated coefficients of temperature are close to zero, while being comparatively precisely estimated, indicating that there is no effect of regional temperature on regional incomes and growth. Moreover, poorer regions do not seem to suffer more from hotter temperatures than richer regions. It is important to note that heterogeneity within countries, i.e., among regions within a country, is substantial regarding temperature and income. This suggests that there is no systematic link between warmer temperatures and incomes, with national institutions, national policy or other national factors potentially helping regions to adapt.

Table 19: *Baseline regressions for the effect of temperature on regional incomes and growth when accounting for country and partly time fixed effects*

Dependent variable	(1) Ln_GDP_ region	(2) Ln_GDP_ region	(3) Ln_GDP_ region	(4) Ln_GDP_ region	(5) Growth	(6) Growth	(7) Growth	(8) Growth
temperature	-0.004	0.007	-0.025**	0.012	0.040	-0.016	0.022	0.069
	(0.007)	(0.009)	(0.012)	(0.013)	(0.027)	(0.027)	(0.042)	(0.052)
Poor		-0.612***				0.211		
		(0.114)				(0.371)		
temperature x Poor		-0.013				0.065**		
		(0.009)				(0.030)		
temperature^2			0.001*				0.001	
			(0.001)				(0.002)	
Years of Education				0.238***				-0.072
				(0.038)				(0.128)
temperature x Years of Education				-0.002				-0.004
				(0.002)				(0.005)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	NO	NO	NO	NO
Observations	9,472	9,472	9,472	7,504	1,527	1,527	1,527	1,505
R^2	0.858	0.884	0.86	0.893	0.626	0.631	0.626	0.627
Residual Std. Error	0.438 (df=9,344)	0.396 (df=9,342)	0.436 (df=9,343)	0.379 (df=7,381)	1.714 (df=1,444)	1.704 (df=1,442)	1.715 (df=1,443)	1.722 (df=1,422)
F Statistic	445.6***	553.3***	447.3***	506.9***	29.49***	29.38***	29.14***	29.15***

Note: The regressions estimate the effect of temperature on logarithmized regional GDP p.c. and regional growth in regressions with the dummy variable Poor (1 if regional GDP is below sample average; 0 otherwise) and its interaction with temperature, Years of education its interaction with temperature, as well as temperature squared. Regressions are run with the Gennaioli et al. (2014) dataset with country and partly time fixed effects. Robust clustered standard error estimates (country-level) are presented below the coefficients. Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

In a similar manner, we run the model as outlined above employing our two DHS samples. The unit of observations are DHS clusters[76]. We use the logarithm of *nightlights*[77] and *gross cell production* (GCP) as dependent variables. Here, we are dealing with cross-sectional data, as our variables *nightlights* and *gross cell production* are only available for 2015 and 2005, respectively. We again account for country fixed effects. Results of estimation equations (3) and (4) are presented in **Table 20**. The results suggest a positive relationship between the cluster temperature and *nightlights* within a cluster, i.e., with every increase in temperature we observe an increase in *nightlights* by 18% to 40%. In relatively poor regions, this positive effect is somewhat less pronounced (specification (2)). We also find that the relationship between temperature and *nightlights* does not follow a non-linear pattern as the coefficient for the squared term of temperature is insignificant.

The relationship of temperature with *gross cell production* is ambiguous. If anything, temperature seems to have a small but negative effect on *gross cell production*, i.e., results suggest that higher temperatures in a cluster tend to reduce *gross cell production* in 2005 by approximately 3%. This only holds in the presence of the dummy variable *Poor*, which is the only other significant variable in our model (specification (5)).

[76] DHS also report the respective subnational region and country for every cluster.

[77] The dataset contains approximately 3,000 zero values for nightlights (which might not necessarily imply complete darkness of a cluster but rather a missing observations) that are transformed into missing values when log-transforming the variable nightlights.

Table 20: *Baseline regressions for the effect of temperature on nightlights in 2015 and gross cell production in 2005 when accounting for country fixed effects*

Dependent variable	(1) Ln_night-lights	(2) Ln_night-lights	(3) Ln_night-lights	(4) Ln_GCP	(5) Ln_GCP	(6) Ln_GCP
temperature	0.181***	0.203***	0.397**	-0.012	-0.026**	0.054
	(0.067)	(0.059)	(0.191)	(0.011)	(0.012)	(0.063)
Poor		-2.370**			-1.428***	
		(0.977)			(0.358)	
temperature x Poor		-0.084**			0.018	
		(0.04)			(0.013)	
temperature²			-0.005			-0.002
			(0.005)			(0.001)
Country FE	YES	YES	YES	YES	YES	YES
Time FE	NO	NO	NO	NO	NO	NO
Observations	15,533	15,533	15,533	14,130	14,130	14,130
R^2	0.381	0.579	0.382	0.84	0.891	0.84
Residual Std. Error	2.627 (df= 15,495)	2.165 (df= 15,493)	2.625 (df= 15,494)	0.379 (df= 14,098)	0.312 (df= 14,096)	0.378 (df= 14,097)
F Statistic	257.3***	546.6***	251.5***	2,382***	3,493***	2,318***

Note: The regressions estimate the effect of temperature on logarithmized regional nightlights (gross cell production) in regressions with the dummy variable Poor (1 if regional nightlights (gross cell production) is below sample average; 0 otherwise) and its interaction with temperature, as well as temperature squared. Nightlights (gross cell production) regressions are run with DHS data for the year 2015 (2005) with country fixed effects. Robust clustered standard error estimates (country-level) are presented below the coefficients. Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

4.4.3 Extensions and Sensitivity Tests

In the following, we present five empirical extensions, aiming at refining our previous estimations.

First, we reconsider our subnational administrative data and create seven year-subsamples, i.e., one cross-section for every first year of a new decade (1950, 1960, 1970, 1980, 1990, 2000, 2010). We proceed with our three main specifications (as seen in **Table 19** and **Table 20**) for every year-subsample. The results for the seven cross-sections displayed in **Table 21** confirm the ambiguous effect of regional temperature on regional GDP per capita. While we observe a negative and statistically significant relationship between temperature and log GDP per capita in a few cases, this effect is sensitive to alterations in specifications in all year-subsamples. For all specifications, the effect of regional temperature on regional GDP per capita is small, as shown by the coefficient estimates ranging between 0.004 to 0.033; that is, regions within a country that are one degree warmer than the average region of the country tend to have a 0.4% to 3.3% smaller GDP. When interacted with Poor, we only find significantly negative coefficients in subsamples for 1950 and 1960. We might conclude that poorer regions had more difficulties to cope with higher temperatures before 1970 but thereafter found adaption methods (such as improvements in medicine, agriculture etc.) that decoupled temperature effects from income. As in **Table 19**, there does not seem to be a clear non-linear relationship between regional temperature and regional GDP per capita.

Table 21: *Baseline regressions for the effect of temperature on regional incomes when accounting for country fixed effects for seven year-subsamples*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable	Ln_GDP_ region 1950	Ln_GDP_ region 1950	Ln_GDP_ region 1950	Ln_GDP_ region 1960	Ln_GDP_ region 1960	Ln_GDP_ region 1960	Ln_GDP_ region 1970	Ln_GDP_ region 1970	Ln_GDP_ region 1970	Ln_GDP_ region 1980
temperature	-0.030***	0.009	-0.031	-0.021***	-0.004***	-0.01	-0.013	-0.003	-0.011	-0.005
	(0.011)	(0.016)	(0.02)	(0.007)	(0.0004)	(0.016)	(0.009)	(0.007)	(0.011)	(0.009)
Poor		0.092			-0.11			-0.443***		
		(0.196)			(0.12)			(0.129)		
temperature x Poor		-0.044**			-0.018*			-0.011		
		(0.02)			(0.009)			(0.013)		
temperature^2			0.00001			-0.0004			-0.0001	
			(0.001)			(0.001)			(0.001)	
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Observations	210	210	210	285	285	285	316	316	316	537
R^2	0.782	0.803	0.782	0.839	0.844	0.839	0.873	0.881	0.873	0.889
Residual Std. Error	0.406 (df=200)	0.388 (df=198)	0.407 (df=199)	0.397 (df=270)	0.392 (df=268)	0.397 (df=269)	0.408 (df=296)	0.396 (df=294)	0.409 (df=295)	0.401 (df=509)
F Statistic	136.9***	132.3***	129.9***	135.5***	138***	131***	172.1***	178.4***	167.2***	261.3***

Note: The regressions estimate the effect of temperature on logarithmized regional GDP p.c. in regressions with the dummy variable Poor (1 if regional GDP is below sample average; 0 otherwise) and its interaction with temperature, as well as temperature squared. Regressions are run with Gennaioli et al. (2014) data subsamples for the years 1950, 1960, 1970, 1980, 1990, 2000, 2010 with country fixed effects. Robust clustered standard error estimates (country-level) are presented below the coefficients. Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

Dependent variable	(11) Ln_GDP _region 1980	(12) Ln_GDP _region 1980	(13) Ln_GDP _region 1990	(14) Ln_GDP _region 1990	(15) Ln_GDP _region 1990	(16) Ln_GDP_ region 2000	(17) Ln_GDP_ region 2000	(18) Ln_GDP_ region 2000	(19) Ln_GDP _region 2010	(20) Ln_GDP _region 2010	(21) Ln_GDP _region 2010
temperature	-0.012**	-0.01	0.01	0.008	-0.009	-0.006	0.003	-0.033**	-0.007	0.003	-0.033**
	(0.005)	(0.016)	(0.009)	(0.011)	(0.015)	(0.012)	(0.011)	(0.016)	(0.012)	(0.009)	(0.014)
Poor	-1.160***			-1.149***			-0.913***			-0.711***	
	(0.262)			(0.427)			(0.112)			(0.09)	
temperature x Poor	0.015			0.003			-0.008			-0.012	
	(0.012)			(0.015)			(0.012)			(0.008)	
temperature²		0.0002			0.001			0.001**			0.001**
		(0.001)			(0.001)			(0.001)			(0.001)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Observations	537	537	844	844	844	1,209	1,209	1,209	1,051	1,051	1,051
R²	0.906	0.889	0.902	0.912	0.903	0.88	0.916	0.883	0.833	0.893	0.837
Residual Std. Error	0.37 (df=507)	0.401 (df=508)	0.391 (df=802)	0.37 (df=800)	0.39 (df=801)	0.41 (df= 1,147)	0.34 (df= 1,145)	0.40 (df= 1,146)	0.411 (df=995)	0.329 (df=993)	0.406 (df=994)
F Statistic	273***	255.8***	205.9***	256.4***	207.5***	211.2***	302.2***	215.6***	89.96***	145.2***	91.42***

Note: The regressions estimate the effect of temperature on logarithmized regional GDP p.c. in regressions with the dummy variable Poor (1 if regional GDP is below sample average; 0 otherwise) and its interaction with temperature, as well as temperature squared. Regressions are run with Gennaioli et al. (2014) data subsamples for the years 1950, 1960, 1970, 1980, 1990, 2000, 2010 with country fixed effects. Robust clustered standard error estimates (country-level) are presented below the coefficients. Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

To refine our results from **Table 20**, we employ the DHS data and account for a popular critique of using average temperature, namely that temperature averages neglect potentially large variation in temperature between months or even days (e.g., Barreca, 2012, Deschênes and Greenstone, 2007, Ranson, 2014, Schlenker and Lobell, 2010). DHS enables us to calculate the difference between the lowest and highest monthly temperature per year and regress it on the logarithm of *nightlights* in 2015 and *gross cell production* in 2005. Results are presented in **Table 22**. We find a statistically significantly negative impact of strong fluctuations, accounting for a reduction in *nightlights* by 16% with every additional degree between minimum and maximum temperature in rich regions. Interestingly, this effect is almost cancelled out if we are dealing with poor regions (positive coefficient of 0.13). We find no robust relationship between temperature fluctuations and *gross cell production* as shown in columns (3) and (4) of **Table 22**.

Table 22: *Baseline regressions for the effect of temperature fluctuations on nightlights and gross cell production in 2015 and 2005 when accounting for country fixed effects*

Dependent variable	(1) Ln_nightlights	(2) Ln_nightlights	(3) Ln_GCP	(4) Ln_GCP
Diff_min_max_temp	-0.122	-0.163**	-0.020	-0.033
	(0.087)	(0.066)	(0.02)	(0.03)
Poor		-5.489***		-1.212***
		(0.349)		(0.179)
Diff_min_max_temp x Poor		0.132***		0.024
		(0.039)		(0.03)
Country FE	YES	YES	YES	YES
Time FE	NO	NO	NO	NO
Observations	15,533	15,533	14,130	14,130
R^2	0.371	0.58	0.84	0.891
Residual Std. Error	2.646 (df=15,495)	2.163 (df=15,493)	0.379 (df=14,098)	0.312 (df=14,096)
F Statistic	247.4***	549.1***	2381***	3491***

Note: The regressions estimate the effect of the difference between the highest and the lowest temperature (measured in a year) on logarithmized regional nightlights (gross cell production) in regressions with the dummy variable Poor (1 if regional nightlights (gross cell production) is below sample average; 0 otherwise) and its interaction with temperature. Nightlights (gross cell production) regressions are run with DHS data for the year 2015 (2005) with country fixed effects. Robust clustered standard error estimates (country-level) are presented below the coefficients. Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

Third, we exploit our two DHS cross-sections for the difference of summer and winter temperatures, expressed by temperature measured in December and July. As DHS data contains mostly countries from the southern hemisphere, we summarize December temperature to be summer time and July temperatures to be winter time. As in **Table 20**, the results in **Table 23** show that *nightlights* are positively correlated with warmer temperatures in December, indicated by statistically significantly positive coefficients between 0.23 and 0.35. The effect in poorer regions is approximately 50% smaller.

Effects of winter time temperatures are less clear, as temperature exerts a much smaller, but still positive, effect on *nightlights* (0.15 in column (4) or 0.12 when interacted with *Poor* (column (5)). Interestingly, being relatively poor (in terms of *nightlights*) in July is more than thrice as harmful than being poor in December, which is potentially due to the fact that fewer sunlight hours in winter (around July) have to be compensated with electricity, which is often unstable or unaffordable in developing regions (see Adeoye and Spataru, 2019, Jiang et al., 2020 for different season-dependent electricity demands in developing countries). This, in return, might explain the stronger negative effect of *Poor* on *gross cell production* (columns (8) and (11)). Whereas temperature in December seems to have no effect on GCP, we observe a negative relationship between temperature in July and GCP of around 0.02 to 0.03. As in all our previous results, we find no support that the relationship between temperature and income (independent of which proxy is used) is non-linear.

Table 23: *Baseline regressions for the effect of temperature in December and July on nightlights and gross cell production in 2015 and 2005 when accounting for country fixed effects*

Dependent variable	(1) Ln_nightlights	(2) Ln_nightlights	(3) Ln_nightlights	(4) Ln_nightlights	(5) Ln_nightlights	(6) Ln_nightlights
dec_temperature	0.231*** (0.071)	0.253*** (0.049)	0.346*** (0.082)			
Poor		-2.114*** (0.597)			-7.194*** (0.742)	
dec_temperature x Poor		-0.106*** (0.024)				
dec_temperature²			-0.003 (0.003)			
jul_temperature				0.152*** (0.056)	0.02 (0.044)	0.045 (0.352)
jul_temperature x Poor					0.123*** (0.036)	
jul_temperature²						0.002 (0.008)
Country FE	YES	YES	YES	YES	YES	YES
Time FE	NO	NO	NO	NO	NO	NO
Observations	15,533	15,533	15,533	15,533	15,533	15,533
R^2	0.387	0.586	0.388	0.378	0.581	0.378
Residual Std. Error	2.613 (df=15,495)	2.147 (df=15,493)	2.611 (df=15,494)	2.632 (df=15,495)	2.161 (df=15,493)	2.632 (df=15,494)
F Statistic	264.6***	563.2***	258.6***	254.6***	550.1***	248.1***

Dependent variable	(7) Ln_GCP	(8) Ln_GCP	(9) Ln_GCP	(10) Ln_GCP	(11) Ln_GCP	(12) Ln_GCP
dec_temperature	0.004 (0.013)	-0.001 (0.02)	0.072 (0.046)			
Poor		-1.021* (0.619)			-1.375*** (0.285)	
dec_temperature x Poor		-0.0001 (0.025)				
dec_temperature²			-0.002 (0.001)			
jul_temperature				-0.019** (0.009)	-0.027*** (0.01)	-0.036 (0.044)
jul_temperature x Poor					0.016 (0.013)	
jul_temperature²						0.0004 (0.001)
Country FE	YES	YES	YES	YES	YES	YES
Time FE	NO	NO	NO	NO	NO	NO
Observations	14,130	14,130	14,130	14,130	14,130	14,130
R^2	0.839	0.89	0.841	0.841	0.892	0.841
Residual Std. Error	0.379 (df=14,098)	0.314 (df=14,096)	0.377 (df=14,097)	0.377 (df=14,098)	0.311 (df=14,096)	0.377 (df = 14,097)
F Statistic	2,372***	3,445***	2,327***	2,400***	3,519***	2,326***

Note: The regressions estimate the effect of the July and December temperature on logarithmized regional nightlights (gross cell production) in regressions with the dummy variable Poor (1 if regional nightlights (gross cell production) is below sample average; 0 otherwise) and its interaction with temperature, as well as July and December temperature squared. Nightlights (gross cell production) regressions are run with DHS data for the year 2015 (2005) with country fixed effects. Robust clustered standard error estimates (country-level) are presented below the coefficients. Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

Due to the exclusion of further control variables, our previous settings gave regional temperature a high chance to emerge as an explanatory factor for income differences. Even though this approach is commonly used in recent cross-country literature (e.g., Burke et al., 2015, 2018, Deryugina and Hsiang, 2014, Li et al., 2019), we would like to provide an initial attempt to include regional and national control variables that are available and that we believe to be relevant for predicting income. In fact, we observe that various subnational geography- and population-specific variables exert a much stronger effect on (proxies for) subnational incomes whereas the effect of temperature tends to be rather unimportant. Covariates presented in **Table 24** add between 0.01 and 0.1 to R^2 in regressions with per capita GDP and per capita GDP growth and between 0.05 and 0.2 in regressions with *nightlights*, whereas regressions with *GCP* lose about 0.1 in explanatory power.

For estimating regional per capita income, we observe that latitude, national GDP, education, the fact that the region contains the national capital and the number of adjacent national borders exert a positive effect of between 0.02 to 0.9, whereas the fact that the region is landlocked or shares borders with a region of another country negatively affects regional incomes of between 0.08 to 0.12. GDP growth on the other hand, is highly influenced by national GDP (coefficient of +10 to +11) and to a much smaller extend by latitude (coefficient of -0.04). *Nightlights* tend to be higher in urban areas (captured by global human footprint with a coefficient of 0.14) and in areas that are equipped for irrigation (coefficient of 0.06), but lower in areas with a high Malaria incidence (coefficient of -6). And lastly, *GCP* is negatively affected by latitude (coefficient of -0.03) and the average number of people who slept under an insecticide treated net (captured by ITN coverage with a coefficient of -0.6).

Table 24: *Baseline regressions for the effect of temperature on regional incomes, regional growth, nightlights and gross cell production with control variables when accounting for country and partly time fixed effects*

Dependent variable	(1) Ln_GDP_ region	(2) Ln_GDP_ region	(3) Ln_GDP_ region	(4) Growth	(5) Growth	(6) Growth
Temperature	0.005	0.015*	-0.004	0.022	-0.02	0.015
	(0.008)	(0.008)	(0.015)	(0.028)	(0.028)	(0.051)
Poor		-0.343***			0.126	
		(0.086)			(0.385)	
temperature x Poor		-0.013**			0.047	
		(0.007)			(0.029)	
Temperature²			0.0003			0.0003
			(0.0005)			(0.002)
Landlocked country	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Landlocked region	-0.126***	-0.110***	-0.118***	-0.079	-0.098	-0.072
	(0.041)	(0.038)	(0.04)	(0.11)	(0.11)	(0.118)
distance_to_ coast	-0.00000*	-0.0000	-0.00000*	-0.00000	-0.00000	-0.00000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
km_length_ coast	-0.00000	-0.00000	-0.00000	0.00001	0.00001	0.00001
	(0.00000)	(0.00000)	(0.00000)	(0.00001)	(0.00001)	(0.00002)
nat_borders	-0.081***	-0.083***	-0.082***	0.218	0.213	0.218
	(0.025)	(0.021)	(0.025)	(0.23)	(0.227)	(0.229)
no_nat_ borders	0.043*	0.044**	0.045**	-0.196	-0.194	-0.194
	(0.022)	(0.021)	(0.02)	(0.154)	(0.15)	(0.156)
Latitude	0.018**	0.017*	0.018**	-0.036**	-0.036**	-0.036**
	(0.009)	(0.009)	(0.009)	(0.015)	(0.017)	(0.015)
Area_sqkm	0.00000**	0.00000**	0.00000**	-0.00000	-0.00000	-0.00000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
Malaria_ ecology	0.03	0.028	0.027	0.019	0.016	0.016
	(0.021)	(0.018)	(0.02)	(0.045)	(0.046)	(0.049)
Ln_Cum_Oil_ Gas_Prod	1.371	1.672	1.203	9.046	8.114	8.953
	(2.236)	(1.682)	(2.22)	(9.739)	(9.859)	(9.42)
Ln_Pop_ density	-0.0003	0.001	0.003	-0.06	-0.059	-0.057
	(0.016)	(0.015)	(0.016)	(0.074)	(0.075)	(0.065)
Capital is in Region	0.335***	0.282***	0.329***	0.319	0.385*	0.315
	(0.049)	(0.044)	(0.047)	(0.217)	(0.221)	(0.209)
Ln_GDP_ country	0.905***	0.736***	0.906***	-11.07***	-9.906***	-11.10***
	(0.104)	(0.091)	(0.103)	(2.299)	(1.947)	(2.349)
Years of Education	0.166***	0.148***	0.166***	-0.105	-0.09	-0.105
	(0.026)	(0.025)	(0.026)	(0.092)	(0.093)	(0.089)
Country FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	NO	NO	NO
Observations	7,500	7,500	7,500	1,505	1,505	1,505
R^2	0.918	0.927	0.918	0.64	0.642	0.64
Residual Std. Error	0.333 (df=7,366)	0.314 (df=7,364)	0.333 (df=7,365)	1.699 (df=1,411)	1.695 (df=1,409)	1.70 (df=1,410)
F Statistic	616.9***	691.5***	613.1***	26.92***	26.57***	26.62***

Dependent variable	(7) Ln_night-lights	(8) Ln_night-lights	(9) Ln_night-lights	(10) Ln_GCP	(11) Ln_GCP	(12) Ln_GCP
Temperature	0.036 (0.049)	0.028 (0.077)	0.455 (0.333)	-0.011 (0.013)	-0.065 (0.044)	0.041 (0.044)
Poor		-1.389 (1.786)			-2.308* (1.328)	
temperature x Poor		0.01 (0.064)			0.062 (0.047)	
Temperature^2			-0.01 (0.008)			-0.001 (0.001)
Latitude	-0.032 (0.037)	-0.028 (0.035)	-0.028 (0.038)	-0.033** (0.016)	-0.021* (0.012)	-0.032** (0.016)
All_Population_Count	0.0000*** (0.00000)	0.0000*** (0.00000)	0.0000*** (0.00000)	0.00000 (0.00000)	0.00000 (0.00000)	
Aridity	-0.016 (0.018)	-0.014 (0.018)	-0.014 (0.017)	-0.003 (0.01)	-0.003 (0.009)	
drought_episodes	0.050* (0.03)	0.042 (0.032)	0.051* (0.03)	-0.012 (0.01)	-0.009 (0.009)	-0.012 (0.01)
Enhanced_Vegetation_Index	-0.0002** (0.0001)	-0.0002* (0.0001)	-0.0002** (0.0001)	0.00001 (0.00003)	0.00003 (0.00003)	
Frost_Days	0.151 (0.894)	0.19 (0.873)	0.337 (0.945)	0.249 (0.228)	0.219 (0.177)	
global_human_footprint	0.141*** (0.005)	0.132*** (0.008)	0.140*** (0.005)	0.002* (0.001)	0.002** (0.001)	0.002* (0.001)
growing_season_length	0.019 (0.078)	0.015 (0.076)	0.025 (0.08)	-0.03 (0.032)	-0.024 (0.03)	-0.029 (0.032)
Irrigation	0.057*** (0.014)	0.056*** (0.012)	0.057*** (0.014)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)
ITN_Coverage	0.908 (0.589)	1.244* (0.638)	0.942 (0.576)	-0.550* (0.284)	-0.575* (0.311)	-0.563** (0.274)
Malaria_Incidence	-6.267* (3.779)	-5.965* (3.56)	-6.302* (3.81)	-0.078 (0.561)	0.03 (0.534)	-0.09 (0.559)
Malaria_Prevalence	2.077 (3.195)	2.016 (3.143)	1.952 (3.19)	-0.019 (0.486)	-0.121 (0.467)	-0.023 (0.487)
PET	-0.319 (0.441)	-0.256 (0.421)	-0.296 (0.44)	-0.057 (0.068)	-0.06 (0.065)	-0.053 (0.066)
proximity_to_national_borders	-0.00000 (0.00000)	-0.00000 (0.00000)	-0.00000 (0.00000)	0.00000 (0.00000)	-0.00000 (0.00000)	0.00000 (0.00000)
Proximity_to_Protected_Areas	0.00000 (0.00000)	0.00000 (0.00000)	0.00000 (0.00000)	-0.00000 (0.00000)	-0.00000 (0.00000)	-0.00000 (0.00000)
proximity_to_water	0.0000*** (0.00000)	0.0000*** (0.00000)	0.0000*** (0.00000)	-0.00000 (0.00000)	-0.00000 (0.00000)	-0.00000 (0.00000)
Rainfall	0.0005* (0.0003)	0.0004 (0.0003)	0.0005* (0.0003)	0.0002* (0.0001)	0.0001 (0.0001)	0.0002* (0.0001)
Slope	-0.055 (0.056)	-0.057 (0.053)	-0.055 (0.056)	-0.02 (0.017)	-0.014 (0.013)	-0.019 (0.017)
Wet_Days	0.03 (0.078)	0.039 (0.076)	0.018 (0.076)	-0.013 (0.02)	-0.002 (0.02)	-0.014 (0.021)
Country FE	YES	YES	YES	YES	YES	YES
Time FE	NO	NO	NO	NO	NO	NO
Observations	5,231	5,231	5,231	5,218	5,218	5,218
R^2	0.619	0.625	0.619	0.763	0.804	0.764
Residual Std. Error	1.969 (df=5,186)	1.952 (df=5,184)	1.967 (df=5,185)	0.325 (df=5,177)	0.296 (df=5,175)	0.325 (df=5,176)

F Statistic	191.1***	188.0***	187.2***	417.8***	504.6***	408.1***

Note: The regressions estimate the effect of temperature on logarithmized regional GDP p.c., regional growth, logarithmized nightlights and logarithmized gross cell production in regressions with the dummy variable Poor (1 if regional GDP/nightlights/gross cell production is below sample average; 0 otherwise) and its interaction with temperature, temperature squared, as well as with a large number of control variables. Regressions are run with the Gennaioli et al. (2014), the DHS 2015 and the DHS 2005 dataset with country and partly time fixed effects. Robust clustered standard error estimates (country-level) are presented below the coefficients. Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

In a final sensitivity test, we want to account for the fact that some regions might be characterized by exceptionally high income, growth rates, *nightlights* and *gross cell production*. Even though these regions represent the actual status quo, we define them as potential outliers and exclude them from our analysis presented in **Table 25**.

. Outliers are identified by plotting the four distribution curves and eliminating scattered regions that are on the far right side of the respective curve. A quick comparison of **Table 19** and **Table 20** with results from **Table 25** reveal that extreme outliers do not change the impact of temperature on regional incomes, *nightlights* and *GCP*. Only regressions on regional GDP growth show different signs and magnitudes, but as results continue to be statistically insignificant, these findings can be neglected. We conclude that for a set of normally distributed regions, within-country heterogeneity matters to a substantial degree which is not driven by extreme outliers.

Table 25: *Baseline regressions for the effect of temperature on regional incomes, regional growth, nightlights and gross cell production when accounting for country and partly time fixed effects in subsamples without extreme outliers*

Dependent variable	(1) Ln_GDP_ region	(2) Ln_GDP_ region	(3) Ln_GDP_ region	(4) Growth	(5) Growth	(6) Growth
temperature	-0.004	0.008	-0.025**	-0.002	-0.032	-0.001
	(0.007)	(0.010)	(0.012)	(0.013)	(0.025)	(0.013)
Poor		-0.580***			0.534*	
		(0.108)			(0.318)	
temperature x Poor		-0.014			0.031	
		(0.010)			(0.022)	
temperature²			0.001			-0.00003
			(0.001)			(0.001)
Country FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	NO	NO	NO
Observations	9,273	9,273	9,273	1,495	1,495	1,495
R^2	0.858	0.884	0.859	0.754	0.763	0.754
Residual Std. Error	0.431 (df=9,145)	0.390 (df=9,143)	0.430 (df=9,144)	0.925 (df=1,412)	0.908 (df=1,410)	0.925 (df=1,411)
F Statistic	434.8***	538.6***	435.4***	52.7***	54.0***	52.0***

Dependent variable	(7) Ln_night-lights	(8) Ln_night-lights	(9) Ln_night-lights	(10) Ln_GCP	(11) Ln_GCP	(12) Ln_GCP
temperature	0.180***	0.207***	0.387**	-0.006	-0.013	0.074
	(0.068)	(0.060)	(0.195)	(0.010)	(0.009)	(0.052)
Poor		-2.260**			-1.157***	
		(0.986)			(0.387)	
temperature x Poor		-0.086**			0.009	
		-0.039			(0.014)	
temperature²			-0.005			-0.002
			(0.005)			(0.001)
Country FE	YES	YES	YES	YES	YES	YES
Time FE	NO	NO	NO	NO	NO	NO
Observations	15,096	15,096	15,096	13,487	13,487	13,487
R^2	0.337	0.545	0.338	0.854	0.908	0.855
Residual Std. Error	2.644 (df=15,058)	2.190 (df=15,056)	2.643 (df=15,057)	0.334 (df=13,455)	0.265 (df=13,453)	0.333 (df=13,454)
F Statistic	206.5***	462.9***	201.9***	2,541***	4,022***	2,483***

Note: The regressions estimate the effect of temperature on logarithmized regional GDP p.c., regional growth, logarithmized nightlights and logarithmized gross cell production in regressions with the dummy variable Poor (1 if regional GDP/nightlights/gross cell production is below sample average; 0 otherwise) and its interaction with temperature, as well as temperature squared. Regressions are run with a subset to the Gennaioli et al. (2014), the DHS 2015 and the DHS 2005 dataset without outliers (details can be requested from the authors) with country and partly time fixed effects. Robust clustered standard error estimates (country-level) are presented below the coefficients. Significance levels are indicated by *p<0.1; **p<0.05; ***p<0.01.

4.4.4 Discussion and Caveats

With this research effort, we aim at contributing to the discussion on whether hotter climate is related to lower income. We explore specifically whether hotter regions have a lower income compared to colder regions, independent of any country-specific circumstances such as institutions. Previous empirical and theoretical contributions have argued that hot temperature may have a *direct* impact on human productivity, labor morale and productivity or on the spread of diseases; hot temperatures may furthermore have an *indirect* impact on development by contributing to the emergence of extractive institutions (e.g., Easterly and Levine, 2003, Gallup et al., 1999). Consequently, hotter regions might be characterized by lower per capita incomes. However, our results for several thousand subnational administrative units and DHS clusters suggest that there is no systematic effect of regional temperature on regional incomes. Indeed, anecdotal evidence suggests that some of the richest regions in the world are among the hottest and among the coldest in the world (e.g., regions in the United Arab Emirates or Canada). We also find little evidence that poorer regions experience more income losses from hotter temperatures.

Interpreting our findings, we must highlight several caveats regarding out data. First, when focusing on subnational administrative units (data from Gennaioli et al., 2014), we employ average temperature data for a time period of fifty years, while subnational per capita GDP is available for several years in this time period. Thus, we do not analyze income changes due to changes in yearly temperature. DHS on the other hand, provides us with two cross-sections for the years 2005 and 2015. Empirically, this leaves us unable to include region fixed effects or country-time fixed effects, where the latter would allow us to account for anything that is unique for a specific nation and time period. Thus, we cannot explore how changes in temperature affect changes in GDP per capita for a specific region, i.e., we do not know whether a region in the United Arab Emirates becoming even hotter would experience a decrease in GDP per capita. Put differently, due to the cross-sectional character of the DHS data, we are restricted to exploring differences between regions rather than differences over time. Therefore, we caution to draw any direct conclusion regarding the effects of (future) anthropogenic climate change.[78] At the same time, the world regions provide numerous examples that hot temperatures can go along with high incomes similarly as cold temperatures may go along with high incomes too. It might be possible to learn from these regions in terms of coping with high and/or increasing temperatures. The reasons for the economic success of hot regions should be further explored.

Second, due to their unavailability on the regional level, we are not able to add many potentially time-variant control variables that may explain regional incomes. Precipitation, extreme weather events such as cyclone activity, population specifics, regional institutions, regional ethno-linguistic diversity, redistribution, etc. are only a few examples from past literature. Similar to the cross-country literature,

[78] Of course, we also worry that there might be a bias against researchers who find no evidence that hotter temperatures decrease GDP per capita.

potential omitted variable bias cannot be fully ruled out even if we include country fixed effects, i.e., while regional temperature is certainly external to a region's GDP, it does not need to be exogenous. Moreover, migration between regions within a country tends to be easier than migration between countries. Temperature could be correlated with migration; in turn, migration could be related to economic activity per capita which would then be a potential confounding factor in our analysis.[79]

Third, general caution must be exercised when dealing with historical subnational temperature datasets, as weather station data is usually much sparser, often interpolated or modeled, or found to be misaligned with original measurements because of rounding or conversion errors (see e.g., Nese, 1994, Rhines et al., 2015). In addition, climate observations often underlie measurement biases due to undesired instrument exposures, which can account for measurement errors of up to 3.6 degrees (see Mahmood et al., 2006). In consequence, we cannot be sure whether our null results represent the absence of a causal relationship or whether they come from an unprecisely measured temperature (or even economic activity) on the subnational level.

Fourth, a potential distortion of results might originate from the structure of the data which is based on political boundaries (data from Gennaioli et al., 2014) or unequally sized clusters not covering the entire regional or national territory (data from DHS). Assuming that boundaries are drawn based on the number of inhabitants (more but smaller numbers of states and provinces in highly populated areas) and that people naturally prefer to live and work in more moderate climatic zones, our sample might be biased towards more temperate geographical units. By this, our results stand in contrast to e.g., Nordhaus (2006) who uses equally-sized grid cell data and consequently analyzes regional incomes in environments of severe and less severe climatic circumstances.

In addition to tackling these data-related caveats, we see further potential for future research in revealing the underlying reasons for why our results differ substantially from past (cross-country) literature. Here, we would encourage to extend our research in the following manner: first, instead of reporting average effects for the entire sample, it would be interesting to further explore the distribution of possible relationships between incomes and temperature across countries. Results can then be directly compared with authors such as Li et al. (2019) for China or Deryugina and Hsiang (2014) and Colacito et al. (2019) for the United States; second, even though our analysis reveals no effect of temperature on GDP per capita or GDP per capita growth, we get a relatively consistent positive effect on nightlights. As this result is rather contra-intuitive, assuming that nightlights is a relevant proxy for subnational incomes, it needs to be further discussed. A potential explanation can be found in the season-dependent electricity demands of developing countries (see e.g., Adeoye and Spataru (2019) or Jiang et al. (2020), which might be an indication for a shift of work- and non-work-related activities to cooler hours (i.e.,

[79] Beine and Parsons (2015) do not find direct effects of long-run climatic factors on international migration employing data from 1960 to 2000.

late evening or night) during hotter time periods. Exploring this phenomena with nocturnal temperatures or with several data subsamples expressing regions with a high and low latitude (corresponding to generally cooler or hotter regions) would be a potential option to test this hypothesis; and third, it would be interesting to explore a potential direct effect of extreme weather events on health- and mortality indicators and a consequent indirect effect on regional incomes (see e.g., Barreca et al., 2016). If done for several time periods, we might also get an indication for how well people and their health adapted to extreme weather over time.

Ultimately, we would be interested in providing an answer to the question how future climate change and associated increases in temperatures will affect future livelihoods and welfare. We approximate welfare by looking at regional GDP per capita. Our cross-sectional analysis is informative but not fully conclusive as the data lacks temperature variations within regions over time. Nevertheless, we might be able to derive a few cautious interpretations regarding anthropogenic climate change from the observed variation across space. First, our results suggest that adaptation to different temperatures within countries was possible in the past. For instance, adaptation may have been achieved thanks to innovation, specialization within countries, regional migration or fiscal equalization systems. Such mechanisms may help to weaken the adverse effects of climate change for hotter (and colder) regions in the future, too. Second, if national factors (such as political institutions) continue to be important drivers of economic growth, adaptation may be facilitated and may reduce any potential direct adverse effects of increased temperatures. While adaptation to higher temperatures was possible in the past, we might still face new challenges if temperatures and adaptation costs increase rapidly and substantially. Thus, our results do not exclude that a more robust negative link between temperatures and regional incomes might emerge in the future. On the other hand, if poorer and hotter regions grow more quickly thanks to improvements along other dimensions, we might continue to find no link between temperature and regional incomes as long as all the other factors that drive economic development are adequately accounted for.

4.5 CONCLUSIONS

This paper explores the impact of temperature on income for a large number of subnational regions and clusters. We use data on temperature, GDP per capita and GDP per capita growth for 1,542 administrative regions in 83 countries for the years 1950 to 2010 from Gennaioli et al. (2014). Moreover, we employ data on temperature, nightlights for 15,533 subnational clusters for the year 2015 in 37 countries and gross cell production for 14,130 subnational clusters for the year 2005 in 31 countries, using additional data from the Demographic and Health Surveys. This subnational focus allows us to account for country fixed effects and therefore control for any factors that are country specific but relevant to regional growth (e.g., national institutions and policies).

We are unable to identify a consistent and robust link between regional temperature and regional incomes. We observe, if anything, a quantitatively negligible negative relationship between regional temperature and regional GDP per capita. This relationship is sensitive to different specifications. We also do not find that there are systematic differences in the role of temperature in regional incomes between rich and poor regions. We find a relatively stable *positive* relationship between temperature and nightlights that is slightly weakened for poor regions. The relationship between temperature and growth or gross cell production is ambiguous. Regardless of which regional income proxy is employed, we find no support for a non-linear relationship between temperature and income at the regional level.

Compared to the cross-country literature on the temperature-income relationship, our approach using subnational data allows us to account for a heterogeneity within a country. We are also able to add to the discussion on the non-linearity assumption of the temperature-income relationship as well as to the discussion whether poor regions suffer more from hot temperatures due to a failure of sufficiently adapting to them. Currently, the missing time variation of the temperature variable at the regional and the cluster level is a caveat of our approach. Ideally, we would want to analyze regional temperature for every year from 1950 onwards so that we can employ region fixed effects[80]. This would allow for an even more stringent testing of the relationship than with country fixed effects. Until then, we caution to remain critical towards transferring the negative effect of temperature on income found in the cross-country literature to the regional level. We think that far more research is required in this domain to establish clear-cut results and offer policy conclusions.

[80] In cooperation with the Wissenschaftszentrum Berlin für Sozialforschung we were able to merge subnational income data (based on the shapefiles created by Gennaioli et al. (2014)) with newly collected temperature data. This is still in progress but some initial regressions show that our null results remain.

Table 26: *Descriptive statistics*

Variable	Description	Median	Mean	Std. Dev.	Min	Max	Obs
	Variables used in regressions with Ln(GDP_region) (Source: Gennaioli et al. (2014))						
Ln(GDP_region)	Logarithm of the gross domestic product per capita in a region (in constant 2005 PPP US$).	8.83	8.82	1.16	5.24	12.02	9,472
Temperature	Temperature (Celsius) averaged for the period 1950 to 2000 within the sub-national region.	12.60	14.18	8.06	-14.49	28.19	9,472
Poor	Dummy variable equals 1 if region is below sample average regarding per capita GDP; 0 otherwise.	1.00	0.63	0.48	0.00	1.00	9,472
Years of education	Average years of schooling from primary school onwards for the population aged 15 years or older in a region.	7.41	7.21	3.25	0.39	13.76	7,504
Landlocked country	Dummy variable that is equal to 1 if the country is landlocked; 0 otherwise.	0.00	0.10	0.30	0	1	9,472
Landlocked region	Dummy variable that is equal to 1 if the region is landlocked; 0 otherwise.	1.00	0.54	0.50	0	1	9,472
nbr	Dummy variable that is equal to 1 if the region has a border to another region in a neighboring country; 0 otherwise.	0.00	0.43	0.50	0.00	1.00	9,487
nbr_nr	Number of borders to other countries incl. A region's own country border.	1.00	1.59	0.87	0.00	8.00	9,487
Latitude	Latitude of the centroid of each region calculated in ArcGIS.	37.47	33.50	16.47	0.02	69.95	9,472
Ln(Area_sqkm)	Logarithm of the area in square kilometers.	9.58	9.75	1.76	3.34	15.18	9,472

Malaria_ecology	The "malaria ecology" index of Kiszewski et al. (2004) measures the risk of being infected by Malaria. The index variable ranges from 0 to 39 with higher values indicating a higher risk and thus less Malaria stability. The index takes into account both climatic factors and the dominant vector species to give an overall measure of the component of malaria variation that is exogenous to human intervention. The index is calculated for grid squares of one half degree longitude by one half degree latitude. Regional averages are calculated via ArcGIS.	0.01	1.09	2.72	0.00	28.68	9,472
Ln(Cum_Oil_Gas_ Prod)	(Logarithmized) cumulative oil, gas and liquid natural gas production from the time production began to 2000. Oil and liquid natural gas were collected in millions of barrels. Gas was collected in billions of cubic feet and divided by 6 to convert to millions of barrels of oil equivalents.	0.00	0.00	0.01	0.00	0.12	9,472
Ln(Pop_density)	Logarithm of the population density which is measured as people per square kilometres in a region.	4.12	4.02	1.74	-4.65	10.06	9,472
Capital is in Region	Dummy variable that is equal to 1 if the region contains a national capital city; 0 otherwise.	0.00	0.05	0.22	0.00	1.00	9,467
Ln(GDP_country)	Logarithm of the gross domestic product per capita in a country (in constant 2005 PPP US$).	9.00	9.00	1.05	5.90	11.56	9,472
Variables used in regressions with Growth (Source: Gennaioli et al. (2014))							
Growth	Growth of gross domestic product per capita in a region (in constant 2005 PPP US$) between the first and the last available year.	0.89	1.79	2.73	-0.73	38.12	1,527
Temperature	see description of variables used in regressions with Ln(GDP_region).	12.18	14.19	8.22	-14.49	28.19	1,527

Poor	see description of variables used in regressions with Ln(GDP_region).	1.00	0.87	0.34	0	1	1,527
Years of education	see description of variables used in regressions with Ln(GDP_region).	6.90	7.01	2.95	0.99	12.95	1,505
Landlocked country	see description of variables used in regressions with Ln(GDP_region).	0.00	0.13	0.34	0	1	1,527
Landlocked region	see description of variables used in regressions with Ln(GDP_region).	1.00	0.60	0.49	0	1	1,527
nbr	see description of variables used in regressions with Ln(GDP_region).	0.00	0.47	0.50	0	1	1,527
nbr_nr	see description of variables used in regressions with Ln(GDP_region).	1.00	1.63	0.85	0.00	8.00	1,527
Latitude	see description of variables used in regressions with Ln(GDP_region).	38.17	34.02	16.83	0.02	69.95	1,527
Ln(Area_sqkm)	see description of variables used in regressions with Ln(GDP_region).	9.31	9.50	1.68	3.34	15.18	1,527
Malaria_ecology	see description of variables used in regressions with Ln(GDP_region).	0.01	1.20	3.12	0.00	28.68	1,527
Ln(Cum_Oil_Gas_Prod)	see description of variables used in regressions with Ln(GDP_region).	0.00	0.00	0.01	0.00	0.12	1,527
Ln(Pop_density)	see description of variables used in regressions with Ln(GDP_region).	4.15	4.07	1.70	-4.03	9.73	1,527
Capital is in Region	see description of variables used in regressions with Ln(GDP_region).	0.00	0.05	0.23	0.00	1.00	1,527
Ln(GDP_country)	see description of variables used in regressions with Ln(GDP_region).	8.86	8.85	0.96	6.26	11.14	1,527

Variables used in regressions with Ln(Nightlights_Composite) (Source: DHS (2015))							
Ln(Nightlights_ Composite)	Logarithm of the average nighttime luminosity of the area (Composite cloud-free radiance values) within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster location in 2015.	-0.78	-1.02	3.34	-11.92	4.94	15,948
temperature	The average yearly temperature (in °C) within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster location.	23.19	22.52	4.36	-3.77	30.38	18,604
Poor	Dummy variable equals 1 if region is below sample average regarding *nightlights*; 0 otherwise.	1.00	0.78	0.41	0	1	19,036
Diff Max Min	The difference between the average annual maximum and minimum temperature (in °C) within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster location.	5.42	7.62	5.76	0.56	29.24	18,604
Temperature December	The average monthly temperature in December (in °C) within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster location.	22.83	20.85	6.21	-13.66	29.68	18,604
Temperature July	The average monthly temperature in July (in °C) within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster location.	24.57	22.96	5.16	2.03	34.52	18,604
Precipitation	The average precipitation measured within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster (in milimeters) in 2015.	87.11	89.13	59.99	0.17	368.69	17,289
Latitude	Latitude	8.27	7.49	17.99	-30.59	42.43	19,051
Ln(pop)	The logarithm of the count of individuals living within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster in 2015 (number of people).	10.50	10.37	1.77	-3.63	15.60	18,247

Aridity	The dataset represents the average yearly precipitation divided by average yearly potential evapotranspiration in 2015, an aridity index defined by the United Nations Environmental Programme (UNEP). Index between 0 (most arid) and 300 (most wet).	23.37	24.88	18.12	0.02	136.13	17,289
drought_episodes	The average number of drought episodes (categorized between 1 (low) and 10 (high)) for the areas within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster location based on 1980-2000 precipitation data.	5.00	5.43	2.68	1.00	10.00	13,205
Enhanced_ Vegetation_Index	The average vegetation index value within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster in 2015. Vegetation index value between 0 (least vegetation) and 10000 (Most vegetation).	3,043.00	2,965.72	1,085.59	7.00	6,093.00	18,683
Frost_Days	The average number of days in which the minimum temperatures of the location surrounding the DHS survey cluster within 2 km (urban) or 10 km (rural) buffers met the criteria to be categorized as a “frosty” day in 2015. Frost days is a synthetic measurement that is based off of the minimum temperature. The full formula to calculate the number of days can be found in the cited Harris et al. (2014) or in New, Hulme, and Jones (2000).	0.00	0.73	2.33	0.00	28.69	17,289

global_human_ footprint	The average of an index between 0 (extremely rural) and 100 (extremely urban) for the location within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster based on 1995-2004 data. It is created from nine global data layers covering human population pressure (population density), human land use and infrastructure (built-up areas, nighttime lights, land use/land cover), and human access (coastlines, roads, railroads, navigable rivers).	36.79	43.15	20.11	0.00	100.00	18,971
growing_season_ length	The length of the growing season in days (reported in one of 16 categories) for the area within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster location based on data collected between 1961 and 1991. 1: 0 days; 2: 1 - 29 days; 3: 30 - 59 days; 4: 60 - 89 days; 5: 90 - 119 days; 6: 120 - 149 days; 7: 150 - 179 days; 8: 180 - 209 days; 9: 210 - 239 days; 10: 240 - 269 days; 11: 270 - 299 days; 12: 300 - 329 days; 13: 330 - 364 days; 14: < 365 days; 15: 365 days; 16: > 365 days.	9.00	8.27	3.57	1.00	16.00	18,465
Irrigation	The average proportion of the area within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster location equipped for irrigation in 2005.	0.10	9.40	20.26	0.00	100.00	18,604
ITN_Coverage	The average number of people within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster location who slept under an insecticide treated net the night before they were surveyed in 2015.	0.62	0.60	0.23	0.00	1.00	10,202

Malaria_Incidence	(Rate!)The average number of people per year who show clinical symptoms of plasmodium falciparum malaria within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster location in 2015.	0.17	0.20	0.15	0.00	0.71	10,202
Malaria_ Prevalence	The average parasite rate of plasmodium falciparum (PfPR) in children between the ages of 2 and 10 years old within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster location in 2015.	0.11	0.17	0.15	0.00	0.81	10,202
PET	The average annual potential evapotranspiration (PET) (millimeters per year) within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster location in 2015.	3.77	3.84	0.77	1.93	7.33	17,289
Ln(proximity_to_ national_borders)	The logarithmized geodesic distance (meters) to the nearest international borders in 2014.	10.34	10.11	1.59	1.23	13.30	19,052
Ln(Proximity_to_ Protected_Areas)	The logarithmized geodesic distance (meters) to the nearest protected area as defined by the United Nations Environment World Conservation Monitoring Centre in 2017. Examples of protected places include national parks, national forests, and national seashores. The dataset includes both aquatic and terrestrial protected areas.	10.82	10.61	1.15	1.89	13.36	18,876
Ln(proximity_to_ water)	The logarithmized geodesic distance (meters) to either a lake or the coastline in 2017. For this extraction we used only the lakes dataset (L2) at full resolution and the shoreline dataset (L1), also at full resolution, in the GSHHG database. The datasets used were based on the World Vector Shorelines, CIA World Data Bank II, and Atlas of the Cryosphere.	10.64	10.30	1.80	0.05	13.45	18,923

Rainfall	The average annual rainfall (in millimeters) within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster location in 2015.	1,003.75	1,063.54	723.33	0.00	5,574.00	18,805
Slope	Slope (in degrees) is a measurement of how rough the terrain around a DHS cluster is in 1996. The United States Geological Survey GTOPO30 digital elevation model was processed into slope by using the slope tool in ArcMap 10.5.0.	0.85	1.81	2.35	0.00	23.13	19,004
Wet_Days	The average number of days receiving rainfall within the 2 km (urban) or 10 km (rural) buffer surrounding the DHS survey cluster location in 2015.	8.29	8.32	4.32	0.00	23.67	17,289
Variables used in regressions with Ln(Gross_Cell_Production) (Source: DHS (2005))							
Ln(Gross_Cell_ Production)	Logarithm of the average Purchasing Power Parity (PPP) in 2005 US dollars for the 2 km (urban) or 10 km (rural) buffers surrounding the DHS survey cluster.	7.30	7.49	0.94	2.13	12.98	14,332
temperature	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	23.64	22.79	4.26	-0.50	30.55	14,594
Poor	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	1.00	0.66	0.47	0	1	14,332
Diff Max Min	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	5.39	7.35	5.23	0.55	21.41	14,594
Temperature December	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	23.06	21.00	5.55	-6.22	29.70	14,594
Temperature July	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	24.86	23.24	5.42	1.76	35.66	14,594
Precipitation	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	84.96	92.79	63.01	0.08	288.50	13,733

Latitude	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	10.94	8.80	17.17	-30.53	42.43	14,910
Ln(pop)	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	10.31	10.20	1.76	0.67	15.47	14,451
Aridity	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	22.46	25.98	18.94	0.01	103.05	13,733
drought_episodes	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	5.00	5.03	2.90	1.00	10.00	10,250
Enhanced_ Vegetation_Index	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	2,982.00	2,990.85	1,124.38	39.00	6,246.00	14,642
Frost_Days	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	0.00	0.53	1.72	0.00	26.81	13,733
global_human_ footprint	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	38.51	44.60	19.63	0.00	100.00	14,878
growing_season_ length	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	9.00	8.42	3.80	1.00	16.00	14,470
Irrigation	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	0.12	9.29	19.84	0.00	100.00	14,594
ITN_Coverage	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	0.01	0.08	0.10	0.00	0.42	7,666
Malaria_Incidence	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	0.30	0.31	0.19	0.00	0.75	7,666
Malaria_ Prevalence	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	0.25	0.29	0.22	0.00	0.97	7,666
PET	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	3.82	3.92	0.83	2.21	7.65	13,733
Ln(proximity_to_ national_borders)	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	10.49	10.23	1.62	0.15	13.22	14,911

Ln(Proximity_to_ Protected_Areas)	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	10.73	10.49	1.21	2.90	13.03	14,766
Ln(proximity_to_ water)	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	10.65	10.33	1.75	0.09	13.46	14,788
Rainfall	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	1,045.00	1,159.44	811.64	0.00	4,875.00	14,673
Slope	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	0.83	1.77	2.23	0.00	22.80	14,881
Wet_Days	see description of variables used in regressions with Ln(Nightlights_Composite) with data from 2005.	8.55	8.84	4.62	0.00	22.42	13,733

CHAPTER 5 SUMMARY, POLICY IMPLICATIONS AND FUTURE RESEARCH

5.1 SUMMARY

Neglecting heterogeneity and differences within countries has been a major caveat of much of past research in development economics. Instead of comparing Moscow region and Kamchatka Krai, the two most apart regions in Russia, cross-country literature compares Russia and the United States. Whereas it makes sense to analyze and compare some factors at the national level (i.e., those that are collated by national statistical offices), it constitutes a great loss of information to aggregate variables that are characterized by a substantial subnational variation such as culture, development aid or temperature. Consider for instance the distinct cultural habits and (economic) behaviors of inhabitants of North and South Italy or West and East Germany – four areas with very persistent income differences despite various national efforts for unification; consider the different opportunities and economic status of individuals living in areas that have been beneficiaries of development aid, potentially because it is the birthplace of the current prime minister or because there is a political interest in developing a certain area due to oil or other resource deposits; or consider the different challenges and opportunities of individuals living in the Yukon Territory and Nova Scotia in Canada or Yakutia and Krasnodar region in Russia where annual temperature differs by more than 20 degrees. If culture, development aid and temperature do in fact play a role in explaining economic development, as suggested by the cross-country literature, then it seems negligent to disregard their distinct within-country heterogeneity.

We are convinced that there is a substantial need in the literature to account for subnational differences and therefore the aim of this doctoral thesis is to explore subnational variation in culture, development aid and temperature and its impact on economic income. We employed empirical analyses using data from a large number of subnational regions or even individuals from countries all around the world. Datasets originated either from surveys, from the World Bank or from national/regional statistical offices that were (if needed) combined based on region names or geocodes.

Our empirical strategy follows a fixed effects regression approach that is common also in the cross-country literature but with the distinction that we can control for country, time and sometimes even region (subnational) fixed effects, i.e., all country-, time- and region-specific unobservables are accounted for. By this, we can re-open rather old discussions on influence factors of (regional) economic development: (i) Can different cultural conventions, such as conformity to a group, individualism, personal freedom, obedience etc. explain income differences? (ii) Can development aid help to improve the quality of living with regards to water and sanitation and have a lasting impact on individual health? (iii) Can hotter temperatures and the inability to adapt to them be a major explaining factor for why some parts of the world are less wealthy compared to their colder counterparts?

By answering these questions from a new perspective, i.e., a subnational perspective, we provide a substantial contribution and extension to existing literature and are able to give valuable policy recommendations. We are aware of the given caveats of our analyses and therefore provide several recommendations for future research as well.

5.2 MAIN CONCLUSIONS AND POLICY IMPLICATIONS

This thesis processes three distinct research questions that are all aiming at explaining persistent differences in subnational incomes. We are exploiting the variation of culture, development aid and temperature, which all have been subject to numerous renowned research efforts, but have never been analyzed in a comprehensive and elaborate manner for a large number of worldwide subnational regions.

Chapter 2 takes up the question on whether and to what extent culture influences economic growth. More specific, we are analyzing whether the regional appreciation of the cultural value *Independence* (*Obedience*) positively (negatively) affects regional per capita income as it is suggested by previous cross-country studies. Undertaking a major data matching effort, we combine cultural, economic, geographical, religious and educational variables for 1,204 (subnational) regions across 66 countries between 1980 and 2010. This dataset allows us to include country-time fixed effects, which reduces the risk of omitted variable bias, issues of endogeneity and the neglection of within-country heterogeneity. In addition, we introduce a new genetic instrument, reflecting the genetic distance to the United Kingdom, which is supposed to resolve remaining endogeneity concerns. Lastly, the dataset also enables us to include three measures of national institutional quality, *Government Effectiveness, Rule of Law* and *Absence of Corruption*, and clearly separate their effects from regional culture, which has been a major concern of cross-country literature. To the best of our knowledge, this research effort is the first contribution that comprehensively analyses the culture-income debate for such a large number of worldwide regions.

For a large number of tests, including data refinements and alterations in the empirical setup, we find a very consistent and positive impact of the regional share of people who appreciate *Independence* and want to transfer this value to their children on regional per capita income. The regional appreciation of the value *Obedience* on the other hand exerts a robustly negative effect on regional per capita income. We find national institutions to have a strong mediating power on the effect of culture on income, i.e., stronger institutions can function as a substitute for regional culture. This is even more pronounced in countries with a centralized state system, where we can assume that regional institutions are absent. Even though we put a lot of effort in finding a relevant instrument on the regional level to control for reversed causality between culture and economic outcomes, we find only low evidence for the relevance of the genetic distance to the United Kingdom in terms of the allele frequency HLA-B*27.

Our insights lead us to the conclusion that despite all other potential reasons for diverging economic development, regional differences in cultural traits matter. Therefore, policy interventions must be carefully attuned to regional characteristics of culture, norms and behaviors, which are formed by parental education, migration background, religion and many more, and cannot be assumed to be unified for the entire country. Results and policy implications from cross-country literature must therefore be treated with caution. Just to mention a few examples from our analysis, we find that the appreciation of the value *Obedience* is more harmful for per capita income in non-Christian regions (i.e., in regions with less than 50% Christians); that the appreciation of the value *Independence* is less important for economic outcomes in regions that do not contain the capital city; and even though the appreciation of *Independence* is similarly important, Asian regions tend to have a 15% lower per capita income from appreciating *Obedience* compared to European regions.

Nevertheless, as a result of globalization and almost unlimited access to worldwide knowledge, education and technology, we can assume that also successful behavior, norms and values are internationally observed and adopted. Consequently, it is the researchers in economics to extract the cultural characteristics that are favorable for (regional) economic prosperity and incentivize them through national and regional policies and the formation of strong national institutions. This is in line with our findings, that strong national institutions can serve as a substitute for regional culture, that might not be characterized by the *right* features for regional economic growth. They are particularly important in countries with a centralized state system, as (inexistent) subnational institutions cannot compensate for critical and growth unfriendly characteristics of the prevalent regional culture.

Chapter 3 of this thesis examines the relationship between World Bank development projects and the improvements of quality and reachability of drinking water, toilet facilities and child mortality (measured by the number of deceased children). To be more concrete, we are comparing the average living situation of individuals in a small geographical unit who have or had access to a World Bank project with the average living situation of those without access. By considering the answers on individual welfare of close to two million respondents from 153 Demographic and Health Surveys conducted across the world, we are able to present a micro-based and ex-post approach to measure the relevance of World Bank development projects in the field of water, sanitation and health. If geocodes are available, this approach can be extended to any other institution, sector or target group. By this, we provide an inexpensive and large-scale approach to complement experimental studies[81] (such as *Randomized Control Trials*) but with the advantage to provide external validity. Our setting also allows us to account for any regional specifics and unobserved heterogeneity through the employment of subnational fixed effects. Our results reveal that the presence of the World Bank, spread across 38

[81] We show that the results of experiment-based evaluation of World Bank projects (in respective reports composed by the World Bank evaluation group) and of our empirics coincide for the case of water-related projects in Senegal. This additionally points to the fact that our approach can complement and extend experimental studies.

developing economies between 1986 and 2017, seems to have a positive impact on the quality of living of individuals living close to the Bank's projects. Their impact remains visible in a large number of robustness tests and data refinements.

The findings of Chapter 3 can directly be translated into three policy recommendations: first, we find that projects are particularly effective in relatively well-developed areas both in terms of education of individuals and in terms of nightlights intensity, which has been frequently used as a proxy for per capita income. This implies, that development institutions might want to initiate projects in accordingly characterized areas as implementation might me easier due to available infrastructure, qualification of people, reachability by staff and implementers (better developed areas are usually closer to bigger cities) etc. Experiences and potential spill-over effects gained through quick wins in higher developed areas can then be transferred conveniently to other areas that might be more remote and characterized by a low coverage of educational institutions, electricity, paved roads etc. The fact that we found higher effects of World Bank projects in low-income countries potentially implies that these countries are characterized by a lower starting point of water quality and reachability, of toilet facilities and of infant mortality and that significant improvements can be easier realized through relatively low financial and personnel efforts; second, we find that the mere presence of the World Bank suffices to realize improvements in the water, sanitation and health sector. But targeting these sectors through specifically planned projects (e.g., building a dam, installing piped water systems, providing access to adequate disposal of wastewater etc.) and directly channeled financial flows leads to even higher improvements in time to water, the quality of drinking water, the quality of toilets and the number of deceased children. This indicates that the World Bank (or any other developing institution) can count on spill-over effects but should carefully plan projects according to their aspirations; and third, our results indicate that the sustainability of World Bank projects can be further expanded (e.g., through monitoring, regular maintenance, trainings of local staff, creating effective incentive structures that guarantee the appropriate use of public facilities etc.) as effects of past projects in our analysis are rarely significant and if so their effects are always dominated by the effects of ongoing projects.

Chapter 4 explores whether regions with a hotter average temperature have a lower per capita income compared to their colder counterparts. Here, we follow past research that associates hotter temperature with lower human productivity, higher prevalence of debilitating diseases, agricultural losses etc. and in consequence with lower income. For this endeavor, we collected information on regional economic (per capita GDP, growth of per capita GDP, nightlights and gross cell production), as well as regional climatic indicators (temperature, precipitation, distance to coast, etc.) for a large number of subnational units, ranging between 1,542 and 15,533, in 31 to 83 countries. Our data originates from two sources, Demographic and Health Surveys and Gennaioli et al. (2014), and allows us to explore subnational incomes disparities that arise from changes in the average temperature between 1950 and 2000 and from cross-region temperature differences in the years 2005 and 2015. Despite several caveats, mainly related to data availability, our approach constitutes a valuable contribution to past attempts to quantify the effect that temperature exerts on economic development. First, we are transferring the cross-country discussion to the subnational level, with a large number of subnational units, and are therefore able to account for a distinct within-country heterogeneity. Second, we include country and time fixed effects which enable us to control for any (unobservable) country-specifics, such as institutional, historical or cultural characteristics. Third, given that we are working with several data sources, we test the effect of regional temperature on several measures/proxies for per capita income, which provides us more insights into subnational economic performance.

Our findings from a variety of tests suggest that there is no systematic link between subnational temperature and income, given that results are hardly significant let alone consistent in sign and magnitude and highly sensitive towards changes in the empirical estimation setting. Nevertheless, we observe a tendency that regional per capita income is negatively correlated with temperature, whereas subnational nightlights are generally positively affected with its magnitude being dependent on the extent of temperature fluctuations and seasonality. Regardless, of which proxy for regional incomes we use, we find only little indication that poorer regions are (still) more prone to adverse effects of temperature or that the income-temperature relationship is non-linear.

We might argue that adaptation possibilities, given on the country-level and accounted for through the inclusion of fixed effects, can explain the inconsistent effect of temperature on income on the subnational level. This hypothesis gets support from performed sensitivity tests, revealing that higher levels of education, which might encourage the invention and use of adaptation measures, seems to be unimportant for the temperature-income relationship on the subnational level; and that the significantly negative effect of temperature on regional incomes of poorer regions disappears after 1970, potentially because suitable adaptation methods decoupled the adverse effects of temperature from income.

Given certain caveats of our analysis, mainly the missing time dimension in our temperature data, we restrain from giving clear-cut and quantifiable policy implications. However, there are two guiding principles that are valid, independent of future evidence from upcoming research. First, transferring the negative effect found in various cross-country research to the subnational level seems premature and presumably inaccurate. Consequently, (national) policy targets should be geared to differences in regional development and regional temperature, which are certainly more distinct in some countries but principally present in all countries. This implies, that not all parts of a country are similarly vulnerable to changing climatic conditions and that they need regionally adjusted policy interventions. Policy makers should encourage regionally-focused research in order to make more profound decisions for e.g., greenhouse gas mitigation strategies. Second, a hotter average temperature does not seem to constitute a systematic and inevitable disadvantage even for poorer geographies. There are numerous examples that hot temperatures can go along with high economic performance and vice versa as observed within the United Arab Emirates or Canada. This does not imply that harmful consequences of climate change should be neglected but that adaptation e.g., through improved medical services for tropical diseases or enhanced machinery to compensate for reduced crop yields, is relevant and most importantly feasible.

5.3 FUTURE RESEARCH

We are convinced that if culture or its aspects is examined in a comparative analysis, it must be investigated on the subnational level, as it shows a distinct variation within countries. Chapter 2 in this doctoral thesis provides such a subnational analysis of the relationship between culture, measured by the regional appreciation of the values *Independence* and *Obedience*, and regional per capita income. Even though we find very consistent and unambiguous results for the two values, we rely on future research endeavors to bullet-proof our results and derive concrete policy implications. We would like to outline the most promising avenues for future research, that are based on our available data and methods. First, we are aware that *Independence* and *Obedience* hardly capture all aspects of culture that have been discussed in previous literature, such as trust, social capital, individual responsibility, tolerance, creativity, etc. In addition, we must take into account that both variables are derived from survey questions, which can be interpreted in very subjective ways and that are lived out very differently across families. In our opinion, exploring the impact of other aspects of culture, captured by survey-based as well as by more objective data sources, on the subnational level, is one of the most promising extensions of the analysis presented in Chapter 2.

Another interesting research avenue would be the examination of migration flows that might unroot certain cultural traits and transfer them to regions with a completely different prevailing culture. In a globalized world, that is characterized by a more or less flexible allocation of human capital, we would be particularly interested in the following questions: how much are regional incomes affected by migrants and their behaviors and norms?; to what extent do migrants retain their original cultural imprint and to what extent do they adapt a new culture?; under what circumstances, when and how long is current economic development affected by different cultures due to migration? Especially the time dimension (not only with regards to migration) mentioned in the last question has been frequently discussed in past literature. Up to date, it is not clear how long it takes until a cultural change affects economic output and therefore regressing a random *past* culture on *today's* income is prone to interpretation errors.

And thirdly, even though we present a variety of control variables and introduce a theoretically approved empirical instrument for the regional level, we cannot completely rule out remaining endogeneity concerns and would like to see this issue further discussed in future regionally-focused research attempts.

We have shown that and how our approach presented in Chapter 3 can be extended to other institutions, geographies, sectors etc. in order to evaluate development aid. Hereby, we provide an attractive possibility for other researchers who wish to complement their insights from cross-country studies or from field experiments to explore the effectiveness of development projects. Therefore, it would be interesting to see our results re-tested for different settings and proof its validity outside the presented analysis. In addition, as pointed out in the section on *Discussion and Caveats*, we would like our research to be brought forward in the following aspects.

In our research we simply consider whether the World Bank is present or not, but we do not look at how its effects differ for different project types (e.g., lending instrument, bottom-up vs. top-down execution, payment and reimbursement modalities, etc.), setups (e.g., project costs and length, etc.), targets (e.g., number of beneficiaries, number of newly installed facilities, etc.) or target groups (e.g., women, children, unemployed, etc.). We also did not explore potential spill-over effects that were indicated by our results, by revealing positive effects of the World Bank on water and health related indicators even though we did not control for the original target sector the World Bank aimed at (e.g., infrastructure, energy, etc.). Apart from including subnational fixed effects, we need to further work on controlling for considerations that might have led to the existing allocations of projects, that might not be purely need-based but based on policy considerations, on the distribution of other development activities in particular from NGOs, on good experiences with the staff, the population or the geographic location of previous projects, etc. Including these aspects in future endeavors, might further sharpen our causality assumptions, i.e., that the World Bank is indeed responsible for the positive development of the water and health indicators in question.

In Chapter 4 we attempt to clarify the relationship between per capita income and temperature for the subnational level, but find no consistent or systematic link for a large number of regions and various measures for income. This constitutes a strong support for Acemoglu and Robinson (2012)'s theory that it is not temperature (among others) but the lack of inclusive institutions that leads to the failing of nations. Interpreting our findings, we need to point to several caveats related to data availability that need to be addressed in future research.

The primary issue of our data is the missing variation of temperature over time, which restricts us to exploring differences between regions rather than differences over time. Gennaioli et al. (2014) data provides us with only one temperature record per region, that is averaged over a time span of fifty years, whereas DHS data limits the availability of regional nightlights and gross cell production to the years 2015 and 2005. Basically, we are unable to analyze the effects that a rising average subnational temperature exerts on the development of subnational incomes, and consequently we cannot directly estimate the consequences of anthropogenic climate change. Adding the time dimension would also enable us to further explore the crucial role of adaptation, for which we received several clear indications from our sensitivity tests. Empirically, we are unable to include country-time or region fixed effects, which would allow us to account for any (unobservable) particularities of a certain region or of a certain country in a certain time period, which clearly increases the risk of omitted variable bias. Apart from the inclusion of further set of fixed effects, this risk could be reduced by using time-variant control variables that also might have a crucial impact on subnational incomes. In Chapter 4 we already provide a range of geographic control variables, but many other influence factors specific to population, culture, institutions, etc. might be of particular relevance. Even though many past efforts have restrained from adding further regional covariates to their regressions, we believe it is a promising avenue for future research.

SUPPLEMENTARY MATERIAL

Exhibit 1: *Further information on our instrumental variable approach*

Although culture is often argued to be exogenous, we provide an initial attempt to control for endogeneity between regional incomes and culture by applying an instrumental variable approach based on genetic information.

We received inspiration from a number of research efforts that explored instruments based on genetic information (e.g., blood types, frequency of selected genes or allele types or historical prevalence of infectious diseases). It is argued that certain genetic predispositions (inherited from parents by their children) lead to the adaption of different cultural values affecting economic behavior (see e.g., Chiao and Blizinsky, 2010, Fincher et al., 2008, Gorodnichenko and Roland, 2011, 2017, Murray and Schaller, 2010, Nikolaev and Salahodjaev, 2017). Similar to the literature, we assume that individuals who are genetically susceptible to infectious and chronical illnesses tend to develop cultural coping strategies, such as ethnocentrism or skepticism. These strategies are supposed to work against the development of cultural values like individualism or independence (see e.g., Chiao and Blizinsky, 2010, Fincher et al., 2008, Gorodnichenko and Roland, 2011, 2017, Murray and Schaller, 2010, Nikolaev and Salahodjaev, 2017, Spolaore and Wacziarg, 2009). The literature argues that there are no direct effects from genes to the wealth of countries such that the exclusion restriction is fulfilled[82]. We assume that this will hold at the regional level too and measure the genetic distance in terms of the frequency of the Human Leukocyte Antigen (HLA)[83] B*27 for 200 out of 1,204 regions. This naturally restricts the scope of our instrumental variable. Allele frequency B*27 is a potential indicator for values linked to independence and obedience as their carriers have improved survival chances in HIV (see e.g., den Uyl et al., 2004, Gao et al., 2005, Magierowska et al., 1999) and are less susceptible to the infection with influenza virus, herpes simplex type 2 virus or Epstein-Barr virus (see e.g., Brooks et al., 1998, Martinez et al., 2004, Voeten et al., 2000). It can be seen as a neutral genetic marker that does not affect a human's general fitness (intelligence, ability to run etc.). We use the Euclidean distance of the allele frequencies HLA B*27 as our instrument[84] and thereby, we closely follow Gorodnichenko and Roland (2011, 2017).

As shown above (see **Table 3**) our results show rather insignificant effects when culture is instrumented with the genetic instrument. This raises the question whether the instrument suggested at

[82] We are aware that this assumption might not be fulfilled but we directly follow the literature of our choices.

[83] The Human Leukocyte Antigen (HLA) is an indicator for how well the immune system works and how likely the carrier is genetically susceptible to infectious and chronical diseases. Potential instruments can be found among the several hundred types of HLA-B alleles, which are associated with infectious diseases like HIV, Hepatitis B and Leprosy (Blackwell et al., 2009). Information on the allele frequency of HLA B*27 can be extracted from the Allele Frequency Net Database (2015).

[84] Searching within Great Britain, which was found to be one of the most individualistic countries (see Hofstede, 2001), and assuming that individualistic societies bring out relatively more innovations (see e.g., Gorodnichenko and Roland, 2011, 2017), we select England's South East, which leads the list of patents (Intellectual Property Office, 2016), as a reference region for cultural differences.

the national level can be generalized to the regional level. We consider it an important and interesting future research endeavor to explore potential regional instruments for culture.

Exhibit 2: *Further information on the panel structure and the inclusion of cluster fixed effects in DHS data*

DHS clusters are consecutively numbered and most cluster numbers are repeated in all available survey years (e.g., cluster number 4 in Senegal is repeated in eight survey years). However, this does not necessarily mean that identical cluster numbers identify the exact same cluster over time. This affects the panel structure of the entire sample.

We state clearly in the manuscript that cluster centers, for which we have geocodes available, might deviate over time. Such deviations tend to be small and can in many cases be associated with changing Enumeration Areas or reasons to protect the privacy of respondents (this is a well-documented procedure; displacement of up to 10 km are possible). In some instances it can also mean that clusters are simply not identical.

Table 27 shows coordinates of cluster number 4 in Senegal in available survey years. Calculating respective distances in kilometers from coordinates, reveals that the two most distant cluster centers are only 31.5km away from each other. We assume time-invariant cluster-specifics (e.g., sea access) do not change, given this rather small dislocation.

Table 27: *Geocodes for cluster number 4 in Senegal in available survey years*

Cluster 4 in Senegal		
Available survey years	**Latitude**	**Longitude**
1992/1993	14.750	-17.400
1997	14.736	-17.446
2005	14.770	-17.158
2008/2009	14.704	-17.467
2012/2013	14.703	-17.443
2014	14.712	-17.465
2015	14.719	-17.498
2016	14.740	-17.498

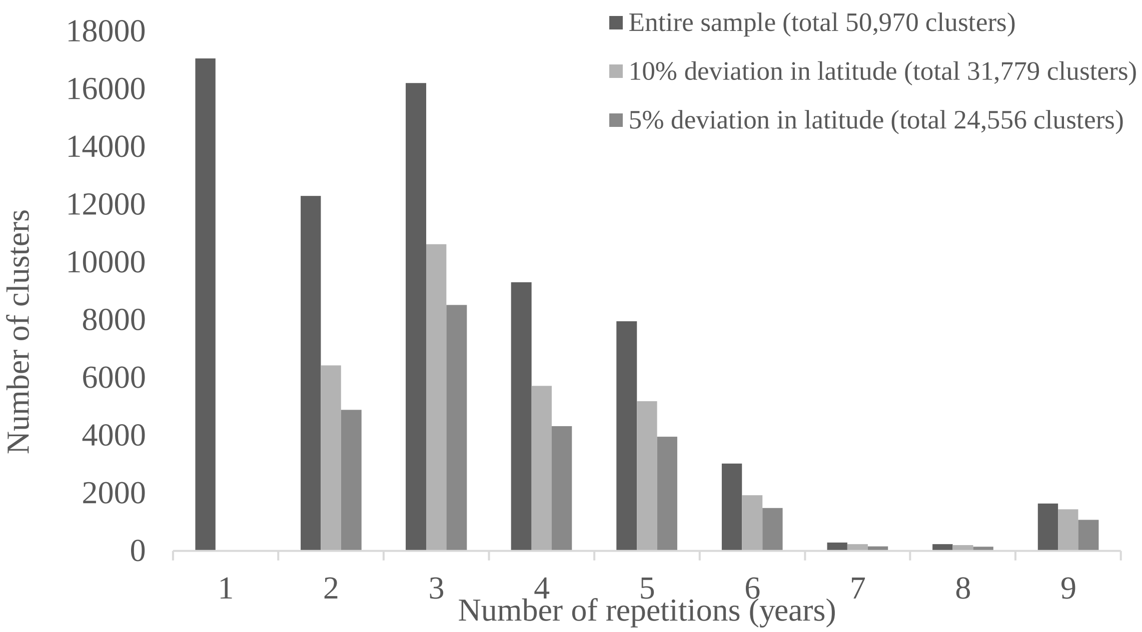
To perform this calculation exercise for every available cluster (approx.. 50,000 clusters reported in at least two survey years) was not possible given our tools at hand. However, we created two data subsamples where latitude coordinates[85] of the same cluster number deviated to a maximum of 5% and 10%[86]. This gives us 24,556 and 31,779 clusters for which we assume that they are comparable over

[85] As changes in longitude depend on the respective latitude, we calculated deviations only with regards to latitude.

[86] It must be noted that percentage changes of geocodes correspond to different distances in km, depending on whether a cluster is close to a pole or close to the equator. However, it should be enough to make assumptions on whether a cluster is comparable over time.

time (i.e., that cluster-specific time-invariant factors do not change due to small dislocations). Figure 8 shows a histogram that illustrates the panel structure of the entire sample and for two sub-samples that allow for a maximum deviation in a cluster's latitude of 5% and 10%.

Figure 8: *Number and repetitions of clusters for three DHS data samples*



Applying our estimation equation for the two subsamples as well as for regressions with region-time and country-time fixed effects reveals robust results. There are only marginal changes in the magnitude of coefficients compared to the baseline setting with cluster and time fixed effects. An anecdotal example for Senegal in Chapter 3.4.5 also confirms our results.

Therefore, we think that our cluster fixed effects approach is generally valid. However, we would like to encourage future research to re-allocate individual responses into equally-sized clusters that can be unambiguously identified over time.

Exhibit 3: *Matching procedure of DHS clusters to World Bank projects*

The matching of DHS clusters and World Bank projects was performed based on the geographic coordinates of the DHS cluster centroids and those of subnational World Bank projects. This was a very time-intensive procedure as our two databases contain around 14,000 World Bank projects and 50,000 clusters (reported in 153 surveys) that had to be merged individually according to year and geocodes.

We aimed at matching every project to at least one DHS selected cluster and therefore we had to allow for some deviations in their latitude and longitude coordinates. Differences started from 0.05 degrees and gradually increased in 0.01 steps until at least one match was obtained. A 0.05 degree change in latitude always corresponds to a change of 5.6 km. Depending on the latitude, a 0.05 degree change of longitude corresponds to a change of 0 to 5.6km. As we only have coordinates for the cluster centroid, we had to assume that if a World Bank project is close to a cluster center then all individuals in that cluster have access.

Our baseline results are based on all matches, irrespective of corresponding distances between clusters and projects. However, as illustrated in **Figure 9** more than 72% of individuals (335,440 of 468,457) could be merged with a maximum distance of 5.6km. We believe that it is fair to assume that a cluster centroid being 5.6km away from a project can still be considered as treated. Our results with this subset (i.e., maximum deviation in both latitude and longitude of 0.05) remain robust and reveal an even higher impact of the World Bank presence on our four variables.

We are aware that our approach allows for different radiuses around a project location in which a match with a cluster is obtained. However, as we introduce a new approach to the literature our aim was it to match as many projects as possible.

We clearly recommend the matching procedure for future research. Ideally, both cluster centroids and World Bank projects should be uploaded into a geographical system (e.g., GIS). A circle with a given radius (that decides over "access" or "no access") around cluster centroids would quickly identify available World Bank projects within this radius. Even though, this still does not control for the fact that clusters vary in size and therefore an individual living at the edge of a large cluster (i.e., far away from the cluster centroid) might still end up with no access to the project (even though the cluster was classified as treated), this would improve our matching substantially. However, only with geocoded individuals we would be able to truthfully define "access" or "no access".

Figure 9: *Matching of respondents and current and past World Bank projects with corresponding tolerances in latitude corresponding tolerances in latitude*

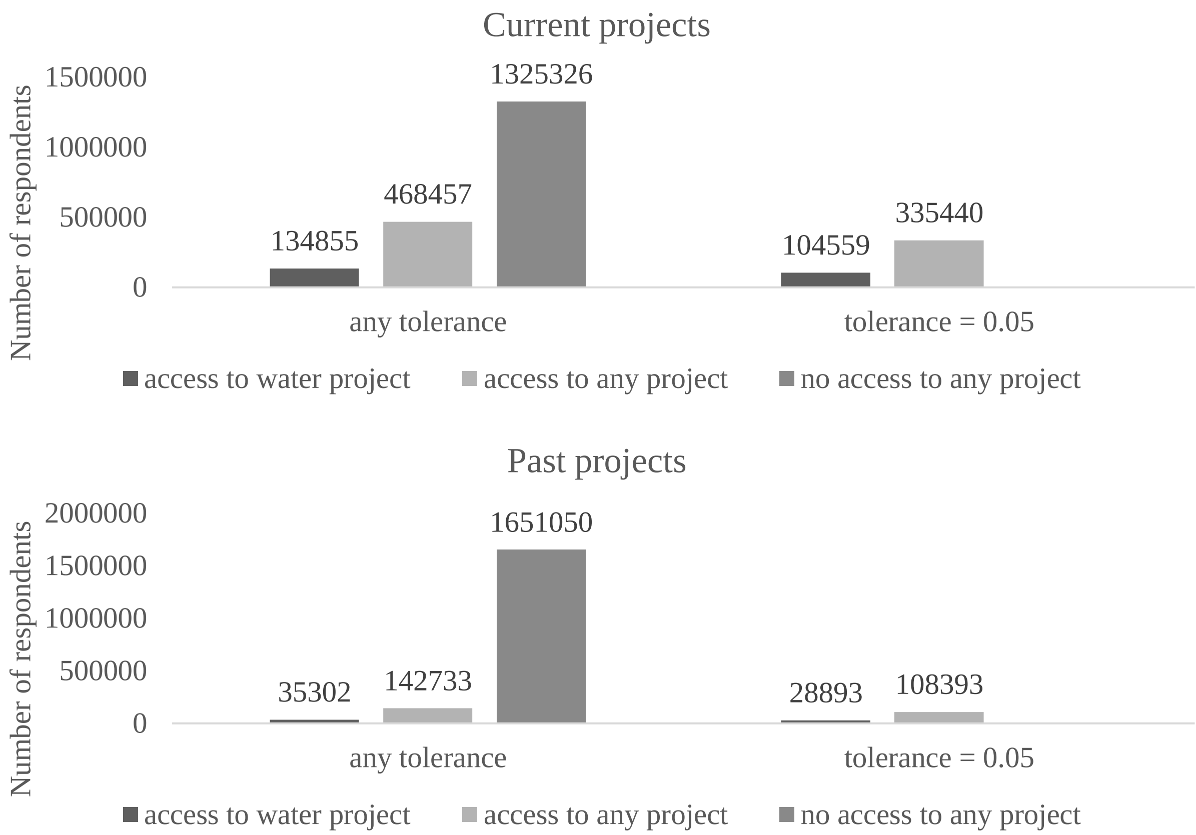


Table 28: *Introduction to **Table 29** and **Table 30***

Column	**Description**	**Example**
	Table 29	
Country	Country name according to Gennaioli et al. (2014)	Switzerland
Gennaioli et al. (2014) Region	Region name according to Gennaioli et al. (2014) [subsample: only regions with a WVS/EVS match]	Aargau
Number of years	Number of available years	2 (i.e. 2000, 2010)
Total respondents over all years	Sum of all respondents from available years	226 (i.e. 53 respondents in 2000 and 173 respondents in 2010)
Average respondents over all years	Average respondents per year	113 (i.e. average over respondents in years 2000 and 2010)
Minimum respondents	Minimum respondents in one of the available years	53 respondents (in 2000)
Maximum respondents	Maximum respondents ind one of the available years	173 respondents (in 2010)
	Table 30	
Country	Country name according to Gennaioli et al. (2014)	Albania
Gennaioli et al. (2014) Region	Region name according to Gennaioli et al. (2014) [subsample: only regions with a WVS/EVS match]	Tirana
WVS/EVS Region	Region name according to WVS/EVS classifications that was matched to the corresponding Gennaioli et al. (2014) region	AL: Tirana
Gennaioli et al. (2014) matched year(s)	Years that are available in both datasets (EVS/EVS and Gennaioli et al. (2014)	2001;2009

Source	Source for data from value surveys as respondent's answers can origin either from WVS (World Value Survey) or EVS (European Value Survey: "Region where the interview was conducted" (variable X048) or "Region: NUTS-2 code" (variable X048B))	WVS: AL: Tirana X048 (EVS): AT: Burgenland X048B (EVS): AT: Ostösterreich - Burgenland
Quality level of matching (QM)	Regional matching was classified in six different quality levels (see table A.1)	Qualiy matching "A" for Tirana (Gennaioli et al. (2014)) and AL: Tirana (WVS)
WVS/EVS Region used more than once	Some regions for the value surveys were very large and contain several Gennaioli et al. (2014) regions (labelled "Yes"). Therefore we used respondent's data from one WVS/EVS region for several smaller Gennaioli et al. (2014) regions. Through this measure we were able to obtain more matches. We are aware that we assume that answers from a large region are identical for its smaller units.	"AL: Center" (WVS/EVS) was matched to three Gennaioli et al. (2014) regions i.e. "Berat", "Durres" and "Elbasan"

Table 29: *Details on respondents per Gennaioli et al. (2014) Region*

Country	Gennaioli et al. (2014) Region	Number of years	Total respondents over all years	Average respondents over all years	Minimum respondents	Maximum respondents
Switzerland	Aargau	2	226	113	53	173
Italy	Abruzzo	4	117	29	16	47
Brazil	Acre	1	402	402	402	402
Turkey	Adana, Gaziantep	2	206	103	37	169
Turkey	Afyonkarahisar	1	63	63	63	63
Mexico	Aguascalientes	4	323	81	12	191
El Salvador	Ahuachapán	1	62	62	62	62
Japan	Aichi	5	929	186	162	225
Latvia	Aizkraukle district	1	20	20	20	20
Jordan	Ajloun	2	98	49	48	50
Norway	Akershus	2	363	182	116	247
Japan	Akita	5	765	153	133	187
Kazakhstan	Akmola & Astana City	1	130	130	130	130
Kazakhstan	Aktobe	1	68	68	68	68
United States	Alabama	4	517	129	84	160
Brazil	Alagoas	2	108	54	20	88
United States	Alaska	1	3	3	3	3
Spain	Álava	4	287	72	64	86
Romania	Alba	4	486	122	10	244
Spain	Albacete	4	230	58	42	77
Canada	Alberta	3	493	164	137	181
Portugal	Alentejo	2	235	118	55	180
Egypt, Arab Rep.	Alexandria	1	201	201	201	201
Portugal	Algarve	3	192	64	40	92
Spain	Alicante/Alacant	4	535	134	122	150

Kazakhstan	Almaty	1	288	288	288	288
Spain	Almería	4	960	240	212	272
France	Alsace	3	256	85	49	107
Guatemala	Alta Verapaz	1	225	225	225	225
Russian Federation	Altai Republic	2	433	217	198	235
Russian Federation	Altai Territory	2	433	217	198	235
Latvia	Aluksne district	1	10	10	10	10
Lithuania	Alytaus apskritis	1	302	302	302	302
Turkey	Amasya	2	292	146	36	256
Brazil	Amazonas, MG, MG do Sul, Rondônia, Roraima	2	462	231	60	402
Peru	Amazonas,PE	1	397	397	397	397
Jordan	Amman	2	773	387	377	396
Thailand	Amnat Chaeron / Ubon Ratchathani	1	535	535	535	535
Russian Federation	Amur Region	3	387	129	121	145
Vietnam	An Giang	1	312	312	312	312
Greece	Anatoliki Makedonia & Thraki	1	90	90	90	90
Peru	Ancash	3	319	106	50	204
India	Andhra Pradesh	4	665	166	143	200
Thailand	Ang Tong	1	583	583	583	583
China	Anhui	3	475	158	50	314
Turkey	Ankara and Kirikkale	2	228	114	88	140
Turkey	Antalya	2	96	48	30	66
Colombia	Antioquia	1	722	722	722	722
Chile	Antofagasta	4	534	134	68	163
Japan	Aomori	5	765	153	133	187
Switzerland	Appenzell A&I Rh.	2	259	130	18	241
Peru	Apurímac	1	117	117	117	117
Jordan	Aqaba	2	104	52	48	56

France	Aquitaine	3	375	125	103	163
Romania	Arad	4	174	44	20	76
Chile	Araucanía	3	501	167	41	232
Iran, Islamic Rep.	Ardebil	2	76	38	26	50
Peru	Arequipa	3	469	156	90	284
Romania	Arges	4	375	94	31	217
United States	Arizona	4	349	87	40	170
United States	Arkansas	4	624	156	119	198
Russian Federation	Arkhangelsk Region	2	133	67	40	93
India	Assam w/ Mizoram	2	113	57	52	61
Russian Federation	Astrakhan Region	3	937	312	281	373
Spain	Asturias	4	289	72	34	118
Egypt, Arab Rep.	Aswan	1	993	993	993	993
Chile	Atacama	3	323	108	20	155
Colombia	Atlantico	2	1,384	692	631	753
Kazakhstan	Atyrau	1	42	42	42	42
Norway	Aust-Agder	2	139	70	15	124
France	Auvergne	3	379	126	47	209
Spain	Ávila	4	277	69	16	101
Peru	Ayacucho	3	618	206	50	284
Turkey	Aydin	1	377	377	377	377
Vietnam	Bac Lieu / Ca Mau	1	312	312	312	312
Vietnam	Bac Ninh / Bac Giang / Ha Bac	2	324	162	144	180
Romania	Bacau	4	391	98	19	230
Hungary	Bács-Kiskun	2	65	33	13	52
Spain	Badajoz	4	251	63	33	115
Germany, West	Baden-Wurttemberg	5	1,126	225	160	328
Brazil	Bahia	2	978	489	70	908
Mexico	Baja California Norte	4	679	170	36	429

Mexico	Baja California Sur	4	615	154	10	429
Guatemala	Baja Verapaz	1	225	225	225	225
Vietnam	Bak Kan / Thai Nguyen	1	180	180	180	180
Spain	Balears, Illes	4	210	53	23	80
Pakistan	Balochistan	1	101	101	101	101
Jordan	Balqa	2	137	69	60	77
Latvia	Balvi district	1	16	16	16	16
Thailand	Bangkok Metropolis	1	583	583	583	583
Slovak Republic	Banskobystrický kraj	4	1,009	252	139	362
Hungary	Baranya	2	67	34	31	36
Spain	Barcelona	4	1,292	323	46	637
Bangladesh	Barisal	2	183	92	78	105
Switzerland	Basel-Land	2	232	116	59	173
Switzerland	Basel-Stadt	2	192	96	19	173
Italy	Basilicata	4	54	14	3	21
France	Basse-Normandie	3	503	168	41	322
Latvia	Bauskas rajons	1	23	23	23	23
Germany, West	Bavaria	5	1,317	263	173	378
Egypt, Arab Rep.	Behera	1	1,129	1,129	1,129	1,129
China	Beijing	4	508	127	25	314
Hungary	Békés	2	94	47	46	48
Russian Federation	Belgorod Region	3	901	300	138	419
Vietnam	Ben Tre	1	312	312	312	312
Indonesia	Bengkulu	1	200	200	200	200
Egypt, Arab Rep.	Beni Suef	1	1,129	1,129	1,129	1,129
Albania	Berat	2	492	246	229	263
Germany, West	Berlin	3	458	153	135	164
Switzerland	Bern w/ Jura	2	414	207	139	275
Philippines	Bicol Region	3	900	300	300	300

India	Bihar	4	857	214	147	275
Romania	Bihor	4	191	48	31	76
Vietnam	Binh Dinh	1	127	127	127	127
Vietnam	Binh Duong / Binh Phuoc	1	207	207	207	207
Vietnam	Binh Thuan / Ninh Thuan	1	127	127	127	127
Chile	Biobío	4	858	215	199	232
Kyrgyz Republic	Bishkek	1	260	260	260	260
Romania	Bistrita-Nasaud	4	285	71	8	222
Croatia	Bjelovar-Bilogora	2	509	509	509	509
Bulgaria	Blagoevgrad	4	669	167	39	408
Sweden	Blekinge	1	1	1	1	1
Colombia	Bogota	2	688	344	330	358
Colombia	Bolivar,CO	1	631	631	631	631
Ireland	Border	2	331	166	134	197
Denmark	Bornholm	3	385	128	5	370
Serbia	Borski	1	600	600	600	600
Hungary	Borsod-A-Z	2	129	65	55	74
Bosnia and Herzegovina	Bosansko-podrinjski k.	1	935	935	935	935
Romania	Botosani	4	316	79	23	230
France	Bourgogne	3	500	167	38	322
Colombia	Boyaca	2	1,765	883	621	1,144
Romania	Braila	4	294	74	17	217
Germany, East	Brandenburg	4	960	240	169	402
Serbia	Branicevski	1	600	600	600	600
Romania	Brasov	4	325	81	30	222
Slovak Republic	Bratislavský kraj	4	424	106	41	159
Bosnia and Herzegovina	Brcko	1	32	32	32	32
Germany, West	Bremen	5	94	19	8	26
France	Bretagne	3	416	139	73	201

Canada	British Columbia	3	623	208	192	239
Croatia	Brod-Posavina	2	509	509	509	509
Russian Federation	Bryansk Region	3	1,429	476	419	530
Romania	Bucuresti [Bucharest]	4	625	156	97	235
Hungary	Budapest	3	497	166	138	185
Argentina	Buenos Aires	3	1,228	409	300	509
Turkey	Burdur	1	107	107	107	107
Bulgaria	Burgas	4	490	123	85	196
Austria	Burgenland	3	176	59	50	65
Spain	Burgos	4	277	69	16	101
Thailand	Buri Ram	1	535	535	535	535
Turkey	Bursa, Istanbul, Kocaeli	2	306	153	47	259
Korea, Rep.	Busan	3	278	93	90	98
Iran, Islamic Rep.	Bushehr	2	55	28	25	30
Norway	Buskerud	2	258	129	67	191
Romania	Buzau	4	312	78	20	217
Indonesia	C. Java	2	654	327	200	454
Indonesia	C. Sulawesi	1	32	32	32	32
El Salvador	Cabañas	1	33	33	33	33
Spain	Cáceres	4	132	33	27	40
Spain	Cádiz	4	896	224	208	262
Egypt, Arab Rep.	Cairo	1	400	400	400	400
Peru	Cajamarca	3	879	293	85	397
Italy	Calabria	4	243	61	25	86
Romania	Calarasi	4	266	67	10	217
Colombia	Caldas	1	722	722	722	722
United States	California	4	615	154	133	170
Italy	Campania	4	742	186	102	313
Mexico	Campeche	4	483	121	12	316

Spain	Cantabria	4	174	44	32	56
Vietnam	Cao Bang	1	180	180	180	180
South Africa	Cape Province	4	2,867	717	196	947
Denmark	Capital region	7	1,097	157	41	370
Australia	Capital Territory	2	744	372	26	718
Colombia	Caqueta	1	142	142	142	142
Romania	Caras-Severin	4	156	39	11	76
Spain	Castellón/Castelló	4	556	139	122	162
Colombia	Cauca	2	1,150	575	486	664
Latvia	Cçsu rajons	1	30	30	30	30
Brazil	Ceará	2	128	64	40	88
Philippines	Central Visayas	2	600	300	300	300
Morocco	Central,MOR	2	253	127	50	203
France	Centre	3	519	173	57	322
Portugal	Centro	3	748	249	135	428
Spain	Ceuta y Melilla	1	4	4	4	4
Thailand	Chachoengsao	1	583	583	583	583
Iran, Islamic Rep.	Chaharmahal and Bakhtiyari	2	68	34	30	38
Thailand	Chai Nat	1	583	583	583	583
Thailand	Chaiyaphum	1	535	535	535	535
El Salvador	Chalatenango	1	45	45	45	45
France	Champagne-Ardenne	3	490	163	28	322
India	Chandigarh	1	25	25	25	25
Thailand	Chanthaburi	1	583	583	583	583
Russian Federation	Chelyabinsk Region	3	817	272	207	326
Ukraine	Cherkasy	2	68	34	24	44
Ukraine	Chernihiv	2	63	32	24	39
Ukraine	Chernivtsi	2	52	26	24	28
Thailand	Chian Mai	1	206	206	206	206

Thailand	Chiang Rai	1	206	206	206	206
Mexico	Chiapas	4	928	232	60	453
Japan	Chiba	5	1,891	378	320	450
Mexico	Chihuahua	4	723	181	60	429
Guatemala	Chimaltenango	1	335	335	335	335
Guatemala	Chiquimula	1	225	225	225	225
Bangladesh	Chittagong	2	199	100	78	121
Colombia	Choco	2	1,150	575	486	664
Thailand	Chon Buri	1	583	583	583	583
Kyrgyz Republic	Chui Oblast	1	21	21	21	21
Russian Federation	Chukotka Autonomous Okrug	3	387	129	121	145
Thailand	Chumphon	1	197	197	197	197
Korea, Rep.	Chungbuk	4	299	75	30	174
Korea, Rep.	Chungnam w/ Daejeon	4	314	79	45	174
Russian Federation	Chuvash Republic	2	261	131	117	144
Serbia	City of Belgrade	1	280	280	280	280
Croatia	City of Zagreb	2	543	543	543	543
Argentina	Ciudad de Bs. As.	3	670	223	202	263
Spain	Ciudad Real	4	422	106	65	177
Romania	Cluj	4	375	94	31	222
Mexico	Coahuila	4	679	170	36	429
Mexico	Colima	2	291	146	100	191
United States	Colorado	4	278	70	40	99
Bangladesh	Comilla	1	88	88	88	88
United States	Connecticut	4	405	101	60	121
Romania	Constanta	4	172	43	27	52
Chile	Coquimbo	4	333	83	46	123
Argentina	Córdoba,ARG	2	215	108	80	135
Spain	Córdoba,SP	4	869	217	181	262

Spain	Coruña (A)	4	656	164	86	306
Romania	Covasna	4	279	70	14	222
Ukraine	Crimea & Sevastopol	2	145	73	71	74
Hungary	Csongrád	2	113	57	37	76
Spain	Cuenca	4	253	63	51	77
Colombia	Cundinamarca	2	1,765	883	621	1,144
El Salvador	Cuscatlán	1	44	44	44	44
Peru	Cusco	3	242	81	50	117
Vietnam	Da Nam / Quang Nam	2	259	130	127	132
Korea, Rep.	Daegu	3	195	65	60	75
Vietnam	Dak Lack	2	163	82	65	98
Egypt, Arab Rep.	Dakahlia	1	1,129	1,129	1,129	1,129
Sweden	Dalarna	1	19	19	19	19
Romania	Dambovita	4	291	73	12	217
Egypt, Arab Rep.	Damietta	1	1,129	1,129	1,129	1,129
Latvia	Daugavpils rajons	1	57	57	57	57
United States	Delaware	4	811	203	118	258
India	Delhi	3	156	52	38	75
Bangladesh	Dhaka	2	277	139	78	199
Albania	Dibra	2	433	217	215	218
United States	District of Columbia	4	811	203	118	258
Mexico	Distrito Federal,MEX	4	993	248	156	425
Ukraine	Dnipropetrovsk	2	408	204	112	296
Latvia	Dobeles rajons	1	20	20	20	20
Bulgaria	Dobrich	4	448	112	30	187
Romania	Dolj	4	268	67	33	118
Poland	Dolnoslaskie	3	219	73	25	115
Ukraine	Donetsk	2	269	135	118	151
Vietnam	Dong Nai / Ba Ria-Vung Tau	1	207	207	207	207

Vietnam	Dong Thap	1	312	312	312	312
Netherlands	Drenthe	3	106	35	15	60
Croatia	Dubrovnik-Neretva	2	369	369	369	369
Mexico	Durango	4	637	159	20	429
Albania	Durres	2	492	246	229	263
Indonesia	E. Java	1	507	507	507	507
Macedonia	East	2	305	153	130	175
United Kingdom	East Anglia	4	247	62	43	85
Iran, Islamic Rep.	East Azarbayejan	2	330	165	145	185
Kazakhstan	East Kazakhstan	1	131	131	131	131
Philippines	Eastern Visayas	2	600	300	300	300
Turkey	Edirne	2	417	209	40	377
Japan	Ehime	5	1,183	237	190	272
Guatemala	El Petén	1	335	335	335	335
Guatemala	El Progreso	1	225	225	225	225
Albania	Elbasan	2	492	246	229	263
Italy	Emilia-Romagna	4	431	108	74	145
Turkey	Erzincan	1	40	40	40	40
Guatemala	Escuintla	1	130	130	130	130
Iran, Islamic Rep.	Esfahan	2	334	167	153	181
Brazil	Espírito Santo	2	938	469	30	908
Finland	Etelã-Suomi w/ Uusimaa	3	1,393	464	258	573
Bangladesh	Faridpur	2	134	67	56	78
Iran, Islamic Rep.	Fars	2	309	155	150	159
Egypt, Arab Rep.	Fayoum	1	1,129	1,129	1,129	1,129
Hungary	Fejér	2	67	34	24	43
Norway	Finnmark Finnmárku	1	18	18	18	18
Albania	Fleri	1	747	747	747	747
Netherlands	Flevoland	3	64	21	15	32

Uruguay	Florida,URU	1	50	50	50	50
United States	Florida,US	4	811	203	118	258
France	Franche-Comté	3	230	77	23	107
Switzerland	Freiburg	2	315	158	40	275
Netherlands	Friesland	3	124	41	17	75
Italy	Friuli-Venezia Giulia	4	132	33	22	42
China	Fujian	4	510	128	25	314
Japan	Fukui	5	929	186	162	225
Japan	Fukuoka	5	1,183	237	190	272
Japan	Fukushima	5	765	153	133	187
Denmark	Fyn	4	594	149	75	350
Bulgaria	Gabrovo	4	469	117	20	179
Romania	Galati	4	240	60	28	118
Korea, Rep.	Gangwon	4	233	58	45	93
China	Gansu w/ Inner Mongolia & Ningxia	2	50	25	25	25
Sweden	Gävleborg	2	52	26	25	27
Netherlands	Gelderland	3	427	142	73	210
Switzerland	Genf	2	279	140	85	194
United States	Georgia	4	811	203	118	258
Egypt, Arab Rep.	Gharbia	1	1,129	1,129	1,129	1,129
Vietnam	Gia Lia / Kon Tum	1	98	98	98	98
Japan	Gifu	5	929	186	162	225
Iran, Islamic Rep.	Gilan	2	195	98	95	100
Turkey	Giresun	1	256	256	256	256
Spain	Girona	4	699	175	46	234
Romania	Giurgiu	4	292	73	9	217
Egypt, Arab Rep.	Giza	1	1,129	1,129	1,129	1,129
Albania	Gjirokastra	2	715	358	353	362
Switzerland	Glarus	1	241	241	241	241

Brazil	Goiás, DF, Tocantins	2	198	99	60	138
Slovenia	Gorenjska	4	422	106	103	111
Slovenia	Goriska	4	239	60	45	77
Romania	Gorj	4	170	43	10	118
Spain	Granada	4	960	240	212	272
Switzerland	Graubünden	2	250	125	9	241
Netherlands	Groningen	3	143	48	37	62
Spain	Guadalajara	4	253	63	51	77
Mexico	Guanajuato	4	453	113	72	191
China	Guangdong w/ Hainan	3	627	209	50	399
China	Guangxi	3	520	173	25	399
Guatemala	Guatemala City	1	310	310	310	310
Mexico	Guerrero	4	559	140	48	316
Spain	Guipúzcoa	4	284	71	64	86
China	Guizhou	4	609	152	65	399
India	Gujarat	4	425	106	96	125
Latvia	Gulbenes rajons	1	14	14	14	14
Japan	Gumma	5	1,891	378	320	450
Korea, Rep.	Gyeongbuk	3	234	78	60	99
Korea, Rep.	Gyeonggi	3	701	234	176	270
Korea, Rep.	Gyeongnam w/ Ulsan	3	250	83	75	100
Hungary	Gyor-M-S	2	181	91	27	154
Vietnam	Ha Tinh / Nghe An	2	278	139	81	197
Vietnam	Hai Duong	1	291	291	291	291
Vietnam	Hai Phong	1	291	291	291	291
Hungary	Hajdú-Bihar	2	116	58	51	65
Sweden	Halland	2	56	28	23	33
Germany, West	Hamburg	5	170	34	20	53
Iran, Islamic Rep.	Hamedan	2	150	75	69	81

Vietnam	Hanoi / Ha Tay	2	490	245	199	291
Romania	Harghita	4	279	70	15	222
Estonia	Harju county	2	472	236	39	433
India	Haryana	3	128	43	34	50
Bulgaria	Haskovo	4	683	171	96	301
Turkey	Hatay	1	107	107	107	107
France	Haute-Normandie	3	510	170	48	322
United States	Hawaii	1	4	4	4	4
China	Hebei	3	454	151	65	314
Norway	Hedmark	2	128	64	47	81
China	Heilongjiang	3	409	136	25	260
China	Henan	3	494	165	75	314
Bosnia and Herzegovina	Herceg-bosanski k.	1	935	935	935	935
Bosnia and Herzegovina	Hercegovacko-nerevtvanski k.	1	935	935	935	935
Germany, West	Hesse	5	665	133	89	191
Hungary	Heves	2	84	42	38	46
Mexico	Hidalgo	4	785	196	36	599
Estonia	Hiiu county	2	62	31	3	59
Japan	Hiroshima	5	1,183	237	190	272
Vietnam	Ho Chi Minh City|Ho Chi Minh	2	335	168	128	207
Japan	Hokkaido	5	765	153	133	187
Norway	Hordaland	2	312	156	131	181
Iran, Islamic Rep.	Hormozgan	2	90	45	45	45
Peru	Huancavelica	1	204	204	204	204
Peru	Huánuco	2	248	124	44	204
China	Hubei	4	418	105	50	138
Spain	Huelva	4	960	240	212	272
Spain	Huesca	4	164	41	37	48
Guatemala	Huhuetenango	1	335	335	335	335

Colombia	Huila	1	722	722	722	722
China	Hunan	3	490	163	41	399
Romania	Hunedoara	4	385	96	49	222
Japan	Hyogo	5	959	192	161	228
Romania	Ialomita	4	277	69	8	217
Romania	Iasi	4	386	97	27	230
Japan	Ibaraki	5	1,891	378	320	450
Peru	Ica	2	249	125	45	204
United States	Idaho	4	215	54	48	59
Estonia	Ida-Viru county	2	316	158	148	168
Iran, Islamic Rep.	Ilam	2	42	21	20	22
France	Île-de-France	3	678	226	183	296
Romania	Ilfov	4	268	67	10	217
United States	Illinois	4	988	247	167	329
Korea, Rep.	Incheon	3	170	57	50	60
United States	Indiana	4	988	247	167	329
United States	Iowa	4	417	104	72	172
Greece	Ipeiros & Dytiki Makedonia	1	90	90	90	90
Jordan	Irbid	2	362	181	179	183
Russian Federation	Irkutsk Region	2	236	118	92	144
Japan	Ishikawa	5	929	186	162	225
Egypt, Arab Rep.	Ismailia	1	174	174	174	174
Turkey	Isparta	1	108	108	108	108
Kyrgyz Republic	Issyk-Kul Oblast	1	124	124	124	124
Croatia	Istria	2	369	369	369	369
Finland	Itã-Suomi	3	412	137	58	208
Ukraine	Ivano-Frankivsk	2	78	39	36	42
Russian Federation	Ivanovo Region	3	1,293	431	344	530
Japan	Iwate	5	765	153	133	187

Guatemala	Izabal	1	225	225	225	225
Turkey	Izmir	2	190	95	74	116
Serbia	Jablanicki	1	600	600	600	600
Spain	Jaén	4	960	240	212	272
Indonesia	Jakarta	1	199	199	199	199
Kyrgyz Republic	Jalal-Abad Oblast	1	147	147	147	147
Guatemala	Jalapa	1	225	225	225	225
Mexico	Jalisco	5	1,024	205	100	495
Indonesia	Jambi	1	200	200	200	200
Sweden	Jämtland	2	16	8	2	14
Jordan	Jarash	2	105	53	45	60
Estonia	Järva county	2	460	230	27	433
Hungary	Jász-N-Sz	2	90	45	41	49
Latvia	Jçkabpils rajons	1	29	29	29	29
Latvia	Jelgavas rajons	2	51	26	18	33
Korea, Rep.	Jeollanam-do w/ Gwangju	3	195	65	60	75
Korea, Rep.	Jeonbuk	3	155	52	45	60
Russian Federation	Jewish Autonomous Region	3	387	129	121	145
China	Jiangsu	4	514	129	25	314
China	Jiangxi	4	473	118	25	314
Czech Republic	Jihocecký kraj	4	487	122	62	187
Czech Republic	Jihomoravský kraj	4	1,162	291	185	430
China	Jilin	4	410	103	25	260
Estonia	Jõgeva county	2	198	99	30	168
Malaysia	Johor	1	140	140	140	140
Sweden	Jönköping	2	135	68	58	77
Slovenia	Jugovzhodna Slovenija	4	255	64	45	77
Peru	Junín	3	315	105	50	204
Guatemala	Jutiapa	1	225	225	225	225

Serbia	Juzno–backi	1	320	320	320	320
Serbia	Juzno–banatski	1	320	320	320	320
Denmark	Jylland	4	2,099	525	494	583
Russian Federation	Kabardino-Balkaria	2	427	214	190	237
Egypt, Arab Rep.	Kafr El Sheikh	1	1,129	1,129	1,129	1,129
Japan	Kagawa	5	1,183	237	190	272
Japan	Kagoshima	5	1,183	237	190	272
Thailand	Kalasin	1	535	535	535	535
Egypt, Arab Rep.	Kaliobia	1	1,129	1,129	1,129	1,129
Sweden	Kalmar	2	50	25	17	33
Russian Federation	Kaluga Region	3	1,293	431	344	530
Thailand	Kam Phaeng Phet	1	206	206	206	206
Russian Federation	Kamchatka	3	387	129	121	145
Japan	Kanagawa	5	1,891	378	320	450
Thailand	Kanchanaburi	1	583	583	583	583
United States	Kansas	4	417	104	72	172
Russian Federation	Karachay-Cherkess Republic	2	427	214	190	237
Kazakhstan	Karagandy	1	130	130	130	130
Jordan	Karak	2	126	63	49	77
Croatia	Karlovac	2	509	509	509	509
Czech Republic	Karlovarský kraj	4	584	146	93	207
India	Karnataka	4	467	117	102	150
Austria	Karnten	3	342	114	108	121
Bulgaria	Karzhali	4	554	139	30	301
Turkey	Kastamonu	2	296	148	40	256
Lithuania	Kauno apskritis	1	246	246	246	246
Malaysia	Kedah and Perlis	1	90	90	90	90
Malaysia	Kelantan	1	57	57	57	57
Russian Federation	Kemerovo Region	2	433	217	198	235

Greece	Kentriki Makedonia	1	240	240	240	240
United States	Kentucky	4	481	120	84	160
India	Kerala	4	298	75	59	100
Iran, Islamic Rep.	Kerman	2	180	90	89	91
Iran, Islamic Rep.	Kermanshah	2	153	77	70	83
Russian Federation	Khabarovsk Territory	3	387	129	121	145
Vietnam	Khanh Hoa	1	127	127	127	127
Ukraine	Kharkiv	2	164	82	69	95
Ukraine	Kherson	2	69	35	34	35
Ukraine	Khmelnytskiy	2	68	34	24	44
Thailand	Khon Kaen	1	535	535	535	535
Iran, Islamic Rep.	Khorasan & Yazd	2	442	221	217	225
Bangladesh	Khulna	2	113	57	36	77
Iran, Islamic Rep.	Khuzestan	2	241	121	112	129
Vietnam	Kien Giang	1	312	312	312	312
Turkey	Kirklareli	1	377	377	377	377
Russian Federation	Kirov Region	2	261	131	117	144
Ukraine	Kirovohrad	2	57	29	21	36
Lithuania	Klaipedos apskritis	1	204	204	204	204
Japan	Kochi	5	1,183	237	190	272
Iran, Islamic Rep.	Kohgiluyeh and Boyerahmad	2	52	26	25	27
Serbia	Kolubarski	1	600	600	600	600
Hungary	Komárom-E	2	67	34	30	37
Turkey	Konya	2	117	59	48	69
Croatia	Koprivnica-Križevci	2	543	543	543	543
Albania	Korca	2	715	358	353	362
Iran, Islamic Rep.	Kordestan	1	49	49	49	49
Slovenia	Koroska	4	143	36	24	46
Slovak Republic	Kosický kraj	3	711	237	128	392

Kazakhstan	Kostanai	1	89	89	89	89
Russian Federation	Kostroma Region	3	1,293	431	344	530
Thailand	Krabi	1	197	197	197	197
Czech Republic	Kraj Vysocina	4	686	172	80	295
Czech Republic	Královéhradecký kraj	3	485	162	80	241
Croatia	Krapina-Zagorje	2	543	543	543	543
Latvia	Krâslavas rajons	1	21	21	21	21
Russian Federation	Krasnodar Region	3	824	275	190	397
Russian Federation	Krasnoyarsk Territory	2	236	118	92	144
Greece	Kriti	2	119	60	39	80
Sweden	Kronoberg	2	59	30	22	37
Poland	Kujawsko-Pomorskie	3	170	57	37	74
Albania	Kukes	2	433	217	215	218
Latvia	Kuldîgas rajons	1	20	20	20	20
Japan	Kumamoto	5	1,183	237	190	272
Russian Federation	Kurgan Region	3	817	272	207	326
Russian Federation	Kursk Region	2	259	130	121	138
Ukraine	Kyiv_city	2	137	69	60	77
Ukraine	Kyiv_sub	2	115	58	55	60
Japan	Kyoto	5	959	192	161	228
Bulgaria	Kyustendil	4	680	170	50	408
Kazakhstan	Kyzylorda	1	57	57	57	57
El Salvador	La Libertad,ES	1	124	124	124	124
Peru	La Libertad,PER	3	558	186	51	397
El Salvador	La Paz,ES	1	60	60	60	60
El Salvador	La Unión	1	60	60	60	60
Estonia	Lääne county	2	80	40	21	59
Estonia	Lääne-Viru county	2	221	111	53	168
Vietnam	Lam Dong	1	98	98	98	98

Peru	Lambayeque	3	557	186	65	397
Thailand	Lampang	1	206	206	206	206
Thailand	Lamphun	1	206	206	206	206
Indonesia	Lampung	1	98	98	98	98
Vietnam	Lang Son	1	180	180	180	180
France	Languedoc-Roussillon	3	397	132	57	235
Italy	Lazio	4	540	135	97	177
Russian Federation	Leningrad Region	3	745	248	177	349
Spain	León	4	607	152	16	279
Albania	Lezha	2	433	217	215	218
China	Liaoning	4	509	127	25	260
Czech Republic	Liberecký kraj	3	566	189	103	241
Chile	Libertador General Bernardo O'Higgins	4	317	79	38	123
Latvia	Liepâjas rajons	2	72	36	24	48
Italy	Liguria	4	270	68	28	140
Croatia	Lika-Senj	2	369	369	369	369
Peru	Lima w/ Callao	3	1,589	530	440	650
Latvia	Limbaþu rajons	1	21	21	21	21
Netherlands	Limburg	3	227	76	34	101
France	Limousin	3	290	97	18	163
Russian Federation	Lipetsk Region	2	259	130	121	138
Portugal	Lisboa	4	941	235	83	364
Spain	Lleida	4	699	175	46	234
Poland	Lódzkie	4	192	64	13	100
Thailand	Loei	1	535	535	535	535
Italy	Lombardia	4	970	243	154	318
Vietnam	Long An	1	312	312	312	312
Thailand	Lop Buri	1	583	583	583	583
Iran, Islamic Rep.	Lorestan	2	133	67	63	70

Peru	Loreto w/ Ucayali	3	507	169	50	397
France	Lorraine	3	267	89	60	107
Chile	Los Lagos	4	581	145	73	232
United States	Louisiana	4	749	187	144	244
Bulgaria	Lovech	4	588	147	132	160
Germany, West	Lower Saxony	5	916	183	104	272
Poland	Lubelskie	4	157	52	5	83
Poland	Lubuskie	3	93	31	13	42
Latvia	Ludzas rajons	1	19	19	19	19
Spain	Lugo	4	354	89	69	112
Ukraine	Luhansk	2	290	145	82	208
Switzerland	Luzern	2	148	74	49	99
Ukraine	Lviv	2	151	76	71	80
Jordan	Ma’an	2	84	42	36	48
Serbia	Macvanski	1	600	600	600	600
Jordan	Madaba	2	87	44	39	48
India	Madhya Pradesh	4	589	147	104	200
Latvia	Madonas rajons	1	30	30	30	30
Peru	Madre de Dios	1	117	117	117	117
Spain	Madrid	4	1,349	337	160	526
Thailand	Mae Hong Son	1	206	206	206	206
Jordan	Mafraq	2	139	70	67	72
Russian Federation	Magadan Region	3	387	129	121	145
Chile	Magallanes y Antártica Chilena	1	236	236	236	236
Thailand	Maha Sarakham	1	535	535	535	535
India	Maharashtra	4	849	212	194	250
United States	Maine	4	379	95	60	121
Spain	Málaga	4	960	240	212	272
Turkey	Malatya	1	64	64	64	64

Poland	Malopolskie	3	251	84	34	121
Kazakhstan	Manghistau	1	39	39	39	39
Turkey	Manisa	2	109	55	24	85
Canada	Manitoba	3	192	64	60	71
Romania	Maramures	4	167	42	15	76
Brazil	Maranhão	2	138	69	50	88
Italy	Marche	4	184	46	17	70
Lithuania	Marijampoles apskritis	1	197	197	197	197
Iran, Islamic Rep.	Markazi	2	119	60	59	60
United States	Maryland	4	811	203	118	258
United States	Massachusetts	4	379	95	60	121
Chile	Maule	4	475	119	62	233
Iran, Islamic Rep.	Mazandaran & Golestan	2	294	147	60	234
Poland	Mazowieckie	3	296	99	4	188
Germany, East	Mecklenburg-West Pomerania	4	673	168	113	255
Croatia	Medimurje	2	543	543	543	543
Romania	Mehedinti	4	324	81	19	156
Malaysia	Melaka	1	30	30	30	30
Argentina	Mendoza	2	130	65	40	90
Egypt, Arab Rep.	Menoufia	1	1,129	1,129	1,129	1,129
Turkey	Mersin	1	31	31	31	31
Colombia	Meta	1	170	170	170	170
Philippines	Metro Manila	3	900	300	300	300
Mexico	Mexico	5	1,601	320	192	599
United States	Michigan	4	988	247	167	329
Mexico	Michoacan	5	1,100	220	72	528
Ireland	Mid-East w/ Dublin	2	881	441	338	543
France	Midi-Pyrénées	3	365	122	93	163
Ireland	Midland	2	274	137	77	197

United Kingdom	Midlands	4	920	230	114	336
Ireland	Mid-West,IRE	1	118	118	118	118
Japan	Mie	5	959	192	161	228
Brazil	Minas Gerais	2	1,138	569	230	908
Philippines	Mindanao	3	900	300	300	300
United States	Minnesota	4	509	127	72	173
United States	Mississippi	4	481	120	84	160
United States	Missouri	4	417	104	72	172
Japan	Miyagi	5	765	153	133	187
Japan	Miyazaki	5	1,183	237	190	272
Italy	Molise	4	72	18	12	29
Bulgaria	Montana,BUL	4	425	106	72	160
United States	Montana,US	4	278	70	40	99
Uruguay	Montevideo	1	500	500	500	500
Peru	Moquegua	1	284	284	284	284
Serbia	Moravski	1	600	600	600	600
Czech Republic	Moravskoslezský kraj	3	1,810	603	235	1,215
El Salvador	Morazán	1	44	44	44	44
Norway	Møre og Romsdal	2	242	121	61	181
Mexico	Morelos	4	763	191	24	599
Russian Federation	Moscow Region	1	187	187	187	187
Turkey	Mugla	1	24	24	24	24
Thailand	Mukhadan / Nakhon Phanom	1	535	535	535	535
Spain	Murcia	4	290	73	33	110
Romania	Mures	4	331	83	31	222
Russian Federation	Murmansk Region	2	133	67	40	93
Ukraine	Mykolayiv	2	64	32	24	40
Bangladesh	Mymensingh	2	203	102	75	128
Japan	Nagano	5	929	186	162	225

Japan	Nagasaki	5	1,183	237	190	272
Thailand	Nakhon Nayok	1	583	583	583	583
Thailand	Nakhon Pathom	1	583	583	583	583
Thailand	Nakhon Ratchasima	1	535	535	535	535
Thailand	Nakhon Sawan	1	206	206	206	206
Thailand	Nakhon Si Thammarat	1	197	197	197	197
Thailand	Nan	1	206	206	206	206
Japan	Nara	5	959	192	161	228
Thailand	Narathiwat	1	197	197	197	197
Colombia	Narino	2	1,150	575	486	664
Kyrgyz Republic	Naryn Oblast	1	80	80	80	80
South Africa	Natal	4	1,973	493	168	620
Spain	Navarra	4	138	35	16	55
Mexico	Nayarit	4	323	81	12	191
Romania	Neamt	4	296	74	15	230
United States	Nebraska	4	417	104	72	172
Malaysia	Negeri Sembilan	1	50	50	50	50
Switzerland	Neuenburg	2	350	175	75	275
United States	Nevada	4	278	70	40	99
Canada	New Brunswick	3	412	137	48	198
United States	New Hampshire	4	379	95	60	121
United States	New Jersey	4	940	235	168	287
United States	New Mexico	4	278	70	40	99
Australia	New South Wales	2	1,172	586	454	718
United States	New York	4	940	235	168	287
Canada	Newfoundland-Labrador	3	266	89	37	134
Switzerland	Nidwalden	1	99	99	99	99
Austria	Niederoesterreich	3	851	284	259	315
Japan	Niigata	5	929	186	162	225

Serbia	Nisavski	1	600	600	600	600
Greece	Nisiá Aigaío	2	84	42	14	70
Slovak Republic	Nitriansky kraj	3	893	298	158	563
Russian Federation	Nizhny Novgorod Region	2	261	131	117	144
Hungary	Nógrád	2	38	19	16	22
Thailand	Nong Bua Lam Phu / Udon Thani	1	535	535	535	535
Thailand	Nong Khai	1	535	535	535	535
Thailand	Nonthaburi	1	583	583	583	583
Netherlands	Noord-Brabant	3	568	189	151	242
Netherlands	Noord-Holland	3	591	197	174	211
France	Nord - Pas-de-Calais	3	287	96	84	113
Norway	Nordland	2	183	92	83	100
Norway	Nord-Trøndelag	2	127	64	26	101
Sweden	Norrbotten	2	41	21	11	30
Portugal	Norte	3	1,296	432	346	595
Colombia	Norte de Santander	2	1,765	883	621	1,144
United Kingdom	North	4	404	101	55	135
United States	North Carolina	4	1,022	256	118	418
United States	North Dakota	4	417	104	72	172
Nigeria	North East	2	271	136	51	220
Kazakhstan	North Kazakhstan	1	60	60	60	60
Germany, West	North Rhine-Westphalia	5	2,121	424	289	624
United Kingdom	North West,GB	4	715	179	69	258
Nigeria	North West,NG	2	603	302	209	394
Morocco	North-Central	2	202	101	88	114
United Kingdom	Northern Ireland	3	1,706	569	304	996
Australia	Northern Territory	2	27	14	11	16
Morocco	Northwestern	2	236	118	116	120
Slovenia	Notranjsko-kraska	4	129	32	26	36

Canada	Nova Scotia	3	446	149	48	225
Russian Federation	Novgorod Region	3	602	201	177	219
Russian Federation	Novosibirsk Region	2	433	217	198	235
Mexico	Nuevo Leon	5	931	186	60	429
Colombia	Nuevos Departamentos	1	170	170	170	170
Pakistan	NWFP	1	118	118	118	118
Mexico	Oaxaca	4	571	143	60	316
Slovenia	Obalno-kraska	4	196	49	37	61
Austria	Oberoesterreich	3	750	250	237	271
Switzerland	Obwalden	2	100	50	1	99
Ukraine	Odesa	2	137	69	59	78
Latvia	Ogres rajons	1	23	23	23	23
United States	Ohio	4	1,158	290	180	337
Japan	Oita	5	1,183	237	190	272
Japan	Okayama	5	1,183	237	190	272
Japan	Okinawa	2	462	231	190	272
United States	Oklahoma	4	624	156	119	198
Czech Republic	Olomoucký kraj	4	982	246	178	360
Romania	Olt	4	304	76	26	217
Russian Federation	Omsk Region	2	433	217	198	235
Canada	Ontario	3	1,642	547	476	648
Poland	Opolskie	4	91	30	20	39
Norway	Oppland	2	161	81	80	81
South Africa	Orange Free State	4	595	149	73	203
Sweden	Örebro	2	58	29	3	55
United States	Oregon	4	215	54	48	59
Russian Federation	Orel Region	3	1,293	431	344	530
Russian Federation	Orenburg Region	3	817	272	207	326
India	Orissa	4	345	86	68	102

Japan	Osaka	5	959	192	161	228
Kyrgyz Republic	Osh Oblast	1	219	219	219	219
Croatia	Osijek-Baranja	2	509	509	509	509
Norway	Oslo	2	365	183	118	247
Slovenia	Osrednjeslovenska	3	740	247	235	266
Sweden	Östergötland	2	36	18	7	29
Norway	Østfold	2	250	125	59	191
Denmark	Østsjælland & Vest- og Sydsjælland	4	763	191	151	263
Spain	Ourense	4	379	95	86	112
Netherlands	Overijssel	3	248	83	68	104
Malaysia	Pahang	1	62	62	62	62
Spain	Palencia	4	277	69	16	101
Spain	Palmas, Las	4	568	142	97	191
Lithuania	Panevezio apskritis	1	229	229	229	229
Brazil	Pará and Amapá	2	118	59	30	88
Brazil	Paraíba	2	128	64	40	88
Brazil	Paraná	2	326	163	80	246
Czech Republic	Pardubický kraj	3	485	162	80	241
Estonia	Pärnu county	2	182	91	64	118
Peru	Pasco	1	204	204	204	204
Thailand	Pattani	1	197	197	197	197
Kazakhstan	Pavlodar	1	78	78	78	78
France	Pays de la Loire	3	422	141	79	201
Uruguay	Paysandú	1	118	118	118	118
Bulgaria	Pazardzhik	4	622	156	40	301
Serbia	Pcinjski	1	600	600	600	600
Macedonia	Pelagonia	2	252	126	121	131
Greece	Peloponnisos & Dytiki Ellada	2	243	122	63	180
United States	Pennsylvania	4	1,033	258	168	309

Russian Federation	Penza Region	3	937	312	281	373
Malaysia	Perak	1	95	95	95	95
Russian Federation	Perm	3	1,133	378	284	523
Brazil	Pernambuco	2	128	64	40	88
Bulgaria	Pernik	4	649	162	19	408
Hungary	Pest	2	219	110	107	112
Thailand	Phachuap Khiri Khan	1	583	583	583	583
Thailand	Phangnga	1	197	197	197	197
Thailand	Phatthalung	1	197	197	197	197
Thailand	Phayao	1	206	206	206	206
Thailand	Phetchabun	1	206	206	206	206
Thailand	Phetchaburi	1	583	583	583	583
Thailand	Phichit	1	206	206	206	206
Thailand	Phitsanulok	1	206	206	206	206
Thailand	Phra Nakhon Sri Ayuthaya	1	583	583	583	583
Thailand	Phrae	1	206	206	206	206
Vietnam	Phu Yen	1	127	127	127	127
Thailand	Phuket	1	197	197	197	197
Brazil	Piauí	1	88	88	88	88
France	Picardie	3	505	168	43	322
Italy	Piemonte	4	463	116	70	147
Serbia	Pirotski	1	600	600	600	600
Peru	Piura	3	552	184	50	397
Bulgaria	Pleven	4	469	117	39	160
Bulgaria	Plovdiv	4	821	205	137	301
Czech Republic	Plzenský kraj	3	471	157	113	187
Poland	Podkarpackie	3	159	53	13	78
Poland	Podlaskie	3	93	31	10	52
Slovenia	Podravska	4	588	147	118	160

Serbia	Podunavski	1	600	600	600	600
Finland	Pohjois-Suomi	3	354	118	65	162
France	Poitou-Charentes	3	411	137	68	201
Macedonia	Polog	2	303	152	150	153
Ukraine	Poltava	2	100	50	48	52
Estonia	Põlva county	2	245	123	23	222
Serbia	Pomoravski	1	600	600	600	600
Poland	Pomorskie-Zachodniopomorskie	3	286	95	18	138
Slovenia	Pomurska	4	293	73	46	90
Spain	Pontevedra	4	369	92	84	112
Egypt, Arab Rep.	Port Said	1	1,129	1,129	1,129	1,129
Bosnia and Herzegovina	Posavski k.	1	935	935	935	935
Croatia	Požega-Slavonia	2	509	509	509	509
Thailand	Prachin Buri / Sa Kaeo	1	583	583	583	583
Czech Republic	Praha	4	756	189	103	296
Romania	Prahova	4	404	101	56	217
Thailand	Pratum Thani	1	583	583	583	583
Latvia	Preiïu rajons	1	20	20	20	20
Slovak Republic	Presovský kraj	4	1,013	253	128	392
Croatia	Primorje-Gorski Kotar	2	369	369	369	369
Russian Federation	Primorsky Krai	3	453	151	121	187
Canada	Prince Edward Island	3	59	20	10	28
Belgium	Prov. Antwerpen	3	664	221	197	242
Belgium	Prov. Brabant	4	998	250	149	497
Belgium	Prov. Hainaut	3	719	240	218	264
Belgium	Prov. Liège	3	512	171	166	176
Belgium	Prov. Limburg (BE)	3	765	255	102	549
Belgium	Prov. Luxembourg (BE)	3	125	42	40	43
Belgium	Prov. Namur	3	245	82	61	107

Belgium	Prov. Oost-Vlaanderen	3	539	180	165	209
Belgium	Prov. West-Vlaanderen	3	853	284	164	525
France	Provence-Côte d'Azur-Corse	3	438	146	98	235
Russian Federation	Pskov Region	3	602	201	177	219
Mexico	Puebla	4	880	220	72	599
Italy	Puglia	4	364	91	71	136
Malaysia	Pulau Pinang	1	72	72	72	72
India	Punjab	3	170	57	49	68
Pakistan	Punjab w/ Islamabad	2	743	372	10	733
Peru	Puno	3	419	140	50	284
Egypt, Arab Rep.	Qena	1	993	993	993	993
Iran, Islamic Rep.	Qom	2	75	38	31	44
Vietnam	Quang Binh	1	197	197	197	197
Vietnam	Quang Ngai	1	127	127	127	127
Vietnam	Quang Ninh	1	180	180	180	180
Vietnam	Quang Tri	1	197	197	197	197
Canada	Quebec	3	1,469	490	429	536
Australia	Queensland	2	574	287	256	318
Mexico	Queretaro	4	753	188	24	599
Guatemala	Quetzaltenango	1	335	335	335	335
Guatemala	Quiché	1	335	335	335	335
Colombia	Quindio	1	722	722	722	722
Mexico	Quintana Roo	4	483	121	12	316
India	Rajasthan	4	466	117	102	150
Bangladesh	Rajshahi	2	133	67	54	79
Bangladesh	Rangpur	1	66	66	66	66
Thailand	Ranong	1	197	197	197	197
Estonia	Rapla county	2	460	230	27	433
Serbia	Rasinski	1	600	600	600	600

Serbia	Raski	1	600	600	600	600
Thailand	Ratchaburi	1	583	583	583	583
Thailand	Rayong	1	583	583	583	583
Bulgaria	Razgrad	3	392	131	86	179
Latvia	Rçzeknes rajons	1	20	20	20	20
Chile	Región Metropolitana de Santiago	4	2,288	572	495	698
Bosnia and Herzegovina	Rep. Srpska	1	545	545	545	545
Russian Federation	Republic of Adygea	2	427	214	190	237
Russian Federation	Republic of Bashkortostan	3	819	273	209	326
Russian Federation	Republic of Buryatia	2	236	118	92	144
Russian Federation	Republic of Dagestan	2	427	214	190	237
Russian Federation	Republic of Ingushetia	2	427	214	190	237
Russian Federation	Republic of Kalmykia	3	937	312	281	373
Russian Federation	Republic of Karelia	2	133	67	40	93
Russian Federation	Republic of Khakassia	2	236	118	92	144
Russian Federation	Republic of Komi	2	133	67	40	93
Russian Federation	Republic of Mari El	2	261	131	117	144
Russian Federation	Republic of Mordovia	2	261	131	117	144
Russian Federation	Republic of North Ossetia-Alania	2	427	214	190	237
Russian Federation	Republic of Sakha (Yakutia)	3	387	129	121	145
Russian Federation	Republic of Tatarstan	3	1,253	418	281	689
Russian Federation	Republic of Tyva	2	236	118	92	144
Guatemala	Retalhuleu	1	130	130	130	130
Germany, West	Rhineland-Palatinate	5	418	84	52	124
United States	Rhode Island	4	379	95	60	121
France	Rhône-Alpes	3	497	166	123	209
Latvia	Rîgas rajons	2	423	212	69	354
Brazil	Rio de Janeiro	2	1,098	549	190	908
Brazil	Rio Grande do Norte	2	98	49	10	88

Brazil	Rio Grande do Sul	2	336	168	90	246
Spain	Rioja, La	4	70	18	8	28
Colombia	Risaralda	1	722	722	722	722
Ukraine	Rivne	2	59	30	24	35
Turkey	Rize	1	256	256	256	256
Uruguay	Rocha	1	41	41	41	41
Norway	Rogaland	2	260	130	124	136
Thailand	Roi Et	1	535	535	535	535
Russian Federation	Rostov Region	2	427	214	190	237
Bulgaria	Ruse	4	385	96	30	179
Russian Federation	Ryazan Region	3	1,293	431	344	530
Indonesia	S. Kalimantan	1	43	43	43	43
Estonia	Saare county	2	77	39	18	59
Germany, West	Saarland	5	116	23	16	35
Malaysia	Sabah w/ Labuan	1	130	130	130	130
Guatemala	Sacatepéquez	1	335	335	335	335
Japan	Saga	5	1,183	237	190	272
Japan	Saitama	5	1,891	378	320	450
Russian Federation	Sakhalin Region	3	387	129	121	145
Thailand	Sakon Nakhon	1	535	535	535	535
Romania	Salaj	4	117	29	8	76
Spain	Salamanca	4	277	69	16	101
Latvia	Saldus district	1	19	19	19	19
Austria	Salzburg	3	286	95	88	101
Russian Federation	Samara Region	3	937	312	281	373
Turkey	Samsun	2	311	156	55	256
Thailand	Samut Prakan	1	583	583	583	583
Thailand	Samut Sakhon	1	583	583	583	583
Thailand	Samut Songkhram	1	583	583	583	583

Mexico	San Luis Potosi	4	377	94	36	191
Guatemala	San Marcos	1	335	335	335	335
Peru	San Martín	2	427	214	30	397
El Salvador	San Miguel	1	96	96	96	96
El Salvador	San Salvador	1	383	383	383	383
El Salvador	San Vicente	1	36	36	36	36
Turkey	Sanliurfa	1	114	114	114	114
El Salvador	Santa Ana	1	108	108	108	108
Brazil	Santa Catarina	2	276	138	30	246
Argentina	Santa Fe	1	220	220	220	220
Guatemala	Santa Rosa	1	130	130	130	130
Colombia	Santander	2	1,765	883	621	1,144
Brazil	São Paulo	2	1,338	669	430	908
Thailand	Saraburi	1	583	583	583	583
Bosnia and Herzegovina	Sarajevski k.	1	935	935	935	935
Russian Federation	Saratov Region	3	937	312	281	373
Malaysia	Sarawak	1	107	107	107	107
Italy	Sardegna	4	155	39	20	57
Canada	Saskatchewan	3	216	72	64	82
Romania	Satu Mare	4	177	44	28	76
Thailand	Satun	1	197	197	197	197
Slovenia	Savinjska	4	522	131	104	158
Germany, East	Saxony	4	1,600	400	289	629
Germany, East	Saxony-Anhalt	4	950	238	169	388
Switzerland	Schaffhausen	2	251	126	10	241
Germany, West	Schleswig-Holstein	5	298	60	22	92
Switzerland	Schwyz	2	109	55	10	99
United Kingdom	Scotland	4	696	174	92	291
Spain	Segovia	4	277	69	16	101

Malaysia	Selangor w/ Kuala Lumpur	1	306	306	306	306
Iran, Islamic Rep.	Semnan	2	122	61	25	97
Korea, Rep.	Seoul	4	1,192	298	255	357
Brazil	Sergipe	1	88	88	88	88
Serbia	Severno–backi	1	320	320	320	320
Serbia	Severno–banatski	1	320	320	320	320
Spain	Sevilla	4	1,851	463	214	725
China	Shaanxi	4	350	88	50	138
China	Shandong	3	680	227	100	314
China	Shanghai	4	502	126	25	314
China	Shanxi	3	243	81	25	138
Japan	Shiga	5	959	192	161	228
Japan	Shimane	5	1,183	237	190	272
Japan	Shizuoka	5	929	186	162	225
Albania	Shkoder	2	1,005	503	218	787
Egypt, Arab Rep.	Shrkia	1	1,129	1,129	1,129	1,129
Bulgaria	Shumen	4	451	113	33	187
Thailand	Si Sa Ket	1	535	535	535	535
Lithuania	Siauliu apskritis	1	54	54	54	54
Croatia	Šibenik-Knin	2	369	369	369	369
Romania	Sibiu	4	335	84	25	222
China	Sichuan w/ Chongqing	3	233	78	25	138
Italy	Sicilia	4	578	145	88	200
Bulgaria	Silistra	3	285	95	20	179
Mexico	Sinaloa	4	1,113	278	40	542
Pakistan	Sindh	1	221	221	221	221
Thailand	Singburi	1	583	583	583	583
Turkey	Sinop	1	256	256	256	256
Croatia	Sisak-Moslavina	2	509	509	509	509

Iran, Islamic Rep.	Sistan and Baluchestan	1	70	70	70	70
Sweden	Skåne	3	981	327	135	636
Macedonia	Skopje	2	573	287	277	296
Poland	Slaskie	3	357	119	21	183
Bulgaria	Sliven	4	490	123	85	196
Russian Federation	Smolensk Region	3	1,293	431	344	530
Bulgaria	Smolyan	4	602	151	20	301
Vietnam	Soc Trang / Can Tho / Hau Gian	2	534	267	222	312
Sweden	Södermanland	2	41	21	17	24
Bulgaria	Sofia	4	751	188	108	408
Bulgaria	Sofia Stolitsa	4	994	249	139	408
Norway	Sogn og Fjordane	2	203	102	22	181
Guatemala	Sololé	1	335	335	335	335
Switzerland	Solothurn	2	331	166	56	275
Hungary	Somogy	2	65	33	31	34
Vietnam	Son La	1	83	83	83	83
Thailand	Songkhla	1	197	197	197	197
Mexico	Sonora	4	667	167	24	429
El Salvador	Sonsonate	1	83	83	83	83
Spain	Soria	4	277	69	16	101
Norway	Sør-Trøndelag	2	163	82	62	101
Australia	South Australia	2	312	156	124	188
United States	South Carolina	4	811	203	118	258
United States	South Dakota	4	417	104	72	172
Nigeria	South East	2	742	371	109	633
United Kingdom	South East w/ London	4	1,109	277	206	403
Kazakhstan	South Kazakhstan	1	226	226	226	226
United Kingdom	South West,GB	4	510	128	83	182
Nigeria	South West,NG	2	351	176	150	201

Morocco	South-Central	2	231	116	100	131
Ireland	South-East	2	615	308	72	543
Macedonia	Southwest	2	228	114	108	120
Ireland	South-West	2	704	352	161	543
Croatia	Split-Dalmatia	2	369	369	369	369
Slovenia	Spodnjeposavska	3	121	40	32	45
Serbia	Srednje–banatski	1	320	320	320	320
Bosnia and Herzegovina	Srednjo-bosanski k.	1	935	935	935	935
Serbia	Sremski	1	320	320	320	320
Switzerland	St. Gallen	2	288	144	47	241
Bulgaria	Stara Zagora	4	459	115	40	196
Russian Federation	Stavropol Territory	3	1,258	419	190	831
Austria	Steiermark	3	684	228	218	245
Greece	Sterea Ellada, Attiki, Ionia Nisia	2	1,569	785	649	920
Sweden	Stockholm	3	687	229	193	262
Czech Republic	Stredoceský kraj	3	462	154	97	253
Romania	Suceava	3	151	50	37	60
Guatemala	Suchitepéquez	1	130	130	130	130
Egypt, Arab Rep.	Suez	1	174	174	174	174
Thailand	Sukhothai	1	206	206	206	206
Serbia	Sumadijski	1	600	600	600	600
Ukraine	Sumy	2	74	37	35	39
Thailand	Suphan Buri	1	583	583	583	583
Thailand	Surat Thani	1	197	197	197	197
Thailand	Surin	1	535	535	535	535
Russian Federation	Sverdlovsk Region	3	1,024	341	284	414
Poland	Swietokrzyskie	3	107	36	27	48
Bangladesh	Sylhet	2	157	79	78	79
Hungary	Szabolcs-Sz-B	2	98	49	39	59

Mexico	Tabasco	4	515	129	24	316
Peru	Tacna	1	284	284	284	284
Uruguay	Tacuarembó	1	73	73	73	73
Jordan	Tafeila	2	98	49	48	50
Philippines	Tagalog, Luzon, W. Visayas	3	900	300	300	300
Thailand	Tak	1	206	206	206	206
Kyrgyz Republic	Talas Oblast	1	12	12	12	12
Latvia	Talsu rajons	1	24	24	24	24
Mexico	Tamaulipas	4	713	178	60	429
Russian Federation	Tambov Region	2	259	130	121	138
India	Tamil Nadu	4	664	166	129	200
Bangladesh	Tangail	2	159	80	78	81
Morocco	Tansift	2	418	209	200	218
Chile	Tarapacá	4	431	108	65	155
Bulgaria	Targovishte	3	292	97	19	187
Spain	Tarragona	4	657	164	46	228
Estonia	Tartu county	2	334	167	112	222
Australia	Tasmania	2	107	54	43	64
Vietnam	Tay Ninh	1	207	207	207	207
Iran, Islamic Rep.	Tehran	2	939	470	399	540
Turkey	Tekirdag	1	377	377	377	377
Norway	Telemark	2	246	123	55	191
Romania	Teleorman	4	297	74	24	217
Lithuania	Telsiu apskritis	1	279	279	279	279
United States	Tennessee	4	481	120	84	160
Malaysia	Terengganu	1	47	47	47	47
Ukraine	Ternopil	2	60	30	24	36
Spain	Teruel	4	156	39	33	48
Switzerland	Tessin	2	232	116	29	203

United States	Texas	4	624	156	119	198
Vietnam	Thai Binh	1	291	291	291	291
Vietnam	Thanh Hoa	1	197	197	197	197
Greece	Thessalia	2	198	99	98	100
Vietnam	Thua Thien - Hue	1	197	197	197	197
Switzerland	Thurgau	2	278	139	37	241
Germany, East	Thuringia	4	862	216	155	314
China	Tibet	1	25	25	25	25
Vietnam	Tien Giang	1	312	312	312	312
Romania	Timis	4	204	51	38	76
Albania	Tirana	2	314	157	145	169
Austria	Tirol	3	288	96	80	123
Mexico	Tlaxcala	4	731	183	12	599
Japan	Tochigi	5	1,891	378	320	450
Turkey	Tokat	1	108	108	108	108
Japan	Tokushima	5	1,183	237	190	272
Japan	Tokyo	5	1,891	378	320	450
Spain	Toledo	4	237	59	49	77
Colombia	Tolima	1	722	722	722	722
Hungary	Tolna	2	54	27	18	36
Russian Federation	Tomsk Region	2	433	217	198	235
Serbia	Toplicki	1	600	600	600	600
Italy	Toscana	4	365	91	65	132
Guatemala	Totonicapán	1	335	335	335	335
Japan	Tottori	5	1,183	237	190	272
Japan	Toyama	5	929	186	162	225
Vietnam	Tra Vinh / Vinh Long	1	312	312	312	312
Turkey	Trabzon	1	109	109	109	109
Thailand	Trang	1	197	197	197	197

Russian Federation	Trans-Baikal Territory	1	100	100	100	100
South Africa	Transvaal	4	4,689	1,172	764	1,394
Thailand	Trat	1	583	583	583	583
Slovak Republic	Trenciansky kraj	3	861	287	140	563
Italy	Trentino-Alto Adige	4	106	27	18	33
Slovak Republic	Trnavský kraj	3	864	288	143	563
Norway	Troms Romsa	1	35	35	35	35
Argentina	Tucumán	2	120	60	25	95
Latvia	Tukums district	1	27	27	27	27
Russian Federation	Tula Region	3	1,293	431	344	530
Romania	Tulcea	4	127	32	20	50
Peru	Tumbes	1	397	397	397	397
Vietnam	Tuyen Quan / Ha Gian	1	180	180	180	180
Bosnia and Herzegovina	Tuzlanski k.	1	935	935	935	935
Russian Federation	Tver Region	3	1,293	431	344	530
Russian Federation	Tyumen Region	2	433	217	198	235
Russian Federation	Udmurt Republic	3	817	272	207	326
Russian Federation	Ulyanovsk Region	3	937	312	281	373
Italy	Umbria	4	134	34	15	59
Bosnia and Herzegovina	Unsko-sanski k.	1	935	935	935	935
Sweden	Uppsala	2	109	55	52	57
Switzerland	Uri	1	99	99	99	99
Turkey	Usak	1	377	377	377	377
Czech Republic	Ústecký kraj	4	671	168	103	222
El Salvador	Usulután	1	76	76	76	76
United States	Utah	4	278	70	40	99
Thailand	Uthai Thani	1	206	206	206	206
Netherlands	Utrecht	3	230	77	34	124
India	Uttar Pradesh	4	1,419	355	301	450

Thailand	Uttaradit	1	206	206	206	206
Romania	Valcea	4	228	57	33	118
Spain	Valencia/València	4	1,059	265	122	408
Estonia	Valga county	2	247	124	25	222
Finland	Väli-Suomi	3	738	246	64	397
Latvia	Valkas rajons	1	16	16	16	16
Spain	Valladolid	4	260	65	16	101
Italy	Valle d'Aosta/Vallée d'Aoste	4	40	10	8	12
Colombia	Valle del Cauca	2	1,150	575	486	664
Latvia	Valmieras rajons	1	29	29	29	29
Chile	Valparaíso	4	637	159	118	207
Turkey	Van	1	114	114	114	114
Croatia	Varaždin	2	543	543	543	543
Macedonia	Vardar	1	129	129	129	129
Sweden	Värmland	2	37	19	12	25
Bulgaria	Varna	4	572	143	114	187
Hungary	Vas	2	68	34	32	36
Romania	Vaslui	4	327	82	22	230
Sweden	Västerbotten	2	87	44	40	47
Sweden	Västernorrland	2	68	34	28	40
Sweden	Västmanland	2	60	30	5	55
Sweden	Västra Götaland	3	447	149	113	217
Bulgaria	Veliko Tarnovo	4	489	122	40	179
Italy	Veneto	4	568	142	84	184
Latvia	Ventspils district	1	7	7	7	7
Mexico	Veracruz	5	995	199	96	318
United States	Vermont	4	379	95	60	121
Norway	Vest-Agder	2	158	79	34	124
Norway	Vestfold	2	265	133	74	191

Hungary	Veszprém	2	82	41	37	45
Australia	Victoria	2	885	443	364	521
Bulgaria	Vidin	4	332	83	20	160
Estonia	Viljandi county	2	158	79	40	118
Lithuania	Vilniaus apskritis	1	504	504	504	504
Ukraine	Vinnytsya	2	102	51	48	54
United States	Virginia	4	811	203	118	258
Croatia	Virovitica-Podravina	2	509	509	509	509
Spain	Vizcaya	5	563	113	63	232
Russian Federation	Vladimir Region	3	1,293	431	344	530
Albania	Vlora	2	715	358	353	362
Russian Federation	Volgograd Region	3	937	312	281	373
Russian Federation	Vologda Region	3	368	123	40	235
Ukraine	Volyn	2	57	29	24	33
Austria	Vorarlberg	3	186	62	55	70
Russian Federation	Voronezh Region	2	259	130	121	138
Estonia	Võru county	2	256	128	34	222
Romania	Vrancea	3	424	141	33	230
Bulgaria	Vratsa	4	341	85	29	160
Croatia	Vukovar-Syrmia	2	509	509	509	509
Indonesia	W. Java	2	739	370	201	538
Indonesia	W. Nusa Tenggara	1	58	58	58	58
Switzerland	Waadt	2	295	148	101	194
Japan	Wakayama	5	959	192	161	228
United Kingdom	Wales	4	521	130	55	282
Switzerland	Wallis	2	294	147	100	194
Poland	Warminsko-Mazurskie	3	100	33	10	46
United States	Washington	4	215	54	48	59
Ireland	West	2	273	137	76	197

Iran, Islamic Rep.	West Azarbayejan	2	216	108	106	110
India	West Bengal	4	699	175	155	200
Germany, West	West Berlin	1	48	48	48	48
Kazakhstan	West Kazakhstan	1	64	64	64	64
United States	West Virginia	4	811	203	118	258
Australia	Western Australia	2	360	180	137	223
Poland	Wielkopolskie	3	258	86	47	129
Austria	Wien	3	899	300	293	309
United States	Wisconsin	4	988	247	167	329
United States	Wyoming	4	278	70	40	99
China	Xinjiang	3	371	124	50	260
Thailand	Yala	1	197	197	197	197
Japan	Yamagata	5	765	153	133	187
Japan	Yamaguchi	5	1,183	237	190	272
Japan	Yamanashi	5	929	186	162	225
Bulgaria	Yambol	4	393	98	17	196
Russian Federation	Yaroslavl Region	3	1,293	431	344	530
Thailand	Yasothon	1	535	535	535	535
Vietnam	Yen Bai / Lao Chai / Lao Cai	2	112	56	29	83
Indonesia	Yogyakarta	1	45	45	45	45
United Kingdom	Yorkshire	4	455	114	57	157
Mexico	Yucatan	4	527	132	36	316
China	Yunnan	3	507	169	25	399
Guatemala	Zacapa	1	225	225	225	225
Mexico	Zacatecas	4	345	86	24	191
Croatia	Zadar	2	369	369	369	369
Croatia	Zagreb County	2	543	543	543	543
Serbia	Zajecarski	1	600	600	600	600
Ukraine	Zakarpattya	2	71	36	35	36

Hungary	Zala	2	61	31	23	38
Spain	Zamora	4	277	69	16	101
Iran, Islamic Rep.	Zanjan & Qazvin	2	107	54	44	63
Serbia	Zapadno–backi	1	320	320	320	320
Bosnia and Herzegovina	Zapadno-hercegovacki k.	1	935	935	935	935
Ukraine	Zaporizhzhya	2	123	62	60	63
Spain	Zaragoza	4	315	79	37	132
Jordan	Zarqa	2	310	155	144	166
Slovenia	Zasavska	4	206	52	23	118
Netherlands	Zeeland	3	91	30	23	39
Bosnia and Herzegovina	Zenicko-dobojski k.	1	935	935	935	935
Kazakhstan	Zhambyl	1	98	98	98	98
China	Zhejiang	3	431	144	25	314
Ukraine	Zhytomyr	2	55	28	24	31
Slovak Republic	Zilinský kraj	4	1,024	256	139	362
Serbia	Zlatiborski	1	600	600	600	600
Czech Republic	Zlínský kraj	3	773	258	178	360
Switzerland	Zug	1	99	99	99	99
Netherlands	Zuid-Holland	3	719	240	212	292
Switzerland	Zürich	2	356	178	101	255

Table 30: *Regional Division in Gennaioli et al. (2014) and matching region from WVS/EVS*

Country	Gennaioli et al. (2014) Region	WVS/EVS Region	Gennaioli et al. (2014) matched year(s)	Source	Quality level of matching (QM)	WVS/EVS Region used more than once
Albania	Tirana	AL: Tirana	2001; 2009	WVS	A	No
Argentina	Ciudad de Bs. As.	AR: Capital Federal	1995; 2000; 2005	WVS	A	No
Argentina	Córdoba,ARG	AR: Córdoba	1995; 2000	WVS	A	No
Argentina	Mendoza	AR: Mendoza	1995; 2000	WVS	A	No
Argentina	Santa Fe	AR: Rosario	1995	WVS	A	No
Argentina	Santa Fe	AR: Santa Fé	1995	WVS	A	No
Argentina	Tucumán	AR: Tucumán	1995; 2000	WVS	A	No
Australia	Capital Territory	AU: Capital territory	2005	WVS	A	No
Australia	New South Wales	AU: New South Wales	2005	WVS	A	No
Australia	Northern Territory	AU: Northern Territory (NT)	1995; 2005	WVS	A	No
Australia	Queensland	AU: Queensland (Qld)	1995; 2005	WVS	A	No
Australia	South Australia	AU: South Australia (SA)	1995; 2005	WVS	A	No
Australia	Tasmania	AU: Tasmania (Tas)	1995; 2005	WVS	A	No
Australia	Victoria	AU: Victoria (Vic)	1995; 2005	WVS	A	No
Australia	Western Australia	AU: Western Australia (WA)	1995; 2005	WVS	A	No
Austria	Burgenland	AT: Burgenland	1990; 2000	EVS X048	A	No
Austria	Burgenland	AT: Ostösterreich - Burgenland	2010	EVS X048B	A	No
Austria	Karnten	AT: Kaernten	1990; 2000	EVS X048	A	No
Austria	Karnten	AT: Südösterreich - Kärnten	2010	EVS X048B	A	No
Austria	Niederoesterreich	AT: Niederoesterreich	1990; 2000	EVS X048	A	No
Austria	Niederoesterreich	AT: Ostösterreich - Niederösterreich	2010	EVS X048B	A	No
Austria	Oberoesterreich	AT: Oberoesterreich	1990; 2000	EVS X048	A	No
Austria	Oberoesterreich	AT: Westösterreich - Oberösterreich	2010	EVS X048B	A	No
Austria	Salzburg	AT: Salzburg	1990; 2000	EVS X048	A	No

Austria	Salzburg	AT: Westösterreich - Salzburg	2010	EVS X048B	A	No
Austria	Steiermark	AT: Steiermark	1990; 2000	EVS X048	A	No
Austria	Steiermark	AT: Südösterreich - Steiermark	2010	EVS X048B	A	No
Austria	Tirol	AT: Tirol	1990; 2000	EVS X048	A	No
Austria	Tirol	AT: Westösterreich - Tirol	2010	EVS X048B	A	No
Austria	Vorarlberg	AT: Vorarlberg	1990; 2000	EVS X048	A	No
Austria	Vorarlberg	AT: Westösterreich - Vorarlberg	2010	EVS X048B	A	No
Austria	Wien	AT: Vienna	1990; 2000	EVS X048	A	No
Austria	Wien	AT: Ostösterreich - Wien	2010	EVS X048B	A	No
Bangladesh	Barisal	BD: Barisal	1999; 2005	WVS	A	No
Bangladesh	Chittagong	BD: Chittagong	1999; 2005	WVS	A	No
Bangladesh	Comilla	BD: Comilla	2005	WVS	A	No
Bangladesh	Dhaka	BD: Dhaka	1999; 2005	WVS	A	No
Bangladesh	Faridpur	BD: Faridpur	1999; 2005	WVS	A	No
Bangladesh	Mymensingh	BD: Mymensingh	1999; 2005	WVS	A	No
Bangladesh	Rajshahi	BD: Rajshahi	1999; 2005	WVS	A	No
Bangladesh	Rangpur	BD: Rangpur	2005	WVS	A	No
Bangladesh	Sylhet	BD: Sylhet	1999; 2005	WVS	A	No
Bangladesh	Tangail	BD: Tangail	1999; 2005	WVS	A	No
Belgium	Prov. Antwerpen	BE: Antwerpen	1995; 2000	EVS X048	A	No
Belgium	Prov. Antwerpen	BE: Vlaams gewest - Prov. Antwerpen	2010	EVS X048B	A	No
Belgium	Prov. Hainaut	BE: Henegouwen	1995; 2000	EVS X048	A	No
Belgium	Prov. Hainaut	BE: Région Wallonne - Prov. Hainaut	2010	EVS X048B	A	No
Belgium	Prov. Liège	BE: Luik	1995; 2000	EVS X048	A	No
Belgium	Prov. Liège	BE: Région Wallonne - Prov. Liège	2010	EVS X048B	A	No
Belgium	Prov. Limburg (BE)	BE: Limburg	1995; 2000	EVS X048	A	No
Belgium	Prov. Limburg (BE)	BE: Vlaams gewest - Prov. Limburg	2010	EVS X048B	A	No
Belgium	Prov. Luxembourg (BE)	BE: Luxemburg	1995; 2000	EVS X048	A	No

Belgium	Prov. Luxembourg (BE)	BE: Région Wallonne - Prov. Luxembourg	2010	EVS X048B	A	No
Belgium	Prov. Namur	BE: Namen	1995; 2000	EVS X048	A	No
Belgium	Prov. Namur	BE: Région Wallonne - Prov. Namur	2010	EVS X048B	A	No
Belgium	Prov. Oost-Vlaanderen	BE: Oost-Vlaanderen	1995; 2000	EVS X048	A	No
Belgium	Prov. Oost-Vlaanderen	BE: Vlaams gewest - Prov. Oost-Vlaanderen	2010	EVS X048B	A	No
Belgium	Prov. West-Vlaanderen	BE: West-Vlaanderen	1995; 2000	EVS X048	A	No
Belgium	Prov. West-Vlaanderen	BE: Vlaams gewest - Prov. West-Vlaanderen	2010	EVS X048B	A	No
Bosnia and Herzegovina	Brcko	BA: Bosna i Hercegovina - Brcko	2010	EVS X048B	A	No
Bosnia and Herzegovina	Rep. Srpska	BA: Bosna i Hercegovina - Republika Srpska	2010	EVS X048B	A	No
Brazil	Alagoas	BR: AL	2010	WVS	A	No
Brazil	Bahia	BR: BA	2010	WVS	A	No
Brazil	Ceará	BR: CE	2010	WVS	A	No
Brazil	Espírito Santo	BR: ES	2010	WVS	A	No
Brazil	Maranhão	BR: MA	2010	WVS	A	No
Brazil	Minas Gerais	BR: MG	2010	WVS	A	No
Brazil	Paraíba	BR: PB	2010	WVS	A	No
Brazil	Paraná	BR: PR	2010	WVS	A	No
Brazil	Pernambuco	BR: PE	2010	WVS	A	No
Brazil	Rio de Janeiro	BR: RJ	2010	WVS	A	No
Brazil	Rio Grande do Norte	BR: RN	2010	WVS	A	No
Brazil	Rio Grande do Sul	BR: RS	2010	WVS	A	No
Brazil	Santa Catarina	BR: SC	2010	WVS	A	No
Brazil	São Paulo	BR: SP	2010	WVS	A	No
Bulgaria	Blagoevgrad	BG: Blagoevgrad	2000	EVS X048	A	No
Bulgaria	Dobrich	BG: Dobrich	2000	EVS X048	A	No

Bulgaria	Gabrovo	BG: Gabrovo	2000	EVS X048	A	No
Bulgaria	Haskovo	BG: Haskovo	2000; 2005	WVS	A	No
Bulgaria	Karzhali	BG: Kardjali	2000	EVS X048	A	No
Bulgaria	Kyustendil	BG: Kyustendil	2000	EVS X048	A	No
Bulgaria	Lovech	BG: Lovech	2000	WVS	A	No
Bulgaria	Montana,BUL	BG: Montana	2000; 2005	WVS	A	No
Bulgaria	Pazardzhik	BG: Pazardijk	2000	EVS X048	A	No
Bulgaria	Pernik	BG: Pernik	2000	EVS X048	A	No
Bulgaria	Pleven	BG: Pleven	2000	EVS X048	A	No
Bulgaria	Plovdiv	BG: Plovdiv	1995; 2000; 2005	EVS X048	A	No
Bulgaria	Razgrad	BG: Razgrad	2000	WVS	A	No
Bulgaria	Ruse	BG: Ruse	2000; 2005	EVS X048	A	No
Bulgaria	Shumen	BG: Shumen	2000	EVS X048	A	No
Bulgaria	Silistra	BG: Silistra	2000	EVS X048	A	No
Bulgaria	Smolyan	BG: Smolian	2000	EVS X048	A	No
Bulgaria	Stara Zagora	BG: Stara Zagora	2000	EVS X048	A	No
Bulgaria	Targovishte	BG: Targovishte	2000	EVS X048	A	No
Bulgaria	Varna	BG: Varna	2000; 2005	WVS	A	No
Bulgaria	Veliko Tarnovo	BG: Veliko Tarnavo	2000	EVS X048	A	No
Bulgaria	Vidin	BG: Vidin	2000	EVS X048	A	No
Bulgaria	Vratsa	BG: Vtatsa	2000	EVS X048	A	No
Bulgaria	Yambol	BG: Yambol	2000	EVS X048	A	No
Canada	Alberta	CA: Alberta	1990; 2000; 2010	EVS X048	A	No
Canada	British Columbia	CA: British Columbia	1990; 2000; 2010	EVS X048	A	No
Canada	Manitoba	CA: Manitoba	1990; 2000; 2010	EVS X048	A	No
Canada	New Brunswick	CA: New Brunswick	1990; 2000; 2010	EVS X048	A	No
Canada	Newfoundland-Labrador	CA: Newfoundland	1990; 2000; 2010	EVS X048	A	No
Canada	Nova Scotia	CA: Nova Scotia	1990; 2000; 2010	EVS X048	A	No

Canada	Ontario	CA: Ontario	1990; 2000; 2010	EVS X048	A	No
Canada	Prince Edward Island	CA: Prince Edward Island	1990; 2000; 2010	EVS X048	A	No
Canada	Quebec	CA: Quebec	1990; 2000; 2010	EVS X048	A	No
Canada	Saskatchewan	CA: Saskatchewan	1990; 2000; 2010	EVS X048	A	No
Chile	Región Metropolitana de Santiago	CL: Zona Metropolitana	1990; 1995; 2000; 2010	WVS	A	No
China	Beijing	CN: Beijing	1990; 2005; 2010	WVS	A	No
China	Jilin	CN: Jilin	1990; 2005; 2010	WVS	A	No
China	Shanghai	CN: Shanghai	1990; 2005; 2010	WVS	A	No
China	Tibet	CN: Xizang	2005	WVS	A	No
China	Xinjiang	CN: Xinjiang	1990; 2010	WVS	A	No
Colombia	Bogota	CO: Bogotá	2000; 2005	WVS	A	No
Croatia	Bjelovar-Bilogora	HR: County of Bjelovar & Bilogora	2000	EVS X048	A	No
Croatia	Brod-Posavina	HR: County of Brod and Posavina	2000	EVS X048	A	No
Croatia	City of Zagreb	HR: City of Zagreb	2000	EVS X048	A	No
Croatia	Dubrovnik-Neretva	HR: County of Dubrovnik and Neretva	2000	EVS X048	A	No
Croatia	Istria	HR: County of Istria	2000	EVS X048	A	No
Croatia	Karlovac	HR: County of Karlovac	2000	EVS X048	A	No
Croatia	Koprivnica-Križevci	HR: County of Koprivnica & Krizevci	2000	EVS X048	A	No
Croatia	Lika-Senj	HR: County of Lika and Senj	2000	EVS X048	A	No
Croatia	Medimurje	HR: County of Medjimurje	2000	EVS X048	A	No
Croatia	Osijek-Baranja	HR: County of Osijek and Baranja	2000	EVS X048	A	No
Croatia	Primorje-Gorski Kotar	HR: County of Primorje and Gorski Kotar	2000	EVS X048	A	No
Croatia	Sisak-Moslavina	HR: County of Sisak and Moslovina	2000	EVS X048	A	No
Croatia	Split-Dalmatia	HR: County of Split and Dalmatia	2000	EVS X048	A	No
Croatia	Varaždin	HR: County of Varazdin	2000	EVS X048	A	No
Croatia	Virovitica-Podravina	HR: County of Virovitica and Podravina	2000	EVS X048	A	No

Croatia	Vukovar-Syrmia	HR: County of Vukovar and Srijem	2000	EVS X048	A	No
Croatia	Zagreb County	HR: County of Zagreb	2000	EVS X048	A	No
Czech Republic	Jihocecký kraj	CZ: Jihoèeský kraj - South Bohemia -	1995; 2000; 2005	WVS	A	No
Czech Republic	Jihomoravský kraj	CZ: Jihomoravský kraj - South Moravia -	1995; 2000; 2005	WVS	A	No
Czech Republic	Kraj Vysocina	CZ: Východoèeský kraj - East Bohemia -	1995; 2000; 2005	WVS	A	Yes
Czech Republic	Praha	CZ: Prague	1995; 2000; 2005	WVS	A	No
Czech Republic	Praha	CZ: Ceska Republika - Praha	2010	EVS X048B	A	No
Czech Republic	Stredoceský kraj	CZ: Støedoèeský kraj - Central Bohemia -	1995; 2000; 2005	WVS	A	No
Denmark	Bornholm	DK: Bornholms Amt	1990; 2000	EVS X048	A	No
Denmark	Fyn	DK: Fyns Amt	1985; 1990; 2000	EVS X048	A	No
Egypt, Arab Rep.	Alexandria	EG: Alexandria	2007	WVS	A	No
Egypt, Arab Rep.	Cairo	EG: Cairo	2007	WVS	A	No
El Salvador	Ahuachapán	SV: Ahuachapán	1999	WVS	A	No
El Salvador	Cabañas	SV: Cabañas	1999	WVS	A	No
El Salvador	Chalatenango	SV: Chalatenango	1999	WVS	A	No
El Salvador	Cuscatlán	SV: Cuscatlán	1999	WVS	A	No
El Salvador	La Libertad,ES	SV: La Libertad	1999	WVS	A	No
El Salvador	La Paz,ES	SV: La Paz	1999	WVS	A	No
El Salvador	La Unión	SV: La Unión	1999	WVS	A	No
El Salvador	Morazán	SV: Morazán	1999	WVS	A	No
El Salvador	San Miguel	SV: San Miguel	1999	WVS	A	No
El Salvador	San Salvador	SV: San Salvador	1999	WVS	A	No
El Salvador	San Vicente	SV: San Vicente	1999	WVS	A	No
El Salvador	Santa Ana	SV: Santa Ana	1999	WVS	A	No

El Salvador	Sonsonate	SV: Sonsonate	1999	WVS	A	No
El Salvador	Usulután	SV: Usulután	1999	WVS	A	No
Finland	Itã-Suomi	FI: Manner-Suomi - Itä-Suomi	2010	EVS X048B	A	No
Finland	Pohjois-Suomi	FI: Manner-Suomi - Pohjois-Suomi	2010	EVS X048B	A	No
France	Alsace	FR: Est - Alsace	2010	EVS X048B	A	No
France	Aquitaine	FR: Sud-Ouest - Aquitaine	2010	EVS X048B	A	No
France	Auvergne	FR: Centre-Est - Auvergne	2010	EVS X048B	A	No
France	Basse-Normandie	FR: Bassin Parisien - Basse-Normandie	2010	EVS X048B	A	No
France	Bourgogne	FR: Bassin Parisien - Bourgogne	2010	EVS X048B	A	No
France	Bretagne	FR: Ouest - Bretagne	2010	EVS X048B	A	No
France	Centre	FR: Bassin Parisien - Centre	2010	EVS X048B	A	No
France	Champagne-Ardenne	FR: Bassin Parisien - Champagne-Ardenne	2010	EVS X048B	A	No
France	Franche-Comté	FR: Est - Franche-Comté	2010	EVS X048B	A	No
France	Haute-Normandie	FR: Bassin Parisien - Haute-Normandie	2010	EVS X048B	A	No
France	Île-de-France	FR: Ile De France	1990; 2000	EVS X048	A	No
France	Île-de-France	FR: Île de France - Île de France	2010	EVS X048B	A	No
France	Languedoc-Roussillon	FR: Méditerranée - Languedoc-Roussillon	2010	EVS X048B	A	No
France	Limousin	FR: Sud-Ouest - Limousin	2010	EVS X048B	A	No
France	Lorraine	FR: Est - Lorraine	2010	EVS X048B	A	No
France	Midi-Pyrénées	FR: Sud-Ouest - Midi-Pyrénées	2010	EVS X048B	A	No
France	Nord - Pas-de-Calais	FR: Nord-Pas-de-Calais - Nord-Pas-de-Calais	2010	EVS X048B	A	No
France	Pays de la Loire	FR: Ouest - Pays de la Loire	2010	EVS X048B	A	No
France	Picardie	FR: Bassin Parisien - Picardie	2010	EVS X048B	A	No
France	Poitou-Charentes	FR: Ouest - Poitou-Charentes	2010	EVS X048B	A	No
France	Provence-Côte d'Azur-Corse	FR: Méditerranée - Provence-Alpes-Côte d’Azur	2010	EVS X048B	A	No

France	Rhône-Alpes	FR: Centre-Est - Rhône-Alpes	2010	EVS X048B	A	No
Germany, East	Brandenburg	DE: Brandenburg	2000; 2005; 2010	EVS X048	A	No
Germany, East	Mecklenburg-West Pomerania	DE: Mecklenburg-Vorpommern	2000; 2005; 2010	EVS X048	A	No
Germany, East	Mecklenburg-West Pomerania	DE: Mecklenburg-Vorpommern - Mecklenburg-Vorpommern	2010	EVS X048B	A	No
Germany, East	Saxony	DE: Sachsen	2000; 2005; 2010	EVS X048	A	No
Germany, East	Saxony-Anhalt	DE: Sachsen-Anhalt	2000; 2005; 2010	EVS X048	A	No
Germany, East	Saxony-Anhalt	DE: Sachsen-Anhalt - Sachsen-Anhalt	2010	EVS X048B	A	No
Germany, East	Thuringia	DE: Thueringen	2000; 2005; 2010	EVS X048	A	No
Germany, East	Thuringia	DE: Thüringen - Thüringen	2010	EVS X048B	A	No
Germany, West	Baden-Wurttemberg	DE: Baden-Wurttemberg	2000; 2005; 2010	EVS X048	A	No
Germany, West	Bavaria	DE: Bayern	1985; 1990; 2000; 2005; 2010	EVS X048	A	No
Germany, West	Berlin	DE: Berlin	2000; 2010	EVS X048	A	No
Germany, West	Berlin	DE: Berlin - Berlin	2010	EVS X048B	A	No
Germany, West	Bremen	DE: Bremen	1985; 1990; 2000; 2005; 2010	EVS X048	A	No
Germany, West	Bremen	DE: Bremen - Bremen	2010	EVS X048B	A	No
Germany, West	Hamburg	DE: Hamburg	1985; 1990; 2000; 2005; 2010	EVS X048	A	No
Germany, West	Hamburg	DE: Hamburg - Hamburg	2010	EVS X048B	A	No
Germany, West	Hesse	DE: Hessen	1985; 1990; 2000; 2005; 2010	EVS X048	A	No
Germany, West	Lower Saxony	DE: Niedersachsen	1985; 1990; 2000; 2005; 2010	EVS X048	A	No
Germany, West	North Rhine-Westphalia	DE: Nordrhein-Westfalen	1985; 1990; 2000; 2005; 2010	EVS X048	A	No

Germany, West	Rhineland-Palatinate	DE: Rheinland-Pfalz	1985; 1990; 2000; 2005; 2010	EVS X048	A	No
Germany, West	Saarland	DE: Saarland	1985; 1990; 2000; 2005; 2010	EVS X048	A	No
Germany, West	Saarland	DE: Saarland - Saarland	2010	EVS X048B	A	No
Germany, West	Schleswig-Holstein	DE: Schleswig-Holstein	1985; 1990; 2000; 2005; 2010	EVS X048	A	No
Germany, West	Schleswig-Holstein	DE: Schleswig-Holstein - Schleswig-Holstein	2010	EVS X048B	A	No
Germany, West	West Berlin	DE: West-Berlin	1980	EVS X048	A	No
Greece	Anatoliki Makedonia & Thraki	GR: Voreia Ellada - Anatoliki Makedonia, Thraki	2010	EVS X048B	A	No
Greece	Kentriki Makedonia	GR: Voreia Ellada - Kentriki Makedonia	2010	EVS X048B	A	No
Greece	Kriti	GR: Nisia Aigaiou, Kriti - Kriti	2010	EVS X048B	A	No
Greece	Thessalia	GR: Voreia Ellada - Thessalia	2010	EVS X048B	A	No
Guatemala	Guatemala City	GT: Capital	2005	WVS	A	No
Hungary	Bács-Kiskun	HU: Bács-Kiskun	2010	WVS	A	No
Hungary	Baranya	HU: Baranya	2000; 2010	EVS X048	A	No
Hungary	Békés	HU: Békés	2000; 2010	EVS X048	A	No
Hungary	Borsod-A-Z	HU: Borsod	2000	EVS X048	A	No
Hungary	Borsod-A-Z	HU: Borsod-Abaúj-Zemplén	2010	WVS	A	No
Hungary	Budapest	HU: Budapest	2000; 2005; 2010	EVS X048	A	No
Hungary	Csongrád	HU: Csongrád	2000; 2010	EVS X048	A	No
Hungary	Fejér	HU: Fejér	2000; 2010	EVS X048	A	No
Hungary	Gyor-M-S	HU: Györ	2000	EVS X048	A	No
Hungary	Hajdú-Bihar	HU: Hajdú-Bihar	2010	WVS	A	No
Hungary	Heves	HU: Heves	2000; 2010	EVS X048	A	No
Hungary	Jász-N-Sz	HU: Jász-Nagykun-Szolnok	2010	WVS	A	No
Hungary	Komárom-E	HU: Komárom	2000	EVS X048	A	No

Hungary	Komárom-E	HU: Komárom-Esztergom	2010	WVS	A	No
Hungary	Nógrád	HU: Nográd	2000	EVS X048	A	No
Hungary	Nógrád	HU: Nógrád	2010	WVS	A	No
Hungary	Pest	HU: Pest	2000; 2010	EVS X048	A	No
Hungary	Somogy	HU: Somogy	2000; 2010	EVS X048	A	No
Hungary	Szabolcs-Sz-B	HU: Szabolcs	2000	EVS X048	A	No
Hungary	Szabolcs-Sz-B	HU: Szabolcs-Szatmár-Bereg	2010	WVS	A	No
Hungary	Tolna	HU: Tolna	2000; 2010	EVS X048	A	No
Hungary	Vas	HU: Vas	2000; 2010	EVS X048	A	No
Hungary	Veszprém	HU: Veszprém	2000; 2010	EVS X048	A	No
Hungary	Zala	HU: Zala	2000; 2010	EVS X048	A	No
India	Andhra Pradesh	IN: Andhra Pradesh	1990; 2000; 2005; 2010	WVS	A	No
India	Bihar	IN: Bihar	1990; 2000; 2005; 2010	WVS	A	No
India	Chandigarh	IN: Chandigarh	2000	WVS	A	No
India	Delhi	IN: Delhi	1990; 2005; 2010	WVS	A	No
India	Gujarat	IN: Gujarat	1990; 2000; 2005; 2010	WVS	A	No
India	Haryana	IN: Haryana	2000; 2005; 2010	WVS	A	No
India	Karnataka	IN: Karnataka	1990; 2000; 2005; 2010	WVS	A	No
India	Kerala	IN: Kerala	1990; 2000; 2005; 2010	WVS	A	No
India	Madhya Pradesh	IN: Madhya Pradesh	1990; 2000; 2005; 2010	WVS	A	No
India	Maharashtra	IN: Maharashtra	1990; 2000; 2005; 2010	WVS	A	No
India	Orissa	IN: Orrisa	1990; 2000; 2005; 2010	WVS	A	No
India	Punjab	IN: Punjab	2000; 2005; 2010	WVS	A	No

India	Rajasthan	IN: Rajasthan	1990; 2000; 2005; 2010	WVS	A	No
India	Tamil Nadu	IN: Tamil Nadu	1990; 2000; 2005; 2010	WVS	A	No
India	Uttar Pradesh	IN: Uttar Pradesh	1990; 2000; 2005; 2010	WVS	A	No
India	West Bengal	IN: West Bengal	1990; 2000; 2005; 2010	WVS	A	No
Indonesia	C. Sulawesi	ID: Center Sulawesi	2010	WVS	A	No
Indonesia	E. Java	ID: East Java	2010	WVS	A	No
Indonesia	Lampung	ID: Lampung	2010	WVS	A	No
Indonesia	S. Kalimantan	ID: South Kalimantan	2010	WVS	A	No
Indonesia	W. Nusa Tenggara	ID: West Nusa Tenggara	2010	WVS	A	No
Indonesia	Yogyakarta	ID: Dareah Istimewa Yogyakarta	2010	WVS	A	No
Iran, Islamic Rep.	Ardebil	IR: Ardabil	2000; 2010	WVS	A	No
Iran, Islamic Rep.	Bushehr	IR: Bushehr	2000; 2010	WVS	A	No
Iran, Islamic Rep.	East Azarbayejan	IR: East azarbayjan	2000; 2010	WVS	A	No
Iran, Islamic Rep.	Esfahan	IR: Isfahan	2000; 2010	WVS	A	No
Iran, Islamic Rep.	Fars	IR: Fars	2000; 2010	WVS	A	No
Iran, Islamic Rep.	Gilan	IR: Gilan	2000; 2010	WVS	A	No
Iran, Islamic Rep.	Hamedan	IR: Hamadan	2000; 2010	WVS	A	No
Iran, Islamic Rep.	Hormozgan	IR: Hormozgan	2000; 2010	WVS	A	No
Iran, Islamic Rep.	Ilam	IR: Ilam	2000; 2010	WVS	A	No
Iran, Islamic Rep.	Kerman	IR: Kerman	2000; 2010	WVS	A	No

Iran, Islamic Rep.	Kermanshah	IR: Kermanshah	2000; 2010	WVS	A	No
Iran, Islamic Rep.	Khuzestan	IR: Khozestan	2000; 2010	WVS	A	No
Iran, Islamic Rep.	Kordestan	IR: Kordestan	2010	WVS	A	No
Iran, Islamic Rep.	Lorestan	IR: Lorestan	2000; 2010	WVS	A	No
Iran, Islamic Rep.	Markazi	IR: Markazi	2000; 2010	WVS	A	No
Iran, Islamic Rep.	Qom	IR: Ghom	2000; 2010	WVS	A	No
Iran, Islamic Rep.	Semnan	IR: Semnan	2000; 2010	WVS	A	No
Iran, Islamic Rep.	Sistan and Baluchestan	IR: Sistan and balouchestan	2010	WVS	A	No
Iran, Islamic Rep.	Tehran	IR: Tehran	2000; 2010	WVS	A	No
Iran, Islamic Rep.	West Azarbayejan	IR: West azarbayjan	2000; 2010	WVS	A	No
Italy	Abruzzo	IT: Abruzzo	1990; 2000; 2005	EVS X048	A	No
Italy	Abruzzo	IT: Sud - Abruzzo	2010	EVS X048B	A	No
Italy	Basilicata	IT: Basilicata	1990; 2000; 2005	EVS X048	A	No
Italy	Basilicata	IT: Sud - Basilicata	2010	EVS X048B	A	No
Italy	Calabria	IT: Calabria	1990; 2000; 2005	EVS X048	A	No
Italy	Calabria	IT: Sud - Calabria	2010	EVS X048B	A	No
Italy	Campania	IT: Campania	1990; 2000; 2005	EVS X048	A	No
Italy	Campania	IT: Sud - Campania	2010	EVS X048B	A	No
Italy	Emilia-Romagna	IT: Emilia-Romagna	1990; 2000; 2005	EVS X048	A	No
Italy	Emilia-Romagna	IT: Nord-Est - Emilia-Romagna	2010	EVS X048B	A	No
Italy	Friuli-Venezia Giulia	IT: Friuli-Venezia Giulia	1990; 2000; 2005	EVS X048	A	No
Italy	Friuli-Venezia Giulia	IT: Nord-Est - Friuli-Venezia Giulia	2010	EVS X048B	A	No
Italy	Lazio	IT: Lazio	1990; 2000; 2005	EVS X048	A	No

Italy	Lazio	IT: Centro - Lazio	2010	EVS X048B	A	No
Italy	Liguria	IT: Liguria	1990; 2000; 2005	EVS X048	A	No
Italy	Liguria	IT: Nord-Ovest - Liguria	2010	EVS X048B	A	No
Italy	Lombardia	IT: Lombardia	1990; 2000; 2005	EVS X048	A	No
Italy	Lombardia	IT: Nord-Ovest - Lombardia	2010	EVS X048B	A	No
Italy	Marche	IT: Marche	1990; 2000; 2005	EVS X048	A	No
Italy	Marche	IT: Centro - Marche	2010	EVS X048B	A	No
Italy	Molise	IT: Molise	1990; 2000; 2005	EVS X048	A	No
Italy	Molise	IT: Sud - Molise	2010	EVS X048B	A	No
Italy	Piemonte	IT: Piemonte	1990; 2000; 2005	EVS X048	A	No
Italy	Piemonte	IT: Nord-Ovest - Piemonte	2010	EVS X048B	A	No
Italy	Puglia	IT: Puglia	1990; 2000; 2005	EVS X048	A	No
Italy	Puglia	IT: Sud - Puglia	2010	EVS X048B	A	No
Italy	Sardegna	IT: Sardegna	1990; 2000; 2005	EVS X048	A	No
Italy	Sardegna	IT: Isole - Sardegna	2010	EVS X048B	A	No
Italy	Sicilia	IT: Sicilia	1990; 2000; 2005	EVS X048	A	No
Italy	Sicilia	IT: Isole - Sicilia	2010	EVS X048B	A	No
Italy	Toscana	IT: Toscana	1990; 2000; 2005	EVS X048	A	No
Italy	Toscana	IT: Centro - Toscana	2010	EVS X048B	A	No
Italy	Trentino-Alto Adige	IT: Trentino-Alto Adige	1990; 2000; 2005	EVS X048	A	No
Italy	Trentino-Alto Adige	IT: Nord-Est - Provincia Autonoma di Trento	2010	EVS X048B	A	No
Italy	Umbria	IT: Umbria	1990; 2000; 2005	EVS X048	A	No
Italy	Umbria	IT: Centro - Umbria	2010	EVS X048B	A	No
Italy	Valle d'Aosta/Vallée d'Aoste	IT: Valle dAoste	1990; 2000; 2005	EVS X048	A	No
Italy	Valle d'Aosta/Vallée d'Aoste	IT: Nord-Ovest - Valle d'Aosta/Vallée d'Aoste	2010	EVS X048B	A	No
Italy	Veneto	IT: Veneto	1990; 2000; 2005	EVS X048	A	No
Italy	Veneto	IT: Nord-Est - Veneto	2010	EVS X048B	A	No

Jordan	Ajloun	JO: AJLOON	2002; 2010	WVS	A	No
Jordan	Amman	JO: AMMAN	2002; 2010	WVS	A	No
Jordan	Aqaba	JO: AQABA	2002; 2010	WVS	A	No
Jordan	Balqa	JO: BALQA	2002; 2010	WVS	A	No
Jordan	Irbid	JO: IRBID	2002; 2010	WVS	A	No
Jordan	Jarash	JO: JERASH	2002; 2010	WVS	A	No
Jordan	Karak	JO: KARAK	2002; 2010	WVS	A	No
Jordan	Ma’an	JO: MA´AN	2002; 2010	WVS	A	No
Jordan	Madaba	JO: MADABA	2002; 2010	WVS	A	No
Jordan	Mafraq	JO: MAFRAQ	2002; 2010	WVS	A	No
Jordan	Tafeila	JO: TAFILA	2002; 2010	WVS	A	No
Jordan	Zarqa	JO: ZARQA	2002; 2010	WVS	A	No
Kazakhstan	Almaty	KZ: Almaty region	2010	WVS	A	No
Kazakhstan	Almaty	KZ: Almaty	2010	WVS	A	No
Kazakhstan	Atyrau	KZ: Atyrau region	2010	WVS	A	No
Kazakhstan	East Kazakhstan	KZ: East Kazakhstan region	2010	WVS	A	No
Kazakhstan	Karagandy	KZ: Karaganda region	2010	WVS	A	No
Kazakhstan	Kostanai	KZ: Kostanai region	2010	WVS	A	No
Kazakhstan	Kyzylorda	KZ: Kyzyl-Ordynsk region	2010	WVS	A	No
Kazakhstan	Manghistau	KZ: Mangistaus region	2010	WVS	A	No
Kazakhstan	North Kazakhstan	KZ: North Kazakhstan region	2010	WVS	A	No
Kazakhstan	Pavlodar	KZ: Pavlodar region	2010	WVS	A	No
Kazakhstan	South Kazakhstan	KZ: South Kazakhstan region	2010	WVS	A	No
Kazakhstan	West Kazakhstan	KZ: West Kazakhstan region	2010	WVS	A	No
Kazakhstan	Zhambyl	KZ: Zhambalyk region	2010	WVS	A	No
Korea, Rep.	Busan	KR: Pusan / Busan	2000; 2005; 2010	WVS	A	No
Korea, Rep.	Chungbuk	KR: Chungbuk / North Chungcheong	2000; 2005; 2010	WVS	A	No
Korea, Rep.	Daegu	KR: Taegu / Daegu	2000; 2005; 2010	WVS	A	No
Korea, Rep.	Gangwon	KR: Kangwon Do	1990	WVS	A	No

Korea, Rep.	Gangwon	KR: Kangwon / Gangwon Do	2000; 2005; 2010	WVS	A	No
Korea, Rep.	Gyeongbuk	KR: Kyeongbuk / North Gyeongsang	2000; 2005; 2010	WVS	A	No
Korea, Rep.	Gyeonggi	KR: Kyeonggi / Gyeonggi Do	2000; 2005; 2010	WVS	A	No
Korea, Rep.	Incheon	KR: Incheon	2000; 2005; 2010	WVS	A	No
Korea, Rep.	Jeonbuk	KR: Jeonbuk / North Jeolla	2000; 2005; 2010	WVS	A	No
Korea, Rep.	Seoul	KR: Seoul	1990; 2000; 2005; 2010	WVS	A	No
Kyrgyz Republic	Bishkek	KG: Bishkek city	2005	WVS	A	No
Kyrgyz Republic	Chui Oblast	KG: Chui oblast/region	2005	WVS	A	No
Kyrgyz Republic	Issyk-Kul Oblast	KG: Issyk-Kol oblast/region	2005	WVS	A	No
Kyrgyz Republic	Jalal-Abad Oblast	KG: Jalal-Abad oblast/region	2005	WVS	A	No
Kyrgyz Republic	Naryn Oblast	KG: Naryn oblast/region	2005	WVS	A	No
Kyrgyz Republic	Osh Oblast	KG: Osh oblast/region	2005	WVS	A	No
Kyrgyz Republic	Talas Oblast	KG: Talas oblast/region	2005	WVS	A	No
Latvia	Cçsu rajons	LV: Cesu d.	2000	WVS	A	No
Latvia	Dobeles rajons	LV: Dobeles d.	2000	WVS	A	No
Latvia	Gulbenes rajons	LV: Gulbenes d.	2000	WVS	A	No
Latvia	Jçkabpils rajons	LV: Jekapils d.	2000	WVS	A	No
Latvia	Jelgavas rajons	LV: Jelgavas d.	2005	WVS	A	No
Latvia	Krâslavas rajons	LV: Kraslavas d.	2000	WVS	A	No
Latvia	Kuldîgas rajons	LV: Kuldigas d.	2000	WVS	A	No
Latvia	Liepâjas rajons	LV: Liepajas d.	2005	WVS	A	No
Latvia	Limbaþu rajons	LV: Limbazu d.	2000	WVS	A	No
Latvia	Ludzas rajons	LV: Ludzas d.	2000	WVS	A	No
Latvia	Madonas rajons	LV: Madonas d.	2000	WVS	A	No

Latvia	Ogres rajons	LV: Ogres d.	2000	WVS	A	No
Latvia	Preiïu rajons	LV: Preilu d.	2000	WVS	A	No
Latvia	Saldus district	LV: Saldus d.	2000	WVS	A	No
Latvia	Talsu rajons	LV: Talsu d.	2000	WVS	A	No
Latvia	Tukums district	LV: Tukuma d.	2000	WVS	A	No
Latvia	Valkas rajons	LV: Valkas d.	2000	WVS	A	No
Latvia	Valmieras rajons	LV: Valmieras d.	2000	WVS	A	No
Macedonia	Pelagonia	MK: Pelagoniski	2000; 2005	WVS	A	No
Macedonia	Polog	MK: Poloski	2000; 2005	WVS	A	No
Macedonia	Skopje	MK: Skopski	2000; 2005	WVS	A	No
Macedonia	Vardar	MK: Vardarska	2000	WVS	A	No
Malaysia	Johor	MY: Johor	2010	WVS	A	No
Malaysia	Kelantan	MY: Kelantan	2010	WVS	A	No
Malaysia	Melaka	MY: Melaka	2010	WVS	A	No
Malaysia	Negeri Sembilan	MY: Negeri Sembilan	2010	WVS	A	No
Malaysia	Pahang	MY: Pahang	2010	WVS	A	No
Malaysia	Perak	MY: Perak	2010	WVS	A	No
Malaysia	Pulau Pinang	MY: Pulau Pinang	2010	WVS	A	No
Malaysia	Sarawak	MY: Sarawak	2010	WVS	A	No
Malaysia	Terengganu	MY: Terengganu	2010	WVS	A	No
Mexico	Aguascalientes	MX: Aguascalientes	2005; 2010	WVS	A	No
Mexico	Baja California Sur	MX: Baja California Sur	2005; 2010	WVS	A	No
Mexico	Campeche	MX: Campeche	2005; 2010	WVS	A	No
Mexico	Chiapas	MX: Chiapas	2005; 2010	WVS	A	No
Mexico	Chihuahua	MX: Chihuahua	2005; 2010	WVS	A	No
Mexico	Coahuila	MX: Coahuila	2005; 2010	WVS	A	No
Mexico	Distrito Federal,MEX	MX: Zona metropolitana	1995; 2000	WVS	A	No
Mexico	Distrito Federal,MEX	MX: Distrito Federal	2005; 2010	WVS	A	No
Mexico	Durango	MX: Durango	2005; 2010	WVS	A	No

Mexico	Guanajuato	MX: Guanajuato	2005; 2010	WVS	A	No
Mexico	Guerrero	MX: Guerrero	2005; 2010	WVS	A	No
Mexico	Hidalgo	MX: Hidalgo	2005; 2010	WVS	A	No
Mexico	Jalisco	MX: Jalisco	2005; 2010	WVS	A	No
Mexico	Michoacan	MX: Michoacán	2005; 2010	WVS	A	No
Mexico	Morelos	MX: Morelos	2005; 2010	WVS	A	No
Mexico	Nayarit	MX: Nayarit	2005; 2010	WVS	A	No
Mexico	Nuevo Leon	MX: Nuevo León	2005; 2010	WVS	A	No
Mexico	Oaxaca	MX: Oaxaca	2005; 2010	WVS	A	No
Mexico	Puebla	MX: Puebla	2005; 2010	WVS	A	No
Mexico	Queretaro	MX: Querétaro	2005; 2010	WVS	A	No
Mexico	Quintana Roo	MX: Quintana Roo	2005; 2010	WVS	A	No
Mexico	San Luis Potosi	MX: San Luis Potosí	2005; 2010	WVS	A	No
Mexico	Sinaloa	MX: Sinaloa	2005; 2010	WVS	A	No
Mexico	Sonora	MX: Sonora	2005; 2010	WVS	A	No
Mexico	Tabasco	MX: Tabasco	2005; 2010	WVS	A	No
Mexico	Tamaulipas	MX: Tamaulipas	2005; 2010	WVS	A	No
Mexico	Tlaxcala	MX: Tlaxcala	2005; 2010	WVS	A	No
Mexico	Veracruz	MX: Veracruz	2005; 2010	WVS	A	No
Mexico	Yucatan	MX: Yucatán	2005; 2010	WVS	A	No
Mexico	Zacatecas	MX: Zacatecas	2005; 2010	WVS	A	No
Netherlands	Drenthe	NL: Drenthe	1995; 2000	EVS X048	A	No
Netherlands	Drenthe	NL: Noord-Nederland - Drenthe	2010	EVS X048B	A	No
Netherlands	Flevoland	NL: Flevoland	1995; 2000	EVS X048	A	No
Netherlands	Flevoland	NL: Oost-Nederland - Flevoland	2010	EVS X048B	A	No
Netherlands	Friesland	NL: Friesland	1995; 2000	EVS X048	A	No
Netherlands	Friesland	NL: Noord-Nederland - Friesland	2010	EVS X048B	A	No
Netherlands	Gelderland	NL: Gelderland	1995; 2000	EVS X048	A	No
Netherlands	Gelderland	NL: Oost-Nederland - Gelderland	2010	EVS X048B	A	No

Netherlands	Groningen	NL: Groningen	1995; 2000	EVS X048	A	No
Netherlands	Groningen	NL: Noord-Nederland - Groningen	2010	EVS X048B	A	No
Netherlands	Limburg	NL: Limburg	1995; 2000	EVS X048	A	No
Netherlands	Limburg	NL: Zuid-Nederland - Limburg	2010	EVS X048B	A	No
Netherlands	Noord-Brabant	NL: Noord-Brabant	1995; 2000	EVS X048	A	No
Netherlands	Noord-Brabant	NL: Zuid-Nederland - Noord-Brabant	2010	EVS X048B	A	No
Netherlands	Noord-Holland	NL: Noord-Holland	1995; 2000	EVS X048	A	No
Netherlands	Noord-Holland	NL: West-Nederland - Noord-Holland	2010	EVS X048B	A	No
Netherlands	Overijssel	NL: Overijssel	1995; 2000	EVS X048	A	No
Netherlands	Overijssel	NL: Oost-Nederland - Overijssel	2010	EVS X048B	A	No
Netherlands	Utrecht	NL: Utrecht	1995; 2000	EVS X048	A	No
Netherlands	Utrecht	NL: West-Nederland - Utrecht	2010	EVS X048B	A	No
Netherlands	Zeeland	NL: Zeeland	1995; 2000	EVS X048	A	No
Netherlands	Zeeland	NL: West-Nederland - Zeeland	2010	EVS X048B	A	No
Netherlands	Zuid-Holland	NL: Zuid-Holland	1995; 2000	EVS X048	A	No
Netherlands	Zuid-Holland	NL: West-Nederland - Zuid-Holland	2010	EVS X048B	A	No
Nigeria	North East	NG: North East	2008	WVS	A	No
Nigeria	North West,NG	NG: North West	2008	WVS	A	No
Norway	Akershus	NO: Akershus	1995	EVS X048	A	No
Norway	Aust-Agder	NO: Aust-Agder	1995	EVS X048	A	No
Norway	Buskerud	NO: Buskerud	1995	EVS X048	A	No
Norway	Finnmark Finnmárku	NO: Finnmark	1995	EVS X048	A	No
Norway	Hedmark	NO: Hedmark	1995	EVS X048	A	No
Norway	Hordaland	NO: Hordaland	1995	EVS X048	A	No
Norway	Møre og Romsdal	NO: Mxre og Romsdal	1995	EVS X048	A	No
Norway	Nordland	NO: Nordland	1995; 2010	EVS X048	A	No
Norway	Nord-Trøndelag	NO: Nord-Trxndelag	1995	EVS X048	A	No
Norway	Oppland	NO: Oppland	1995	EVS X048	A	No
Norway	Oslo	NO: Oslo	1995	EVS X048	A	No

Norway	Østfold	NO: Xstfold	1995	EVS X048	A	No
Norway	Rogaland	NO: Rogaland	1995	EVS X048	A	No
Norway	Sogn og Fjordane	NO: Sogn og Fjordane	1995	EVS X048	A	No
Norway	Sør-Trøndelag	NO: Sxr-Trxndelag	1995	EVS X048	A	No
Norway	Telemark	NO: Telemark	1995	EVS X048	A	No
Norway	Troms Romsa	NO: Troms	1995	EVS X048	A	No
Norway	Vest-Agder	NO: Vest-Agder	1995	EVS X048	A	No
Norway	Vestfold	NO: Vestfold	1995	EVS X048	A	No
Peru	Ancash	PE: Ancash	2010	WVS	A	No
Peru	Arequipa	PE: Arequipa	2001; 2010	WVS	A	No
Peru	Ayacucho	PE: Ayacucho	2010	WVS	A	No
Peru	Cajamarca	PE: Cajamarca	2010	WVS	A	No
Peru	Cusco	PE: Cusco	2001; 2010	WVS	A	No
Peru	Huánuco	PE: Huánuco	2010	WVS	A	No
Peru	Ica	PE: Ica	2010	WVS	A	No
Peru	Junín	PE: Junín	2010	WVS	A	No
Peru	La Libertad,PER	PE: La libertad	2010	WVS	A	No
Peru	Lambayeque	PE: Lambayeque	2010	WVS	A	No
Peru	Piura	PE: Piura	2001; 2010	WVS	A	No
Peru	Puno	PE: Puno	2010	WVS	A	No
Peru	San Martín	PE: San Martín	2010	WVS	A	No
Philippines	Mindanao	PH: MINDANAO	1997; 2006; 2010	WVS	A	No
Poland	Dolnoslaskie	PL: Dolnolslaskie	2000	EVS X048	A	No
Poland	Dolnoslaskie	PL: Region Póludniowo-Zachodni - Dolnoslaskie	2010	EVS X048B	A	No
Poland	Kujawsko-Pomorskie	PL: Kujawsko-Pomorskie	2000	EVS X048	A	No
Poland	Kujawsko-Pomorskie	PL: Region Pólnocny - Kujawsko-Pomorskie	2010	EVS X048B	A	No
Poland	Lódzkie	PL: Lodzkie	1995; 2000	WVS	A	No
Poland	Lódzkie	PL: Region centralny - Lódzkie	2010	EVS X048B	A	No

Poland	Lubelskie	PL: Lubelskie	1995; 2000	WVS	A	No
Poland	Lubelskie	PL: Region Wschodni - Lubelskie	2010	EVS X048B	A	No
Poland	Lubuskie	PL: Lubuskie	2000	EVS X048	A	No
Poland	Lubuskie	PL: Region Pólnocno-Zachodni - Lubuskie	2010	EVS X048B	A	No
Poland	Malopolskie	PL: Malopotskie	2000	EVS X048	A	No
Poland	Malopolskie	PL: Region Poludniowy -Malopolskie	2010	EVS X048B	A	No
Poland	Mazowieckie	PL: Mazowieckie	2000	EVS X048	A	No
Poland	Mazowieckie	PL: Region centralny - Mazowieckie	2010	EVS X048B	A	No
Poland	Opolskie	PL: Opolskie	1990; 1995; 2000	EVS X048	A	No
Poland	Opolskie	PL: Region Póludniowo-Zachodni - Opolskie	2010	EVS X048B	A	No
Poland	Podkarpackie	PL: Podkarpackie	2000	EVS X048	A	No
Poland	Podkarpackie	PL: Region Wschodni - Podkarpackie	2010	EVS X048B	A	No
Poland	Podlaskie	PL: Podlaskie	2000	EVS X048	A	No
Poland	Podlaskie	PL: Region Wschodni - Podlaskie	2010	EVS X048B	A	No
Poland	Slaskie	PL: Slaskie	2000	EVS X048	A	No
Poland	Slaskie	PL: Region Poludniowy - Slaskie	2010	EVS X048B	A	No
Poland	Swietokrzyskie	PL: Swietokryskie	2000	EVS X048	A	No
Poland	Swietokrzyskie	PL: Region Wschodni - Swietokrzyskie	2010	EVS X048B	A	No
Poland	Warminsko-Mazurskie	PL: Warminsko-Mazurskie	2000	EVS X048	A	No
Poland	Warminsko-Mazurskie	PL: Region Pólnocny - Warminsko-Mazurskie	2010	EVS X048B	A	No
Poland	Wielkopolskie	PL: Wielkopolskie	2000	EVS X048	A	No
Poland	Wielkopolskie	PL: Region Pólnocno-Zachodni - Wielkopolskie	2010	EVS X048B	A	No
Portugal	Alentejo	PT: Alentejo	2000	EVS X048	A	No
Portugal	Alentejo	PT: Continente - Alentejo	2010	EVS X048B	A	No
Portugal	Algarve	PT: Algarve	1990; 2000	EVS X048	A	No
Portugal	Algarve	PT: Continente - Algarve	2010	EVS X048B	A	No

Portugal	Centro	PT: Center	2000	EVS X048	A	No
Portugal	Centro	PT: Continente - Centro	2010	EVS X048B	A	No
Portugal	Lisboa	PT: Continente - Lisboa	2010	EVS X048B	A	No
Portugal	Norte	PT: North	2000	EVS X048	A	No
Portugal	Norte	PT: Continente - Norte	2010	EVS X048B	A	No
Romania	Alba	RO: Alba	2005; 2010	WVS	A	No
Romania	Arad	RO: Arad	2000; 2005; 2010	EVS X048	A	No
Romania	Arges	RO: Arges	2000; 2005; 2010	EVS X048	A	No
Romania	Bacau	RO: Bacau	2000; 2005; 2010	EVS X048	A	No
Romania	Bihor	RO: Bihor	2000; 2005; 2010	EVS X048	A	No
Romania	Bistrita-Nasaud	RO: Bistrita-Nasaud	2000; 2005; 2010	EVS X048	A	No
Romania	Botosani	RO: Botosani	2000; 2005; 2010	EVS X048	A	No
Romania	Braila	RO: Braila	2000; 2005; 2010	EVS X048	A	No
Romania	Brasov	RO: Brasov	2000; 2005; 2010	EVS X048	A	No
Romania	Bucuresti [Bucharest]	RO: Bucuresti	1995; 2000; 2005	EVS X048	A	No
Romania	Buzau	RO: Buzau	2000; 2005; 2010	EVS X048	A	No
Romania	Calarasi	RO: Calarasi	2000; 2005; 2010	EVS X048	A	No
Romania	Caras-Severin	RO: Caras-Severin	2000; 2005; 2010	EVS X048	A	No
Romania	Cluj	RO: Cluj	2000; 2005; 2010	EVS X048	A	No
Romania	Constanta	RO: Constanta	2000; 2005; 2010	EVS X048	A	No
Romania	Covasna	RO: Covasna	2000; 2005; 2010	EVS X048	A	No
Romania	Dambovita	RO: Dambovita	2000; 2005; 2010	EVS X048	A	No
Romania	Dolj	RO: Dolj	2000; 2005; 2010	EVS X048	A	No
Romania	Galati	RO: Galati	2000; 2005; 2010	EVS X048	A	No
Romania	Giurgiu	RO: Giurgiu	2000; 2005; 2010	EVS X048	A	No
Romania	Gorj	RO: Gorj	2000; 2005; 2010	EVS X048	A	No
Romania	Harghita	RO: Harghita	2000; 2005; 2010	EVS X048	A	No
Romania	Hunedoara	RO: Hunedoara	2000; 2005; 2010	EVS X048	A	No
Romania	Ialomita	RO: Ialomita	2000; 2005; 2010	EVS X048	A	No

Romania	Iasi	RO: Iasi	2000; 2005; 2010	EVS X048	A	No
Romania	Ilfov	RO: Ilfov	2000; 2005; 2010	EVS X048	A	No
Romania	Maramures	RO: Maramures County	2000; 2005; 2010	WVS	A	No
Romania	Mehedinti	RO: Mehedinti	2005; 2010	WVS	A	No
Romania	Mures	RO: Mures	2000; 2005; 2010	EVS X048	A	No
Romania	Neamt	RO: Neamt	2000; 2005; 2010	EVS X048	A	No
Romania	Olt	RO: Olt	2000; 2005; 2010	EVS X048	A	No
Romania	Prahova	RO: Prahova	2000; 2005; 2010	EVS X048	A	No
Romania	Salaj	RO: Salaj	2000; 2005; 2010	EVS X048	A	No
Romania	Satu Mare	RO: Satu Mare	2000; 2005; 2010	EVS X048	A	No
Romania	Sibiu	RO: Sibiu	2000; 2005; 2010	EVS X048	A	No
Romania	Suceava	RO: Suceava	2000; 2005; 2010	EVS X048	A	No
Romania	Teleorman	RO: Teleorman	2000; 2005; 2010	EVS X048	A	No
Romania	Timis	RO: Timis	2000; 2005; 2010	EVS X048	A	No
Romania	Tulcea	RO: Tulcea	2000; 2005; 2010	EVS X048	A	No
Romania	Valcea	RO: Valcea	2000; 2005; 2010	EVS X048	A	No
Romania	Vaslui	RO: Vaslui	2000; 2005; 2010	EVS X048	A	No
Romania	Vrancea	RO: Vrancea	2000	EVS X048	A	No
Russian Federation	Moscow Region	RU: Moscow	2010	WVS	A	No
Slovak Republic	Banskobystrický kraj	SK: B. Bystrica County	2000	EVS X048	A	No
Slovak Republic	Bratislavský kraj	SK: Bratislava County	1995; 2000; 2005	WVS	A	No
Slovak Republic	Bratislavský kraj	SK: Slovenská Republika - Bratislavský kraj	2010	EVS X048B	A	No
Slovak Republic	Kosický kraj	SK: Kosice County	2000	EVS X048	A	No
Slovak Republic	Nitriansky kraj	SK: Nitra County	2000	EVS X048	A	No

Slovak Republic	Presovský kraj	SK: Presov County	2000	EVS X048	A	No
Slovak Republic	Trenciansky kraj	SK: Trencin County	2000	EVS X048	A	No
Slovak Republic	Trnavský kraj	SK: Trnava County	2000	EVS X048	A	No
Slovak Republic	Zilinský kraj	SK: Zilina County	2000	EVS X048	A	No
Slovenia	Gorenjska	SI: Gorensjka	1995; 2000; 2005; 2010	EVS X048	A	No
Slovenia	Goriska	SI: Goriska	1995; 2000; 2005; 2010	EVS X048	A	No
Slovenia	Jugovzhodna Slovenija	SI: JV Slovenija	2005; 2010	WVS	A	Yes
Slovenia	Koroska	SI: Koroska	1995; 2000; 2005; 2010	EVS X048	A	No
Slovenia	Notranjsko-kraska	SI: Notr. - Kraska	2005; 2010	WVS	A	No
Slovenia	Obalno-kraska	SI: Obalno-Kraska	1995; 2005; 2010	EVS X048	A	No
Slovenia	Osrednjeslovenska	SI: Osrednja Slovenska	1995; 2000; 2005	EVS X048	A	No
Slovenia	Podravska	SI: Podravska	1995; 2000; 2005; 2010	EVS X048	A	No
Slovenia	Pomurska	SI: Pomurska	1995; 2000; 2005; 2010	EVS X048	A	No
Slovenia	Savinjska	SI: Savinjska	1995; 2000; 2005; 2010	EVS X048	A	No
Slovenia	Spodnjeposavska	SI: Spodnje Posavska	1995; 2000; 2005	EVS X048	A	No
Slovenia	Zasavska	SI: Zasavska	1995; 2000; 2005; 2010	EVS X048	A	No
Spain	Asturias	ES: Asturias	1990; 1995; 2000; 2010	WVS	A	No
Spain	Asturias	ES: Noroeste - Principado de Asturias	2010	EVS X048B	A	No
Spain	Balears, Illes	ES: Baleares	1990; 1995; 2000; 2010	WVS	A	No
Spain	Balears, Illes	ES: Este - Illes Balears	2010	EVS X048B	A	No

Spain	Cantabria	ES: Cantabria	1990; 1995; 2000; 2010	WVS	A	No
Spain	Cantabria	ES: Noroeste - Cantabria	2010	EVS X048B	A	No
Spain	Madrid	ES: Madrid	1990; 1995; 2000; 2010	WVS	A	No
Spain	Madrid	ES: Comunidad de Madrid - Comunidad de Madrid	2010	EVS X048B	A	No
Spain	Murcia	ES: Murcia	1990; 1995; 2000; 2010	WVS	A	No
Spain	Murcia	ES: Sur - Región de Murcia	2010	EVS X048B	A	No
Spain	Navarra	ES: Navarra	1990; 1995; 2000; 2010	WVS	A	No
Spain	Navarra	ES: Noreste - Comunidad Foral de Navarra	2010	EVS X048B	A	No
Spain	Rioja, La	ES: Rioja	1990; 1995; 2000; 2010	WVS	A	No
Spain	Rioja, La	ES: Noreste - La Rioja	2010	EVS X048B	A	No
Sweden	Blekinge	SE: Blekinge	1990	EVS X048	A	No
Sweden	Dalarna	SE: Dalarna	2010	WVS	A	No
Sweden	Gävleborg	SE: Gavleborg	1990	EVS X048	A	No
Sweden	Gävleborg	SE: Gävleborg	2010	WVS	A	No
Sweden	Halland	SE: Halland	1990; 2010	EVS X048	A	No
Sweden	Jämtland	SE: Jamtland	1990; 2010	EVS X048	A	No
Sweden	Jönköping	SE: Jonkoping	1990	EVS X048	A	No
Sweden	Jönköping	SE: Jönköping	2010	WVS	A	No
Sweden	Kalmar	SE: Kalmar	1990; 2010	EVS X048	A	No
Sweden	Kronoberg	SE: Kronoberg	1990; 2010	EVS X048	A	No
Sweden	Norrbotten	SE: Norbotten	1990; 2010	EVS X048	A	No
Sweden	Örebro	SE: Örebro	2010	WVS	A	No
Sweden	Östergötland	SE: Ostergotland	1990	EVS X048	A	No
Sweden	Östergötland	SE: Östergötland	2010	WVS	A	No

Sweden	Skåne	SE: Skåne	2010	WVS	A	No
Sweden	Södermanland	SE: Sodermanland	1990; 2010	EVS X048	A	No
Sweden	Stockholm	SE: Stor Stockholm	1990; 2000	EVS X048	A	No
Sweden	Stockholm	SE: Östra Sverige - Stockholm	2010	EVS X048B	A	No
Sweden	Uppsala	SE: Uppsala	1990; 2010	EVS X048	A	No
Sweden	Värmland	SE: Varmland	1990	EVS X048	A	No
Sweden	Värmland	SE: Värmland	2010	WVS	A	No
Sweden	Västerbotten	SE: Vasterbotten	1990	EVS X048	A	No
Sweden	Västerbotten	SE: Västerbotten	2010	WVS	A	No
Sweden	Västernorrland	SE: Vasternorrland	1990	EVS X048	A	No
Sweden	Västernorrland	SE: Västernorrland	2010	WVS	A	No
Sweden	Västmanland	SE: Vastmanland	1990	EVS X048	A	No
Sweden	Västmanland	SE: Västmanland	2010	WVS	A	No
Sweden	Västra Götaland	SE: Västra Götaland	2010	WVS	A	No
Switzerland	Aargau	CH: AG	2000	WVS	A	No
Switzerland	Basel-Land	CH: BL	2000	WVS	A	No
Switzerland	Basel-Stadt	CH: BS	2000	WVS	A	No
Switzerland	Freiburg	CH: FR	2000	WVS	A	No
Switzerland	Genf	CH: GE	2000	WVS	A	No
Switzerland	Graubünden	CH: GR	2000	WVS	A	No
Switzerland	Luzern	CH: LU	2000	WVS	A	No
Switzerland	Neuenburg	CH: NE	2000	WVS	A	No
Switzerland	Obwalden	CH: OW	2000	WVS	A	No
Switzerland	Schaffhausen	CH: SH	2000	WVS	A	No
Switzerland	Schwyz	CH: SZ	2000	WVS	A	No
Switzerland	Solothurn	CH: SO	2000	WVS	A	No
Switzerland	St. Gallen	CH: SG	2000	WVS	A	No
Switzerland	Tessin	CH: TI	2000	WVS	A	No
Switzerland	Tessin	CH: Schweiz/Suisse/Svizzera - Ticino	2010	EVS X048B	A	No

Switzerland	Thurgau	CH: TG	2000	WVS	A	No
Switzerland	Waadt	CH: VD	2000	WVS	A	No
Switzerland	Wallis	CH: VS	2000	WVS	A	No
Switzerland	Zürich	CH: ZH	2000	WVS	A	No
Switzerland	Zürich	CH: Schweiz/Suisse/Svizzera - Zürich	2010	EVS X048B	A	No
Turkey	Afyonkarahisar	TR: Afyonkarahisar	1990	WVS	A	No
Turkey	Amasya	TR: Amasya	1990	WVS	A	No
Turkey	Edirne	TR: Edirne	1990	WVS	A	No
Turkey	Erzincan	TR: Erzincan	1990	WVS	A	No
Turkey	Izmir	TR: Izmir	2000	WVS	A	No
Turkey	Kastamonu	TR: Kastamonu	1990	WVS	A	No
Turkey	Konya	TR: Konya	1990; 2000	WVS	A	No
Turkey	Malatya	TR: Malatya	1990	WVS	A	No
Turkey	Mugla	TR: Muğla	1990	WVS	A	No
Turkey	Samsun	TR: Samsun	1990	WVS	A	No
Ukraine	Cherkasy	UA: Cherkasy oblast	2005	EVS X048	A	No
Ukraine	Cherkasy	UA: Centre - Cherkasy Oblast	2010	EVS X048B	A	No
Ukraine	Chernihiv	UA: Chernigiv oblast	2005	EVS X048	A	No
Ukraine	Chernihiv	UA: North - Chernihiv Oblast	2010	EVS X048B	A	No
Ukraine	Chernivtsi	UA: Chernivtsi oblast	2005	EVS X048	A	No
Ukraine	Chernivtsi	UA: West - Chernivtsi Oblast	2010	EVS X048B	A	No
Ukraine	Dnipropetrovsk	UA: East - Dnipropetrovsk	2010	EVS X048B	A	No
Ukraine	Donetsk	UA: East - Donetsk	2010	EVS X048B	A	No
Ukraine	Ivano-Frankivsk	UA: Ivano-Frankivsk oblast	2005	EVS X048	A	No
Ukraine	Ivano-Frankivsk	UA: West - Ivano-Frankovsk Oblast	2010	EVS X048B	A	No
Ukraine	Kharkiv	UA: East - Kharkiv	2010	EVS X048B	A	No
Ukraine	Kherson	UA: Kherson oblast	2005	EVS X048	A	No
Ukraine	Kherson	UA: South - Kherson Oblast	2010	EVS X048B	A	No
Ukraine	Khmelnytskiy	UA: Hmelnytsk oblast	2005	EVS X048	A	No

Ukraine	Khmelnytskiy	UA: Centre - Khmelnytskyi Oblast	2010	EVS X048B	A	No
Ukraine	Kirovohrad	UA: Kirovograd oblast	2005	EVS X048	A	No
Ukraine	Kirovohrad	UA: Centre - Kirovohrad Oblast	2010	EVS X048B	A	No
Ukraine	Kyiv_city	UA: Kyiv city	2005	EVS X048	A	No
Ukraine	Kyiv_city	UA: North - Kyiv	2010	EVS X048B	A	No
Ukraine	Luhansk	UA: Luhansk oblast	2005	WVS	A	No
Ukraine	Luhansk	UA: East - Luhansk Oblast	2010	EVS X048B	A	No
Ukraine	Lviv	UA: Lviv oblast	2005	EVS X048	A	No
Ukraine	Lviv	UA: West - Lviv Oblast	2010	EVS X048B	A	No
Ukraine	Mykolayiv	UA: Mykolayiv oblast	2005	EVS X048	A	No
Ukraine	Mykolayiv	UA: South - Mykolaiv Oblast	2010	EVS X048B	A	No
Ukraine	Odesa	UA: South - Odesa	2010	EVS X048B	A	No
Ukraine	Poltava	UA: Poltava oblast	2005	EVS X048	A	No
Ukraine	Poltava	UA: Centre - Poltava Oblast	2010	EVS X048B	A	No
Ukraine	Rivne	UA: Rivnå oblast	2005	EVS X048	A	No
Ukraine	Rivne	UA: West - Rivne Oblast	2010	EVS X048B	A	No
Ukraine	Sumy	UA: Sumy oblast	2005	EVS X048	A	No
Ukraine	Sumy	UA: North - Sumy Oblast	2010	EVS X048B	A	No
Ukraine	Ternopil	UA: Ternopil oblast	2005	EVS X048	A	No
Ukraine	Ternopil	UA: West - Ternopil Oblast	2010	EVS X048B	A	No
Ukraine	Vinnytsya	UA: Vinnytsia oblast	2005	EVS X048	A	No
Ukraine	Vinnytsya	UA: Centre - Vinnytsia Oblast	2010	EVS X048B	A	No
Ukraine	Volyn	UA: Volyn oblast	2005	EVS X048	A	No
Ukraine	Volyn	UA: West - Volyn Oblast	2010	EVS X048B	A	No
Ukraine	Zakarpattya	UA: Zakarpattia oblast	2005	EVS X048	A	No
Ukraine	Zakarpattya	UA: West - Zakarpattia Oblast	2010	EVS X048B	A	No
Ukraine	Zaporizhzhya	UA: East - Zaporizhia	2010	EVS X048B	A	No
Ukraine	Zhytomyr	UA: Zhitomyr oblast	2005	EVS X048	A	No
Ukraine	Zhytomyr	UA: North - Zhytomyr Oblast	2010	EVS X048B	A	No

United Kingdom	East Anglia	GB: East Anglia	2000	WVS	A	No
United Kingdom	East Anglia	GB-GBN: East of England – East Anglia	2010	EVS X048B	A	No
United Kingdom	North	GB: North	2000; 2005	WVS	A	No
United Kingdom	North West,GB	GB-GBN: North West	1995; 2000	EVS X048	A	No
United Kingdom	North West,GB	GB: North West	2000; 2005	WVS	A	No
United Kingdom	Northern Ireland	Northern Ireland	1995; 2000	S003	A	No
United Kingdom	Northern Ireland	GB-NIR: Northern Ireland - Northern Ireland	2010	EVS X048B	A	No
United Kingdom	Scotland	GB-GBN: Scotland	1995; 2000	EVS X048	A	No
United Kingdom	Scotland	GB: Scotland	2000; 2005	WVS	A	No
United Kingdom	South West,GB	GB-GBN: South West	1995; 2000	EVS X048	A	No
United Kingdom	South West,GB	GB: South West	2000; 2005	WVS	A	No
United Kingdom	Wales	GB-GBN:Wales	1995; 2000	EVS X048	A	No
United Kingdom	Wales	GB:Wales	2000; 2005	WVS	A	No
United States	Alaska	US: Alaska	2010	WVS	A	No
United States	California	US: California	1990; 1995; 2000; 2010	EVS X048	A	No
United States	Hawaii	US: Hawai	2010	WVS	A	No
Uruguay	Florida,URU	UY: Florida	2000	WVS	A	No
Uruguay	Montevideo	UY: Montevideo	2000	WVS	A	No
Uruguay	Paysandú	UY: Paysandú	2000	WVS	A	No
Uruguay	Rocha	UY: Rocha	2000	WVS	A	No

Uruguay	Tacuarembó	UY: Tacuarembó	2000	WVS	A	No
Argentina	Buenos Aires	AR: Gran Buenos Aires	1995; 2000; 2005	WVS	B	No
Brazil	Pará and Amapá	BR: PA	2010	WVS	B	No
Bulgaria	Burgas	BG: Burgaska - province of Burgaska -	1995; 2000; 2005	EVS X048	B	No
Bulgaria	Sofia	BG: Sofia-province	1995; 2000; 2005	EVS X048	B	No
Bulgaria	Sofia Stolitsa	BG: Sofia-City	1995; 2000; 2005	EVS X048	B	No
Chile	Antofagasta	CL: Second Region	1990	WVS	B	No
Chile	Araucanía	CL: Ninth Region	1995	WVS	B	No
Chile	Atacama	CL: Third Region	1995	WVS	B	No
Chile	Biobío	CL: Eighth Region	1990; 1995	WVS	B	Yes
Chile	Coquimbo	CL: Fourth Region	1990; 1995	WVS	B	Yes
Chile	Libertador General Bernardo O'Higgins	CL: Sixth Region	1990; 1995	WVS	B	Yes
Chile	Los Lagos	CL: Tenth Region	1990; 1995	WVS	B	Yes
Chile	Maule	CL: Seventh Region	1990; 1995	WVS	B	Yes
Chile	Tarapacá	CL: First Region	1990; 1995	WVS	B	Yes
Chile	Valparaíso	CL: Fifth Region	1990	WVS	B	No
China	Anhui	CN: Anhui Province	2005; 2010	WVS	B	No
China	Fujian	CN: Fujian Province	1990; 2005; 2010	WVS	B	No
China	Guangdong w/ Hainan	CN: Guangdong Province	2005; 2010	WVS	B	No
China	Guangxi	CN: Guangxi Province	2005; 2010	WVS	B	No
China	Guizhou	CN: Guizhou Province	1990; 2005; 2010	WVS	B	No
China	Hebei	CN: Hebei Province	2005; 2010	WVS	B	No
China	Heilongjiang	CN: Heilongjiang Province	2005; 2010	WVS	B	No
China	Henan	CN: Henan Province	2005; 2010	WVS	B	No
China	Hubei	CN: Hubei Province	1990; 2005; 2010	WVS	B	No
China	Hunan	CN: Hunan Province	2005; 2010	WVS	B	No
China	Jiangsu	CN: Jiangsu Province	1990; 2005; 2010	WVS	B	No
China	Jiangxi	CN: Jiangxi Province	1990; 2005; 2010	WVS	B	No

China	Liaoning	CN: Liaoning Province	1990; 2005; 2010	WVS	B	No
China	Shaanxi	CN: Shaannxi Province	1990; 2005; 2010	WVS	B	No
China	Shandong	CN: Shandong Province	2005; 2010	WVS	B	No
China	Shanxi	CN: Shanxi Province	2005; 2010	WVS	B	No
China	Sichuan w/ Chongqing	CN: Sichuan	2005; 2010	WVS	B	No
China	Yunnan	CN: Yunnan Province	2005; 2010	WVS	B	No
China	Zhejiang	CN: Zhejiang Province	2005; 2010	WVS	B	No
Croatia	Krapina-Zagorje	HR: County of Zagorje	2000	EVS X048	B	No
Croatia	Požega-Slavonia	HR: County of Pozega	2000	EVS X048	B	No
Croatia	Šibenik-Knin	HR: County of Sibenik	2000	EVS X048	B	No
Croatia	Zadar	HR: County of Zadar and Knin	2000	EVS X048	B	No
Czech Republic	Moravskoslezský kraj	CZ: Moravia	1995	EVS X048	B	No
Czech Republic	Moravskoslezský kraj	CZ: Severomoravský kraj - North Moravia -	1995; 2000	WVS	B	No
Czech Republic	Moravskoslezský kraj	CZ: Ceska Republika - Stredni Morava	2010	EVS X048B	B	No
Denmark	Capital region	DK: Københavns Amt	1980; 1990; 2000	EVS X048	B	No
Denmark	Capital region	DK: København	1980; 1995; 2005	EVS X048	B	No
Denmark	Capital region	DK: Danmark - Hovedstaden	2010	EVS X048B	B	No
Estonia	Harju county	EE: Harjumaa	1996	WVS	B	No
Estonia	Hiiu county	EE: Hiiumaa	1996	WVS	B	No
Estonia	Ida-Viru county	EE: Isa-Virumaa	1996	WVS	B	No
Estonia	Järva county	EE: Jravamaa	1996	WVS	B	No
Estonia	Jõgeva county	EE: Jogevamaa	1996	WVS	B	No
Estonia	Lääne county	EE: Laanemaa	1996	WVS	B	No
Estonia	Lääne-Viru county	EE: Laane-Viruma	1996	WVS	B	No
Estonia	Pärnu county	EE: Parnumaa	1996	WVS	B	No
Estonia	Põlva county	EE: Polvamaa	1996	WVS	B	No
Estonia	Rapla county	EE: Raplama	1996	WVS	B	No

Estonia	Saare county	EE: Saaremaa	1996	WVS	B	No
Estonia	Tartu county	EE: Tartumaa	1996	WVS	B	No
Estonia	Valga county	EE: Valgamaa	1996	WVS	B	No
Estonia	Viljandi county	EE: Vijandimaa	1996	WVS	B	No
Estonia	Võru county	EE: Vorumaa	1996	WVS	B	No
Finland	Etelã-Suomi w/ Uusimaa	FI: Manner-Suomi - Etelä-Suomi	2010	EVS X048B	B	No
Hungary	Bács-Kiskun	HU: Bács	2000	EVS X048	B	No
Hungary	Hajdú-Bihar	HU: Hajdu	2000	EVS X048	B	No
Hungary	Jász-N-Sz	HU: Szolnok	2000	EVS X048	B	No
India	Assam w/ Mizoram	IN: Assam	2005; 2010	WVS	B	No
Indonesia	Bengkulu	ID: Bengkulu province	2005	WVS	B	No
Indonesia	C. Java	ID: Central Java province	2005; 2010	WVS	B	No
Indonesia	Jakarta	ID: Jakarta province	2005	WVS	B	No
Indonesia	Jambi	ID: Jambi province	2005	WVS	B	No
Indonesia	W. Java	ID: West java province	2005; 2010	WVS	B	No
Iran, Islamic Rep.	Chaharmahal and Bakhtiyari	IR: Chaharmahal	2000; 2010	WVS	B	No
Iran, Islamic Rep.	Kohgiluyeh and Boyerahmad	IR: Boyer ahmad	2000; 2010	WVS	B	No
Kazakhstan	Aktobe	KZ: Aktyubinsk region	2010	WVS	B	No
Korea, Rep.	Chungnam w/ Daejeon	KR: Chungnam / South Chungcheong	2000; 2005; 2010	WVS	B	No
Korea, Rep.	Gyeongnam w/ Ulsan	KR: Kyeongnam / South Gyeongsang	2000; 2005; 2010	WVS	B	No
Latvia	Aizkraukle district	LV: Aizkraukles d.	2000	WVS	B	No
Latvia	Aluksne district	LV: Aluksness d.	2000	WVS	B	No
Latvia	Balvi district	LV: Balvu d.	2000	WVS	B	No
Latvia	Bauskas rajons	LV: Bauskas d.	2000	WVS	B	No
Latvia	Daugavpils rajons	LV: Daugavpils	2000	WVS	B	No
Latvia	Liepâjas rajons	LV: Liepaja	2000	WVS	B	No
Latvia	Rçzeknes rajons	LV: Rezeknes d.	2000	WVS	B	No

Latvia	Rîgas rajons	LV: Riga	2000; 2005	EVS X048	B	No
Latvia	Ventspils district	LV: Ventpils d.	2000	WVS	B	No
Lithuania	Kauno apskritis	LT: Kaunas	2000	WVS	B	No
Lithuania	Klaipedos apskritis	LT: Klaipeda	2000	WVS	B	No
Lithuania	Panevezio apskritis	LT: Panevezys	2000	WVS	B	No
Lithuania	Siauliu apskritis	LT: Siauliai	2000	WVS	B	No
Lithuania	Vilniaus apskritis	LT: South East Lithuania	2000	EVS X048	B	No
Lithuania	Vilniaus apskritis	LT: Vilnius	2000	WVS	B	No
Malaysia	Sabah w/ Labuan	MY: Sabah	2010	WVS	B	No
Malaysia	Selangor w/ Kuala Lumpur	MY: Selangor	2010	WVS	B	No
Mexico	Baja California Norte	MX: Baja California	2005; 2010	WVS	B	No
Mexico	Mexico	MX: Zona metropolitana	1980; 1995	WVS	B	No
Mexico	Mexico	MX: Estado de México	2005; 2010	WVS	B	No
Morocco	Tansift	MA: Marrakech Tensift	2005; 2010	WVS	B	No
Pakistan	Punjab w/ Islamabad	PK: Punjab	2000	WVS	B	No
Peru	Lima w/ Callao	PE: GRAN LIMA	2005	WVS	B	No
Peru	Lima w/ Callao	PE: Lima	2001; 2010	WVS	B	No
Peru	Loreto w/ Ucayali	PE: Loreto	2010	WVS	B	No
Philippines	Metro Manila	PH: NCR	1997; 2006; 2010	WVS	B	No
Poland	Pomorskie-Zachodniopomorskie	PL: Pomorsie	2000	EVS X048	B	No
Poland	Pomorskie-Zachodniopomorskie	PL: Zachodniopomorskie	2000	EVS X048	B	No
Poland	Pomorskie-Zachodniopomorskie	PL: Region Pólnocno-Zachodni - Zachodniopomorskie	2010	EVS X048B	B	No
Poland	Pomorskie-Zachodniopomorskie	PL: Region Pólnocny - Pomorskie	2010	EVS X048B	B	No
Serbia	City of Belgrade	CS: Belgrad area	2002	WVS	B	No
Slovenia	Notranjsko-kraska	SI: Kraska	1995; 2000	EVS X048	B	No
South Africa	Natal	ZA: KwaZulu/ Natal (KZN)	2000; 2005; 2010	WVS	B	No

South Africa	Orange Free State	ZA: Free State	2000; 2005; 2010	WVS	B	No
Spain	Ceuta y Melilla	ES: Sur - Ciudad Autónoma de Ceuta	2010	EVS X048B	B	No
Switzerland	Appenzell A&I Rh.	CH: AI	2000	WVS	B	No
Switzerland	Bern w/ Jura	CH: BE	2000	WVS	B	No
Turkey	Ankara and Kirikkale	TR: Ankara (center)	1990; 2000	WVS	B	No
Turkey	Antalya	TR: Antalya (south)	1990; 2000	WVS	B	No
Turkey	Isparta	TR: Isparta (west)	2000	EVS X048	B	No
Turkey	Izmir	TR: Izmir (west)	1990	WVS	B	No
Turkey	Manisa	TR: Manisa (west)	1990; 2000	WVS	B	No
Turkey	Mersin	TR: Mersin (south)	2000	EVS X048	B	No
Turkey	Sanliurfa	TR: Sanliurfa (southeast)	2000	EVS X048	B	No
Turkey	Tokat	TR: Tokat (center north)	2000	EVS X048	B	No
Turkey	Trabzon	TR: Trabzon (north)	2000	EVS X048	B	No
Turkey	Van	TR: Van (east)	2000	EVS X048	B	No
Ukraine	Crimea & Sevastopol	UA: Crimea	2005	EVS X048	B	No
Ukraine	Crimea & Sevastopol	UA: South - Autonomous Republic of Crimea	2010	EVS X048B	B	No
Ukraine	Dnipropetrovsk	UA: Dnipropetrovsk oblast	2005	WVS	B	No
Ukraine	Dnipropetrovsk	UA: East - Dnipropetrovsk Oblast	2010	EVS X048B	B	No
Ukraine	Donetsk	UA: Donetsk oblast	2005	EVS X048	B	No
Ukraine	Donetsk	UA: East - Donetsk Oblast	2010	EVS X048B	B	No
Ukraine	Kharkiv	UA: Kharkiv oblast	2005	EVS X048	B	No
Ukraine	Kharkiv	UA: East - Kharkiv Oblast	2010	EVS X048B	B	No
Ukraine	Kyiv_sub	UA: Kyiv oblast	2005	EVS X048	B	No
Ukraine	Kyiv_sub	UA: North - Kyiv Oblast	2010	EVS X048B	B	No
Ukraine	Odesa	UA: Odessa oblast	2005	EVS X048	B	No
Ukraine	Odesa	UA: South - Odesa Oblast	2010	EVS X048B	B	No
Ukraine	Zaporizhzhya	UA: Zaporizhia oblast	2005	EVS X048	B	No
Ukraine	Zaporizhzhya	UA: East - Zaporizhia Oblast	2010	EVS X048B	B	No

Belgium	Prov. Brabant	BE: Vlaams Brabant	1995; 2000	EVS X048	C	No
Belgium	Prov. Brabant	BE: Waals-Brabant	1995; 2000	EVS X048	C	No
Belgium	Prov. Brabant	BE: Région Wallonne - Prov. Brabant Wallon	2010	EVS X048B	C	No
Belgium	Prov. Brabant	BE: Vlaams gewest - Prov. Vlaams-Brabant	2010	EVS X048B	C	No
China	Guangdong w/ Hainan	CN: Hainan Province	2010	WVS	C	No
Denmark	Jylland	DK: Århus Amt	1985; 1990; 2000	EVS X048	C	No
Denmark	Jylland	DK: Nordjyllands Amt	1985; 1990; 2000	EVS X048	C	No
Denmark	Jylland	DK: Ringkøbing Amt	1985; 1990; 2000	EVS X048	C	No
Denmark	Jylland	DK: Sønderjyllands og Ribe Amt	1985; 1990; 2000	EVS X048	C	No
Denmark	Jylland	DK: Vejle Amt	1985; 1990; 2000	EVS X048	C	No
Denmark	Jylland	DK: Viborg Amt	1985; 1990; 2000	EVS X048	C	No
Denmark	Østsjælland & Vest- og Sydsjælland	DK: Roskilde Amt	1985; 1990; 2000	EVS X048	C	No
Denmark	Østsjælland & Vest- og Sydsjælland	DK: Storstøms Amt	1985; 1990; 2000	EVS X048	C	No
Denmark	Østsjælland & Vest- og Sydsjælland	DK: Vestsjællands Amt	1985; 1990; 2000	EVS X048	C	No
Germany, West	Baden-Wurttemberg	DE: Nord Baden-Wurttemberg	1985; 1990	EVS X048	C	No
Germany, West	Baden-Wurttemberg	DE: Sud Baden-Wurttemberg	1985; 1990	EVS X048	C	No
Germany, West	Bavaria	DE: Bayern - Mittelfranken	2010	EVS X048B	C	No
Germany, West	Bavaria	DE: Bayern - Niederbayern	2010	EVS X048B	C	No
Germany, West	Bavaria	DE: Bayern - Oberbayern	2010	EVS X048B	C	No
Germany, West	Bavaria	DE: Bayern - Oberfranken	2010	EVS X048B	C	No
Germany, West	Bavaria	DE: Bayern - Oberpfalz	2010	EVS X048B	C	No

Germany, West	Bavaria	DE: Bayern - Schwaben	2010	EVS X048B	C	No
Germany, West	Bavaria	DE: Bayern - Unterfranken	2010	EVS X048B	C	No
Germany, West	Berlin	DE: Ost-Berlin	1991	EVS X048	C	No
Germany, West	Berlin	DE: West-Berlin	1991	EVS X048	C	No
Greece	Ipeiros & Dytiki Makedonia	GR: Kentriki Ellada - Ipeiros	2010	EVS X048B	C	No
Greece	Ipeiros & Dytiki Makedonia	GR: Voreia Ellada - Dytiki Makedonia	2010	EVS X048B	C	No
Greece	Kriti	GR: Chania	2000	EVS X048	C	No
Greece	Kriti	GR: Dodekanisos	2000	EVS X048	C	No
Greece	Kriti	GR: Kriti (rest)	2000	EVS X048	C	No
Greece	Nisiá Aigaío	GR: Chios	2000	EVS X048	C	No
Greece	Nisiá Aigaío	GR: Kyklades	2000	EVS X048	C	No
Greece	Nisiá Aigaío	GR: Nisia Aigaiou, Kriti - Notio Aigaio	2010	EVS X048B	C	No
Greece	Nisiá Aigaío	GR: Nisia Aigaiou, Kriti - Voreio Aigaio	2010	EVS X048B	C	No
Greece	Peloponnisos & Dytiki Ellada	GR: Aitoloakarnania	2000	EVS X048	C	No
Greece	Peloponnisos & Dytiki Ellada	GR: Argolida	2000	EVS X048	C	No
Greece	Peloponnisos & Dytiki Ellada	GR: Arkadia	2000	EVS X048	C	No
Greece	Peloponnisos & Dytiki Ellada	GR: Korinthia	2000	EVS X048	C	No
Greece	Peloponnisos & Dytiki Ellada	GR: Lakonia	2000	EVS X048	C	No
Greece	Peloponnisos & Dytiki Ellada	GR: Messinia	2000	EVS X048	C	No

Greece	Peloponnisos & Dytiki Ellada	GR: Voiotia	2000	EVS X048	C	No
Greece	Peloponnisos & Dytiki Ellada	GR: Kentriki Ellada - Dytiki Ellada	2010	EVS X048B	C	No
Greece	Peloponnisos & Dytiki Ellada	GR: Kentriki Ellada - Peloponnisos	2010	EVS X048B	C	No
Greece	Sterea Ellada, Attiki, Ionia Nisia	GR: Attiki	2000	EVS X048	C	No
Greece	Sterea Ellada, Attiki, Ionia Nisia	GR: Evvoia	2000	EVS X048	C	No
Greece	Sterea Ellada, Attiki, Ionia Nisia	GR: Fthiotida	2000	EVS X048	C	No
Greece	Sterea Ellada, Attiki, Ionia Nisia	GR: Kerkyra	2000	EVS X048	C	No
Greece	Sterea Ellada, Attiki, Ionia Nisia	GR: Attiki - Attiki	2010	EVS X048B	C	No
Greece	Sterea Ellada, Attiki, Ionia Nisia	GR: Kentriki Ellada - Ionia Nisia	2010	EVS X048B	C	No
Greece	Sterea Ellada, Attiki, Ionia Nisia	GR: Kentriki Ellada - Sterea Ellada	2010	EVS X048B	C	No
Greece	Thessalia	GR: Karditsa	2000	EVS X048	C	No
Greece	Thessalia	GR: Larisa	2000	EVS X048	C	No
Greece	Thessalia	GR: Magnisia	2000	EVS X048	C	No
Greece	Thessalia	GR: Thessalia (rest)	2000	EVS X048	C	No
Greece	Thessalia	GR: Trikala	2000	EVS X048	C	No
Iran, Islamic Rep.	Khorasan & Yazd	IR: Khorasan	2000; 2010	WVS	C	No
Iran, Islamic Rep.	Mazandaran & Golestan	IR: Mazandaran	2000	WVS	C	No
Iran, Islamic Rep.	Mazandaran & Golestan	IR: Golestan	2000; 2010	WVS	C	No
Iran, Islamic Rep.	Zanjan & Qazvin	IR: Ghazvin	2000; 2010	WVS	C	No
Ireland	Border	IE: Cavan	1991	EVS X048	C	No

Ireland	Border	IE: Donegal	1991	EVS X048	C	No
Ireland	Border	IE: Leitrim	1991	EVS X048	C	No
Ireland	Border	IE: Louth	1991	EVS X048	C	No
Ireland	Border	IE: Monaghan	1991	EVS X048	C	No
Ireland	Border	IE: Sligo	1991	EVS X048	C	No
Ireland	Mid-East w/ Dublin	IE: Dublin City	1991	EVS X048	C	No
Ireland	Mid-East w/ Dublin	IE: Dublin County	1991	EVS X048	C	No
Ireland	Mid-East w/ Dublin	IE: Kildkare	1991	EVS X048	C	No
Ireland	Mid-East w/ Dublin	IE: Meath	1991	EVS X048	C	No
Ireland	Mid-East w/ Dublin	IE: Wicklow	1991	EVS X048	C	No
Ireland	Midland	IE: Laois	1991	EVS X048	C	No
Ireland	Midland	IE: Longford	1991	EVS X048	C	No
Ireland	Midland	IE: Offaly	1991	EVS X048	C	No
Ireland	Midland	IE: Westmeath	1991	EVS X048	C	No
Ireland	Mid-West,IRE	IE: Clare	1991	EVS X048	C	No
Ireland	Mid-West,IRE	IE: Limerick City	1991	EVS X048	C	No
Ireland	Mid-West,IRE	IE: Limerick County	1991	EVS X048	C	No
Ireland	Mid-West,IRE	IE: Tipp N	1991	EVS X048	C	No
Ireland	South-West	IE: Cork City	1991	EVS X048	C	No
Ireland	South-West	IE: Cork County	1991	EVS X048	C	No
Ireland	South-West	IE: Kerry	1991	EVS X048	C	No
Ireland	West	IE: Galway	1991	EVS X048	C	No
Ireland	West	IE: Mayo	1991	EVS X048	C	No
Ireland	West	IE: Roscommon	1991	EVS X048	C	No
Kazakhstan	Akmola & Astana City	KZ: Akmolinsk region	2010	WVS	C	No
Kazakhstan	Akmola & Astana City	KZ: Astana	2010	WVS	C	No
Latvia	Jelgavas rajons	LV: Jelgava	2000	WVS	C	No
Lithuania	Alytaus apskritis	LT: Aukstaitija	2000	EVS X048	C	No
Lithuania	Alytaus apskritis	LT: Dzukija	2000	EVS X048	C	No

Lithuania	Marijampoles apskritis	LT: Suvalkija	2000	EVS X048	C	No
Lithuania	Telsiu apskritis	LT: Zemaitija	2000	EVS X048	C	No
Malaysia	Kedah and Perlis	MY: Kedah	2010	WVS	C	No
Pakistan	Balochistan	PK: Rural Balochistan	2004	WVS	C	No
Pakistan	Balochistan	PK: Urban Balochistan	2004	WVS	C	No
Pakistan	NWFP	PK: Rural NWFP (Khyber Pakhtunkhwa)	2004	WVS	C	No
Pakistan	Punjab w/ Islamabad	PK: Islamabad	2004	WVS	C	No
Pakistan	Sindh	PK: Rural Sindh	2004	WVS	C	No
Poland	Lubuskie	PL: Gorzowskie	1990	EVS X048	C	No
Poland	Podkarpackie	PL: Rzeszowskie	1990	EVS X048	C	No
Portugal	Centro	PT: Literoral Centro	1990	EVS X048	C	No
South Africa	Natal	ZA: Durban	1995	WVS	C	No
South Africa	Natal	ZA: Rest of Natal	1995	WVS	C	No
South Africa	Orange Free State	ZA: Bloemfontein	1995	WVS	C	No
South Africa	Orange Free State	ZA: Rest of Orange Free State	1995	WVS	C	No
South Africa	Transvaal	ZA: Rest of Transvaal	1995	WVS	C	No
Sweden	Skåne	SE: Norr	2000	EVS X048	C	No
Sweden	Skåne	SE: Öst	2000	EVS X048	C	No
Sweden	Skåne	SE: Syd	2000	EVS X048	C	No
Sweden	Skåne	SE: Väst	2000	EVS X048	C	No
Sweden	Västra Götaland	SE: Alvsborg	1990	EVS X048	C	No
Sweden	Västra Götaland	SE: Skaraborg	1990	EVS X048	C	No
Sweden	Västra Götaland	SE: Stor Göteborg och Bohus	1990; 2000	EVS X048	C	No
United Kingdom	Midlands	GB-GBN: East Midlands	1995; 2000	EVS X048	C	No
United Kingdom	Midlands	GB-GBN: West Midlands	1995; 2000	EVS X048	C	No
United Kingdom	Midlands	GB: West Midlands	2000; 2005	WVS	C	No

United Kingdom	Midlands	GB-GBN: East Midlands (England) – Derbyshire and Nottinghamshire	2010	EVS X048B	C	No
United Kingdom	Midlands	GB-GBN: East Midlands (England) – Leicestershire, Rutland and Northamptonshire	2010	EVS X048B	C	No
United Kingdom	Midlands	GB-GBN: East Midlands (England) – Lincolnshire	2010	EVS X048B	C	No
United Kingdom	Midlands	GB-GBN: East of England – Bedfordshire and Hertfordshire	2010	EVS X048B	C	No
United Kingdom	Midlands	GB-GBN: West Midlands (England) – Herefordshire, Worcestershire and Warwickshire	2010	EVS X048B	C	No
United Kingdom	Midlands	GB-GBN: West Midlands (England) – Shropshire and Staffordshire	2010	EVS X048B	C	No
United Kingdom	Midlands	GB-GBN: West Midlands (England) – West Midlands	2010	EVS X048B	C	No
United Kingdom	North West,GB	GB-GBN: North West (England) – Cheshire	2010	EVS X048B	C	No
United Kingdom	North West,GB	GB-GBN: North West (England) – Cumbria	2010	EVS X048B	C	No
United Kingdom	North West,GB	GB-GBN: North West (England) – Greater Manchester	2010	EVS X048B	C	No
United Kingdom	North West,GB	GB-GBN: North West (England) – Lancashire	2010	EVS X048B	C	No
United Kingdom	North West,GB	GB-GBN: North West (England) – Merseyside	2010	EVS X048B	C	No
United Kingdom	Scotland	GB-GBN: Scotland – Eastern Scotland	2010	EVS X048B	C	No
United Kingdom	Scotland	GB-GBN: Scotland – Highlands and Islands	2010	EVS X048B	C	No
United Kingdom	Scotland	GB-GBN: Scotland – South Western Scotland	2010	EVS X048B	C	No
United Kingdom	South East w/ London	GB-GBN: London	1995; 2000	EVS X048	C	No

United Kingdom	South East w/ London	GB-GBN: South East	2000	EVS X048	C	No
United Kingdom	South East w/ London	GB: South East	2005	WVS	C	No
United Kingdom	South East w/ London	GB-GBN: East of England – Essex	2010	EVS X048B	C	No
United Kingdom	South East w/ London	GB-GBN: London – Inner London	2010	EVS X048B	C	No
United Kingdom	South East w/ London	GB-GBN: London – Outer London	2010	EVS X048B	C	No
United Kingdom	South East w/ London	GB-GBN: South East (England) – Berkshire, Buckinghamshire and Oxfordshire	2010	EVS X048B	C	No
United Kingdom	South East w/ London	GB-GBN: South East (England) – Hampshire and Isle of Wight	2010	EVS X048B	C	No
United Kingdom	South East w/ London	GB-GBN: South East (England) – Kent	2010	EVS X048B	C	No
United Kingdom	South East w/ London	GB-GBN: South East (England) – Surrey, East and West Sussex	2010	EVS X048B	C	No
United Kingdom	South West,GB	GB-GBN: South West (England) – Cornwall and Isles of Scilly	2010	EVS X048B	C	No
United Kingdom	South West,GB	GB-GBN: South West (England) – Devon	2010	EVS X048B	C	No
United Kingdom	South West,GB	GB-GBN: South West (England) – Dorset and Somerset	2010	EVS X048B	C	No
United Kingdom	South West,GB	GB-GBN: South West (England) – Gloucestershire, Wiltshire and Bristol/Bath area	2010	EVS X048B	C	No
United Kingdom	Wales	GB-GBN: Wales – East Wales	2010	EVS X048B	C	No
United Kingdom	Wales	GB-GBN: Wales – West Wales and The Valleys	2010	EVS X048B	C	No
United Kingdom	Yorkshire	GB-GBN: Yorks & Humberside	2000	EVS X048	C	No

United Kingdom	Yorkshire	GB: Yorks & Humberside	2000; 2005	WVS	C	No
United Kingdom	Yorkshire	GB-GBN: Yorkshire and the Humber – East Yorkshire and Northern Lincolnshire	2010	EVS X048B	C	No
United Kingdom	Yorkshire	GB-GBN: Yorkshire and the Humber – North Yorkshire	2010	EVS X048B	C	No
United Kingdom	Yorkshire	GB-GBN: Yorkshire and the Humber – South Yorkshire	2010	EVS X048B	C	No
United Kingdom	Yorkshire	GB-GBN: Yorkshire and the Humber – West Yorkshire	2010	EVS X048B	C	No
Bangladesh	Khulna	BD: Jhenaidah	1999; 2005	WVS	D	No
Belgium	Prov. Brabant	BE: Brussel	2005	EVS X048	D	No
Brazil	Amazonas, MG, MG do Sul, Rondônia, Roraima	BR: AM	2010	WVS	D	No
Brazil	Amazonas, MG, MG do Sul, Rondônia, Roraima	BR: MS	2010	WVS	D	No
Brazil	Amazonas, MG, MG do Sul, Rondônia, Roraima	BR: MT	2010	WVS	D	No
Brazil	Goiás, DF, Tocantins	BR: DF	2010	WVS	D	No
Brazil	Goiás, DF, Tocantins	BR: GO	2010	WVS	D	No
China	Gansu w/ Inner Mongolia & Ningxia	CN: Neimenggu	2005	WVS	D	No
China	Gansu w/ Inner Mongolia & Ningxia	CN: Ningxia Province	2010	WVS	D	No
Denmark	Capital region	DK: Frederiksborg Amt	1985	EVS X048	D	No
Denmark	Jylland	DK: Danmark - Midtjylland	2010	EVS X048B	D	No
Denmark	Jylland	DK: Danmark - Nordjylland	2010	EVS X048B	D	No
Finland	Etelã-Suomi w/ Uusimaa	FI: Kymen	2000	WVS	D	No

Finland	Etelã-Suomi w/ Uusimaa	FI: Etelä-Karjala	2000	EVS X048	D	No
Finland	Etelã-Suomi w/ Uusimaa	FI: Kanta-Häme	2000	EVS X048	D	No
Finland	Etelã-Suomi w/ Uusimaa	FI: Kymenlaakso	2000	EVS X048	D	No
Finland	Etelã-Suomi w/ Uusimaa	FI: Päijät-Häme	2000	EVS X048	D	No
Finland	Etelã-Suomi w/ Uusimaa	FI: Varsinais-Suomi	2000	EVS X048	D	No
Finland	Etelã-Suomi w/ Uusimaa	FI: Uusimaa	2000; 2005	EVS X048	D	No
Finland	Itã-Suomi	FI: Kuopion	2000	WVS	D	No
Finland	Itã-Suomi	FI: Etelä-Savo	2000	EVS X048	D	No
Finland	Itã-Suomi	FI: Kainuu	2000	EVS X048	D	No
Finland	Itã-Suomi	FI: Pohjois-Karjala	2000	EVS X048	D	No
Finland	Itã-Suomi	FI: Pohjois-Savo	2000; 2005	EVS X048	D	No
Finland	Pohjois-Suomi	FI: Lapin	2000	WVS	D	No
Finland	Pohjois-Suomi	FI: Keski-Pohjanmaa	2000	EVS X048	D	No
Finland	Pohjois-Suomi	FI: Lappi	2000	EVS X048	D	No
Finland	Pohjois-Suomi	FI: Pohjois-Pohjanmaa	2000; 2005	EVS X048	D	No
Finland	Väli-Suomi	FI: Hämeen	2000	WVS	D	No
Finland	Väli-Suomi	FI: Keski-Suomi	2000	EVS X048	D	No
Finland	Väli-Suomi	FI: Pirkanmaa	2000	EVS X048	D	No
Finland	Väli-Suomi	FI: Pohjanmaa	2000	EVS X048	D	No
Finland	Väli-Suomi	FI: Satakunta	2000	EVS X048	D	No
Finland	Väli-Suomi	FI: Etelä-Pohjanmaa	2000; 2005	EVS X048	D	No
Finland	Väli-Suomi	FI: Manner-Suomi - Länsi-Suomi	2010	EVS X048B	D	No
Germany, East	Brandenburg	DE: Cottbus	1991	EVS X048	D	No
Germany, East	Brandenburg	DE: Frankfurt/Oder	1991	EVS X048	D	No
Germany, East	Brandenburg	DE: Potsdam	1991	EVS X048	D	No

Germany, East	Brandenburg	DE: Brandenburg - Brandenburg - Nordost	2010	EVS X048B	D	No
Germany, East	Brandenburg	DE: Brandenburg - Brandenburg-Südwest	2010	EVS X048B	D	No
Germany, East	Mecklenburg-West Pomerania	DE: Neubrandenburg	1991	EVS X048	D	No
Germany, East	Mecklenburg-West Pomerania	DE: Rostock	1991	EVS X048	D	No
Germany, East	Mecklenburg-West Pomerania	DE: Schwerin	1991	EVS X048	D	No
Germany, East	Saxony	DE: Dresden	1991	EVS X048	D	No
Germany, East	Saxony	DE: Karl Marxstadt (Chemnitz)	1991	EVS X048	D	No
Germany, East	Saxony	DE: Leipzig	1991	EVS X048	D	No
Germany, East	Saxony	DE: Sachsen - Chemnitz	2010	EVS X048B	D	No
Germany, East	Saxony	DE: Sachsen - Dresden	2010	EVS X048B	D	No
Germany, East	Saxony	DE: Sachsen - Leipzig	2010	EVS X048B	D	No
Germany, East	Saxony-Anhalt	DE: Halle	1991	EVS X048	D	No
Germany, East	Saxony-Anhalt	DE: Magdeburg	1991	EVS X048	D	No
Germany, East	Thuringia	DE: Erfurt	1991	EVS X048	D	No
Germany, East	Thuringia	DE: Gera	1991	EVS X048	D	No
Germany, East	Thuringia	DE: Suhl	1991	EVS X048	D	No
Germany, West	Baden-Wurttemberg	DE: Baden-Württemberg - Freiburg	2010	EVS X048B	D	No
Germany, West	Baden-Wurttemberg	DE: Baden-Württemberg - Karlsruhe	2010	EVS X048B	D	No
Germany, West	Baden-Wurttemberg	DE: Baden-Württemberg - Stuttgart	2010	EVS X048B	D	No
Germany, West	Baden-Wurttemberg	DE: Baden-Württemberg - Tübingen	2010	EVS X048B	D	No
Germany, West	Hesse	DE: Hessen - Darmstadt	2010	EVS X048B	D	No
Germany, West	Hesse	DE: Hessen - Gießen	2010	EVS X048B	D	No

Germany, West	Hesse	DE: Hessen - Kassel	2010	EVS X048B	D	No
Germany, West	Lower Saxony	DE: Niedersachsen - Braunschweig	2010	EVS X048B	D	No
Germany, West	Lower Saxony	DE: Niedersachsen - Hannover	2010	EVS X048B	D	No
Germany, West	Lower Saxony	DE: Niedersachsen - Lüneburg	2010	EVS X048B	D	No
Germany, West	Lower Saxony	DE: Niedersachsen - Weser-Ems	2010	EVS X048B	D	No
Germany, West	North Rhine-Westphalia	DE: Nordrhein-Westfalen - Arnsberg	2010	EVS X048B	D	No
Germany, West	North Rhine-Westphalia	DE: Nordrhein-Westfalen - Detmold	2010	EVS X048B	D	No
Germany, West	North Rhine-Westphalia	DE: Nordrhein-Westfalen - Düsseldorf	2010	EVS X048B	D	No
Germany, West	North Rhine-Westphalia	DE: Nordrhein-Westfalen - Köln	2010	EVS X048B	D	No
Germany, West	North Rhine-Westphalia	DE: Nordrhein-Westfalen - Münster	2010	EVS X048B	D	No
Germany, West	Rhineland-Palatinate	DE: Rheinland-Pfalz - Koblenz	2010	EVS X048B	D	No
Germany, West	Rhineland-Palatinate	DE: Rheinland-Pfalz - Rheinhessen-Pfalz	2010	EVS X048B	D	No
Ireland	South-East	IE: Carlow	1991	EVS X048	D	No
Ireland	South-East	IE: Waterford City	1991	EVS X048	D	No
Ireland	South-East	IE: Waterford County	1991	EVS X048	D	No
Ireland	South-East	IE: Wexford	1991	EVS X048	D	No
Korea, Rep.	Jeollanam-do w/ Gwangju	KR: Jeonnam / South Jeolla	2000; 2005; 2010	WVS	D	No
Latvia	Rîgas rajons	LV: Jurmala	2000	WVS	D	No
Macedonia	East	MK: Bregalnicki	2000; 2005	WVS	D	No
Macedonia	Southwest	MK: Ohridski	2000; 2005	WVS	D	No
Morocco	Central,MOR	MA: Chaouia Ouadigha	2005; 2010	WVS	D	No

Morocco	Central,MOR	MA: Boukkala Abda	2010	WVS	D	No
Morocco	North-Central	MA: Fès Boulemane	2005; 2010	WVS	D	No
Morocco	Northwestern	MA: Gharb Chrarda	2005; 2010	WVS	D	No
Morocco	South-Central	MA: Meknès Tafilalet	2005; 2010	WVS	D	No
Nigeria	North East	NG: Maduguri	1992	WVS	D	No
Nigeria	North West,NG	NG: Kaduna	1992	WVS	D	No
Nigeria	North West,NG	NG: Kano	1992	WVS	D	No
Nigeria	North West,NG	NG: Zaria	1992	WVS	D	No
Nigeria	South East	NG: Enuou	1992	WVS	D	No
Nigeria	South East	NG: Owerri	1992	WVS	D	No
Nigeria	South West,NG	NG: Lagos	1992; 2008	WVS	D	No
Peru	Ancash	PE: Chimbote	2001	WVS	D	No
Peru	Junín	PE: Huancayo	2001	WVS	D	No
Peru	La Libertad,PER	PE: Trujillo	2001	WVS	D	No
Peru	Lambayeque	PE: Chiclayo	2001	WVS	D	No
Peru	Loreto w/ Ucayali	PE: Iquitos	2001	WVS	D	No
Peru	Puno	PE: Juliaca	2001	WVS	D	No
Poland	Dolnoslaskie	PL: Wroclawskie	1990	EVS X048	D	No
Poland	Kujawsko-Pomorskie	PL: Bydgoskie	1990	EVS X048	D	No
Poland	Lódzkie	PL: Piotrkowskie	1990	EVS X048	D	No
Poland	Lubelskie	PL: Bialskopodlaskie	1990	EVS X048	D	No
Poland	Malopolskie	PL: Krakowskie	1990	EVS X048	D	No
Poland	Mazowieckie	PL: Ciechanowskie	1990	EVS X048	D	No
Poland	Podlaskie	PL: Suwalskie	1990	EVS X048	D	No
Poland	Pomorskie-Zachodniopomorskie	PL: Szczecinskie	1990	EVS X048	D	No
Poland	Slaskie	PL: Bielskie	1990	EVS X048	D	No
Poland	Swietokrzyskie	PL: Kielecki	1990	EVS X048	D	No
Poland	Warminsko-Mazurskie	PL: Elblaskie	1990	EVS X048	D	No

Poland	Wielkopolskie	PL: Poznanskie	1990	EVS X048	D	No
Portugal	Norte	PT: Grande Porto	1990	EVS X048	D	No
Portugal	Norte	PT: Interior Norte	1990	EVS X048	D	No
Portugal	Norte	PT: Litoral Norte	1990	EVS X048	D	No
Slovenia	Jugovzhodna Slovenija	SI: Dolensjka	1995; 2000	EVS X048	D	No
Slovenia	Obalno-kraska	SI: Primorska	2000	EVS X048	D	No
South Africa	Cape Province	ZA: Cape Town	1995	WVS	D	No
South Africa	Cape Province	ZA: East London	1995	WVS	D	No
South Africa	Cape Province	ZA: Kimberly	1995	WVS	D	No
South Africa	Cape Province	ZA: Rest of Cape Providence	1995	WVS	D	No
South Africa	Cape Province	ZA: Eastern Cape	2000; 2005; 2010	WVS	D	No
South Africa	Cape Province	ZA: Northern Cape	2000; 2005; 2010	WVS	D	No
South Africa	Cape Province	ZA: Western Cape	2000; 2005; 2010	WVS	D	No
South Africa	Transvaal	ZA: Johannesburg	1995	WVS	D	No
South Africa	Transvaal	ZA: Pretoria	1995	WVS	D	No
South Africa	Transvaal	ZA: Reaf/Vaal	1995	WVS	D	No
South Africa	Transvaal	ZA: Gauteng	2000; 2005; 2010	WVS	D	No
South Africa	Transvaal	ZA: Mpumalanga	2000; 2005; 2010	WVS	D	No
South Africa	Transvaal	ZA: North West	2000; 2005; 2010	WVS	D	No
South Africa	Transvaal	ZA: Northern Province/Limpopo	2000; 2005; 2010	WVS	D	No
Sweden	Örebro	SE: Kopparberg	1990	EVS X048	D	No
Sweden	Skåne	SE: Kristianstad	1990	EVS X048	D	No
Sweden	Skåne	SE: Malmohus	1990	EVS X048	D	No
Sweden	Skåne	SE: Öresund	2000	EVS X048	D	No
Turkey	Adana, Gaziantep	TR: Adana	1990; 2000	WVS	D	No
Turkey	Adana, Gaziantep	TR: Gaziantep (southeast)	2000	EVS X048	D	No
Turkey	Bursa, Istanbul, Kocaeli	TR: Bursa	1990; 2000	WVS	D	No
Turkey	Bursa, Istanbul, Kocaeli	TR: Istanbul (northwest)	2000	EVS X048	D	No

United Kingdom	North	GB-GBN: North East	1995; 2000	EVS X048	D	No
United Kingdom	North	GB-GBN: North East (England) – Northumberland and Tyne and Wear	2010	EVS X048B	D	No
United Kingdom	North	GB-GBN: North East (England) – Tees Valley and Durham	2010	EVS X048B	D	No
United Kingdom	South East w/ London	GB-GBN: Home countries/Kent/Sussex	1995	EVS X048	D	No
United Kingdom	South East w/ London	GB-GBN: South	1995	EVS X048	D	No
Albania	Fleri	AL: Albania – South-Albania	2009	EVS X048B	E	No
Australia	Capital Territory	AU: New South Wales and ACT (NSW&ACT)	1995	WVS	E	Yes
Australia	New South Wales	AU: New South Wales and ACT (NSW&ACT)	1995	WVS	E	No
Bosnia and Herzegovina	Bosansko-podrinjski k.	BA: Bosna i Hercegovina - Federacija Bosne i Hercegovine	2010	EVS X048B	E	Yes
Bosnia and Herzegovina	Herceg-bosanski k.	BA: Bosna i Hercegovina - Federacija Bosne i Hercegovine	2010	EVS X048B	E	Yes
Bosnia and Herzegovina	Hercegovacko-nerevtvanski k.	BA: Bosna i Hercegovina - Federacija Bosne i Hercegovine	2010	EVS X048B	E	Yes
Bosnia and Herzegovina	Posavski k.	BA: Bosna i Hercegovina - Federacija Bosne i Hercegovine	2010	EVS X048B	E	Yes
Bosnia and Herzegovina	Sarajevski k.	BA: Bosna i Hercegovina - Federacija Bosne i Hercegovine	2010	EVS X048B	E	Yes
Bosnia and Herzegovina	Srednjo-bosanski k.	BA: Bosna i Hercegovina - Federacija Bosne i Hercegovine	2010	EVS X048B	E	Yes
Bosnia and Herzegovina	Tuzlanski k.	BA: Bosna i Hercegovina - Federacija Bosne i Hercegovine	2010	EVS X048B	E	No
Bosnia and Herzegovina	Unsko-sanski k.	BA: Bosna i Hercegovina - Federacija Bosne i Hercegovine	2010	EVS X048B	E	Yes

Bosnia and Herzegovina	Zapadno-hercegovacki k.	BA: Bosna i Hercegovina - Federacija Bosne i Hercegovine	2010	EVS X048B	E	Yes
Bosnia and Herzegovina	Zenicko-dobojski k.	BA: Bosna i Hercegovina - Federacija Bosne i Hercegovine	2010	EVS X048B	E	Yes
Brazil	Amazonas, MG, MG do Sul, Rondônia, Roraima	BR: Northwest	1995	WVS	E	No
Bulgaria	Blagoevgrad	BG: Sofia-province	1995; 2005	EVS X048	E	Yes
Bulgaria	Blagoevgrad	BG: Yugozapadna i yuzhna tsentralna Bulgaria - Yugozapaden	2010	EVS X048B	E	Yes
Bulgaria	Burgas	BG: Severna i iztochna Bulgaria - Yugoiztochen	2010	EVS X048B	E	No
Bulgaria	Dobrich	BG: Varienska - Province of Varienska -	1995	EVS X048	E	Yes
Bulgaria	Dobrich	BG: Varna	2005	WVS	E	Yes
Bulgaria	Dobrich	BG: Severna i iztochna Bulgaria - Severoiztochen	2010	EVS X048B	E	Yes
Bulgaria	Gabrovo	BG: Loveschka	1995; 2005	EVS X048	E	Yes
Bulgaria	Gabrovo	BG: Severna i iztochna Bulgaria - Severen tsentralen	2010	EVS X048B	E	Yes
Bulgaria	Haskovo	BG: Xaskovska	1995	EVS X048	E	Yes
Bulgaria	Haskovo	BG: Yugozapadna i yuzhna tsentralna Bulgaria - Yuzhen tsentralen	2010	EVS X048B	E	Yes
Bulgaria	Karzhali	BG: Xaskovska	1995	EVS X048	E	Yes
Bulgaria	Karzhali	BG: Haskovo	2005	WVS	E	Yes
Bulgaria	Karzhali	BG: Yugozapadna i yuzhna tsentralna Bulgaria - Yuzhen tsentralen	2010	EVS X048B	E	Yes
Bulgaria	Kyustendil	BG: Sofia-province	1995; 2005	EVS X048	E	Yes
Bulgaria	Kyustendil	BG: Yugozapadna i yuzhna tsentralna Bulgaria - Yugozapaden	2010	EVS X048B	E	Yes
Bulgaria	Lovech	BG: Loveschka	1995; 2005	EVS X048	E	No

Bulgaria	Lovech	BG: Severna i iztochna Bulgaria - Severozapaden	2010	EVS X048B	E	No
Bulgaria	Montana,BUL	BG: Mikchailovgradska	1995	EVS X048	E	No
Bulgaria	Montana,BUL	BG: Severna i iztochna Bulgaria - Severozapaden	2010	EVS X048B	E	Yes
Bulgaria	Pazardzhik	BG: Plovdiv	1995; 2005	EVS X048	E	Yes
Bulgaria	Pazardzhik	BG: Yugozapadna i yuzhna tsentralna Bulgaria - Yuzhen tsentralen	2010	EVS X048B	E	Yes
Bulgaria	Pernik	BG: Sofia-province	1995; 2005	EVS X048	E	Yes
Bulgaria	Pernik	BG: Yugozapadna i yuzhna tsentralna Bulgaria - Yugozapaden	2010	EVS X048B	E	Yes
Bulgaria	Pleven	BG: Loveschka	1995; 2005	EVS X048	E	Yes
Bulgaria	Pleven	BG: Severna i iztochna Bulgaria - Severozapaden	2010	EVS X048B	E	Yes
Bulgaria	Plovdiv	BG: Yugozapadna i yuzhna tsentralna Bulgaria - Yuzhen tsentralen	2010	EVS X048B	E	No
Bulgaria	Razgrad	BG: Razgradska - Province of Razgradska -	1995	EVS X048	E	No
Bulgaria	Razgrad	BG: Severna i iztochna Bulgaria - Severen tsentralen	2010	EVS X048B	E	Yes
Bulgaria	Ruse	BG: Severna i iztochna Bulgaria - Severen tsentralen	2010	EVS X048B	E	No
Bulgaria	Ruse	BG: Razgradska - Province of Razgradska -	1995	EVS X048	E	Yes
Bulgaria	Shumen	BG: Varienska - Province of Varienska -	1995	EVS X048	E	Yes
Bulgaria	Shumen	BG: Varna	2005	WVS	E	Yes
Bulgaria	Shumen	BG: Severna i iztochna Bulgaria - Severoiztochen	2010	EVS X048B	E	Yes
Bulgaria	Silistra	BG: Razgradska - Province of Razgradska -	1995	EVS X048	E	Yes
Bulgaria	Silistra	BG: Severna i iztochna Bulgaria - Severen tsentralen	2010	EVS X048B	E	Yes

Bulgaria	Sliven	BG: Burgaska - province of Burgaska -	1995; 2000; 2005	EVS X048	E	Yes
Bulgaria	Sliven	BG: Severna i iztochna Bulgaria - Yugoiztochen	2010	EVS X048B	E	Yes
Bulgaria	Smolyan	BG: Plovdiv	1995; 2005	EVS X048	E	Yes
Bulgaria	Smolyan	BG: Yugozapadna i yuzhna tsentralna Bulgaria - Yuzhen tsentralen	2010	EVS X048B	E	Yes
Bulgaria	Sofia	BG: Yugozapadna i yuzhna tsentralna Bulgaria - Yugozapaden	2010	EVS X048B	E	Yes
Bulgaria	Sofia Stolitsa	BG: Yugozapadna i yuzhna tsentralna Bulgaria - Yugozapaden	2010	EVS X048B	E	No
Bulgaria	Stara Zagora	BG: Xaskovska	1995	EVS X048	E	No
Bulgaria	Stara Zagora	BG: Haskovo	2005	WVS	E	Yes
Bulgaria	Stara Zagora	BG: Severna i iztochna Bulgaria - Yugoiztochen	2010	EVS X048B	E	Yes
Bulgaria	Targovishte	BG: Razgradska - Province of Razgradska -	1995	EVS X048	E	Yes
Bulgaria	Targovishte	BG: Severna i iztochna Bulgaria - Severoiztochen	2010	EVS X048B	E	Yes
Bulgaria	Varna	BG: Varienska - Province of Varienska -	1995	EVS X048	E	No
Bulgaria	Varna	BG: Severna i iztochna Bulgaria - Severoiztochen	2010	EVS X048B	E	No
Bulgaria	Veliko Tarnovo	BG: Loveschka	1995; 2005	EVS X048	E	Yes
Bulgaria	Veliko Tarnovo	BG: Severna i iztochna Bulgaria - Severen tsentralen	2010	EVS X048B	E	Yes
Bulgaria	Vidin	BG: Mikchailovgradska	1995	EVS X048	E	Yes
Bulgaria	Vidin	BG: Montana	2005	WVS	E	Yes
Bulgaria	Vidin	BG: Severna i iztochna Bulgaria - Severozapaden	2010	EVS X048B	E	Yes
Bulgaria	Vratsa	BG: Mikchailovgradska	1995	EVS X048	E	Yes
Bulgaria	Vratsa	BG: Montana	2005	WVS	E	Yes

Bulgaria	Vratsa	BG: Severna i iztochna Bulgaria - Severozapaden	2010	EVS X048B	E	Yes
Bulgaria	Yambol	BG: Burgaska - province of Burgaska -	1995; 2005	EVS X048	E	Yes
Bulgaria	Yambol	BG: Severna i iztochna Bulgaria - Yugoiztochen	2010	EVS X048B	E	Yes
Colombia	Caqueta	CO: Amazonia	2005	WVS	E	No
Croatia	Bjelovar-Bilogora	HR: Hrvatska - Sredisnja i Istocna (Panonska) Hrvatska	2010	EVS X048B	E	Yes
Croatia	Brod-Posavina	HR: Hrvatska - Sredisnja i Istocna (Panonska) Hrvatska	2010	EVS X048B	E	Yes
Croatia	City of Zagreb	HR: Hrvatska - Sjeverozapadna Hrvatska	2010	EVS X048B	E	No
Croatia	Dubrovnik-Neretva	HR: Hrvatska - Jadranska Hrvatska	2010	EVS X048B	E	Yes
Croatia	Istria	HR: Hrvatska - Jadranska Hrvatska	2010	EVS X048B	E	Yes
Croatia	Karlovac	HR: Hrvatska - Sredisnja i Istocna (Panonska) Hrvatska	2010	EVS X048B	E	Yes
Croatia	Koprivnica-Križevci	HR: Hrvatska - Sjeverozapadna Hrvatska	2010	EVS X048B	E	Yes
Croatia	Krapina-Zagorje	HR: Hrvatska - Sjeverozapadna Hrvatska	2010	EVS X048B	E	Yes
Croatia	Lika-Senj	HR: Hrvatska - Jadranska Hrvatska	2010	EVS X048B	E	Yes
Croatia	Medimurje	HR: Hrvatska - Sjeverozapadna Hrvatska	2010	EVS X048B	E	Yes
Croatia	Osijek-Baranja	HR: Hrvatska - Sredisnja i Istocna (Panonska) Hrvatska	2010	EVS X048B	E	No
Croatia	Požega-Slavonia	HR: Hrvatska - Sredisnja i Istocna (Panonska) Hrvatska	2010	EVS X048B	E	Yes
Croatia	Primorje-Gorski Kotar	HR: Hrvatska - Jadranska Hrvatska	2010	EVS X048B	E	Yes
Croatia	Šibenik-Knin	HR: Hrvatska - Jadranska Hrvatska	2010	EVS X048B	E	Yes
Croatia	Sisak-Moslavina	HR: Hrvatska - Sredisnja i Istocna (Panonska) Hrvatska	2010	EVS X048B	E	Yes
Croatia	Split-Dalmatia	HR: Hrvatska - Jadranska Hrvatska	2010	EVS X048B	E	No

Croatia	Varaždin	HR: Hrvatska - Sjeverozapadna Hrvatska	2010	EVS X048B	E	Yes
Croatia	Virovitica-Podravina	HR: Hrvatska - Sredisnja i Istocna (Panonska) Hrvatska	2010	EVS X048B	E	Yes
Croatia	Vukovar-Syrmia	HR: Hrvatska - Sredisnja i Istocna (Panonska) Hrvatska	2010	EVS X048B	E	Yes
Croatia	Zadar	HR: Hrvatska - Jadranska Hrvatska	2010	EVS X048B	E	Yes
Croatia	Zagreb County	HR: Hrvatska - Sjeverozapadna Hrvatska	2010	EVS X048B	E	Yes
Czech Republic	Jihocecký kraj	CZ: Ceska Republika - Jihozapad	2010	EVS X048B	E	No
Czech Republic	Jihomoravský kraj	CZ: Ceska Republika - Jihovychod	2010	EVS X048B	E	No
Czech Republic	Karlovarský kraj	CZ: Západoèeský kraj - West Bohemia -	1995; 2000; 2005	WVS	E	Yes
Czech Republic	Karlovarský kraj	CZ: Ceska Republika - Severozapad	2010	EVS X048B	E	Yes
Czech Republic	Kraj Vysocina	CZ: Ceska Republika - Jihovychod	2010	EVS X048B	E	Yes
Czech Republic	Královéhradecký kraj	CZ: Východoèeský kraj - East Bohemia -	1995; 2000	WVS	E	No
Czech Republic	Královéhradecký kraj	CZ: Ceska Republika - Severovychod	2010	EVS X048B	E	No
Czech Republic	Liberecký kraj	CZ: Severoèeský kraj - North Bohemia -	1995; 2000	WVS	E	Yes
Czech Republic	Liberecký kraj	CZ: Ceska Republika - Severovychod	2010	EVS X048B	E	Yes
Czech Republic	Olomoucký kraj	CZ: Severomoravský kraj - North Moravia -	1995; 2000; 2005	WVS	E	Yes
Czech Republic	Olomoucký kraj	CZ: Ceska Republika - Stredni Morava	2010	EVS X048B	E	Yes
Czech Republic	Pardubický kraj	CZ: Východoèeský kraj - East Bohemia -	1995; 2000	WVS	E	Yes
Czech Republic	Pardubický kraj	CZ: Ceska Republika - Severovychod	2010	EVS X048B	E	Yes

Czech Republic	Plzenský kraj	CZ: Západoèeský kraj - West Bohemia -	1995; 2000	WVS	E	No
Czech Republic	Plzenský kraj	CZ: Ceska Republika - Jihozapad	2010	EVS X048B	E	Yes
Czech Republic	Ústecký kraj	CZ: Severoèeský kraj - North Bohemia -	1995; 2000; 2005	WVS	E	No
Czech Republic	Ústecký kraj	CZ: Ceska Republika - Severozapad	2010	EVS X048B	E	No
Czech Republic	Zlínský kraj	CZ: Severomoravský kraj - North Moravia -	1995; 2000	WVS	E	Yes
Czech Republic	Zlínský kraj	CZ: Ceska Republika - Stredni Morava	2010	EVS X048B	E	Yes
Denmark	Bornholm	DK: Danmark - Hovedstaden	2010	EVS X048B	E	Yes
Denmark	Fyn	DK: Danmark - Syddanmark	2010	EVS X048B	E	No
Denmark	Østsjælland & Vest- og Sydsjælland	DK: Danmark- Sjælland	2010	EVS X048B	E	No
Egypt, Arab Rep.	Ismailia	EG: Canal zone	2007	WVS	E	No
Egypt, Arab Rep.	Suez	EG: Canal zone	2007	WVS	E	Yes
France	Alsace	FR: Est	1990; 2000	EVS X048	E	Yes
France	Aquitaine	FR: Sud Ouest	1990; 2000	EVS X048	E	No
France	Auvergne	FR: Sud Est	1990	EVS X048	E	Yes
France	Auvergne	FR: Centre Est	2000	EVS X048	E	Yes
France	Basse-Normandie	FR: Bassin Parisien	1990; 2000	EVS X048	E	Yes
France	Bourgogne	FR: Bassin Parisien	1990; 2000	EVS X048	E	Yes
France	Bretagne	FR: Ouest	1990; 2000	EVS X048	E	Yes
France	Centre	FR: Bassin Parisien	1990; 2000	EVS X048	E	No
France	Champagne-Ardenne	FR: Bassin Parisien	1990; 2000	EVS X048	E	Yes
France	Franche-Comté	FR: Est	1990; 2000	EVS X048	E	Yes
France	Haute-Normandie	FR: Bassin Parisien	1990; 2000	EVS X048	E	Yes
France	Languedoc-Roussillon	FR: Méditerranée	1990; 2000	EVS X048	E	Yes

France	Limousin	FR: Sud Ouest	1990; 2000	EVS X048	E	Yes
France	Lorraine	FR: Est	1990; 2000	EVS X048	E	No
France	Midi-Pyrénées	FR: Sud Ouest	1990; 2000	EVS X048	E	Yes
France	Nord - Pas-de-Calais	FR: Nord	1990; 2000	EVS X048	E	No
France	Pays de la Loire	FR: Ouest	1990; 2000	EVS X048	E	No
France	Picardie	FR: Bassin Parisien	1990; 2000	EVS X048	E	Yes
France	Poitou-Charentes	FR: Ouest	1990; 2000	EVS X048	E	Yes
France	Provence-Côte d'Azur-Corse	FR: Méditerranée	1990; 2000	EVS X048	E	No
France	Rhône-Alpes	FR: Sud Est	1990	EVS X048	E	No
France	Rhône-Alpes	FR: Centre Est	2000	EVS X048	E	No
Guatemala	Alta Verapaz	GT: Oriente/Izabal/Verapaces	2005	WVS	E	No
Guatemala	Baja Verapaz	GT: Oriente/Izabal/Verapaces	2005	WVS	E	Yes
Guatemala	Izabal	GT: Oriente/Izabal/Verapaces	2005	WVS	E	Yes
Hungary	Gyor-M-S	HU: Dunántúl - Nyugat-Dunántúl	2010	EVS X048B	E	No
Ireland	Border	IE: Ireland - Border, Midland and Western	2010	EVS X048B	E	Yes
Ireland	Mid-East w/ Dublin	IE: Ireland - Southern and Eastern	2010	EVS X048B	E	No
Ireland	Midland	IE: Ireland - Border, Midland and Western	2010	EVS X048B	E	No
Ireland	South-East	IE: Ireland - Southern and Eastern	2010	EVS X048B	E	Yes
Ireland	South-West	IE: Ireland - Southern and Eastern	2010	EVS X048B	E	Yes
Ireland	West	IE: Ireland - Border, Midland and Western	2010	EVS X048B	E	Yes
Japan	Aichi	JP: Chubu,Hokuriku	1985; 1990; 1995; 2000; 2005	WVS	E	No
Japan	Akita	JP: Hokkaido/Tohoku	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Aomori	JP: Hokkaido/Tohoku	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Chiba	JP: Kanto	1985; 1990; 1995; 2000; 2005	WVS	E	Yes

Japan	Ehime	JP: Chugoku,Shikoku,Kyushu,Okinawa	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Fukui	JP: Chubu,Hokuriku	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Fukuoka	JP: Chugoku,Shikoku,Kyushu,Okinawa	1985; 1990; 1995; 2000; 2005	WVS	E	No
Japan	Fukushima	JP: Hokkaido/Tohoku	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Gifu	JP: Chubu,Hokuriku	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Gumma	JP: Kanto	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Hiroshima	JP: Chugoku,Shikoku,Kyushu,Okinawa	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Hokkaido	JP: Hokkaido/Tohoku	1985; 1990; 1995; 2000; 2005	WVS	E	No
Japan	Hyogo	JP: Kinki	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Ibaraki	JP: Kanto	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Ishikawa	JP: Chubu,Hokuriku	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Iwate	JP: Hokkaido/Tohoku	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Kagawa	JP: Chugoku,Shikoku,Kyushu,Okinawa	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Kagoshima	JP: Chugoku,Shikoku,Kyushu,Okinawa	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Kanagawa	JP: Kanto	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Kochi	JP: Chugoku,Shikoku,Kyushu,Okinawa	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Kumamoto	JP: Chugoku,Shikoku,Kyushu,Okinawa	1985; 1990; 1995; 2000; 2005	WVS	E	Yes

Japan	Kyoto	JP: Kinki	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Mie	JP: Kinki	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Miyagi	JP: Hokkaido/Tohoku	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Miyazaki	JP: Chugoku,Shikoku,Kyushu,Okinawa	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Nagano	JP: Chubu,Hokuriku	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Nagasaki	JP: Chugoku,Shikoku,Kyushu,Okinawa	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Nara	JP: Kinki	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Niigata	JP: Chubu,Hokuriku	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Oita	JP: Chugoku,Shikoku,Kyushu,Okinawa	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Okayama	JP: Chugoku,Shikoku,Kyushu,Okinawa	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Okinawa	JP: Chugoku,Shikoku,Kyushu,Okinawa	2000; 2005	WVS	E	Yes
Japan	Osaka	JP: Kinki	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Saga	JP: Chugoku,Shikoku,Kyushu,Okinawa	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Saitama	JP: Kanto	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Shiga	JP: Kinki	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Shimane	JP: Chugoku,Shikoku,Kyushu,Okinawa	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Shizuoka	JP: Chubu,Hokuriku	1985; 1990; 1995; 2000; 2005	WVS	E	Yes

Japan	Tochigi	JP: Kanto	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Tokushima	JP: Chugoku,Shikoku,Kyushu,Okinawa	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Tokyo	JP: Kanto	1985; 1990; 1995; 2000; 2005	WVS	E	No
Japan	Tottori	JP: Chugoku,Shikoku,Kyushu,Okinawa	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Toyama	JP: Chubu,Hokuriku	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Wakayama	JP: Kinki	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Yamagata	JP: Hokkaido/Tohoku	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Yamaguchi	JP: Chugoku,Shikoku,Kyushu,Okinawa	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Japan	Yamanashi	JP: Chubu,Hokuriku	1985; 1990; 1995; 2000; 2005	WVS	E	Yes
Korea, Rep.	Chungbuk	KR: Chungchong Do	1990	WVS	E	Yes
Korea, Rep.	Chungnam w/ Daejeon	KR: Chungchong Do	1990	WVS	E	No
Nigeria	South East	NG: East	2008	WVS	E	No
Norway	Akershus	NO: Oslo and Akershus	2010	WVS	E	Yes
Norway	Aust-Agder	NO: Agder and Rogaland	2010	WVS	E	Yes
Norway	Buskerud	NO: South Eastern Norway	2010	WVS	E	Yes
Norway	Hedmark	NO: Hedmark and Oppland	2010	WVS	E	No
Norway	Hordaland	NO: Western Norway	2010	WVS	E	No
Norway	Møre og Romsdal	NO: Western Norway	2010	WVS	E	Yes
Norway	Nord-Trøndelag	NO: Trøndelag	2010	WVS	E	Yes
Norway	Oppland	NO: Hedmark and Oppland	2010	WVS	E	Yes
Norway	Oslo	NO: Oslo and Akershus	2010	WVS	E	No
Norway	Østfold	NO: South Eastern Norway	2010	WVS	E	No
Norway	Rogaland	NO: Agder and Rogaland	2010	WVS	E	No

Norway	Sogn og Fjordane	NO: Western Norway	2010	WVS	E	Yes
Norway	Sør-Trøndelag	NO: Trøndelag	2010	WVS	E	No
Norway	Telemark	NO: South Eastern Norway	2010	WVS	E	Yes
Norway	Vest-Agder	NO: Agder and Rogaland	2010	WVS	E	Yes
Norway	Vestfold	NO: South Eastern Norway	2010	WVS	E	Yes
Philippines	Central Visayas	PH: VISAYAS	1997; 2006	WVS	E	Yes
Philippines	Eastern Visayas	PH: VISAYAS	1997; 2006	WVS	E	Yes
Philippines	Tagalog, Luzon, W. Visayas	PH: VISAYAS	1997; 2006; 2010	WVS	E	No
Portugal	Lisboa	PT: Lisbon & Tagus Valley (Grande Lisboa)	1990; 2000	EVS X048	E	No
Portugal	Lisboa	PT: Vale de tejo	1995	EVS X048	E	No
Romania	Bucuresti [Bucharest]	RO: Macroregiunea trei - Bucuresti-Ilfov	2010	EVS X048B	E	No
Russian Federation	Altai Republic	RU: Western Siberia	1995; 2000	WVS	E	Yes
Russian Federation	Altai Territory	RU: Western Siberia	1995; 2000	WVS	E	No
Russian Federation	Amur Region	RU: Far East	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Arkhangelsk Region	RU: Northern	1995; 2000	WVS	E	Yes
Russian Federation	Astrakhan Region	RU: Volga	2000	EVS X048	E	Yes
Russian Federation	Astrakhan Region	RU: Volga; Povolzskij	1995; 2010	WVS	E	Yes
Russian Federation	Belgorod Region	RU: Central Black Earth	2000	EVS X048	E	No
Russian Federation	Belgorod Region	RU: Central	1995; 2010	WVS	E	Yes
Russian Federation	Bryansk Region	RU: Central	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Chelyabinsk Region	RU: Urals	1995; 2000; 2010	WVS	E	Yes

Russian Federation	Chukotka Autonomous Okrug	RU: Far East	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Chuvash Republic	RU: Volgo-Vyatki	1995; 2000	WVS	E	Yes
Russian Federation	Irkutsk Region	RU: Eastern Siberia	1995; 2000	WVS	E	Yes
Russian Federation	Ivanovo Region	RU: Central	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Jewish Autonomous Region	RU: Far East	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Kabardino-Balkaria	RU: North Caucasus	1995; 2000	WVS	E	Yes
Russian Federation	Kaluga Region	RU: Central	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Kamchatka	RU: Far East	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Karachay-Cherkess Republic	RU: North Caucasus	1995; 2000	WVS	E	Yes
Russian Federation	Kemerovo Region	RU: Western Siberia	1995; 2000	WVS	E	Yes
Russian Federation	Khabarovsk Territory	RU: Far East	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Kirov Region	RU: Volgo-Vyatki	1995; 2000	WVS	E	No
Russian Federation	Kostroma Region	RU: Central	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Krasnodar Region	RU: North Caucasus	1995; 2000	WVS	E	No
Russian Federation	Krasnodar Region	RU: South	2010	WVS	E	No
Russian Federation	Krasnoyarsk Territory	RU: Eastern Siberia	1995; 2000	WVS	E	No
Russian Federation	Kurgan Region	RU: Urals	1995; 2000; 2010	WVS	E	Yes

Russian Federation	Kursk Region	RU: Central Black Earth	1995; 2000	WVS	E	Yes
Russian Federation	Leningrad Region	RU: North-Western	1995; 2000; 2010	WVS	E	No
Russian Federation	Leningrad Region	RU: North West federal district	2010	EVS X048B	E	No
Russian Federation	Lipetsk Region	RU: Central Black Earth	1995; 2000	WVS	E	Yes
Russian Federation	Magadan Region	RU: Far East	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Murmansk Region	RU: Northern	1995; 2000	WVS	E	Yes
Russian Federation	Nizhny Novgorod Region	RU: Volgo-Vyatki	1995; 2000	WVS	E	Yes
Russian Federation	Novgorod Region	RU: North-Western	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Novosibirsk Region	RU: Western Siberia	1995; 2000	WVS	E	Yes
Russian Federation	Omsk Region	RU: Western Siberia	1995; 2000	WVS	E	Yes
Russian Federation	Orel Region	RU: Central	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Orenburg Region	RU: Urals	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Penza Region	RU: Volga	2000	EVS X048	E	Yes
Russian Federation	Penza Region	RU: Volga; Povolzskij	1995; 2010	WVS	E	Yes
Russian Federation	Perm	RU: Volga; Povolzskij	2010	WVS	E	No
Russian Federation	Perm	RU: Urals	1995; 2000	WVS	E	Yes
Russian Federation	Primorsky Krai	RU: Far East	1995; 2000; 2010	WVS	E	No

Russian Federation	Primorsky Krai	RU: Far East federal district	2010	EVS X048B	E	No
Russian Federation	Pskov Region	RU: North-Western	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Republic of Adygea	RU: North Caucasus	1995; 2000	WVS	E	Yes
Russian Federation	Republic of Bashkortostan	RU: Urals	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Republic of Buryatia	RU: Eastern Siberia	1995; 2000	WVS	E	Yes
Russian Federation	Republic of Dagestan	RU: North Caucasus	1995; 2000	WVS	E	Yes
Russian Federation	Republic of Ingushetia	RU: North Caucasus	1995; 2000	WVS	E	Yes
Russian Federation	Republic of Kalmykia	RU: Volga	2000	EVS X048	E	Yes
Russian Federation	Republic of Kalmykia	RU: Volga; Povolzskij	1995; 2010	WVS	E	Yes
Russian Federation	Republic of Karelia	RU: Northern	1995; 2000	WVS	E	Yes
Russian Federation	Republic of Khakassia	RU: Eastern Siberia	1995; 2000	WVS	E	Yes
Russian Federation	Republic of Komi	RU: Northern	1995; 2000	WVS	E	Yes
Russian Federation	Republic of Mari El	RU: Volgo-Vyatki	1995; 2000	WVS	E	Yes
Russian Federation	Republic of Mordovia	RU: Volgo-Vyatki	1995; 2000	WVS	E	Yes
Russian Federation	Republic of North Ossetia-Alania	RU: North Caucasus	1995; 2000	WVS	E	Yes
Russian Federation	Republic of Sakha (Yakutia)	RU: Far East	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Republic of Tatarstan	RU: Volga	2000	EVS X048	E	No

Russian Federation	Republic of Tatarstan	RU: Volga; Povolzskij	1995; 2010	WVS	E	No
Russian Federation	Republic of Tatarstan	RU: Privolzhsky federal district	2010	EVS X048B	E	No
Russian Federation	Republic of Tyva	RU: Eastern Siberia	1995; 2000	WVS	E	Yes
Russian Federation	Rostov Region	RU: North Caucasus	1995; 2000	WVS	E	Yes
Russian Federation	Ryazan Region	RU: Central	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Sakhalin Region	RU: Far East	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Samara Region	RU: Volga	2000	EVS X048	E	Yes
Russian Federation	Samara Region	RU: Volga; Povolzskij	1995; 2010	WVS	E	Yes
Russian Federation	Saratov Region	RU: Volga	2000	EVS X048	E	Yes
Russian Federation	Saratov Region	RU: Volga; Povolzskij	1995; 2010	WVS	E	Yes
Russian Federation	Smolensk Region	RU: Central	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Stavropol Territory	RU: South Federal district	2010	EVS X048B	E	No
Russian Federation	Stavropol Territory	RU: South	2010	WVS	E	No
Russian Federation	Stavropol Territory	RU: North Caucasus	1995; 2000	WVS	E	Yes
Russian Federation	Sverdlovsk Region	RU: Urals	1995; 2000; 2010	WVS	E	No
Russian Federation	Sverdlovsk Region	RU: Siberian federal district	2010	EVS X048B	E	No
Russian Federation	Tambov Region	RU: Central Black Earth	1995; 2000	WVS	E	Yes

Russian Federation	Tomsk Region	RU: Western Siberia	1995; 2000	WVS	E	Yes
Russian Federation	Trans-Baikal Territory	RU: Far East	2010	WVS	E	No
Russian Federation	Tula Region	RU: Central	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Tver Region	RU: Central	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Tyumen Region	RU: Western Siberia	1995; 2000	WVS	E	Yes
Russian Federation	Udmurt Republic	RU: Urals	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Ulyanovsk Region	RU: Volga	2000	EVS X048	E	Yes
Russian Federation	Ulyanovsk Region	RU: Volga; Povolzskij	1995; 2010	WVS	E	Yes
Russian Federation	Vladimir Region	RU: Central	1995; 2000; 2010	WVS	E	Yes
Russian Federation	Volgograd Region	RU: Volga	2000	EVS X048	E	Yes
Russian Federation	Volgograd Region	RU: Volga; Povolzskij	1995; 2010	WVS	E	Yes
Russian Federation	Vologda Region	RU: North-Western	2010	WVS	E	No
Russian Federation	Vologda Region	RU: Northern	1995; 2000	WVS	E	Yes
Russian Federation	Voronezh Region	RU: Central Black Earth	1995; 2000	WVS	E	Yes
Russian Federation	Yaroslavl Region	RU: Central	1995; 2000; 2010	WVS	E	Yes
Serbia	Borski	CS: Central Serbia	2002	WVS	E	Yes
Serbia	Branicevski	CS: Central Serbia	2002	WVS	E	Yes
Serbia	Jablanicki	CS: Central Serbia	2002	WVS	E	Yes
Serbia	Juzno–backi	CS: Vojvodina	2002	WVS	E	No

Serbia	Juzno–banatski	CS: Vojvodina	2002	WVS	E	Yes
Serbia	Kolubarski	CS: Central Serbia	2002	WVS	E	Yes
Serbia	Macvanski	CS: Central Serbia	2002	WVS	E	Yes
Serbia	Moravski	CS: Central Serbia	2002	WVS	E	Yes
Serbia	Nisavski	CS: Central Serbia	2002	WVS	E	No
Serbia	Pcinjski	CS: Central Serbia	2002	WVS	E	Yes
Serbia	Pirotski	CS: Central Serbia	2002	WVS	E	Yes
Serbia	Podunavski	CS: Central Serbia	2002	WVS	E	Yes
Serbia	Pomoravski	CS: Central Serbia	2002	WVS	E	Yes
Serbia	Rasinski	CS: Central Serbia	2002	WVS	E	Yes
Serbia	Raski	CS: Central Serbia	2002	WVS	E	Yes
Serbia	Severno–backi	CS: Vojvodina	2002	WVS	E	Yes
Serbia	Severno–banatski	CS: Vojvodina	2002	WVS	E	Yes
Serbia	Srednje–banatski	CS: Vojvodina	2002	WVS	E	Yes
Serbia	Sremski	CS: Vojvodina	2002	WVS	E	Yes
Serbia	Sumadijski	CS: Central Serbia	2002	WVS	E	Yes
Serbia	Toplicki	CS: Central Serbia	2002	WVS	E	Yes
Serbia	Zajecarski	CS: Central Serbia	2002	WVS	E	Yes
Serbia	Zapadno–backi	CS: Vojvodina	2002	WVS	E	Yes
Serbia	Zlatiborski	CS: Central Serbia	2002	WVS	E	Yes
Slovak Republic	Banskobystrický kraj	SK: Central Slovakia	1995; 2005	WVS	E	Yes
Slovak Republic	Banskobystrický kraj	SK: Slovenská Republika - Stredné Slovensko	2010	EVS X048B	E	Yes
Slovak Republic	Kosický kraj	SK: Eastern Slovakia	1995	WVS	E	Yes
Slovak Republic	Kosický kraj	SK: Slovenská Republika - Východné Slovensko	2010	EVS X048B	E	Yes
Slovak Republic	Nitriansky kraj	SK: West Slovakia	1995	WVS	E	No

Slovak Republic	Nitriansky kraj	SK: Slovenská Republika - Západné Slovensko	2010	EVS X048B	E	No
Slovak Republic	Presovský kraj	SK: Eastern Slovakia	1995; 2005	WVS	E	No
Slovak Republic	Presovský kraj	SK: Slovenská Republika - Východné Slovensko	2010	EVS X048B	E	No
Slovak Republic	Trenciansky kraj	SK: West Slovakia	1995	WVS	E	Yes
Slovak Republic	Trenciansky kraj	SK: Slovenská Republika - Západné Slovensko	2010	EVS X048B	E	Yes
Slovak Republic	Trnavský kraj	SK: West Slovakia	1995	WVS	E	Yes
Slovak Republic	Trnavský kraj	SK: Slovenská Republika - Západné Slovensko	2010	EVS X048B	E	Yes
Slovak Republic	Zilinský kraj	SK: Central Slovakia	1995	WVS	E	No
Slovak Republic	Zilinský kraj	SK: Northern Slovakia	2005	WVS	E	No
Slovak Republic	Zilinský kraj	SK: Slovenská Republika - Stredné Slovensko	2010	EVS X048B	E	No
Spain	Álava	ES: Pais Vasco	1990; 1995; 2000	WVS	E	Yes
Spain	Álava	ES: Noreste - País Vasco	2010	EVS X048B	E	Yes
Spain	Albacete	ES: Castilla-Mancha	1990; 1995; 2000; 2010	WVS	E	Yes
Spain	Alicante/Alacant	ES: C Valenciana	1990; 1995; 2000; 2010	WVS	E	Yes
Spain	Almería	ES: Andalucia	1990; 1995; 2000	WVS	E	Yes
Spain	Almería	ES: Sur - Andalucía	2010	EVS X048B	E	Yes
Spain	Ávila	ES: Castilla Leon	1990; 1995; 2000	WVS	E	Yes
Spain	Ávila	ES: Centro - Castilla y León	2010	EVS X048B	E	Yes
Spain	Badajoz	ES: Extremadura	1990; 1995; 2000	WVS	E	No
Spain	Badajoz	ES: Centro - Extremadura	2010	EVS X048B	E	No
Spain	Barcelona	ES: Cataluna	1990; 1995; 2000	WVS	E	No

Spain	Barcelona	ES: Este - Cataluña	2010	EVS X048B	E	No
Spain	Burgos	ES: Castilla Leon	1990; 1995; 2000	WVS	E	Yes
Spain	Burgos	ES: Centro - Castilla y León	2010	EVS X048B	E	Yes
Spain	Cáceres	ES: Extremadura	1990; 1995; 2000; 2010	WVS	E	Yes
Spain	Cádiz	ES: Andalucia	1990; 1995; 2000; 2010	WVS	E	Yes
Spain	Castellón/Castelló	ES: C Valenciana	1990; 1995; 2000	WVS	E	Yes
Spain	Castellón/Castelló	ES: Este - Comunidad Valenciana	2010	EVS X048B	E	Yes
Spain	Ciudad Real	ES: Castilla-Mancha	1990; 1995; 2000	WVS	E	No
Spain	Ciudad Real	ES: Centro - Castilla-La Mancha	2010	EVS X048B	E	No
Spain	Córdoba,SP	ES: Cataluna	2010	WVS	E	No
Spain	Córdoba,SP	ES: Andalucia	1990; 1995; 2000	WVS	E	Yes
Spain	Coruña (A)	ES: Galicia	1990; 1995; 2000	WVS	E	No
Spain	Coruña (A)	ES: Noroeste - Galicia	2010	EVS X048B	E	No
Spain	Cuenca	ES: Castilla-Mancha	1990; 1995; 2000	WVS	E	Yes
Spain	Cuenca	ES: Centro - Castilla-La Mancha	2010	EVS X048B	E	Yes
Spain	Girona	ES: Cataluna	1990; 1995; 2000	WVS	E	Yes
Spain	Girona	ES: Este - Cataluña	2010	EVS X048B	E	Yes
Spain	Granada	ES: Andalucia	1990; 1995; 2000	WVS	E	Yes
Spain	Granada	ES: Sur - Andalucía	2010	EVS X048B	E	Yes
Spain	Guadalajara	ES: Castilla-Mancha	1990; 1995; 2000	WVS	E	Yes
Spain	Guadalajara	ES: Centro - Castilla-La Mancha	2010	EVS X048B	E	Yes
Spain	Guipúzcoa	ES: Pais Vasco	1990; 1995; 2000; 2010	WVS	E	Yes
Spain	Huelva	ES: Andalucia	1990; 1995; 2000	WVS	E	Yes
Spain	Huelva	ES: Sur - Andalucía	2010	EVS X048B	E	Yes
Spain	Huesca	ES: Aragon	1990; 1995; 2000	WVS	E	Yes
Spain	Huesca	ES: Noreste - Aragón	2010	EVS X048B	E	Yes
Spain	Jaén	ES: Andalucia	1990; 1995; 2000	WVS	E	Yes

Spain	Jaén	ES: Sur - Andalucía	2010	EVS X048B	E	Yes
Spain	León	ES: Castilla Leon	1990; 1995; 2000; 2010	WVS	E	No
Spain	León	ES: Centro - Castilla y León	2010	EVS X048B	E	No
Spain	Lleida	ES: Cataluna	1990; 1995; 2000	WVS	E	Yes
Spain	Lleida	ES: Este - Cataluña	2010	EVS X048B	E	Yes
Spain	Lugo	ES: Galicia	1990; 1995; 2000; 2010	WVS	E	Yes
Spain	Málaga	ES: Andalucia	1990; 1995; 2000	WVS	E	Yes
Spain	Málaga	ES: Sur - Andalucía	2010	EVS X048B	E	Yes
Spain	Ourense	ES: Galicia	1990; 1995; 2000	WVS	E	Yes
Spain	Ourense	ES: Noroeste - Galicia	2010	EVS X048B	E	Yes
Spain	Palencia	ES: Castilla Leon	1990; 1995; 2000	WVS	E	Yes
Spain	Palencia	ES: Centro - Castilla y León	2010	EVS X048B	E	Yes
Spain	Palmas, Las	ES: Canarias	1990; 1995; 2000; 2010	WVS	E	No
Spain	Palmas, Las	ES: Canarias - Canarias	2010	EVS X048B	E	No
Spain	Pontevedra	ES: Galicia	1990; 1995; 2000; 2010	WVS	E	Yes
Spain	Salamanca	ES: Castilla Leon	1990; 1995; 2000	WVS	E	Yes
Spain	Salamanca	ES: Centro - Castilla y León	2010	EVS X048B	E	Yes
Spain	Segovia	ES: Castilla Leon	1990; 1995; 2000	WVS	E	Yes
Spain	Segovia	ES: Centro - Castilla y León	2010	EVS X048B	E	Yes
Spain	Sevilla	ES: Andalucia	1990; 1995; 2000; 2010	WVS	E	No
Spain	Sevilla	ES: Sur - Andalucía	2010	EVS X048B	E	No
Spain	Soria	ES: Castilla Leon	1990; 1995; 2000	WVS	E	Yes
Spain	Soria	ES: Centro - Castilla y León	2010	EVS X048B	E	Yes
Spain	Tarragona	ES: Cataluna	1990; 1995; 2000; 2010	WVS	E	Yes

Spain	Teruel	ES: Aragon	1990; 1995; 2000; 2010	WVS	E	Yes
Spain	Toledo	ES: Castilla-Mancha	1990; 1995; 2000; 2010	WVS	E	Yes
Spain	Valencia/València	ES: C Valenciana	1990; 1995; 2000; 2010	WVS	E	No
Spain	Valencia/València	ES: Este - Comunidad Valenciana	2010	EVS X048B	E	No
Spain	Valladolid	ES: Castilla Leon	1990; 1995; 2000; 2010	WVS	E	Yes
Spain	Vizcaya	ES: Pais Vasco	1990; 1995; 2000; 2005; 2010	WVS	E	No
Spain	Vizcaya	ES: Noreste - País Vasco	2010	EVS X048B	E	No
Spain	Zamora	ES: Castilla Leon	1990; 1995; 2000	WVS	E	Yes
Spain	Zamora	ES: Centro - Castilla y León	2010	EVS X048B	E	Yes
Spain	Zaragoza	ES: Aragon	1990; 1995; 2000; 2010	WVS	E	No
Spain	Zaragoza	ES: Noreste - Aragón	2010	EVS X048B	E	No
Switzerland	Aargau	CH: Schweiz/Suisse/Svizzera - Nordwestschweiz	2010	EVS X048B	E	No
Switzerland	Appenzell A&I Rh.	CH: Schweiz/Suisse/Svizzera - Ostschweiz	2010	EVS X048B	E	Yes
Switzerland	Basel-Land	CH: Schweiz/Suisse/Svizzera - Nordwestschweiz	2010	EVS X048B	E	Yes
Switzerland	Basel-Stadt	CH: Schweiz/Suisse/Svizzera - Nordwestschweiz	2010	EVS X048B	E	Yes
Switzerland	Bern w/ Jura	CH: Schweiz/Suisse/Svizzera - Espace Mittelland	2010	EVS X048B	E	Yes
Switzerland	Freiburg	CH: Schweiz/Suisse/Svizzera - Espace Mittelland	2010	EVS X048B	E	Yes
Switzerland	Genf	CH: Schweiz/Suisse/Svizzera - Région lémanique	2010	EVS X048B	E	Yes
Switzerland	Glarus	CH: Schweiz/Suisse/Svizzera - Ostschweiz	2010	EVS X048B	E	Yes

Switzerland	Graubünden	CH: Schweiz/Suisse/Svizzera - Ostschweiz	2010	EVS X048B	E	Yes
Switzerland	Luzern	CH: Schweiz/Suisse/Svizzera - Zentralschweiz	2010	EVS X048B	E	No
Switzerland	Neuenburg	CH: Schweiz/Suisse/Svizzera - Espace Mittelland	2010	EVS X048B	E	Yes
Switzerland	Nidwalden	CH: Schweiz/Suisse/Svizzera - Zentralschweiz	2010	EVS X048B	E	Yes
Switzerland	Obwalden	CH: Schweiz/Suisse/Svizzera - Zentralschweiz	2010	EVS X048B	E	Yes
Switzerland	Schaffhausen	CH: Schweiz/Suisse/Svizzera - Ostschweiz	2010	EVS X048B	E	Yes
Switzerland	Schwyz	CH: Schweiz/Suisse/Svizzera - Zentralschweiz	2010	EVS X048B	E	Yes
Switzerland	Solothurn	CH: Schweiz/Suisse/Svizzera - Espace Mittelland	2010	EVS X048B	E	No
Switzerland	St. Gallen	CH: Schweiz/Suisse/Svizzera - Ostschweiz	2010	EVS X048B	E	No
Switzerland	Thurgau	CH: Schweiz/Suisse/Svizzera - Ostschweiz	2010	EVS X048B	E	Yes
Switzerland	Uri	CH: Schweiz/Suisse/Svizzera - Zentralschweiz	2010	EVS X048B	E	Yes
Switzerland	Waadt	CH: Schweiz/Suisse/Svizzera - Région lémanique	2010	EVS X048B	E	No
Switzerland	Wallis	CH: Schweiz/Suisse/Svizzera - Région lémanique	2010	EVS X048B	E	Yes
Switzerland	Zug	CH: Schweiz/Suisse/Svizzera - Zentralschweiz	2010	EVS X048B	E	Yes
Thailand	Amnat Chaeron / Ubon Ratchathani	TH: The Northeast	2010	WVS	E	Yes
Thailand	Ang Tong	TH: The Central	2010	WVS	E	Yes
Thailand	Bangkok Metropolis	TH: The Central	2010	WVS	E	No
Thailand	Buri Ram	TH: The Northeast	2010	WVS	E	Yes
Thailand	Chachoengsao	TH: The Central	2010	WVS	E	Yes

Thailand	Chai Nat	TH: The Central	2010	WVS	E	Yes
Thailand	Chaiyaphum	TH: The Northeast	2010	WVS	E	Yes
Thailand	Chanthaburi	TH: The Central	2010	WVS	E	Yes
Thailand	Chian Mai	TH: The North	2010	WVS	E	No
Thailand	Chiang Rai	TH: The North	2010	WVS	E	Yes
Thailand	Chon Buri	TH: The Central	2010	WVS	E	Yes
Thailand	Chumphon	TH: The South	2010	WVS	E	Yes
Thailand	Kalasin	TH: The Northeast	2010	WVS	E	Yes
Thailand	Kam Phaeng Phet	TH: The North	2010	WVS	E	Yes
Thailand	Kanchanaburi	TH: The Central	2010	WVS	E	Yes
Thailand	Khon Kaen	TH: The Northeast	2010	WVS	E	Yes
Thailand	Krabi	TH: The South	2010	WVS	E	Yes
Thailand	Lampang	TH: The North	2010	WVS	E	Yes
Thailand	Lamphun	TH: The North	2010	WVS	E	Yes
Thailand	Loei	TH: The Northeast	2010	WVS	E	Yes
Thailand	Lop Buri	TH: The Central	2010	WVS	E	Yes
Thailand	Mae Hong Son	TH: The North	2010	WVS	E	Yes
Thailand	Maha Sarakham	TH: The Northeast	2010	WVS	E	Yes
Thailand	Mukhadan / Nakhon Phanom	TH: The Northeast	2010	WVS	E	Yes
Thailand	Nakhon Nayok	TH: The Central	2010	WVS	E	Yes
Thailand	Nakhon Pathom	TH: The Central	2010	WVS	E	Yes
Thailand	Nakhon Ratchasima	TH: The Northeast	2010	WVS	E	No
Thailand	Nakhon Sawan	TH: The North	2010	WVS	E	Yes
Thailand	Nakhon Si Thammarat	TH: The South	2010	WVS	E	No
Thailand	Nan	TH: The North	2010	WVS	E	Yes
Thailand	Narathiwat	TH: The South	2010	WVS	E	Yes
Thailand	Nong Bua Lam Phu / Udon Thani	TH: The Northeast	2010	WVS	E	Yes
Thailand	Nong Khai	TH: The Northeast	2010	WVS	E	Yes

Thailand	Nonthaburi	TH: The Central	2010	WVS	E	Yes
Thailand	Pattani	TH: The South	2010	WVS	E	Yes
Thailand	Phachuap Khiri Khan	TH: The Central	2010	WVS	E	Yes
Thailand	Phangnga	TH: The South	2010	WVS	E	Yes
Thailand	Phatthalung	TH: The South	2010	WVS	E	Yes
Thailand	Phayao	TH: The North	2010	WVS	E	Yes
Thailand	Phetchabun	TH: The North	2010	WVS	E	Yes
Thailand	Phetchaburi	TH: The Central	2010	WVS	E	Yes
Thailand	Phichit	TH: The North	2010	WVS	E	Yes
Thailand	Phitsanulok	TH: The North	2010	WVS	E	Yes
Thailand	Phra Nakhon Sri Ayuthaya	TH: The Central	2010	WVS	E	Yes
Thailand	Phrae	TH: The North	2010	WVS	E	Yes
Thailand	Phuket	TH: The South	2010	WVS	E	Yes
Thailand	Prachin Buri / Sa Kaeo	TH: The Central	2010	WVS	E	Yes
Thailand	Pratum Thani	TH: The Central	2010	WVS	E	Yes
Thailand	Ranong	TH: The South	2010	WVS	E	Yes
Thailand	Ratchaburi	TH: The Central	2010	WVS	E	Yes
Thailand	Rayong	TH: The Central	2010	WVS	E	Yes
Thailand	Roi Et	TH: The Northeast	2010	WVS	E	Yes
Thailand	Sakon Nakhon	TH: The Northeast	2010	WVS	E	Yes
Thailand	Samut Prakan	TH: The Central	2010	WVS	E	Yes
Thailand	Samut Sakhon	TH: The Central	2010	WVS	E	Yes
Thailand	Samut Songkhram	TH: The Central	2010	WVS	E	Yes
Thailand	Saraburi	TH: The Central	2010	WVS	E	Yes
Thailand	Satun	TH: The South	2010	WVS	E	Yes
Thailand	Si Sa Ket	TH: The Northeast	2010	WVS	E	Yes
Thailand	Singburi	TH: The Central	2010	WVS	E	Yes
Thailand	Songkhla	TH: The South	2010	WVS	E	Yes

Thailand	Sukhothai	TH: The North	2010	WVS	E	Yes
Thailand	Suphan Buri	TH: The Central	2010	WVS	E	Yes
Thailand	Surat Thani	TH: The South	2010	WVS	E	Yes
Thailand	Surin	TH: The Northeast	2010	WVS	E	Yes
Thailand	Tak	TH: The North	2010	WVS	E	Yes
Thailand	Trang	TH: The South	2010	WVS	E	Yes
Thailand	Trat	TH: The Central	2010	WVS	E	Yes
Thailand	Uthai Thani	TH: The North	2010	WVS	E	Yes
Thailand	Uttaradit	TH: The North	2010	WVS	E	Yes
Thailand	Yala	TH: The South	2010	WVS	E	Yes
Thailand	Yasothon	TH: The Northeast	2010	WVS	E	Yes
United Kingdom	East Anglia	GB-GBN: Eastern	1995; 2000	EVS X048	E	No
United Kingdom	East Anglia	GB: Eastern	2005	WVS	E	No
United Kingdom	Yorkshire	GB-GBN: North	1995	EVS X048	E	No
United States	Alabama	US: East South Central	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Arizona	US: Rocky Mountain state	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Arkansas	US: West South Central	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Colorado	US: Rocky Mountain state	1990; 1995; 2000; 2010	EVS X048	E	No
United States	Connecticut	US: New England	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Delaware	US: South Atlantic	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	District of Columbia	US: South Atlantic	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Florida,US	US: South Atlantic	1990; 1995; 2000; 2010	EVS X048	E	No

United States	Georgia	US: South Atlantic	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Idaho	US: Northwest	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Illinois	US: East North Central	1990; 1995; 2000; 2010	EVS X048	E	No
United States	Indiana	US: East North Central	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Iowa	US: West North Central	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Kansas	US: West North Central	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Kentucky	US: East South Central	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Louisiana	US: West South Central	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Maine	US: New England	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Maryland	US: South Atlantic	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Massachusetts	US: New England	1990; 1995; 2000; 2010	EVS X048	E	No
United States	Michigan	US: East North Central	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Minnesota	US: West North Central	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Mississippi	US: East South Central	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Missouri	US: West North Central	1990; 1995; 2000; 2010	EVS X048	E	No
United States	Montana,US	US: Rocky Mountain state	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Nebraska	US: West North Central	1990; 1995; 2000; 2010	EVS X048	E	Yes

United States	Nevada	US: Rocky Mountain state	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	New Hampshire	US: New England	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	New Jersey	US: Middle Atlantic States	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	New Mexico	US: Rocky Mountain state	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	New York	US: Middle Atlantic States	1990; 1995; 2000; 2010	EVS X048	E	No
United States	North Carolina	US: South Atlantic	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	North Dakota	US: West North Central	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Ohio	US: East North Central	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Oklahoma	US: West South Central	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Oregon	US: Northwest	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Pennsylvania	US: Middle Atlantic States	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Rhode Island	US: New England	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	South Carolina	US: South Atlantic	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	South Dakota	US: West North Central	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Tennessee	US: East South Central	1990; 1995; 2000; 2010	EVS X048	E	No
United States	Texas	US: West South Central	1990; 1995; 2000; 2010	EVS X048	E	No
United States	Utah	US: Rocky Mountain state	1990; 1995; 2000; 2010	EVS X048	E	Yes

United States	Vermont	US: New England	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Virginia	US: South Atlantic	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Washington	US: Northwest	1990; 1995; 2000; 2010	EVS X048	E	No
United States	West Virginia	US: South Atlantic	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Wisconsin	US: East North Central	1990; 1995; 2000; 2010	EVS X048	E	Yes
United States	Wyoming	US: Rocky Mountain state	1990; 1995; 2000; 2010	EVS X048	E	Yes
Vietnam	An Giang	VN: mekong river delta	2006	WVS	E	Yes
Vietnam	Bac Lieu / Ca Mau	VN: mekong river delta	2006	WVS	E	Yes
Vietnam	Bac Ninh / Bac Giang / Ha Bac	VN: northeast	2006; 2008	WVS	E	No
Vietnam	Bak Kan / Thai Nguyen	VN: northeast	2006	WVS	E	Yes
Vietnam	Ben Tre	VN: mekong river delta	2006	WVS	E	Yes
Vietnam	Binh Dinh	VN: central coast	2006	WVS	E	Yes
Vietnam	Binh Duong / Binh Phuoc	VN: southeast	2006	WVS	E	Yes
Vietnam	Binh Thuan / Ninh Thuan	VN: central coast	2006	WVS	E	Yes
Vietnam	Cao Bang	VN: northeast	2006	WVS	E	Yes
Vietnam	Da Nam / Quang Nam	VN: central coast	2000; 2006	WVS	E	No
Vietnam	Dak Lack	VN: central highland	2000; 2006	WVS	E	No
Vietnam	Dong Nai / Ba Ria-Vung Tau	VN: southeast	2006	WVS	E	Yes
Vietnam	Dong Thap	VN: mekong river delta	2006	WVS	E	Yes
Vietnam	Gia Lia / Kon Tum	VN: central highland	2006	WVS	E	Yes
Vietnam	Ha Tinh / Nghe An	VN: north central	2000; 2006	WVS	E	No
Vietnam	Hai Duong	VN: red river delta	2006	WVS	E	Yes

Vietnam	Hai Phong	VN: red river delta	2006	WVS	E	Yes
Vietnam	Hanoi / Ha Tay	VN: red river delta	2000; 2006	WVS	E	No
Vietnam	Ho Chi Minh City|Ho Chi Minh	VN: southeast	2000; 2006	WVS	E	No
Vietnam	Khanh Hoa	VN: central coast	2006	WVS	E	Yes
Vietnam	Kien Giang	VN: mekong river delta	2006	WVS	E	Yes
Vietnam	Lam Dong	VN: central highland	2006	WVS	E	Yes
Vietnam	Lang Son	VN: northeast	2006	WVS	E	Yes
Vietnam	Long An	VN: mekong river delta	2006	WVS	E	Yes
Vietnam	Phu Yen	VN: central coast	2006	WVS	E	Yes
Vietnam	Quang Binh	VN: north central	2006	WVS	E	Yes
Vietnam	Quang Ngai	VN: central coast	2006	WVS	E	Yes
Vietnam	Quang Ninh	VN: northeast	2006	WVS	E	Yes
Vietnam	Quang Tri	VN: north central	2006	WVS	E	Yes
Vietnam	Soc Trang / Can Tho / Hau Gian	VN: mekong river delta	2000; 2006	WVS	E	No
Vietnam	Son La	VN: northwest	2006	WVS	E	Yes
Vietnam	Tay Ninh	VN: southeast	2006	WVS	E	Yes
Vietnam	Thai Binh	VN: red river delta	2006	WVS	E	Yes
Vietnam	Thanh Hoa	VN: north central	2006	WVS	E	Yes
Vietnam	Thua Thien - Hue	VN: north central	2006	WVS	E	Yes
Vietnam	Tien Giang	VN: mekong river delta	2006	WVS	E	Yes
Vietnam	Tra Vinh / Vinh Long	VN: mekong river delta	2006	WVS	E	Yes
Vietnam	Tuyen Quan / Ha Gian	VN: northeast	2006	WVS	E	Yes
Vietnam	Yen Bai / Lao Chai / Lao Cai	VN: northwest	2000; 2006	WVS	E	No
Albania	Berat	AL: Center	2001; 2009	WVS	F	Yes
Albania	Dibra	AL: North	2001; 2009	WVS	F	No
Albania	Durres	AL: Center	2001; 2009	WVS	F	No
Albania	Elbasan	AL: Center	2001; 2009	WVS	F	Yes

Albania	Gjirokastra	AL: South	2001; 2009	WVS	F	Yes
Albania	Korca	AL: South	2001; 2009	WVS	F	Yes
Albania	Kukes	AL: North	2001; 2009	WVS	F	Yes
Albania	Lezha	AL: North	2001; 2009	WVS	F	Yes
Albania	Shkoder	AL: Albania – North-Albania	2009	EVS X048B	F	No
Albania	Shkoder	AL: North	2001	WVS	F	Yes
Albania	Vlora	AL: South	2001; 2009	WVS	F	No
Brazil	Acre	BR: Northwest	1995	WVS	F	Yes
Brazil	Alagoas	BR: North	1995	WVS	F	Yes
Brazil	Bahia	BR: Southeast	1995	WVS	F	Yes
Brazil	Ceará	BR: North	1995	WVS	F	Yes
Brazil	Espírito Santo	BR: Southeast	1995	WVS	F	Yes
Brazil	Goiás, DF, Tocantins	BR: Center-West	1995	WVS	F	No
Brazil	Maranhão	BR: North	1995	WVS	F	Yes
Brazil	Minas Gerais	BR: Southeast	1995	WVS	F	Yes
Brazil	Pará and Amapá	BR: North	1995	WVS	F	Yes
Brazil	Paraíba	BR: North	1995	WVS	F	Yes
Brazil	Paraná	BR: South	1995	WVS	F	Yes
Brazil	Pernambuco	BR: North	1995	WVS	F	No
Brazil	Piauí	BR: North	1995	WVS	F	Yes
Brazil	Rio de Janeiro	BR: Southeast	1995	WVS	F	Yes
Brazil	Rio Grande do Norte	BR: North	1995	WVS	F	Yes
Brazil	Rio Grande do Sul	BR: South	1995	WVS	F	No
Brazil	Santa Catarina	BR: South	1995	WVS	F	Yes
Brazil	São Paulo	BR: Southeast	1995	WVS	F	No
Brazil	Sergipe	BR: North	1995	WVS	F	Yes
Chile	Antofagasta	CL: Norte	1995; 2000; 2010	WVS	F	No
Chile	Araucanía	CL: Sur	2000; 2010	WVS	F	Yes
Chile	Atacama	CL: Norte	2000; 2010	WVS	F	Yes

Chile	Biobío	CL: Sur	2000; 2010	WVS	F	No
Chile	Coquimbo	CL: Centro	2000; 2010	WVS	F	Yes
Chile	Libertador General Bernardo O'Higgins	CL: Centro	2000; 2010	WVS	F	Yes
Chile	Los Lagos	CL: Sur	2000; 2010	WVS	F	Yes
Chile	Magallanes y Antártica Chilena	CL: Sur	2000	WVS	F	No
Chile	Maule	CL: Centro	2000; 2010	WVS	F	Yes
Chile	Tarapacá	CL: Norte	2000; 2010	WVS	F	Yes
Chile	Valparaíso	CL: Centro	1995; 2000; 2010	WVS	F	No
China	Anhui	CN: East	1995	WVS	F	Yes
China	Beijing	CN: East	1995	WVS	F	Yes
China	Fujian	CN: East	1995	WVS	F	Yes
China	Guangdong w/ Hainan	CN: South	1995	WVS	F	No
China	Guangxi	CN: South	1995	WVS	F	Yes
China	Guizhou	CN: South	1995	WVS	F	Yes
China	Hebei	CN: East	1995	WVS	F	Yes
China	Heilongjiang	CN: North	1995	WVS	F	Yes
China	Henan	CN: East	1995	WVS	F	Yes
China	Hubei	CN: Center	1995	WVS	F	Yes
China	Hunan	CN: South	1995	WVS	F	Yes
China	Jiangsu	CN: East	1995	WVS	F	Yes
China	Jiangxi	CN: East	1995	WVS	F	Yes
China	Jilin	CN: North	1995	WVS	F	Yes
China	Liaoning	CN: North	1995	WVS	F	No
China	Shaanxi	CN: Center	1995	WVS	F	Yes
China	Shandong	CN: East	1995	WVS	F	No
China	Shanghai	CN: East	1995	WVS	F	Yes
China	Shanxi	CN: Center	1995	WVS	F	Yes
China	Sichuan w/ Chongqing	CN: Center	1995	WVS	F	No

China	Xinjiang	CN: North	1995	WVS	F	Yes
China	Yunnan	CN: South	1995	WVS	F	Yes
China	Zhejiang	CN: East	1995	WVS	F	Yes
Colombia	Antioquia	CO: Central	2000	WVS	F	No
Colombia	Atlantico	CO: Atlántica	2000; 2005	WVS	F	Yes
Colombia	Bolivar,CO	CO: Atlántica	2000	WVS	F	No
Colombia	Boyaca	CO: Centro Oriental	2000; 2005	WVS	F	Yes
Colombia	Caldas	CO: Central	2000	WVS	F	Yes
Colombia	Cauca	CO: Pacífica	2000	WVS	F	Yes
Colombia	Cauca	CO: Occidente	2005	WVS	F	Yes
Colombia	Choco	CO: Pacífica	2000	WVS	F	Yes
Colombia	Choco	CO: Occidente	2005	WVS	F	Yes
Colombia	Cundinamarca	CO: Centro Oriental	2000; 2005	WVS	F	No
Colombia	Huila	CO: Central	2000	WVS	F	Yes
Colombia	Meta	CO: Orinoquia	2005	WVS	F	Yes
Colombia	Narino	CO: Occidente	2005	WVS	F	No
Colombia	Narino	CO: Pacífica	2000	WVS	F	Yes
Colombia	Norte de Santander	CO: Centro Oriental	2000; 2005	WVS	F	Yes
Colombia	Nuevos Departamentos	CO: Orinoquia	2005	WVS	F	No
Colombia	Quindio	CO: Central	2000	WVS	F	Yes
Colombia	Risaralda	CO: Central	2000	WVS	F	Yes
Colombia	Santander	CO: Centro Oriental	2000; 2005	WVS	F	Yes
Colombia	Tolima	CO: Central	2000	WVS	F	Yes
Colombia	Valle del Cauca	CO: Pacífica	2000	WVS	F	No
Colombia	Valle del Cauca	CO: Occidente	2005	WVS	F	Yes
Egypt, Arab Rep.	Aswan	EG: Upper egypt	2007	WVS	F	Yes
Egypt, Arab Rep.	Behera	EG: Lower egypt	2007	WVS	F	Yes

Egypt, Arab Rep.	Beni Suef	EG: Lower egypt	2007	WVS	F	Yes
Egypt, Arab Rep.	Dakahlia	EG: Lower egypt	2007	WVS	F	Yes
Egypt, Arab Rep.	Damietta	EG: Lower egypt	2007	WVS	F	Yes
Egypt, Arab Rep.	Fayoum	EG: Lower egypt	2007	WVS	F	Yes
Egypt, Arab Rep.	Gharbia	EG: Lower egypt	2007	WVS	F	Yes
Egypt, Arab Rep.	Giza	EG: Lower egypt	2007	WVS	F	Yes
Egypt, Arab Rep.	Kafr El Sheikh	EG: Lower egypt	2007	WVS	F	Yes
Egypt, Arab Rep.	Kaliobia	EG: Lower egypt	2007	WVS	F	Yes
Egypt, Arab Rep.	Menoufia	EG: Lower egypt	2007	WVS	F	Yes
Egypt, Arab Rep.	Port Said	EG: Lower egypt	2007	WVS	F	Yes
Egypt, Arab Rep.	Qena	EG: Upper egypt	2007	WVS	F	No
Egypt, Arab Rep.	Shrkia	EG: Lower egypt	2007	WVS	F	No
Estonia	Harju county	EE: North-Western Estonia	2000	EVS X048	F	No
Estonia	Hiiu county	EE: Western Estonia	2000	EVS X048	F	Yes
Estonia	Ida-Viru county	EE: North-Eastern Estonia	2000	EVS X048	F	No
Estonia	Järva county	EE: North-Western Estonia	2000	EVS X048	F	Yes
Estonia	Jõgeva county	EE: North-Eastern Estonia	2000	EVS X048	F	Yes
Estonia	Lääne county	EE: Western Estonia	2000	EVS X048	F	Yes
Estonia	Lääne-Viru county	EE: North-Eastern Estonia	2000	EVS X048	F	Yes
Estonia	Pärnu county	EE: South-Western Estonia	2000	EVS X048	F	No
Estonia	Põlva county	EE: South-Eastern Estonia	2000	EVS X048	F	Yes

Estonia	Rapla county	EE: North-Western Estonia	2000	EVS X048	F	Yes
Estonia	Saare county	EE: Western Estonia	2000	EVS X048	F	No
Estonia	Tartu county	EE: South-Eastern Estonia	2000	EVS X048	F	No
Estonia	Valga county	EE: South-Eastern Estonia	2000	EVS X048	F	Yes
Estonia	Viljandi county	EE: South-Western Estonia	2000	EVS X048	F	Yes
Estonia	Võru county	EE: South-Eastern Estonia	2000	EVS X048	F	Yes
Guatemala	Chimaltenango	GT: Altiplano/Centro	2005	WVS	F	Yes
Guatemala	Chiquimula	GT: Oriente/Izabal/Verapaces	2005	WVS	F	Yes
Guatemala	El Petén	GT: Altiplano/Centro	2005	WVS	F	No
Guatemala	El Progreso	GT: Oriente/Izabal/Verapaces	2005	WVS	F	Yes
Guatemala	Escuintla	GT: Sur	2005	WVS	F	No
Guatemala	Huhuetenango	GT: Altiplano/Centro	2005	WVS	F	Yes
Guatemala	Jalapa	GT: Oriente/Izabal/Verapaces	2005	WVS	F	Yes
Guatemala	Jutiapa	GT: Oriente/Izabal/Verapaces	2005	WVS	F	Yes
Guatemala	Quetzaltenango	GT: Altiplano/Centro	2005	WVS	F	Yes
Guatemala	Quiché	GT: Altiplano/Centro	2005	WVS	F	Yes
Guatemala	Retalhuleu	GT: Sur	2005	WVS	F	Yes
Guatemala	Sacatepéquez	GT: Altiplano/Centro	2005	WVS	F	Yes
Guatemala	San Marcos	GT: Altiplano/Centro	2005	WVS	F	Yes
Guatemala	Santa Rosa	GT: Sur	2005	WVS	F	Yes
Guatemala	Sololé	GT: Altiplano/Centro	2005	WVS	F	Yes
Guatemala	Suchitepéquez	GT: Sur	2005	WVS	F	Yes
Guatemala	Totonicapán	GT: Altiplano/Centro	2005	WVS	F	Yes
Guatemala	Zacapa	GT: Oriente/Izabal/Verapaces	2005	WVS	F	Yes
Mexico	Aguascalientes	MX: Centro	1995	WVS	F	Yes
Mexico	Aguascalientes	MX: Centro occidente	2000	WVS	F	Yes
Mexico	Baja California Norte	MX: Norte	1995; 2000	WVS	F	Yes
Mexico	Baja California Sur	MX: Norte	1995; 2000	WVS	F	Yes
Mexico	Campeche	MX: Sur	1995; 2000	WVS	F	Yes

Mexico	Chiapas	MX: Sur	1995; 2000	WVS	F	No
Mexico	Chihuahua	MX: Norte	1995; 2000	WVS	F	Yes
Mexico	Coahuila	MX: Norte	1995; 2000	WVS	F	Yes
Mexico	Colima	MX: Centro	1995	WVS	F	Yes
Mexico	Colima	MX: Centro occidente	2000	WVS	F	Yes
Mexico	Durango	MX: Norte	1995; 2000	WVS	F	Yes
Mexico	Guanajuato	MX: Centro	1995	WVS	F	Yes
Mexico	Guanajuato	MX: Centro occidente	2000	WVS	F	Yes
Mexico	Guerrero	MX: Sur	1995; 2000	WVS	F	Yes
Mexico	Hidalgo	MX: Centro	1995; 2000	WVS	F	Yes
Mexico	Jalisco	MX: Centro	1995	WVS	F	No
Mexico	Jalisco	MX: Centro occidente	1980; 2000	WVS	F	No
Mexico	Mexico	MX: Centro	2000	WVS	F	Yes
Mexico	Michoacan	MX: Centro	1980; 1995	WVS	F	No
Mexico	Michoacan	MX: Centro occidente	2000	WVS	F	Yes
Mexico	Morelos	MX: Centro	1995; 2000	WVS	F	Yes
Mexico	Nayarit	MX: Centro	1995	WVS	F	Yes
Mexico	Nayarit	MX: Centro occidente	2000	WVS	F	Yes
Mexico	Nuevo Leon	MX: Norte	1980; 1995; 2000	WVS	F	No
Mexico	Oaxaca	MX: Sur	1995; 2000	WVS	F	Yes
Mexico	Puebla	MX: Centro	1995; 2000	WVS	F	No
Mexico	Queretaro	MX: Centro	1995; 2000	WVS	F	Yes
Mexico	Quintana Roo	MX: Sur	1995; 2000	WVS	F	Yes
Mexico	San Luis Potosi	MX: Centro	1995	WVS	F	Yes
Mexico	San Luis Potosi	MX: Centro occidente	2000	WVS	F	Yes
Mexico	Sinaloa	MX: Norte	1995; 2000	WVS	F	No
Mexico	Sonora	MX: Norte	1995; 2000	WVS	F	Yes
Mexico	Tabasco	MX: Sur	1995; 2000	WVS	F	Yes
Mexico	Tamaulipas	MX: Norte	1995; 2000	WVS	F	Yes

Mexico	Tlaxcala	MX: Centro	1995; 2000	WVS	F	Yes
Mexico	Veracruz	MX: Sur	1980; 1995; 2000	WVS	F	No
Mexico	Yucatan	MX: Sur	1995; 2000	WVS	F	Yes
Mexico	Zacatecas	MX: Centro	1995	WVS	F	Yes
Mexico	Zacatecas	MX: Centro occidente	2000	WVS	F	Yes
Peru	Amazonas,PE	PE: NORTE	2005	WVS	F	Yes
Peru	Ancash	PE: CENTRO	2005	WVS	F	Yes
Peru	Apurímac	PE: ORIENTE	2005	WVS	F	Yes
Peru	Arequipa	PE: SUR	2005	WVS	F	Yes
Peru	Ayacucho	PE: SUR	2001; 2005	WVS	F	Yes
Peru	Cajamarca	PE: NORTE	2001; 2005	WVS	F	Yes
Peru	Cusco	PE: ORIENTE	2005	WVS	F	No
Peru	Huancavelica	PE: CENTRO	2005	WVS	F	Yes
Peru	Huánuco	PE: CENTRO	2005	WVS	F	Yes
Peru	Ica	PE: CENTRO	2005	WVS	F	Yes
Peru	Junín	PE: CENTRO	2005	WVS	F	No
Peru	La Libertad,PER	PE: NORTE	2005	WVS	F	Yes
Peru	Lambayeque	PE: NORTE	2005	WVS	F	Yes
Peru	Loreto w/ Ucayali	PE: NORTE	2005	WVS	F	Yes
Peru	Madre de Dios	PE: ORIENTE	2005	WVS	F	Yes
Peru	Moquegua	PE: SUR	2005	WVS	F	Yes
Peru	Pasco	PE: CENTRO	2005	WVS	F	Yes
Peru	Piura	PE: NORTE	2005	WVS	F	Yes
Peru	Puno	PE: SUR	2005	WVS	F	Yes
Peru	San Martín	PE: NORTE	2005	WVS	F	Yes
Peru	Tacna	PE: SUR	2005	WVS	F	Yes
Peru	Tumbes	PE: NORTE	2005	WVS	F	Yes
Philippines	Bicol Region	PH: SOUTH LUZON	1997; 2006; 2010	WVS	F	No
Romania	Alba	RO: Transylvania	1995; 2000	EVS X048	F	Yes

Romania	Arad	RO: Crisana-Maramures (region)	1995	EVS X048	F	Yes
Romania	Arges	RO: Mutenia	1995	EVS X048	F	Yes
Romania	Bacau	RO: Moldova	1995	EVS X048	F	Yes
Romania	Bihor	RO: Crisana-Maramures (region)	1995	EVS X048	F	No
Romania	Bistrita-Nasaud	RO: Transylvania	1995	EVS X048	F	Yes
Romania	Botosani	RO: Moldova	1995	EVS X048	F	Yes
Romania	Braila	RO: Mutenia	1995	EVS X048	F	Yes
Romania	Brasov	RO: Transylvania	1995	EVS X048	F	Yes
Romania	Buzau	RO: Mutenia	1995	EVS X048	F	Yes
Romania	Calarasi	RO: Mutenia	1995	EVS X048	F	Yes
Romania	Caras-Severin	RO: Banat	1995	EVS X048	F	Yes
Romania	Cluj	RO: Transylvania	1995	EVS X048	F	No
Romania	Constanta	RO: Dobrogia	1995	EVS X048	F	No
Romania	Covasna	RO: Transylvania	1995	EVS X048	F	Yes
Romania	Dambovita	RO: Mutenia	1995	EVS X048	F	Yes
Romania	Dolj	RO: Oltenia	1995	EVS X048	F	No
Romania	Galati	RO: Oltenia	1995	EVS X048	F	Yes
Romania	Giurgiu	RO: Mutenia	1995	EVS X048	F	Yes
Romania	Gorj	RO: Oltenia	1995	EVS X048	F	Yes
Romania	Harghita	RO: Transylvania	1995	EVS X048	F	Yes
Romania	Hunedoara	RO: Transylvania	1995	EVS X048	F	Yes
Romania	Ialomita	RO: Mutenia	1995	EVS X048	F	Yes
Romania	Iasi	RO: Moldova	1995	EVS X048	F	No
Romania	Ilfov	RO: Mutenia	1995	EVS X048	F	Yes
Romania	Maramures	RO: Crisana-Maramures (region)	1995	EVS X048	F	Yes
Romania	Mehedinti	RO: Oltenia	1995; 2000	EVS X048	F	Yes
Romania	Mures	RO: Transylvania	1995	EVS X048	F	Yes
Romania	Neamt	RO: Moldova	1995	EVS X048	F	Yes
Romania	Olt	RO: Mutenia	1995	EVS X048	F	Yes

Romania	Prahova	RO: Mutenia	1995	EVS X048	F	No
Romania	Salaj	RO: Crisana-Maramures (region)	1995	EVS X048	F	Yes
Romania	Satu Mare	RO: Crisana-Maramures (region)	1995	EVS X048	F	Yes
Romania	Sibiu	RO: Transylvania	1995	EVS X048	F	Yes
Romania	Teleorman	RO: Mutenia	1995	EVS X048	F	Yes
Romania	Timis	RO: Banat	1995	EVS X048	F	No
Romania	Tulcea	RO: Dobrogia	1995	EVS X048	F	Yes
Romania	Valcea	RO: Oltenia	1995	EVS X048	F	Yes
Romania	Vaslui	RO: Moldova	1995	EVS X048	F	Yes
Romania	Vrancea	RO: Moldova	1995	EVS X048	F	Yes
Romania	Vrancea	RO: Macroregiunea doi - Sud-Est	2010	EVS X048B	F	Yes
Turkey	Amasya	TR: Karadeniz	2000	WVS	F	Yes
Turkey	Aydin	TR: Ege-Marmara	2000	WVS	F	Yes
Turkey	Burdur	TR: Akdeniz	2000	WVS	F	Yes
Turkey	Edirne	TR: Ege-Marmara	2000	WVS	F	Yes
Turkey	Giresun	TR: Karadeniz	2000	WVS	F	Yes
Turkey	Hatay	TR: Akdeniz	2000	WVS	F	No
Turkey	Kastamonu	TR: Karadeniz	2000	WVS	F	Yes
Turkey	Kirklareli	TR: Ege-Marmara	2000	WVS	F	Yes
Turkey	Rize	TR: Karadeniz	2000	WVS	F	Yes
Turkey	Samsun	TR: Karadeniz	2000	WVS	F	Yes
Turkey	Sinop	TR: Karadeniz	2000	WVS	F	Yes
Turkey	Tekirdag	TR: Ege-Marmara	2000	WVS	F	Yes
Turkey	Usak	TR: Ege-Marmara	2000	WVS	F	Yes

Table 31: *Other summary statistics*

Country	WB income classification	No of resp	Available surveys	No of Regions	No of Clusters	Ind w/ access to WB current	Ind w/ access to WB past	% of Ind. w/ access to WB current	% of Ind. w/ access WB past
Angola	Lower-middle	2,972	2007	4	115	163	-	5.5%	0.0%
Angola	Lower-middle	8,589	2011	4	238	4,120	-	48.0%	0.0%
Angola	Lower-middle	14,379	2016	18	625	3,619	606	25.2%	4.2%
Armenia	Upper-middle	5,922	2010	11	308	5,865	-	99.0%	0.0%
Armenia	Upper-middle	6,116	2016	11	313	5,727	5,696	93.6%	93.1%
Bangladesh	Lower-middle	10,544	2000	6	341	-	-	0.0%	0.0%
Bangladesh	Lower-middle	11,440	2004	6	361	3,100	-	27.1%	0.0%
Bangladesh	Lower-middle	10,996	2007	6	361	4,788	-	43.5%	0.0%
Bangladesh	Lower-middle	17,842	2011	7	600	11,881	-	66.6%	0.0%
Bangladesh	Lower-middle	17,863	2014	7	600	11,680	6,484	65.4%	36.3%
Benin	Lower	5,491	1996	6	200	-	-	0.0%	0.0%
Benin	Lower	6,219	2001	6	247	-	-	0.0%	0.0%
Benin	Lower	16,599	2012	12	750	6,503	2,648	39.2%	16.0%
BurkinaFaso	Lower	6,354	1993	5	230	-	-	0.0%	0.0%
BurkinaFaso	Lower	6,445	1999	5	210	-	-	0.0%	0.0%
BurkinaFaso	Lower	12,477	2003	14	400	238	-	1.9%	0.0%
BurkinaFaso	Lower	17,087	2010	13	573	4,085	-	23.9%	0.0%
BurkinaFaso	Lower	8,111	2014	13	252	2,039	1,199	25.1%	14.8%
Burundi	Lower	9,389	2011	5	376	4,174	-	44.5%	0.0%
Burundi	Lower	5,149	2013	5	200	2,658	1,189	51.6%	23.1%
Burundi	Lower	17,269	2017	17	554	5,585	6,807	32.3%	39.4%
Cambodia	Lower-middle	15,352	2000	24	471	-	-	0.0%	0.0%
Cambodia	Lower-middle	16,823	2006	19	557	2,411	-	14.3%	0.0%
Cambodia	Lower-middle	18,753	2011	19	611	4,791	-	25.5%	0.0%

Cambodia	Lower-middle	17,578	2014	19	611	2,477	3,663	14.1%	20.8%
Cameroon	Lower-middle	3,871	1991	5	149	-	-	0.0%	0.0%
Cameroon	Lower-middle	10,656	2004	12	466	-	-	0.0%	0.0%
Cameroon	Lower-middle	15,426	2011	12	578	4,729	-	30.7%	0.0%
CotedIvoire	Lower-middle	8,099	1994	10	246	-	-	0.0%	0.0%
CotedIvoire	Lower-middle	3,040	1999	3	140	-	-	0.0%	0.0%
CotedIvoire	Lower-middle	10,060	2012	11	351	3,200	197	31.8%	2.0%
DominicanRepublic	Upper-middle	27,195	2007	32	1,428	27	-	0.1%	0.0%
DominicanRepublic	Upper-middle	9,372	2013	9	524	2,436	-	26.0%	0.0%
DRCongo	Lower	9,995	2007	11	300	4,941	-	49.4%	0.0%
DRCongo	Lower	18,827	2014	11	536	7,605	3,486	40.4%	18.5%
Egypt	Lower-middle	9,864	1993	5	546	-	-	0.0%	0.0%
Egypt	Lower-middle	14,779	1996	6	934	-	-	0.0%	0.0%
Egypt	Lower-middle	15,573	2000	6	1,000	10	-	0.1%	0.0%
Egypt	Lower-middle	9,159	2003	5	976	1,862	-	20.3%	0.0%
Egypt	Lower-middle	19,474	2005	6	1,359	3,212	-	16.5%	0.0%
Egypt	Lower-middle	16,527	2008	6	1,264	2,254	-	13.6%	0.0%
Egypt	Lower-middle	21,762	2014	6	1,828	7,841	592	36.0%	2.7%
Ethiopia	Lower	14,070	1997	11	535	3,688	-	26.2%	0.0%
Ethiopia	Lower	15,367	2000	11	539	-	-	0.0%	0.0%
Ethiopia	Lower	16,515	2003	11	596	6,913	-	41.9%	0.0%
Ethiopia	Lower	15,683	2016	11	643	6,389	6,396	40.7%	40.8%
Ghana	Lower-middle	4,562	1994	10	400	-	-	0.0%	0.0%
Ghana	Lower-middle	4,843	1999	10	400	-	-	0.0%	0.0%
Ghana	Lower-middle	5,691	2003	10	412	-	-	0.0%	0.0%
Ghana	Lower-middle	4,916	2008	10	411	2,496	-	50.8%	0.0%
Ghana	Lower-middle	9,396	2014	10	427	5,560	2,978	59.2%	31.7%
Ghana	Lower-middle	5,150	2016	10	200	216	3,191	4.2%	62.0%
Guinea	Lower	6,753	1999	5	293	-	-	0.0%	0.0%

Guinea	Lower	7,954	2005	8	295	1,807	-	22.7%	0.0%
Guinea	Lower	9,142	2012	8	300	4,938	-	54.0%	0.0%
Haiti	Lower	10,159	2000	10	317	-	-	0.0%	0.0%
Haiti	Lower	10,757	2006	10	339	-	-	0.0%	0.0%
Haiti	Lower	14,287	2012	11	445	9,342	1,096	65.4%	7.7%
Jordan	Upper-middle	6,006	2002	3	498	582	-	9.7%	0.0%
Jordan	Upper-middle	10,876	2007	3	928	1,354	-	12.4%	0.0%
Jordan	Upper-middle	11,352	2012	3	806	3,929	-	34.6%	0.0%
Kenya	Lower-middle	8,195	2003	8	400	-	-	0.0%	0.0%
Kenya	Lower-middle	8,444	2009	8	398	3,221	-	38.1%	0.0%
Kenya	Lower-middle	31,079	2014	8	1,593	10,898	3,451	35.1%	11.1%
Kenya	Lower-middle	5,394	2015	8	245	3,385	1,001	62.8%	18.6%
Lesotho	Lower-middle	7,095	2005	10	405	-	-	0.0%	0.0%
Lesotho	Lower-middle	7,624	2010	10	400	1,463	-	19.2%	0.0%
Lesotho	Lower-middle	6,621	2014	10	399	2,246	802	33.9%	12.1%
Liberia	Lower	5,239	1986	4	156	-	-	0.0%	0.0%
Liberia	Lower	7,092	2007	6	298	14	-	0.2%	0.0%
Liberia	Lower	4,397	2009	6	150	2,123	-	48.3%	0.0%
Liberia	Lower	3,939	2011	6	150	2,075	-	52.7%	0.0%
Liberia	Lower	9,239	2013	5	322	4,120	2,190	44.6%	23.7%
Liberia	Lower	4,290	2016	6	150	2,741	1,994	63.9%	46.5%
Madagascar	Lower	7,060	1997	6	269	-	-	0.0%	0.0%
Madagascar	Lower	17,375	2009	21	594	5,233	-	30.1%	0.0%
Madagascar	Lower	8,169	2011	21	267	3,032	-	37.1%	0.0%
Madagascar	Lower	8,045	2013	4	274	2,960	1,579	36.8%	19.6%
Madagascar	Lower	10,655	2016	21	358	1,412	2,250	13.3%	21.1%
Malawi	Lower	13,220	2000	3	559	-	-	0.0%	0.0%
Malawi	Lower	11,698	2005	3	521	-	-	0.0%	0.0%
Malawi	Lower	23,020	2010	3	849	4,376	-	19.0%	0.0%

Malawi	Lower	2,906	2012	3	140	1,642	126	56.5%	4.3%
Malawi	Lower	2,897	2014	3	140	1,751	1,161	60.4%	40.1%
Malawi	Lower	24,562	2016	3	850	8,859	6,485	36.1%	26.4%
Malawi	Lower	3,860	2017	3	150	2,737	1,955	70.9%	50.6%
Mali	Lower	9,704	1996	8	300	-	-	0.0%	0.0%
Mali	Lower	12,849	2001	9	402	-	-	0.0%	0.0%
Mali	Lower	14,583	2006	9	407	2,303	-	15.8%	0.0%
Mali	Lower	10,424	2013	6	413	4,555	1,738	43.7%	16.7%
Mali	Lower	7,758	2015	6	177	4,852	1,633	62.5%	21.0%
Mozambique	Lower	11,212	2009	10	270	3,877	-	34.6%	0.0%
Mozambique	Lower	13,745	2011	10	610	7,151	-	52.0%	0.0%
Mozambique	Lower	7,749	2015	10	306	4,236	2,094	54.7%	27.0%
Namibia	Upper-middle	6,755	2000	13	259	-	-	0.0%	0.0%
Namibia	Upper-middle	9,804	2007	13	500	673	-	6.9%	0.0%
Namibia	Upper-middle	10,018	2013	13	549	689	1,145	6.9%	11.4%
Nepal	Lower	8,726	2001	5	251	-	-	0.0%	0.0%
Nepal	Lower	10,793	2006	5	260	3,547	-	32.9%	0.0%
Nepal	Lower	12,674	2011	3	289	7,042	-	55.6%	0.0%
Nepal	Lower	12,862	2016	7	383	6,059	4,164	47.1%	32.4%
Nigeria	Lower-middle	8,781	1990	4	298	-	-	0.0%	0.0%
Nigeria	Lower-middle	7,620	2003	6	362	207	-	2.7%	0.0%
Nigeria	Lower-middle	33,385	2008	6	886	3,888	-	11.6%	0.0%
Nigeria	Lower-middle	6,344	2010	6	239	5,206	-	82.1%	0.0%
Nigeria	Lower-middle	38,948	2013	6	896	18,724	2,338	48.1%	6.0%
Nigeria	Lower-middle	8,034	2015	6	326	5,512	1,307	68.6%	16.3%
Peru	Upper-middle	27,843	2000	24	1,414	-	-	0.0%	0.0%
Peru	Upper-middle	41,648	2008	25	1,851	-	-	0.0%	0.0%
Peru	Upper-middle	24,212	2009	25	1,132	4,974	-	20.5%	0.0%
Philippines	Lower-middle	13,633	2003	17	819	2,514	-	18.4%	0.0%

Philippines	Lower-middle	13,594	2008	17	792	9,365	-	68.9%	0.0%
Philippines	Lower-middle	25,074	2017	17	1,248	5,424	-	21.6%	0.0%
Rwanda	Lower	11,321	2005	11	462	-	-	0.0%	0.0%
Rwanda	Lower	7,313	2008	5	249	778	-	10.6%	0.0%
Rwanda	Lower	13,671	2011	5	492	4,713	-	34.5%	0.0%
Rwanda	Lower	13,497	2015	5	492	6,081	5,403	45.1%	40.0%
Senegal	Lower	6,310	1993	4	258	-	-	0.0%	0.0%
Senegal	Lower	8,593	1997	4	320	-	-	0.0%	0.0%
Senegal	Lower	14,602	2005	11	376	2,439	-	16.7%	0.0%
Senegal	Lower	19,441	2009	11	320	9,384	-	48.3%	0.0%
Senegal	Lower	15,688	2011	14	391	7,927	-	50.5%	0.0%
Senegal	Lower	17,272	2013	14	200	5,098	6,672	29.5%	38.6%
Senegal	Lower	16,976	2014	14	400	4,680	7,788	27.6%	45.9%
Senegal	Lower	17,702	2015	14	214	9,474	10,820	53.5%	61.1%
Senegal	Lower	17,730	2016	14	428	6,490	6,292	36.6%	35.5%
SierraLeone	Lower	7,374	2008	4	353	2,132	-	28.9%	0.0%
SierraLeone	Lower	16,658	2013	4	435	5,211	-	31.3%	0.0%
SierraLeone	Lower	8,501	2016	4	336	2,521	1,827	29.7%	21.5%
Tanzania	Lower	4,029	1999	22	176	-	-	0.0%	0.0%
Tanzania	Lower	12,522	2004	21	345	32	-	0.3%	0.0%
Tanzania	Lower	16,318	2008	26	475	4,759	-	29.2%	0.0%
Tanzania	Lower	10,139	2010	26	475	3,337	-	32.9%	0.0%
Tanzania	Lower	19,319	2012	28	583	8,984	1,173	46.5%	6.1%
Tanzania	Lower	13,266	2016	28	608	5,565	3,345	41.9%	25.2%
TimorLeste	Lower-middle	13,137	2010	13	455	2,525	-	19.2%	0.0%
TimorLeste	Lower-middle	12,607	2016	13	455	4,830	3,041	38.3%	24.1%
Togo	Lower	3,360	1988	5	153	-	-	0.0%	0.0%
Togo	Lower	8,569	1998	6	288	-	-	0.0%	0.0%
Togo	Lower	9,480	2014	6	330	3,772	184	39.8%	1.9%

Togo	Lower	4,674	2017	6	171	2,260	643	48.4%	13.8%
Uganda	Lower	7,246	2001	4	297	-	-	0.0%	0.0%
Uganda	Lower	8,531	2006	9	368	903	-	10.6%	0.0%
Uganda	Lower	4,108	2009	10	169	1,237	-	30.1%	0.0%
Uganda	Lower	8,700	2011	10	404	5,213	-	59.9%	0.0%
Uganda	Lower	5,322	2015	10	210	3,711	3,219	69.7%	60.5%
Uganda	Lower	18,506	2016	15	696	9,387	6,496	50.7%	35.1%
Zambia	Lower-middle	7,146	2007	9	319	2,203	-	30.8%	0.0%
Zambia	Lower-middle	16,411	2014	10	721	5,448	2,119	33.2%	12.9%
Zimbabwe	Lower	5,907	1999	10	230	-	-	0.0%	0.0%
Zimbabwe	Lower	8,907	2006	10	398	-	-	0.0%	0.0%
Zimbabwe	Lower	9,171	2011	10	406	28	-	0.3%	0.0%
Zimbabwe	Lower	9,955	2015	10	400	1,014	70	10.2%	0.7%

Table 32: *Sector allocation of World Bank Water projects*

Sector names in World Bank dataset that were allocated to the Water sector
(Historic)Hydro
(Historic)Other water supply and sanitation
(Historic)Pollution control / waste management
(Historic)Rural water supply and sanitation
(Historic)Urban water supply
(Historic)Water supply and sanitation adjustment
Other Water Supply
Sanitation and Waste Management
Water
Sanitation
Public Administration - Water Sanitation and Waste Management
Public Administration - Water
Sewerage
Waste Management
Water resource management
Water Supply

Note: Only a few project budgets are dedicated to one sector only (100%). Therefore we took the sector with the highest budget allocation percentage (independent of whether all percentages for budget allocation add up to 100% or not). If the highest percentage has no given sector then sector was treated as not available (n/a) and if several sectors are listed with the same budget allocation percentage then we allocated the sector that was mentioned first.

Table 33: *Transformation of descriptive variables into numerical values*

Transformation of descriptive variables into numerical values for the variable
Quality of drinking water

Description	**Value**
Canal; Covered spring; Dam; Dam/lake/pond; Developed spring; Improved spring; Improved stream; Lake, pond; Lake/pond/river/channel/irrigation channel; Nile, canal; Nile/canals; Ocean/lake; Open spring; Other spring; Pond, lake; Pond, River, Stream; Pond,lake; Pond/lake; Pond/lake/dam; Pond/tank/lake; Pretected source; Protected source; Protected spring; Public fountain; Puits, forage; Resevoir; Rier/dam/lake/ponds/stream/canal/irrigation channel; River; River or stream; River, lake, sea; River, stream; River, stream, pond, lake; River,spring,pond /ma; River,spring,surf. w; River,stream; River/dam/lake/pond/stream/canal/irrigation channel; River/dam/lake/ponds/stream/canal/irirgation channel; River/dam/lake/ponds/stream/canal/irrigation channel; River/stream; River/stream not protected; River/stream/pond/lake; River/stream/pond/lake/dam; RiviŠre; Sea, lake; Souce not protected; Source; Spring; Spring water unprotected; Spring, Not improved; Sprong/kuwa; Surface water (river/dam); Surface water (River/Dam/Lake/Pond/Stream/Canal/Irrigation channel); Surface water(river/dam/lake/pond/stream/canal/irrigation channel; Surface well/other well; Surface/other well; Undeveloped spring; Unprotected spring; Other rainwater; Pluie; Rainwater; Rainwater cistern; Rainwater in a cistern	1
Borehole public; Dug - well unprotected; Dugout; Gravity flow scheme; Gravity flow water; Non protected well; Open dug well; Open public well; Open well; Open well /Hole/Cesspool in residence; Open well /hole/cesspool outside residence; Public and others Unprotected well; Public borehole; Public well; Public well, cement, not covered; Public well, traditional; Spring - protected; Spring water protected; Tubed/Piped public well or borehole; Unprotectd well; Unprotected dug well; Unprotected public well/spring; Unprotected well; Well without cover; Neighbor's open well; Neighbour's open well; Open well in yard; Open well in yard/compound; Open well in yard/plot; Unprotected well to yard; Unprotected well/spring in yard/plot; Open well in compound/plot; Open well in dwelling; open well in dwelling/yard; Well in residence/yard/plot	2
Covered public well; Covered well; Dug well - protected; Manual pumped water; Others Protected well; Protected dug well; protected public dug well; Protected public well; Protected public well/spring; Protected well; Protected without pump; Protected/covered well; Public well, cement, covered; Semi-protected well; Well equipped with pump; Well outside residence; Well with cover; Well with handpump; Well with pump; Well without handpum; Well without hndpump; Protected well in someone else's yard/plot; Public/neighbor's tubewell; Public/neighbor's well; Protected well to yard; Protected well in yard/ compound; Protected well in yard/plot; Protected well/spring in yard/plot; Well in yard/plot; Covered well in compound/plot; protected dug well in dwelling/yard/plot; Protected well in dwelling; Well in compound; Well in dwelling; Well in house/yard/plot; Well in residence; Well in residence/yard/compound; Well inside dwelling; Well into dwelling/yard/plot	3

Borehole; Borehole /Pump; Borehole or tubewell; Borehole with pump; Borehole with pump outside residence; Borehole/ tubewell; Deep tubewell; Forage; Hand pump / Tube well or borehole; Shallow tubewell; Tube well; Tube well or borehole; Tubewell; Tubewell or borehole; Neighbor's borehole; Borehole in yard/plot; Tubewell in yard/plot; Borehole with pump in residence	4
Borne fontaine; Community stand pipe; Community standpipe; Eau courante; Piped - public; Piped - public tap / standpipe; Piped outside dwel.; Piped outside dwelling; Piped outside residence; Piped public tap; Public tab/standpipe; Public tap; Public tap / neighbors house; Public tap/standpipe; Public to neighborhood; Public/nieghbor's tap; Stone tap/dhara; Neighbor's house; Neighbor's tap; Neighbor's Tap, NAWASA (others recode); Neighbor's Tap, Source Unknown (others recode); Neighbor's tap/standpipe; Neighbour's tap; Of a neighbor; Piped from the neighbor; Piped into neighbour's yard/plot; Piped into someone else's yard/plot; Piped to neighbor; Piped to neighbour's house; Piped water elsewhere; Private tap/neighbor; In the courtyard; Outside house; Outside pipe; Piped - into yard/plot; Piped into tap in yard/plot; Piped into yard; Piped into yard /plot; Piped into yard/plot; Piped into yard/plot/building; Piped outside compound; Piped outside dwelling but within buikding; Piped to yard/plot; Tubed/piped well or bore hole in dwelling/yard; In the house; Pipe into dwelling (own artesian); Piped - into dwelling; Piped in dwelling; Piped in dwelling/yard/plot; Piped inside dwel.; Piped inside dwelling; Piped into compound; Piped into compound/plot; Piped into dwelling; Piped into house; Piped into house/yard/plot; Piped into own dwelling; Piped into residence; Piped water into residence; Piped water into residence/yard/compound; Tap in compound; Tap in dwelling; Water in house	5
Autre vendeur; Bicycle with jerrycans; Bottled water; Bottled water or sachets; Bottled water/refilling station; Buy water from a car; Camion, citerne; Cart with small tank; Mineral water in sachet; Motorcycle with three wheels; Sachet water; Sachet water (in a bag); Sales Company of water; Satchel water; Tanker truck; Tanker truck/ cistern; Tanker truck/bowser; Tanker truck/peddler; Tanker,truck,other v; Vendor; Vendor = Cart with small tank; Vendor: Cart with small tank; Water from vendor; Water in plastic bag; Water in sachet; Water sachets; Water sachets (pure water); Water sale by company; Water vender; Water vendor; Other; Along the road; Autre; Marigot; Other; Others	Other

Note: We listed all entries irrespective of identical meanings but variant forms of spelling. Descriptions that are transformed into "Other" are not included in our regressions.

Transformation of descriptive variables into numerical values for the variable
Type of toilet

Description	Value
No facilities; No facilities, bush; No facility; No facility / bush / field; No facility, bush; No facility, bush, field; No facility,bush; No facility/ bush/ field; No facility/ bush/ field/ river; No facility/bush; No facility/bush/field; No facility/Field; No facility/outdoors/bush; No service; No toilet facility, nature; No toilet/field/bush; No toilet/field/forest; Not facility; Open air; River; River, canal; River/canal	0
Bucket; Bucket latrine; Bucket toilet; Bucket, pan; Bucket/Pan; Bucket/pan toilet; Bucket/potty/other container; Bush; Bush/field; Dans la nature; Stream/river	1
Latrine over river/lake	2
Pit latrine without slab/open pit; Basic Pit; Close pit; Covered pit latrine - without slab / open pit; Covered pit latrine no slab; Covered pit latrine, no slab; Fosse etanche; No flush toilet, where; Non covered latrine; Non-VIP pit latrine with slab; Non-VIP pit latrine without slab; Not improved latrine; Open pit; Own traditional pit toilet; Pit; Pit latrine - without slab; Pit latrine - without slab/open pit; Pit latrine (traditional); Pit latrine without slab / open pit; Pit latrine without slab non-wahable; Pit latrine without slab/ open pit; Pit latrine, without slab/open pit; Pit toilet latrine; Pit toilet, latrine; Pit toilet/latrine; Pit toilet/Open borehole; Pit toilet\latrine; Pour flush latrine; Private latrine without slab; Puits perdu; Rudimentary pit toilet latrine; Share latrine without slab; Share pit toilet/letrine; Shared traditional pit toilet; Simple latrine; Slit latrine; Toilet without flush; Trad. pit toilet; Trad. w bucket flush; Trad. w tank flush; Traditional bucket flush; Traditional latrine; Traditional pit latrine; Traditional pit toilet; Traditional Pit/Latrine unconnected to sewer/without septic; Traditional with bucket flush; Traditional with tank flush; Uncovered pit latrine - without slab; Uncovered pit latrine no slab; Uncovered pit latrine, no slab; Uncovered pit-latrine; Without cement sink; Pit latrine; Pit latrine - without slab / open pit; Open latrine; Pit latrine - with slab; Cemented with sink; Covered hole; Covered pit latrine - with slab; Covered pit latrine with slab; Covered pit latrine, with slab; Pit latrine with non-washable slab; Pit latrine with slab (not washable); Pit latrine with slab (washable); Pit latrine with slab no washable; Pit latrine with slab that can not be washed; Pit latrine with washable slab; Pit latrine, with slab; Private latrine with slab; Share latrine with slab; Uncovered pit latrine - with slab; Uncovered pit latrine with slab; Uncovered pit latrine, with slab; Pit latrine with slab; Ventilated Improved Pit latrine (VIP); (VIP) Latrine/Blair Toilet; Improved (ventilated) pit latrine; Improved latrine; Improved pit latrine; Improved pit toilet latrine; Outside dwelling; Own pit toilet/latrine; Pit latrine - ventilated improved; Pit latrine - ventilated improved pit (VIP); Pit latrine (outside); Pit latrine ventilated improved pit latrine; Pit latrine, ventilated improved; Septic hole; Septic well; Traditional improved latrine; Unventilated latrine; Vent. imp. pit latr.; Vent. imp. pit latrine; Vent.imp.pit latrine; Vented improved pit latrine; Ventilated improved (VIP); Ventilated improved pit; Ventilated improved pit (VIP) latrine; Ventilated improved pit lat; Ventilated improved pit latrine; Ventilated improved pit latrine (LAA); Ventilated improved pit toilet; Ventilated improved pit/latrine (VIP Blair toilet); Ventilated improved pit-latrine; Ventilated latrine; Ventilated/improved pit latrine; VIP latrine; Inside dwelling	3

Covered latrine; Covered pit-latrine; Latrine; Latrine (ciego o negro); Latrine with manual flush; Inside yard: Latrine to open pit (ditch or river); Out of yard: Latrine to open pit (ditch or river); Indoors: Latrine to septic tank; Inside yard: Latrine to septic tank; Latrine connected to sewer/with septic tank; Mobile chemical toilet; Out of yard: Latrine to septic tank; Indoors: Latrine to piped public system; Inside yard: Latrine to piped public system; Out of yard: Latrine to piped public system	4
Flush, don't know where; Flush to somewhere else; Flush - to somewhere else; Flush - don't know where; Avec chasse d'eau; Flush; Flush - ; Flush - where; Flush don't know where; Flush or pour flush toilet; Flush other; Flush to vault (Bayara); Flush toileet; Flush toilet; Flush toilet to somewhere else; Flush toilet: own; Flush toilet: shared; Flush unconnected to sewer/without septic tank; Flush, where; Flust to pipe connected to canal; Modern flush; Modern flush toilet; Out/public; Own flush toilet; Own flush toilet outsite/yard; Personal toilet; Public flush toilet; Public toilet; Share toilet; Shared flush toilet; Toilet in common; Toilet with flush; W.C.; Water flow do not know where; Flush - to pit latrine; Hanging latrine; Drop/Hanging toilet; Drop/overhang; Flush to latrine; Flush toilet to pit latrine; Hanging toilet; Hanging toilet / hanging latrine; Indoors: Flush to open pit (ditch or river); Inside yard: Flush to open pit (ditch or river); Out of yard: Flush to open pit (ditch or river); Toilet hanging (on stilts); Traditional tank flush; Water sealed/slab latrine; Flush to pit latrine; Hanging toilet/latrine; Water sealed/slab la; Flush to septic tank; Flush - to septic tank; Barrel, tank; Composting toilet; Composting toilet / ECOSAN; Composting toilet/Arbo loo; Composting toilet/ecosan; Ecosan; Flush - to septic tank; Flush connected to sewer/with septic tank; Flush to pipe connected to ground water; Flush toilet to septic tank; Indoors: Flush to septic tank; Inside yard: Flush to septic tank; Out of yard: Flush to septic tank; Out/private; Septic pit; Septic tank; Share flush toilet outside/yard; Septic tank/toilet; Septic tank/modern toilet; Flush - to piped sewer system; Flush toilet to piped sewer system; Flushed to piped sewer system; Indoors: Flush to piped public system; Inside yard: Flush to piped public system; Out of yard: Flush to piped public system; Own flust toilet into residence; Piped sewage system; Private toilet; Share flush toilet into residence; Flush to piped sewer system	5
Delete; Non de jure resident; Not a de jure resident; Other; Other place; Other; Autre	Other

Note: We listed all entries irrespective of identical meanings but variant forms of spelling. Descriptions that are transformed into "Other" are not included in our regressions.

Transformation of descriptive variables into numerical values for the variable
Relation to household head

Description	**Value**
Head	1
Co-spouse; Co-wife; Spouse; Wife; Wife or husband	2
Mother; Parent; Parent/ parent-in-law; Parents/ parent-in-law	3
Daughter; Son /daughter; Son/daughter	4
Brother /sister; Brother/sister; Sister	5

Grandchild; Granddaughter; Grand-daughter; Grand-son/daughter	6
Niece; Niece by blood; Niece/nehew by blood; Niece/nephew; Niece/nephew by blood; Niece/nephew by blood*	7
Mother-in-law; Parent-in-law	8
Daughter-in-law; Son /daughter-in-law; Son/daughter-in-law	9
Brother or sister-in-law; Brother/Sister in law; Niece by marriage; Niece/nephew by marriage; Niece/nephew by marriage*; Sister in law; Sister-in-law	10
Other relative; Uncle/Aunt/Other relative	11
Adopted /foster child; Adopted/ foster/ stepchild; Adopted/foster child; Adopted/foster child/stepchild; Adopted/foster daughter; Adopted/foster/step child; Stepson/daughter; Step-son/daughter; Step-son/step-daughter	12
Not related	13
Domestic employee; Domestic employee (CS); Domestic service; House maid; Maid	14

Note: We listed all entries irrespective of identical meanings but variant forms of spelling.

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