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Social Cohesion and Growth

Bachelor Thesis

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Abstrakt

V této práci zkoumáme vliv sociální soudržnosti na ekonomický růst. Sociální soudržnost měříme pomocí Indexu sociální soudržnosti, který kombinuje několik zdrojů dat do snadno interpretovatelného indexu pokrývající 155 zemí. Problém modelové nejistoty a endogenity sociální soudržnosti řešíme kombinací metody "Bayesian Model Averaging" (BMA) a dvoustupňového odhadu metody nejmenších čtverců. Při uvážení více než dvaceti nezávislých proměnných pro padesát tři zemí demonstrujeme, že sociální soudržnost má pozitivní vliv na ekonomický růst. Pomocí citlivostní analýzy vyhodnocujeme variabilitu sociální soudržnosti napříč různými priorními strukturami. Validaci výsledků provedeme přidáním proměnných "Vlády práva" a "Integrace", a odhaneme tento model pomocí metody "Instrumental Variable Baysian Model Averaging" (IVBMA), abychom eliminovali značnou nejistotu ohledně instrumentů. Výsledky naznačují, že sociální soudržnost je důležitý determinant ekonomického růstu.

Klíčová slova	Sociální soudržnost, Růst, Bayesovské modelové průměrování

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Abstract

In this thesis, we examine the effect of social cohesion on economic growth. As a measure of social cohesion, we use Social Cohesion Index that combines several data sources into one comprehensible index covering 155 countries. We deal with model uncertainty and endogeneity of social cohesion at the same time by employing Bayesian model averaging together with two-stage least square estimation. Considering more than twenty regressors for fifty-three countries, we show that social cohesion has a positive effect on economic growth. We perform a prior sensitivity analysis to assess variability of social cohesion across different prior structures. As a robustness check, we include Rule of Law and Integration variables into our model and estimate it with Instrumental Variable Bayesian Model Averaging (IVBMA) methodology to cope with a considerable degree of instrument uncertainty. The results suggest that social cohesion is indeed a vital determinant of economic growth.

Keywords	Social Cohesion, Growth, Bayesian Model Averaging

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Declaration of Authorship

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Project of Bachelor Thesis

Author of the thesis: Milan Frydrych
Supervisor of the thesis: doc. Roman Horváth, M.A., Ph.D.
Theme: Social Cohesion and Growth

Goals of the thesis:

Performance of economies depends on various factors, and one of them is culture. In my Bachelor thesis, I intend to examine the impact of social cohesion on economic growth. Firstly, I provide relevant literature review in the field of social cohesion. Then I continue with introducing a suitable definition of social cohesion for the analysis. Lastly, I present the estimation methodology and carry out empirical analysis to determine whether social cohesion is a robust determinant of economic growth.

Preliminary structure of the thesis:

1. Introduction
2. Literature review, the definition of social cohesion
3. Empirical analysis
4. Discussion of results
5. Conclusion

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Acronyms

2SLS	Two-stage Least Square
BMA	Bayesian Model Averaging
GDP	Gross Domestic Product
IVBMA	Instrumental Variable for Bayesian Model Averaging
MC^3	Markov Chain Monte Carlo Model Composition
OECD	Organization for Economic Co-operation and Development
PIP	Posterior Inclusion Probability
SCI	Social Cohesion Index

1 Introduction

Levels of income substantially differ across countries. The world's richest and poorest nations level of GDP per capita differ by a factor of more than 180. The Democratic Republic of Congo, the poorest economy in the world for which the national statistics are available, has an income per capita of $697, in contrast to Qatar's $130053. Ten richest countries together have higher GDP per capita than a hundred and thirty-three poorest countries.[1] What factors are behind these huge differences and what can we do to mitigate them?

This thesis investigates one of plentiful determinants that have the potential to explain differences in income levels - social cohesion. This rather vague term was intellectualized by a prominent French sociologist Emile Durkheim in his influential book, "The Division of Labor in Society," where he theorized that solidarity formed the basis of social cohesion and at the same time recognized that the concept is problematic in terms of measurement and definition. The interest in social cohesion of policy makers and researchers began to rise in 1980 in reaction to globalisation and new socio-economic developments such as higher population mobility and diversity. In early 1980s, OECD pointed out that greater attention should be payed to social policy (Jenson 2010). European Union recognized the importance of social cohesion as it was reflected in the Treaty of Maastricht. Also, Canadian Heritage put social cohesion at the centre of its report (Canadian Identity, Culture and Values: Building a Cohesive Society 1997). In academics, the focus has been mostly on social capital which is frequently viewed as a prerequisite to social cohesion (Spoonley 2005). Vivid discussion has been devoted to the definition of social cohesion. Leading works in this regard are Bollen and Hoayle (1990), , Berger (1998), Bernard (1999) or Chan et al. (2006). Unfortunately, the discussion so far has failed to find a consensus on how to define social cohesion (Andréasson et al. 2013). Ritzen et al (2000), Easterly et al. (2006) and Hellen (2009) find a positive impact of social cohesion on economic growth through formal institutions. A drawback of their work is that as proxies for cohesion, ethnic fractionalization and income inequality are used, which may be only weakly reliable or valid as measures of social cohesion (Foa 2011).

Empirical growth literature accentuates model uncertainty (Fernandez et

[1] These figures are for year 2012 and are expressed in current international dollars, PPP adjusted. The source is World Bank, http://data.worldbank.org.

al. 2001a, Durlauf et al. 2004). Growth econometrics has been fruitful in identifying potential determinants of growth, and many growth theories have been developed. Consequently, there is a considerable degree of uncertainty about the 'true' model of economic growth.

In short, the literature identifies four major issues: (i) proper definition, (ii) measurement issues (valid proxy variable), (iii) model uncertainty and (iv) endogeneity of social cohesion. This thesis aims at contributing to the literature and try to address issues (ii), (iv) and partly (iii). As a proxy for social cohesion, we use Social Cohesion Index from Foa (2011). This index combines several data sources into one comprehensible index based on an aggregation method used to construct World Governance Indicators and Transparency International's Corruptions Perceptions Index (Foa 2011). The tremendous advantage of this approach is a vast number of countries and minimized level of error in the estimates. We address model uncertainty by employing Bayesian Model Averaging technique (BMA). Unlike in frequentist econometrics where model uncertainty is addressed in an ad-hoc and opaque manner, BMA is a transparent estimating procedure where the 'true' model is treated as an unobservable variable and is well grounded in statistical theory (Raftery et al. 1997). Moreover, BMA can estimate tens of regressors jointly and, therefore, reduce omitted variable bias. Regressors are ranked according to posterior inclusion probability (PIP) that tells us, what is the probability that a certain regressor belongs to the 'true' model. To cope with endogeneity, we follow the methodology developed by Durlauf et al. (2008) and use a two-stage least square estimation together with BMA.

The results based on 53 countries and 21 explanatory variables suggest that social cohesion is likely to play a significant role in explaining differences in income levels. Hence, our findings support the evidence of Easterly et al. (2006) and reassure policy makers of the importance of social cohesion.

This thesis is organized as follows. Section 2 provides the rationale for social cohesion. Section 3 review the relevant literature. Next, section 4 presents BMA technique and section 5 methodology of the estimation. A description of the data is in section 6. Section 7 provides the results. Finally, section 8 concludes. Appendix with additional tables follows.

2 Impact of Social Cohesion, Social Cohesion Index

This section is devoted to a description of channels through which social cohesion might influence economic growth. Furthermore, we provide a brief explanation how Social Cohesion Index is constructed.

2.1 Channels

Why might we expect a positive relationship between growth and social cohesion? There are many areas in human life where social cohesion can help alleviate problems in society. The explanations about to follow are not by any means exhaustive. Before we start, it might be useful to define what we mean by socially cohesive society. In this regard, we follow Foa (2011): "We understand a socially cohesive society to be one in which institutions exist that foster norms of cooperation between distinct ethnic, religious, and other identity groups, including non-discrimination, such as in the labour or capital market; and non-violence, whether it be via low-level, spontaneous communal conflict such as riots, assassinations and progroms or more institutionalized forms of intergroup struggle such as terrorist activities or civil war."

Many explanations of how social cohesion can yield economic payoff come from social capital literature, for example, Putnam (1993) or Woolcock (1998).

Social cohesion can contribute to growth through reducing transaction costs - search and information costs, bargaining costs, policing and enforcement costs. Countries which experience lower trust among different groups, be it ethnical or religious, have the costs of cooperation higher, therefore, its economic activity is hindered. The most common measure is generalized trust - trust based on general knowledge of the population agents. La Porta et al. (1997) find that "trust promotes cooperation, especially in large organizations." Moreover, Knack and Keefer (1997) show that trust is a valid predictor of future economic growth.

In areas where there is not possible to obtain accurate and up-to-date information, social cohesion can be of help. In the study of the US labor market, Granovetter (1975) describe the role of interpersonal relationships in providing information about available jobs and job applicants. As many jobs are offered

on the basis of personal recommendations and word-of-mouth, interpersonal relationships create an information network, compensating for missing or inefficiently working formal institutions. Durlauf and Fafchamps (2005) note that such example does not provide enough evidence to promote this mechanism because establishing formal institutions may be a superior alternative. However, when it is complicated or costly to erect such institutions, promoting interpersonal relationships can become more desirable.

Social cohesion enables politicians to employ effective reforms. Easterly et al. (2006) hypothesize that one reason why even seasoned politicians with good intentions enact bad reforms is that social cohesion in society is too low. In particular, citizens do not believe politicians that long-term gains will outweigh short-term losses.

Social cohesion maintains capital accumulation. If the intergroup violence is present, it poses severe consequences for the country's growth by destroying physical infrastructure as well as reducing human capital. The cost of civil war can be substantial. Collier (1999) estimates that the growth rate during war decrease by 2.2% per year and a civil war lasting 15 years can reduce GDP per capita roughly by 30%.

Lastly, social cohesion improves allocative efficiency. In societies where social cohesion is lacking, allocatively suboptimal outcomes may appear. If economic agents hesitate to engage in economic activities with other actors of different religious, ethnic or caste groups, then allocative efficiency will not be secured. For instance, in labour market, when discrimination is present, employers do not hire people of a different race even though they are qualified. A welfare loss will occur to both agents. Also, if minority groups are restrained from obtaining equal access to education, health care, or any other life standard that is commonly available to the majority, then these groups cannot reach their full potential. Therefore, lack of social cohesion can lead to isolation and exclusion of minorities, reduced human and productive capital and burden for state budget since members of discriminated groups remain unemployed.

2.2 Social Cohesion Index

As a proxy for social cohesion, this thesis uses Social Cohesion Index developed by Foa (2011). It is composed of various data sources such as World Values Surveys, Fund for Peace or International Country Risk Guide. Sources

involve data about number of riots, terrorist acts, questions about trust, discrimination or ethnic tolerance. It is created by the technique that combines different indicators into an index and is called the matching percentiles method used in World Bank's Worldwide Governance Indicators or Transparency International's Corruptions Perceptions Index. The idea of said method is that every set of indicators represents some unobservable value of the underlying phenomenon in each society on a different scale, with varying country samples and with different degrees of measurement error. The crucial assumption involves errors to be uncorrelated across sources to allow for combining indicators to reduce the aggregate level of error.

Formally, for a phenomenon there exists some latent value (L_i) that constitutes the true level of the phenomenon in society i. Each of the l available indicators x_{il} demonstrates the level of (L_i), taking a different functional form h_l and having a different degree of measurement error ϵ_{il} such that:

$$x_{il} = h_l\left(L_i\right) + \epsilon_{il}$$

There is no assumption about functional form, so the aggregation process is a non-parametric one. Hence, there is nor assumption about the linearity between x_l and L neither about the distribution of x_l. The only fact the relationship states is that the relative position of countries in x for variable l mirrors a better or worse underlying condition with respect to L. When adding a new indicator to the index, its score is assigned to the countries based on the values allocated to the same sample of countries already in the measure. Assume that we have five countries, Czech Republic, the United States of America, the United Kingdom, Cambodia and Costa Rica. Their index values are so far 0.35, 0.23, 0.43, 0.32 and 0.21 respectively, so the United Kingdom has the best position. Now we want to add another indicator to the index with values 0.8, 0.2, 0.34, 0.46 and 0.78 respectively. Then Czech Republic obtains a newly matched value of 0.43, Costa Rica 0.35, Cambodia 0.32, the United Kingdom 0.23 and the United States 0.21. Once all indicators are incorporated, the results are averaged to obtain the index. Additionally, the results are weighted by the level of linguistic, religious and ethnic fractionalization to favour countries that have reached a high level of social cohesion in spite of high heterogeneity in society.

The most important feature of this approach is the treatment of missing observations. If there is a country for which the indicator is not available, it does not mean the indicator cannot be used for the rest of the countries. Thus,

the number of indicators used in the index differs across countries. As a result, Social Cohesion Index is available for 155 countries. Detailed description of the method along with comparison with other aggregation methods can be found in Foa and Tanner (2011).

3 Literature Review

In this section, we are going to discuss obstacles and challenges that social cohesion and growth econometrics face. The first subsection provides a brief overview of growth econometrics. The second subsection presents a literature review of social cohesion with focus on its definition and measurement issues.

3.1 Brief Introduction to Growth Econometrics

Economic growth has been in the center of interest of economic theory for many decades, and it is one of the oldest and indisputably most important research agendas. Growth economics mainly revolves around two topics. The first one concerns the question of convergence: "Do differences in economies' per capita incomes tend to get smaller over a long period of time?" The second one focuses on identifying salient determinants of growth which is also the main concern of this thesis.

Initially, the majority of studies had focused on explaining economic growth through changes of factor inputs, technology and accumulation of human capital. The basic motivation for a cross-country regression comes from neoclassical theory; one-sector model, RCK or Solow-Swan, is approximated (first order) and together with algebra manipulation yields the linear equation of the form: $\gamma = g - \beta log(y^E_{i,\infty}) - \beta log(A_{i,0}) + \beta log(y_{i,0})$, where γ is growth rate of output per worker from a starting point 0 to time t, g is a constant rate of technological process, A is the efficiency level of workers and y^E is output per efficient worker. Here, we are not going to go into detail as our focus is on additional or non-macroeconomic determinants. The derivation and deeper elaboration can be found, for example, in Durlauf et al. (2004).

Over the course of time, non-macroeconomic determinants have been recognized as vitally important and are now commonly included in statistical analysis. The main argument for omitting such determinants was the difficulty to measure them and the question of comparability and reliability of such data (Pourgerami and Djeto 1992). This pitfall has been partly overcome by improving indicators for institutional quality and others and by finding suitable proxy variables. The pioneering work in the field of non-macroeconomic determinants was done by Kormendi and Meguire (1985) or Barro (1991). Both investigated

the effect of political stability on economic growth which was found to be positive. Since then, there have been many studies devoted to various determinants such as population density, trust, religion or institutions. Soon the number of potential determinants was as high as there was a number of countries in most datasets. That raised a question: "Which determinants belong to the 'true' growth model?" Standard econometric techniques were not able to deal with model uncertainty and this problem lead to the usage of model averaging. The most used econometric technique is Bayesian Model Averaging (BMA) which takes the 'true' model as an unobservable variable. We will discuss BMA in detail in the next section.

3.2 Social Cohesion

The interest in social cohesion in economics and social sciences as a whole has relatively short history. The emergence of social cohesion began in the beginning of 1980s, when OECD started raising the issue of social policy and its importance for future economic prosperity (Jenson 2010). The European Commission published its first cohesion report concerning the state of the social cohesion progress and means which have contributed to achieving social cohesion (European Commission 1996) A year later; Canadian Heritage publication put social cohesion as a top priority on its list in order to identify the potential problems that can arise in Canadian society by the year 2005 as a result of economic, demographic and social trends (Canadian Identity, Culture and Values: Building a Cohesive Society 1997). On 12 May 2000, the European Committee for Social Cohesion (CDSC) identifies some factors for strengthening social cohesion such as:

- setting up mechanisms and institutions which will prevent the factors of division (such as an excessive gap between rich and poor or the multiple forms of discrimination) from becoming so acute as to endanger social harmony
- the importance of decent and adequately remunerated employment
- measures to combat poverty and social exclusion, particularly in areas such as housing, health, education and training, employment and income distribution and social services

- strengthening social security systems
- developing policies for families, with particular emphasis on children and the elderly
- partnership with civil society bodies, in particular trade unions, employers' representatives and NGOs.

Council of Europe (2001)

To define social cohesion is not a simple task due to an extended range of norms, beliefs and values it can represent. There has been no generally accepted definition among individual researchers or international organizations so far (Chan et al. 2006, Andreasson et al. 2013). Paul Bernard claims that social cohesion has a characteristic of a 'quasi-concept' - a hybrid mental construction:

"I say "hybrid" because these constructions have two faces: they are, on the one hand, based, in part and selectively, on an analysis of the data of the situation, which allows them to be relatively realistic and to benefit from the aura of legitimacy conferred by the scientific method; and they maintain, on the other hand, a vagueness that makes them adaptable to various situations, flexible enough to follow the meanderings and necessities of political action from day to day."

Bernard (1999)

In other words, Bernard stresses ambiguity of such concept and vulnerability on the empirical grounds, and concludes that social cohesion must be necessarily connected to inequality and social injustice; a claim criticized by Chan et al. (2006) for putting too much emphasis on causes of social cohesion rather than on the phenomenon itself.

Hulse and Stone (2007) review the literature and conclude that social cohesion is usually defined in three ways. The first one refers to the social relations of everyday life and includes some ideas of social capital. The second dimension is connected with the reduction of cleavages, differences and inequality. The last includes a distinct cultural dimension, referring to "the norms underlying the 'ties that bind' people together and which include a sense of common purpose,

shared identity, common values such as tolerance of difference and diversity, and behaviours which reflect these."

Chan et al. (2006) approach very differently to defining social cohesion. They critically review the concept ofsocial cohesion in order to provide a better definition for policy purposes. Their motivation comes from the rich conceptualizations of social cohesion. In many cases, definitions are vague, and there is a confusion between the content and the causes. According to the authors social cohesion is "a largely ill-defined term, whose exact content varies from one author to another." One way some researchers look at the social cohesion can be equaled to 'trust' or 'solidarity' while another is broader and refers to social capital, poverty and inclusion. Authors then proceed with a review of academic and policy discourse. In an analysis of academic discourse on social cohesion, which intellectual origin dates back to Emile Durkheim, founder of modern sociology, they identify several key features in the works of academics. One is that "social cohesion is often analyzed in terms of the broader question of social integration, stability and disintegration." Thus, the works usually suffer from a systemic level analysis, with no care for empirical individual data and without any definition of social cohesion. The second feature which appears in the academic literature is the extreme view on social cohesion that focuses on negative events such as the presence of crime or urban riots and serves as a "useful early warning mechanism." Chan et al., however, strive to provide more balanced, neutral definition which would be able to capture both the negative and positive signs of social cohesion. The authors do not dismiss those works, but rather give a warning that these concepts cannot be operationalized and, as a result, are not suitable for policy analysis. The policy discourse is focused on a wide range of indicators such as education, civic participation and income. According to Chan et al. policymakers have recognized the importance of social cohesion and a new form of governance which: "(1) promotes trust or solidarity, alongside with other traditional welfare and economic policies; (2) recognize that the process of participation matters as much as the outcome and (3) a more holistic approach to public policy design and coordination." They argue that a useful definition of social cohesion must be "minimal in scope" and "close to ordinary usage". The former refers to exclusion of components which are not essential to social cohesion such as factors or conditions which promote it while the latter stresses the importance of an intuitive definition. With these two requirements in mind, authors propose the following definition:

"Social cohesion is a state of affairs concerning both the vertical and the horizontal interactions amoong members of society as characterized by a set of attitudes and norms that includes trust, a sense of belonging and the willingness to participate and help, as well as their behavioural manifestations."

Chan et al. (2006)

Here, a member of society can be an individual as well as a group of individuals or institutions. The vertical interactions are interactions between individuals while horizontal interactions concern the relationship between the state and society. An important feature of this definition is that it characterizes social cohesion as "a state of affairs" not as a process which is the main confusion point. The article ends with a proposition of framework and a set of questions suitable for capturing the social cohesion as defined above. Some of the questions are adopted from World Value Survey, however, most of them are not surveyed by any institution or organization yet.

The considerable body of the literature focuses on whether social cohesion is a multidimensional concept. Green et al. (2009) identify four distinctive regimes of social cohesion, using cluster analysis on 20 OECD countries. The clusters are East Asian regime, a social market (north-western continental countries), a social democratic (Nordic countries) and a liberal (English-speaking countries). A drawback of their work is that they include various variables such as size of welfare state or wage regulation, thus mixing together welfare state regime and models of social cohesion.

Further analysis on multidimensionality of social cohesion is provided by Dickes et al. (2010). They analyze 33 European countries using data from European Values Survey with multidimensional scaling and confirmatory analysis. They follow Bernard's and Chan's definition of social cohesion and their results suggest coherence with the theory and identify four elements of social cohesion: social participation, political participation, trust and solidarity.

Janmaat (2011) explores to what extent the suggested conceptions at macro-level of social cohesion can be empirically verified. His findings cast doubt on its usage for policy-oriented and empirical research. Furthermore, Janmaat examines two perspectives (models) on social cohesion. One perspective (universalist) is expected to be related to socio-economic development while the second perspective (particularist) to cultural and historical traits. Based on data from

World Bank, the United Nations and World Value Survey for 70 countries, Janmaat finds evidence for both models. One model (universalist) is found to be composed of equality, trust and order and the second model (particularist) consist of national pride, tolerance and political engagement.

A distinct area in social cohesion literature represent articles that analyze the relationship between social cohesion and economic reforms.

Ritzen et al. (2000) examine the effect of social cohesion on formal institutions which in turn affect growth. Social cohesion is defined as "*a state of affairs in which a group of people (delineated by a geographical region, like a country) demonstrate an aptitude for collaboration that produces a climate for change.*" So defined social cohesion is proxied by ethnic fractionalization and income inequality. They employ three-stage least square technique to establish a causal relationship between formal institutions and growth. The results confirm the hypothesis that higher social cohesion (lower ethnic fractionalization and income inequality) leads to better formal institutions which in turn lead to higher growth. Various measures of institutions are considered to ensure the robustness of the findings, for example, World Governance Indicators, International Country Risk Guide's indicators or data from Freedom House.

Easterly et al. (2006) is in many ways similar to Ritzen et al. (2000). The three-stage least square estimation is used as well as ethnic fractionalization and income inequality. Easterly et al. (2006) argue that the reason why even good politicians with best intentions at heart enact 'bad' policies is low trust of citizens that short-term losses will be outweighed by long-term gains. They define social cohesion as *"the nature and extent of social and economic divisions within society."* The results confirm the initial claim that a higher level of social cohesion determines the quality of institutions which in turn influence growth.

Heller (2009) has a similar approach to Easterly et al. (2006). She defines social cohesion as *"those attributes that contribute to a breakdown of economic, social and political barriers to reform within a society."* Similarly as Easterly et al. (2006), it is argued that socially cohesive society provides politicians more room to implement reforms. In addition to the previous studies in this field, Heller (2009) as a measure of social cohesion includes inequality and ethnic fractionalization, but also education (adult literacy). Her findings are consistent with the previous literature; social cohesion positively influences growth through institutional quality. Two problems of her analysis stand out. First, education is not a good instrument for institutional quality because it might be endogenous to growth. Secondly, the definition of social cohesion provided in the paper

is tautological; social cohesion by its definition will always be beneficial for reforms.

Andréasson et al. (2013) reach the opposite conclusion than previous studies. Firstly, they perform a principal-component factor analysis on 16 indicators used to measure social cohesion for 40 countries. They identify five distinct dimensions. Thus, their findings are consistent with the previous literature on multidimensionality of social cohesion. In the next step, economic reforms, measured as a five-year change in the Economic Freedom of the World Index, are regressed on each identified dimension of social cohesion. Authors conclude that most dimensions do not influence the occurrence of reforms.

Up to date, there is no consensus on the definition for policy making purposes or individual research agenda. Most international organizations, as well as governments, are sticking to the broad concept of social cohesion. The recent example is OECD and its report from 2011 (Perspectives on Global Development 2012: Social Cohesion in a Shifting World) where identifies social mobility, social capital and social inclusion as main components. It is important to note that usually, the possible endogeneity of social cohesion is not discussed.

4 Bayesian Model Averaging

With the computational advances, BMA has experienced a surge of popularity in the economics literature over the last two decades. It is used to tackle the problem of model uncertainty, transparently and rigorously. In the field of economics where there are many competing theories, such technique can be of a tremendous help.

One of the most known works in this field is "Model Uncertainty in Cross-country Growth Regressions" by C. Fernández, E. Ley and M. F. Steel. They employ BMA on a dataset containing 41 regressors which yield over two trillion possible models.

Bayesian econometrics is built on a few rules of probability. Let assume we have two random variables, A and B. From equating $p(A, B) = p(A|B)\, p(B)$ and $p(B, A) = p(B|A)\, p(A)$ we acquire Bayes' rule that lies at the core of Bayesian econometrics:

$$p(B|A) = \frac{p(A|B)\, p(B)}{p(A)} \tag{1}$$

Let M_r denote r different models. Every model depends on a vector of parameters θ_r. Using Bayes' rule we have:

$$p(\theta_r|y, M_r) = \frac{p(y|\theta_r, M_r)\, p(\theta_r|M_r)}{p(y|M_r)} \tag{2}$$

where $p(y|\theta_r, M_r)$ is the likelihood function, $p(\theta_r|M_r)$ is the prior density and $p(\theta_r|y, M_r)$ is referred to as the posterior density. The prior, $p(\theta_r|M_r)$, is not dependent on the data. It summarizes what the researcher knows about θ prior to seeing the data. In growth econometrics, there are not any beliefs or information which are common or shared among researchers, thus noninformative priors are used in most cases. Common practice is to assign the prior a low importance, so it plays little role in posterior formula.

The likelihood function, $p(y|\theta_r, M_r)$, is the density of the data, it is called 'the data generating process.'

The posterior, $p(\theta_r|y, M_r)$, is of fundamental interest. It says how much we know about θ_r, given the data.

Similarly, for $A = y$ and $B = M_r$ we obtain:

$$p(M_r|y) = \frac{p(y|M_r)\, p(M_r)}{p(y)} \tag{3}$$

where $p(M_r|y)$ is referred to as posterior model probability. It allows for ranking of models and model comparison.

Now lets us consider a dataset with a dependent variable Y with n observations and a set of k regressors $X_1.....X_k$. We want to identify which regressors are robust determinants of Y. In frequentist econometrics, a common approach is to specify a set of the core regressors (core model) and assessing robustness by adding additional regressors. In many cases, the procedure is non-transparent and faces problems from a decision-theoretic perspective. When using BMA, number of explanatory variables is limited only by number of observations. Therefore, by using BMA we can include many more regressors and reduce omitted variable bias.

Assume that the researcher is interested in the effect of, for example,social cohesion on economic growth. To assess its effect when we have many regressors and, therefore, numerous models (for k regressors we have $2^k = r$ different models) may be problematic with frequentist methods. But within BMA framework, it is a straightforward task. Let ϕ be a vector of parameters which has a common interpretation across all models. In our case, we are interested in a social cohesion coefficient so ϕ is that coefficient in every regression. What Bayesian econometrics says is that all we know about ϕ is included in its posterior $p(\phi|y)$. By rules of probability:

$$p(\phi|y) = \sum_{r=1}^{R} p(\phi|y, M_r)\, p(M_r|y) \tag{4}$$

The above formula says that to obtain information about ϕ, we estimate every model ($p(\phi|y, M_r)$) and average them where weights are the posterior model probabilities $p(M_r|y)$. This way, one can obtain the posterior inclusion probability which tells us what is the probability that a given regressor belongs to the 'true' model. In (4), M_1, . . . , M_r are different models under consideration. The posterior probability for model M_r is given by:

$$p(M_r|y) = \frac{p(y|M_r)\, p(M_r)}{\sum_{r=1}^{R} p(y|M_l)\, p(M_l)} \tag{5}$$

where

$$p(y|M_r) = \int p(y|\theta_r M_r)\, p(\theta_r|M_r) d\theta_r \tag{6}$$

is the integrated likelihood of model M_r, $\theta_r$is the vector of parameters of

model M_r, $p(\theta_r|M_r)$ is the prior density of θ_r under model M_r, $p(y|\theta_r, M_r)$ is the likelihood, and $p(M_r)$ is the prior probability that M_r is the true model, assuming that one of the model under considerations is true.

5 Methodology

The goal of this thesis is to assess the impact of social cohesion on economic growth. While there is no doubt that there exists a relationship between social cohesion and growth, we must show this relationship is a causal one. There are two possible scenarios. The first one is that a high level of social cohesion can be a result of processes of sustained economic growth. Robert Inglehart in his book "Modernization and Postmodernization" forms a theory that says that eventually every society will converge in their development to the point of diminishing returns, which provides motivation towards other goals (= members of society become wealthy/educated enough to focus on other aspects of human life) such as support of cohesion programmes, friendship or the importance of self-expression. The second one, greater long-term economic growth can be reliant on the prior formal and informal institutional structure that accumulate over the course of society's history. That is a higher level of social cohesion (better informal institutions) leads to a higher level of economic growth. We would like to prove the latter. Hence, we use a two-stage least squares technique together with BMA developed by Durlauf et al. (2008) to establish causality between social cohesion and economic growth. We estimate the system of equations:

$$GDP = \alpha + \beta X + \varphi SCI + \epsilon \tag{7}$$

$$SCI = \delta + \theta Z + \eta \tag{8}$$

where X is a set of explanatory variables, SCI represents social cohesion captured by Social Cohesion Index and Z is a set of instruments, a fraction of the population speaking English as first language, a fraction of the population speaking one of the major languages of Western Europe as first language and major religious denominations (the reason for their usage as instruments will be described in data section). When instrumenting for social cohesion, we will be interested in a number of factors. Firstly, instruments must satisfy the two

following conditions: (i) instruments must be correlated with the endogenous variable (SCI) and (ii) instruments must be uncorrelated with the dependent variable in the first regression, GDP, other than through its correlation with the endogenous variable (SCI). Secondly, we will be interested in F-statistic from the first-stage regression. Generally, value above ten is sufficient to mitigate bias (Staiger and Stock 1997). As a robustness check, we add to our regression Rule of Law and Integration variables.

To deal with model uncertainty, BMA technique is employed which allows to consider many variables in a single-regression equation. We consider 21 explanatory variables which yield over two million ($2^{21} = r$) models. Since it is impossible to evaluate every single model even with modern computers, various algorithms have been developed. This thesis uses so-called 'Markov Chain Monte Carlo Model Composition' (MC^3). It 'wanders' across model space and takes a lot of draws from model space where posterior probability is high and few draws where posterior probability is low. Here we are not going into detail; a deeper elaboration can be found in "Bayesian Econometrics" by Gary Koop. We set up a number of draws and burn-ins so a correlation between the analytical and MC^3 posterior model probabilities is sufficiently high (0.99 in our case).

Next, the choice of parameter prior must be made. Since prior influences marginal likelihood, the researcher has to be careful what type of prior he or she chooses. We use Unit Information Prior (UIP) as a default prior together with an uniform model prior based on a suggestion by Eichter et al. (2007) who claim "The Unit Information Prior, combined with an uniform model prior outperformed other popular priors in the growth dataset and in simulated data." Technically:

$$log\, pr(D|M_i) \approx c - \frac{1}{2} BIC_r, \tag{9}$$

where

$$BIC_r = n\, log(1 - R_r^2) + p_r log(n) \tag{10}$$

In (9), c is a constant that does not change across models and, as a result it disappears in the model averaging. In (10), R_r^2 is the R-squared value and p_r stands for the number of regressors for model M_i.

In addition to UIP prior, we consider another two priors proposed by Fernandez et al. (2001b). They are based on a form of the natural conjugate gamma

family of priors so called 'g-prior density':

$$pr(\sigma|M_i) \propto 1/\sigma, \tag{11}$$

$$pr(\alpha|M_i) \propto 1, \tag{12}$$

$$pr(\beta^{(r)}|M_i) \sim N\left(0, \sigma^2(g_k Z^{(k)'} Z^{(k)})^{-1}\right), \tag{13}$$

where $Z^{(k)}$ denotes the $n \times p_k$ matrix composed of the p_k demeaned regressors included in M_i. The value $g = 0$ corresponds to perfectly noninformative prior, whereas $g = 1$ means that prior information and data information have same weight in the posterior covariance matrix. The first prior is called BRIC and it is the one recommended by Fernandez et al. (2001b). Its g-value equals to $1/max(N, k^2)$ (in our case $k^2 > N$). Prior with g equal to $1/(lnN)^3$ is a version of Hannah and Quinn criterion. Besides these two priors, RIC (Risk inflation Criterion) with $g = 1/k^2$ is commonly used. However, in our setting it equals to BRIC prior.

Finally, we include in our analysis two hyper-g priors:

$$\pi(g) = \frac{a-2}{2}(1+g)^{a/2}, \tag{14}$$

where $a \in (2, 4>$. The first one sets parameter a such that the prior expected shrinkage conforms to UIP. The second sets the parameter according to BRIC.

Choosing the uniform model prior give us setting that assigns equal prior probability to all models M_i, thus we have $pr(M_i) = 1/R$ for each i. In total we have five different parameter priors and one model prior.

6 Data

In this section, we present data for our analysis. This section is divided into two subsections. The first one briefly presents the explanatory variables and the countries included in the sample. Then, we discuss the possible instruments and provide the reasoning for choosing them.

6.1 Dataset

We consider dataset used by Eicher et al. (2012) which in turn builds on that of Rodrik et al. (2002). The dataset is used to explain the differences in the level of income per capita by alternative theories of economic development, namely geography, formal institutions and integration (trade). Here, we use this dataset to analyse effect of social cohesion on differences in the income levels.

The dependent variable is the logarithm of GDP per capita for year 1995. For explanatory variables, mostly geographic variables are considered along with religion and trade variables. The full list of independent variables is: Rule of Law, Integration, Tropics, Area, Sub-Sahara Africa, Fraction of Catholic, Policy Openness, Population Growth, Fraction of Muslim, Latin America, French Legal Origin, Frost Area, Frost Day, Mean Temperature, East Asia dummy, Distance from Equator, Oil dummy, Malaria Index, Sea Access dummy, a fraction of Protestant, Settler Mortality, a fraction of the population speaking English, a fraction of the population speaking Western language and Trade Shares.

To the dataset we add our measure of social cohesion. The values in our sample range from 2.95 (Nigeria) to 9.42 (Canada) with mean 4.9 and standard deviation 1.31. Other countries with high index are, for example, the United States, Australia or New Zealand. At the bottom besides Nigeria are Pakistan and Congo.

As for countries, we exclude Benin because it is not available for Social Cohesion Index variable. We are left with 53 countries: El Salvador, Haiti, Burundi, Costa Rica, Sri Lanka, Sierra Leone, Guatemala, Honduras, Nicaragua, Bangladesh, Tunisia, Uruguay, Senegal, Uganda, Ghana, Guinea, Gabon, New Zealand, Burkina Faso, Ecuador, Cote d'Ivore, Malaysia, the Republic of Congo, Paraguay, Morocco, Papua New Guinea, Cameroon, Keyna, Madagascar, Central African Republic, Chile, Pakistan, Venezuela, Nigeria, Tanzania, Egypt,

Mauritania, Bolivia, Colombia, South Africa, Angola, Mali, Niger, Chad, Peru, Indonesia, Mexico, Argentina, India, Australia, Brazil, the United States and Canada.

6.2 Instruments for endogenous variables

As instruments for Social Cohesion Index, we propose several candidates. Similarly to trust, we can use a fraction of the population belonging to major religious denominations (Protestantism, Catholicism, Buddhism, Islam, Eastern Orthodox).[2] Religious beliefs act as an important force forming social norms, conventions and habits in society. Putnam (1993) points out that hierarchical religion discourages "horizontal" ties among members of society, therefore, reducing trust. This is confirmed by La Porta et al. (1997) who find "strong negative association between trust and the dominance of a strong hierarchical religion in a country, most notably Catholicism."

The second set of instruments are a fraction of the population speaking English as first language today (English Fraction) and a fraction of the population speaking one of the major languages of Western Europe as first language today (European Fraction). They represent correlates of Western European influence around the world starting in 16th century. As Hall and Jones (1999) state, the extent of this influence was not uniform across the world, thus providing us with necessary exogenous variation.[3]They also argue that their variable, social infrastructure - the precedents, norms and cultural expectations, is correlated with Western Europe influence because " Western Europe discovered the ideas of Adam Smith, the importance of property rights, and the system of check and balances in government . . ." and thus countries that were strongly influenced by Westerners were more prone to adopt favorable infrastructure. Moreover, Western influence "exported" its norms, beliefs and religion. According to Weber (1958), Protestantism plays an important role in fostering norms of trust, civic engagement and voluntary association. In this context, especially English Fraction variable should exert strong and positive effect on social cohesion because Protestantism played an important role in the building of political and

[2]Because some religious denominations are not included in the dataset, we use Robert J. Barro's data which is kindly provided on his website.

[3]Hall and Jones (1999) claim that although Europeans sought sparsely populated areas with rich natural resources, there is no tendency today for these areas to have high output.

religious life in England which was also one of the main colonizers around the world.

For the rest of endogenous variables (Rule of Law and Integration) we follow Rodrik et al. (2002).

Rule of Law variable is instrumented with mortality rates of colonial settlers. Rodrik et al. (2002) summarize the reasoning of Acemoglu et al. (AJR, 2001): " . . . settler mortality had an important effect on the type of institutions that were built in lands that were colonized by the main European powers. Where the colonizers encountered relatively few health hazards to European settlement, they erected solid institutions that protected property rights and established the rule of law. In other areas, their interests were limited to extracting as much resources as quickly as possible, and they showed little interest in building high-quality institutions."

Rodrik et al. (2012)

Integration (measured as the natural logarithm of openness) is instrumented by trade/GDP shares constructed on the basis of a gravity equation for bilateral trade flows. Detailed description can be found in Frankler and Romer (1999).

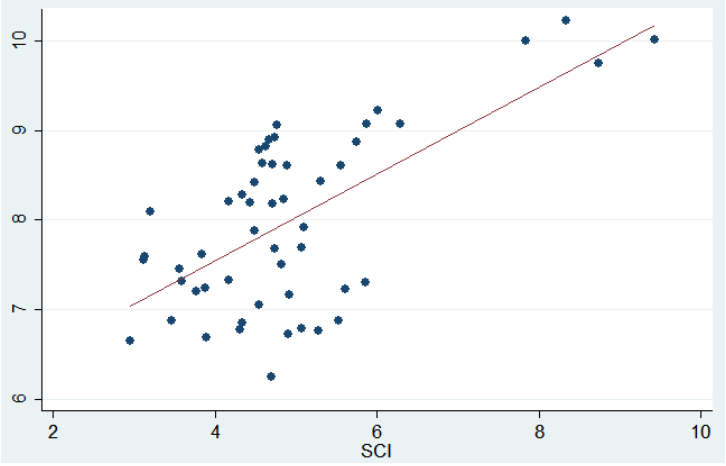
7 Results

In this section we assess whether suggested instruments are suitable for Social Cohesion Index. Then, we move to the baseline case of estimation where we combine 2SLS and BMA. Furthermore, we test the variability of regressors across different prior specifications. Lastly, we peform a robustness check to determine if social cohesion is a robust determinant of economic growth.

7.1 Baseline specification

Before we proceed to the baseline results, it is helpful to take a glance at a scatter plot that show the relationship between social cohesion and income. Figure 1 shows us a clear and unambiguously positive relationship between the variables. Simple correlation coefficient is 0.63. Hence, our variable of interest has the potential to explain levels of income.

Figure 1: Social cohesion and GDP per capita



To address endogeneity, we consider two sets of instruments described in data section. First set is composed of major religious denominations: Protestantism, Catholicism, Buddhism, Islam and Eastern Orthodox. First-stage results are not very convincing. Table 1 shows that none of the variables considered, except for Protestantism, are significant on any convenient level. Only Protestantism is significant at 10% confidence level. F-statistic is way below 10. Even when we regress Protestantism solely on social cohesion, the F-statistic is still below

Table 1: First-stage regression results, religion denominations

Variable	coefficient	Std. Error	t-value
Intercept	4.534	0.731	6.208***
Protestantism	0.032	0.018	1.783
Buddhism	-1.973	2.091	-0.944
Eastern Orthodox	8.748	7.363	1.188
Catholic	0.204	0.861	0.237
Muslim	-0.275	0.997	-0.276
Adjusted R^2- 0.112, F-statistic: 2.31			
*** significant at 0			

10, however, the variable becomes significant at 1% level (not reported). Therefore, the results suggest that major religious denominations are not suitable as instruments for our setting.

Second set of instruments considered are correlates of Western European influence, a fraction of the population speaking English as first language (English Fraction) and a fraction of the population speaking one of the major languages of Western Europe as first language (European Fraction). Here, a completely different picture emerges. As expected English Fraction variable has a positive and very strong effect on social cohesion with a mean of almost 4 and t-statistic of over 7. European Fraction variable also performs exceptionally; it is significant at 0.1% and positive. The F-statistic is approaching 50, and the model explains over 65% variation in social cohesion. All statistics mentioned can be found in table 2. Based on these results we continue our analysis with English Fraction and European Fraction variables as instruments for social cohesion.[4]

[4]We also experimented with genetic distance data from Spolaore and Wacziarg (2009) because it is can be used as an instrument for generalized trust (Horváth 2012). Although we find it to be significant at 0.1% level, F-statistic is below 10, so we choose not to include it.

Table 2: First-stage regression results, western correlates

Variable	coefficient	std. Error	t-value
Intercept	4.534	0.132	33.314***
English Fraction	3.956	0.525	7.543***
European Fraction	0.776	0.287	2.705**
Adjusted R^2- 0.653, F-statistic: 49.88			
*** significant at 0, ** significant at 0.001			

Now, we proceed to the BMA analysis where we use the predicted level of social cohesion as the regressor in our model. Table 3 presents the results of the baseline specification with social cohesion instrumented with correlates of Western European influence. Here, we use the UIP prior with the uniform model prior for a default specification. Regressors are ranked according to its posterior inclusion probability (the probability that a regressor is included in the correct model). The sign of social cohesion is positive as expected with posterior inclusion probability (PIP) 0.73 indicating it is an important factor in explaining differences in income. Thus, countries with a higher level of social cohesion should also have a higher level of income. Another regressors that received high PIP are Mortality (-), East Asia dummy (+), Sea Access (-), French Legal Origin and Malaria (both +). The negative sign for Sea Access variable (-) is rather counter-intuitive. This also holds for Dist.Equator - i.e., we would expect that the closer country is to equator the worse it performs because it has to deal with infectious diseases and less friendly working conditions. These results for geographic variables are consistent with Rodrik et al. (2002) who too find 'wrong' sign for these variables.

Table 3: Baseline results, Rule of Law, Integration excluded

Variable	PIP	Post Mean	Post SD
Mortality	0.86	-0.22935	0.13232
SCI	**0.73**	**0.22218**	**0.15927**
E. Asia	0.71	0.62777	0.48341
Sea Access	0.68	-0.29175	0.25784
French Legal Origin	0.59	0.24082	0.24385
Malaria	0.51	-0.28405	0.33674
Mean Temp	0.38	-0.01585	0.02385
Lat. America	0.35	0.16719	0.27794
Oil	0.35	0.14816	0.24559
Tropics	0.34	-0.17782	0.29752
Frost Area	0.3	0.23435	0.43168
Population Growth	0.3	-0.05528	0.10313
Policy Openness	0.29	0.22961	0.42145
Fraction Muslim	0.24	-0.001	0.0022
Sub. Africa	0.17	-0.06532	0.1871
Trade Shares	0.15	-0.05199	0.1665
Area	0.15	3.15E-08	9.48E-08
Frost Day	0.14	0.00283	0.01262
Fraction Catholic	0.14	0.00012	0.00211
Dist.Equator	0.08	-0.00079	0.00495
Fraction Protestant	0.04	-0.00006	0.00147

7.2 Prior sensitivity analysis

Next, we focus on parameter prior sensitivity of regressors. Besides the Unit Informative Prior, we consider 4 alternative parameter priors. Table 4 in appendix shows posterior inclusion probability, posterior mean and posterior standard deviation for all regressors whose PIP is above 0.5. For the sake of brevity, regressors with PIP below 0.5 are not reported. First alternative prior is BRIC. Mortality rate and SCI are the only variables that passed 0.5 PIP

threshold. This result is consistent with Eicher et al. (2007) findings that UIP identifies a richer set of determinants than BRIC prior. The second alternative prior under consideration is HQ. The results are very similar to UIP. Top six regressors' PIPs are almost identical whereas the rest of regressors had its PIP values slightly lowered. Last two priors are hyper-g priors UIP and BRIC. With these two, we obtain the most optimistic results. Similarly to UIP and HQ priors, hyper-g UIP and BRIC priors provide practically identical PIPs.

In summary, SCI only slightly varies across different prior structures, having over 0.72 PIP. Malaria, Sea Access, East Asia dummy and French Legal Origin variables rank among top six regressors that pass 0.5 PIP for all prior structures except for BRIC prior.

7.3 Robustness check

In the next step, we conduct a robustness check to have a higher degree of confidence that social cohesion is indeed an important factor in explaining differences in income levels. To do so, we add to our model two endogenous variables namely, Rule of Law and Integration (trade). This would leave us with three endogenous variables to instrument and expose us to a high degree of instrument uncertainty. Fortunately, this issue has been recognized in growth literature and recently, several methods that include first-stage regression within BMA framework such as Koop et al. (2012) or Eicher et al. (2012), have been developed. Here, we use IVBMA ('Instrumental Variable Bayesian Model Averaging') estimate developed by Karl and Lenkoski (2012). Authors claim that unlike in Koop et al. (2012) methodology, their method has limited issues regarding mixing and is straightforward to implement. However, only UIP parameter prior with uniform model prior is available.

Table 5 in appendix presents results of first-stage regression for Social Cohesion Index, Rule of Law and Integration, respectively. The results of the first-stage regression confirm that English Fraction and European Fraction variables are suitable instruments for SCI, both receiving over 0.96 PIP. On the other hand, for Rule of Law, the preferred instrument variable settler mortality rate obtained only 0.1 inclusion probability. Alternative instruments for Rule of Law used in Rodrik et al. (2002), English Fraction and European Fraction, received much higher support (inclusion probability of 0.75 and 0.76, respectively). Covariate Tropics received the highest inclusion probability of 0.89

which is consistent with Rodrik et al. (2002) who find that geography exerts a strong effect on institutional quality. The last instrumented variable is Integration. The proposed instrument, predicted trade shares, received inclusion probability of 1. Another two variables also received high inclusion probability, namely, East Asia dummy and Oil dummy (0.94 and 0.84). The Bayes Sargan test clearly show that over-identification is none of concern.

Table 6 shows the results of second-stage regression. The results indicate that SCI is not very robust to the inclusion of Rule of Law and (or) Integration, its inclusion probability dropped below 0.5. the drop of SCI might be attributable to the slight similarity between Rule of Law and SCI variables - for instance, both variables include *some* data from Latinobarometer. Rule of Law dropped to 0.81 compared to Karl and Lenkoski (2012) who report inclusion probability of nearly 1 (SCI is not included in their model). Integration received inclusion probability close to 1.

To clarify this, we exclude Rule of Law from our model. At instrument level similar picture emerges. However, second-stage regression yields surprising results (table 7). SCI obtains inclusion probability of nearly 1 along with Integration. It appears that SCI and Rule of Law indeed partly capture the same underlying phenomenon. However, Rule of law seems to trump social cohesion.

8 Conclusion

In this thesis, we investigate the effect of social cohesion on GDP per capita. Previous literature has stressed several problems in connection with analysing effect of social cohesion on growth. In particular, vague definitions of social cohesion, measurement issues, model uncertainty, and endogeneity of social cohesion. We address three of said issues.

As a measure of social cohesion, Social Cohesion Index (SCI) is used. The advantages of this index are a large number of countries covered, effective usage of available data and overcoming problem of sampling bias (Foa 2011). To deal with endogeneity, we test several variables suggested by social capital literature; major religious denominations, correlates of western influence and genetic distance data. The clear winner is western influence proxied by a fraction of the population speaking one of major languages of Western Europe as a mother

language. The suitability of western influence is confirmed by simple ordinary least-squares regression as well as within IVBMA framework. Lastly, we tackle the problem of model uncertainty by Bayesian model averaging. Within BMA framework, we avoid non-transparent procedure of the choice of the conditioning regressors and, therefore, reduce omitted variable bias. It is important to note that previous literature that analyzed social cohesion has not addressed concerns about model uncertainty. We contribute to the literature by establishing causality from social cohesion to growth and dealing with model uncertainty at the same time. To do so, we follow the methodology developed by Durlauf et al. (2008) and combine 2SLS estimation with BMA.

Our results suggest that social cohesion is an important determinant of growth, and that countries with a higher level of social cohesion enjoy higher growth. The baseline case of Bayesian model averaging indicates a high posterior inclusion probability of 0.73. Social cohesion is also very robust to various prior specifications, ranging from 0.72 to 0.73 PIP. As a robustness check, we add Rule of Law and Integration (trade) variables to be sure that social cohesion is indeed a vital determinant of growth. We use IVBMA developed by Karl and Lenkoski (2012) to cope with a high degree of instrument uncertainty since we include three endogenous variables in our model. We find out that social cohesion drops significantly once Rule of Law is included in the regression. We attribute the drop in PIP for social cohesion to similar data sources from which both variables are composed of. When we exclude Rule of Law, SCI receives PIP of nearly one along with Integration.

As for future research, it is vitally important to find a consensus on definition for social cohesion to simplify comparison among studies. Furthermore, the focus should be set to improve indices for social cohesion. Clearly, social cohesion cannot be proxied by one simple variable. Additionally, examining the effect of social cohesion on growth with a richer dataset can provide us with more information about its robustness and magnitude of the impact. It is essential to analyze the endogenous determinants of growth within IVBMA (2SBMA) frameworks because instrument uncertainty can play a significant role in the estimation procedure as show Eicher et al. (2012) and Karl and Lenkoski (2012). Lastly, it might be useful to explore different functional forms. As Andréasson et al. (2013) note, the relationship between social cohesion and growth is likely to be non-linear and not necessarily always positive. Taking into account all these challenges would greatly advance work in the field of growth econometrics.

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A Appendix

Table 4: Different prior structures

UIP	PIP	Post Mean	Post SD
Mortality	0.86	-0.2294	0.13232
SCI	0.73	0.2222	0.15927
E. Asia	0.71	0.6278	0.48341
Sea Access	0.68	-0.2918	0.25784
French Legal Origin	0.59	0.2408	0.24385
Malaria	0.51	-0.2841	0.33674

BRIC	PIP	Post Mean	Post SD
Mortality	0.74	-0.238	0.17175
SCI	0.72	0.2324	0.16796

HQ	PIP	Post Mean	Post SD
Mortality	0.85	-0.2305	0.13449
SCI	0.73	0.2237	0.15977
E. Asia	0.7	0.6218	0.48587
Sea Access	0.66	-0.2866	0.25937
French Legal Origin	0.57	0.2368	0.24474
Malaria	0.5	-0.2842	0.34028

hyper-g-BRIC	PIP	Post Mean	Post SD
Mortality	0.87	-0.2249	0.12818
SCI	0.73	0.2161	0.15745
E. Asia	0.73	0.6316	0.47569
Sea Access	0.71	-0.2975	0.25385
French Legal Origin	0.62	0.2472	0.2409
Malaria	0.53	-0.2789	0.3269

hyper-g-UIP	PIP	Post Mean	Post SD
Mortality	0.87	-0.225	0.12808
SCI	0.73	0.2161	0.15742
E. Asia	0.73	0.632	0.4755
Sea Access	0.71	-0.2976	0.25378
French Legal Origin	0.62	0.2476	0.24086
Malaria	0.53	-0.2788	0.32674

Table 5: First-stage results for SCI, Rule of Law and Integration

	SCI		Rule of Law		Integration	
Variable	PIP	Post Mean	PIP	Post Mean	PIP	Post Mean
Mortality	**0.133**	0.006	**0.101**	-0.58E-02	**0.01**	-0.66E-02
Trade Shares	**0.704**	0.285	**0.127**	0.010	**1**	0.559
English Fraction	**0.964**	1.787	**0.792**	0.856	**0.528**	0.237
European Fraction	**0.996**	1.547	**0.738**	0.585	**0.162**	-0.020
French Legal Origin	0.251	-0.018	0.167	-0.24E-02	0.131	0.90E-02
Malaria	0.326	0.069	0.237	-0.041	0.280	-0.064
Mean Temp	0.055	-0.69E-03	0.019	-0.23E-03	0.0172	-0.10E-03
Lat. America	0.301	-0.004	0.636	-0.414	0.169	-0.018
Oil	0.627	-0.369	0.401	-0.145	0.854	0.377
Tropics	0.500	0.220	0.901	-0.568	0.338	0.097
Frost Area	0.433	0.135	0.519	0.241	0.399	0.148
Population Growth	0.262	0.029	0.042	-0.16E-02	0.039	0.25E-04
Policy Openness	0.742	0.670	0.371	0.122	0.245	0.024
Fraction Muslim	0.004	-0.11E-04	0.002	-0.84E-06	0.003	-0.20E-05
Sub. Africa	0.924	0.930	0.263	-0.060	0.172	0.025
Area	0	0	0	0	0	0
Frost Day	0.270	0.021	0.040	0.83E-03	0.019	0.13E-03
Fraction Catholic	0.006	0.15E-04	0.13	-0.73E-04	0.005	0.47E-06
Dist. Equator	0.739	0.042	0.037	0.74E-03	0.008	-0.30E-04
Fraction Protestant	0.037	0.55E-03	0.006	0.17E-04	0.013	0.83E-04
E. Asia	0.689	0.616	0.368	0.104	0.950	0.653
Sea Access	0.301	0.076	0.173	-0.016	0.119	-0.24E-02
Intercept	0.880	1.709	0.287	0.038	0.999	2.237

Table 6: Second-stage results

Variable	PIP	Post Mean
SCI	**0.450**	**0.152**
Rule of Law	0.812	0.720
Integration	0.998	0.893
French Legal Origin	0.415	-0.122
Malaria	0.266	-0.050
Mean Temp	0.250	-2.07E-04
Lat. America	0.919	0.831
Oil	0.494	0.216
Tropics	0.522	-0.264
Frost Area	0.330	0.066
Population Growth	0.998	0.224
Policy Openness	0.479	0.211
Fraction Muslim	0.026	-1.46E-04
Sub. Africa	0.426	-0.198
Area	0	0
Frost Day	0.024	-1.31E-06
Fraction Catholic	0.023	1.765E-04
Dist. Equator	0.037	-1.03E-03
Fraction Protestant	0.007	3.75E-05
E. Asia	0.356	0.114
Sea Access	0.183	-0.017
Intercept	0.533	0.308
Bayes-Sargan p-value: 0.9884		

Table 7: Second-stage results without Rule of Law

Variable	PIP	Post Mean
SCI	**0.995**	**0.441**
Integration	**0.993**	**0.767**
French Legal Origin	0.396	0.123
Malaria	0.278	-0.063
Mean Temp	0.023	-0.11E-03
Lat. America	0.768	0.461
Oil	0.556	0.255
Tropics	0.713	-0.449
Frost Area	0.325	0.056
Population Growth	0.993	0.203
Policy Openness	0.339	0.091
Fraction Muslim	0.031	-0.19E-03
Sub. Africa	0.705	-0.441
Area	0	0
Frost Day	0.030	-0.31E-03
Fraction Catholic	0.024	0.16E-03
Dist. Equator	0.064	-0.18E-02
Fraction Protestant	0.009	0.36E-04
E. Asia	0.358	0.110
Sea Access	0.207	-0.030
Mortality	0.423	-0.088
Intercept	0.527	0.299