Master's Thesis in International Economics and Development

The effect of ethnic fractionalization on economic development

A multilevel analysis

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The effect of ethnic fractionalization on economic development

ABSTRACT. This paper focuses on the relationship between ethnic diversity and economic development. While the former is measured using the well-known Ethnic Fractionalization Index, the latter is measured using the Subnational Human Development Index. Ethnic diversity as an explanatory variable in economic development research is a rather recent phenomenon. The existing literature is limited and has been rather inconclusive about the issue. Popular opinion in the field points towards a negative relationship between ethnic diversity and economic development. However, there also exists evidence of a positive relationship or a mutual dependency. Using a multilevel approach, the results of this paper conclude a negative relationship between the two variables; with a high degree of ethnic fractionalization on the national level being associated with a low degree of development on the subnational level.

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1. Introduction

Considering the diversity embedded in low- and middle-income countries, it would be a mistake to talk about *the* developing world as a whole. Development Economics generally makes the distinction between natural resource abundant economies, land-locked economies, and coastal exporters (Hino, Lonsdale, Ranis, & Stewart, 2012). Yet, such demarcation leaves further differences unmasked. While many authors ought to discover the underlying determinants causing relatively backward economic development in many low- and middle-income countries, the same mainstream factors have arisen. The relatively weak economic performance was blamed on corruption, poor policies, violations of the Washington Consensus, the climate, the Dutch Disease, and other related factors (Hino, Langer, Lonsdale, & Stewart, 2019). Fundamental characteristics of many low- and middle-income countries, such as the large number of ethnic groups, were left unaccounted for in explaining economic outcomes (Akobo & Damisah, 2018).

Yet, as historians and anthropologists argue, the economic nature of developing countries can only be understood by proper interaction between economics, political science, history, and anthropology (Green, 2013). The latter was a latecomer in the economic development literature. It was only in 1997 that Easterly and Levine pointed out the importance of ethnic diversity as an explanatory variable for relatively backward economic development (Easterly & Levine, 1997). Their view on the adverse effects accompanied with ethnic division seems, nowadays, to be accepted and supported by more recent literature (Gören, 2014. Bove & Elia, 2017).

This literature has brought forward the potential costs associated with ethnic diversity within given national boundaries. According to Ziller (2015), ethnic diversity may not only lead to racism and prejudices but may also cause conflict of interests that give rise to suboptimal policies. This undermines the benefit of a society as a whole. Moreover, the likelihood of the occurrence of civil wars is higher. This is especially the case when certain ethnic minorities are subject to oppression (Masella, 2013). Similarly, high levels of ethnic diversity have also been found to be associated with low levels of investment as well as poorer institutional quality (Wimmer, 2018).

Despite this popular opinion of ethnic heterogeneity forming an obstacle in the path towards economic development, it still has its benefits. The coexistence of various ethnic groups within the same geographical boundaries can bring out a variety of cultures, experiences, and abilities, which may lead to enhanced creativity and innovation (Ravallion, 2020). In addition, Parotta, Pozzoli, & Pytlikova (2010) as well as Trax, Brunow, & Suedekum (2012) have found high levels of ethnic diversity to have a positive effect on firm-level productivity.

All in all, the relationship between ethnic diversity and economic development seems – according to the existing literature – not to be a straightforward one. Whereas some evidence points towards a negative relationship between the two (Ziller, 2015), another strand of the literature highlights the existence of a positive relationship (Alesina, Harnoss, & Rapoport, 2016). At the same time, some studies call attention to the possibility of ethnic diversity and economic development being mutually dependent. This means that the relationship is not causal with both variables affecting one another simultaneously (Essen, Brochu, Dickson, 2012).

Nevertheless, further clarification of the relationship between ethnic diversity and economic development remains of crucial importance. Especially in the case of low- and middle-income countries where the existence of multiple ethnic communities is common (Houle, 2017). This ethnically heterogenous nature gives rise to the question whether it provides opportunities towards accelerated development or shuts doors in the face of new prospects. More clarity on the issue can assist policy makers in acknowledging the issue and acting upon its impact; whether this is by using the level of ethnic diversity to promote development or minimize the risks associated with it (Churchill & Smyth, 2017).

Yet, the size of the literature on this topic remains modest, mainly as a result of the limited data availability concerning the level of ethnic diversity in developing countries (Houle, 2017). Therefore, this study adds to the literature by providing further evidence on the relationship between ethnic diversity and economic development using an alternative approach. Existing studies have conducted a one-level analysis, whereas this research makes use of a multilevel approach combining data on both the national as well as on the subnational level. The use of subnational level data provides the advantage of being able to capture within country variation, since different regions develop at different paces. National level data is useful in performing cross-country comparisons but does not always present an accurate picture of the actual state of a country and the differences within (Chawanpaiboon, Vogel, Moller, Petzold, Hogan, & Lewis, 2019).

Moreover, the existing literature has measured economic development in terms of GDP growth rates. This is in line with the view of orthodox economists who emphasize that an increase in wellbeing goes hand in hand with an increase in GDP-growth, with the latter being a natural cause of the former (Obeng-Odoom, 2015). However, research has shown that there is often a gap between mainstream economics and the world as we see it, and that wellbeing is not limited to material wealth. GDP falls short since it is a measure of the size of an economy rather than a reflection of its welfare (Nwachukwu, 2017).

For this reason, this paper uses an alternative measure of economic development. Namely, the Subnational Human Development Index (SHDI)[1]. This is a translation of the UNDP's Human Development Index (HDI)[2] to the subnational level (Smits & Permanyer, 2018). This measure takes on a more human approach to welfare and emphasizes that the wellbeing of people should be the ultimate criterion for assessing the level of development. It recognizes the multidimensional nature of economic development and includes the educational, material, as well as the health aspect of it (McGillivray& White,1993). Using the Subnational Human Development Index (SHDI) and the Ethnic Fractionalization Index (EF-Index), the relationship between ethnic diversity and economic development is analysed. The focus is on low- and middle-income countries, with a dataset containing 68 countries and the regions within (819 regions).

The rest of this paper is structured in the following manner. Section 2 provides an overview of the literature regarding the nature of the relationship between ethnic diversity and economic development. Section 3 presents the econometric model that is used in order to estimate this relationship. section 4 explains the dependent, independent, and control variables, together with the motivation behind using these respective variables. Section 5 shows the results of the analysis, meanwhile section 6 concludes the paper and discusses its shortcomings. Finally, section 7 states the final recommendations.

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[1] https://globaldatalab.org/shdi/
[2] http://hdr.undp.org

2. Literature review

As many developing countries are characterized by the existence of multiple ethnic groups, and as research in the economic field has become increasingly interdisciplinary, economic researchers have drawn attention to the role of ethnicity and ethnic diversity in the process of explaining economic phenomena (Gören, 2014). This has translated into a wide range of different views resulting from empirical research and the discovery of several channels through which ethnic diversity can affect economic development (Hino et. al, 2012).

Positive economic effects

Ethnic heterogeneity can be beneficial to the process of economic development. Coming from diverse ethnic groups often implies the exposure to a different set of ideas and beliefs. It means that individuals differ in their productive skills and the way they interpret and solve problems. For this reason, having an ethnically diverse workforce benefits production as the degree of innovation is higher, thereby enhancing productivity (Brückner, 2013). According to Alesina and Ferrara (2005), more ethnically diverse groups outperform ethnically homogenous groups when it comes to problem-solving, even when the former has limited abilities, and the latter is endowed with higher abilities. This has to do with the intuition that an individual's likelihood of developing sophisticated problem-solving skills is determined by the extent to which other group members have a different perspective. Moreover, ethnic diversity is found to have a positive effect on creativity and task completion (Oetzel & Oh, 2019).

In addition, and according to Smallbone, Kitching, and Athayde (2010), ethnic diversity can enhance the level of competitiveness in a given city or region. This occurs through the creation of businesses owned by ethnically diverse entrepreneurs who extend the range of the available goods and services. Demand for such products, such as ethnic-specific food, clothing, and art, can foster business opportunities and lead to higher economic activity. Along the same line of reasoning, Churchill (2017) states that ethnic diversity could lead to a variation in entrepreneurial activities, which is favourable for business development as well as for economic growth. This has to do with what Sobel, Dutta, and Roy (2010) call *cultural capital*. Namely, the level of innovation that results from highly heterogeneous societies when allowing for the fusion and exchange of the different ideas between the existing ethnic groups within national boundaries.

Likewise, Ferrara (2003) shows that membership in ethnic groups can be advantageous for developing countries, but only when close relationships are maintained. Her research highlights the relevance of non-market institutions as a mechanism of coping with market failures. Evidence suggests that belonging to an ethnic group facilitates the process of getting informal credit and promotes social enforcement. This promotes economic development since those who are in need of credit, but lack collateral, can still obtain it through personal relationships. These relationships serve as 'social collateral' and improve repayment. This is in line with later findings of Bagwell (2008) who explores the role of trust in the way ethnic networks operate. According to the author, ethnic networks can be of crucial importance as being part of an ethnic network can provide access to resources and funding. However, it is stressed that such a phenomenon can only take place when there is mutual trust between the members of an ethnic network. This is a necessary condition for the sustainability of these networks as well as the deterrence of opportunistic behaviour which threatens the existence of these communities. Similarly, information and communication costs are lower since members of the same ethnic groups have greater mutual understanding (Nathan, 2013).

Negative economic effects

When it comes to developing countries, the empirical findings suggesting a negative effect of ethnic diversity on economic development seem to dominate (Wegenast & Basedau, 2014). Early findings from Easterly and Levine (1997) argued that a high degree of ethnic diversity in a given country leads to less economic growth. Their research suggests that ethnic fractionalization leads to poor policies, which in turn causes economic performance to be affected negatively. The study, which is of cross-country character, has shown that this ethnic fragmentation accounts for approximately 28% of the growth differences between African and East-Asian countries. These findings were later on confirmed by Alesina et al. (1999), who extended the analysis to a wider set of countries, and – once more – highlighted the negative relationship associated with ethnic diversity and long-run economic growth. These studies have both used the ethno-linguistic fractionalization (ELF) index as a measure of ethnic diversity and have used data originating from the Atlas Narodov Mira (1964), which provides a list of population by ethnicity constructed by Soviet researchers.

Although the Atlas Narodov Mira has been a commonly used data source for the ethno-linguistic fractionalization index, it has not been free of criticism. Therefore, findings – such as those by Easterly and Levine (1997) and Alesina et al. (1999) – have been called into question. As a result, the insights resulting from early papers were initially subject to distrust. However, and despite the criticism, they have been taken as a benchmark and have been confirmed by subsequent work. This has generated the widely accepted idea that national economic performance depends on the level of ethnic diversity; more ethnically homogenous countries tend to experience higher economic performance in comparison to those that are ethnically heterogeneous (Campos et al., 2011).

This phenomenon has several explanations, which have been identified in the existing literature. Evidence shows that in cases of high ethnic fractionalization, cooperation is difficult which makes the process of coming to an agreement challenging or - at times - even impossible (Yehoue, 2007. Ko, 2019). Economic and political activities cannot be coordinated since different ethnic groups prioritize different things. This lack of national sentiment, as opposed to a strong ethnic identity, works unfavourably for economic development (Patsiurko, Campbell, & Hall, 2013).

On the other hand, ethnic violence plays a major role in defining the extent to which ethnic diversity hinders economic processes. Ethnic conflict, especially when resulting in civil wars, has detrimental consequences for the economic development of a country (Bezemer & Jong-A-Pin, 2013). The political instability blocks the exchange of ideas between the different ethnic groups and leads to human capital destruction. The latter is especially at hand when those carrying innovative ideas that contradict the dominant ideology established by governments, are killed, or forced to flee into exile. Generally, these tend to be the higher educated people, meaning that the human capital outflow turns out to be severe. Naturally, this hampers a country's economic development (Gerring, Thacker, Lu, & Huang, 2015).

Moreover, ethnic civil wars can have more deeply rooted consequences. The traumatic experiences can affect social life in such a way that it takes decades for it to return to its prior conditions (Shneiderman & Tillin, 2015). Until then, an atmosphere of risk and uncertainty is present, which leads to lower investment rates. Investment in both human as well as physical capital is discouraged, thereby damaging the process of capital accumulation; one that is essential for economic development (Kanbur, Rajaram, & Varshney, 2011).

In addition, there is the public goods discussion. Researchers claim that one of the main reasons behind the negative effects of ethnic diversity on economic development is the inability of members of different ethnic groups to agree on public policies and public goods (Baldwin & Huber, 2010. Van Staveren & Pervaiz, 2017). According to the literature, this phenomenon has several explanations. Firstly, different ethnic groups can have differing preferences when it comes to the type of public goods that should be provided (Van Staveren & Pervaiz, 2017). Many ethnic groups value only the public goods that benefit

their respective group. This can be the result of a heterogeneity of preferences, but can also be due to a reduction in utility level once a public good is used by another ethnic group outside one's own (Gisselquist, Leiderer, & Nino-Zarazua, 2016). As public goods in their nature are non-rival and non-excludable, it is difficult to prevent other ethnic groups from reaping their benefits. This discourages the investment in public goods and leads to their undersupply. As a result, this could raise the level of inequality in a country, thereby contributing to an increase in poverty (Chandra, 2001, Van der meer & Tolsma, 2014). Moreover, and as emphasized by Garcia-Montalvo & Reynal-Querol (2005), when countries are divided along ethnic lines, tensions between the different ethnic groups may emerge. This generates the need for some individuals to use their resources - whether time, labor, or capital - in order to gain political influence and establish authority. At the same time, this means that the available resources are used unproductively, instead of being used as a contribution to public goods provision.

Inspired by prior findings that confirmed the negative effects associated with ethnic diversity, Collier (2000) investigated the effect of ethnic diversity on economic development through the channel of political environment. His results explain that, in case of a democracy, ethnic diversity does not hamper economic growth. Meanwhile in the context of a dictatorship, ethnic diversity leads to growth-reducing policies. Kotera, Mizuno, & Samreth (2015) clarify that this has to do with the fact that in case of a democratic system, the political process is based on a citizen-candidate model where all citizens have the right to vote or to run for election. However, when there is a dictatorship in place, it is common that these rights are limited to a specific ethnic group. This dominant ethnic group monopolizes political power and chooses policies that favor their own respective ethnic group while neglecting the overall good. In support of these findings, Bluedorn (2001) finds evidence that a democracy plays a positive role in diminishing the adverse effects of ethnic diversity on economic performance. He claims that democratic institutions are better able to manage inter-ethnic conflicts that might arise, thereby preventing any instability to the economic system.

On the other hand, attempting to explain the instability of economic performance in developing countries, Rodrik (1999) finds evidence suggesting that even when controlling for the quality of institutions, ethnic division matters to a country's ability to manage shocks. He claims that poor economic performance in developing countries has a lot to do with their limited skills to deal with external shocks. The diversity delays and hampers fast decision making as preferences differ and interests are not aligned.

Mutual dependency

Interestingly, the majority of economic research concludes a causal relationship with ethnic diversity as the source and unsophisticated economic development as the outcome. Especially in the case of Africa, many authors attribute the existence of bad public policies to the high levels of ethnic diversity (Green, 2018). Evidence does indeed show that more ethnically fragmented societies experience lower quality of both public goods provision and government policies (Van Staveren & Pervaiz, 2017). However, correlation does not guarantee causation. The question remains whether ethnic diversity leads to bad government policies, or that bad government policies strengthen the differences between the existing ethnic groups thereby leading to tensions and further disintegration? Although government policies are affected significantly by the existence of a highly ethnically diverse population (Casey & Owen, 2014), it is not the only determinant. Other factors, such as the perspective and goals of a country's leader, may play a (perhaps more) important role (Ahlerup, 2016).

According to Alesina and Giuliano (2015), it is important that governments remain impartial and refrain from favoring one ethnic group over the other. This is essential in order to achieve sustained economic growth and escape poverty. Typically, economic growth goes hand in hand with an increase in average incomes, but it also affects the income distribution (Ferreira, 2010). As soon as economic growth is followed by an increase in income inequality between the different ethnic groups in a country, growth cannot be sustained. This is where government impartiality plays an important role. When improved economic performance benefits different ethnic groups disproportionately, this may create tension and eventually lead to political conflict and attempts of secession (Bazzi, Gaduh, Rothenberg, & Wong, 2019). This is typically the case when growth benefits the ethnic groups that have significant influence and occupy powerful positions in national politics. Ethnic minorities, or those not directly benefiting from economic development, may feel discriminated against and distrust the government. This creates an environment in which economic growth cannot be sustained and remains temporary (Devarajan & Khemani, 2018, Bazzi et al., 2019).

For this reason – Berg, Ostry, & Zettelmeyer (2012) explain – many developing countries have experienced relatively short periods of economic growth. Seldom had they been able to extend the process for a longer period of time. In their research, the authors' objective is not to attempt to refute prior findings regarding the direct effects of ethnic diversity on economic development. On the contrary, they acknowledge the economic impact of ethnically diverse population structures. According to them, ethnic diversity can translate into a lack of cohesion, which creates a lack of trust between economic agents. This makes it rather difficult to do business and organize collective action. It is also harder to agree upon policies that prevent group favoritism. Nevertheless, the authors highlight the fact that this relationship between ethnic diversity and economic development is not a one-way street. Ethnic diversity has an effect on economic development, but the opposite holds as well. When governments create development policies that favor their own respective ethnic groups, patterns of ethnic division and a lack of cohesion are most likely to sustain and, in some cases, become more severe (Ostry, Berg, & Zettelmeyer, 2008).

Therefore, the way to economic development matters for the extent to which ethnic diversity serves as an obstacle for long-term growth. Hodler and Raschky (2014) find that foreign aid directed towards African countries is often located in the home regions of the leaders, thereby indicating ethno-regional favoritism. Similarly, Kramon and Posner (2012), in their research about distributive politics in Kenya, find evidence of ethnic favoritism in educational outcomes. This pattern once again gets confirmed by Ahlerup and Isaksson (2015). In their conducted survey, it appears that respondents who live in regions where co-ethnics of the country's leader are established, they experience relatively fair treatment from the government. On the contrary, those who are situated outside of those regions, experience unfair treatment and view the government to be biased. According to Ahlerup, Baskaran, and Bigsten (2016), this ethnic favoritism and lack of impartiality indicate that governments do not allocate resources in accordance with economic criteria that will benefit a country as a whole. Rather, they could be allocating resources to individuals, sectors, or regions, to achieve their individual interests or those of a relatively small group of people.

All in all, it is important to acknowledge the complexity of the issue at hand. As much as there is a consensus regarding the direct negative effects of ethnic diversity on economic development, the indirect effects should also be considered. Ethnic diversity in many low and middle-income countries does hinder economic development. However, the development strategy chosen and the nature of the path towards development can also have an effect on ethnic diversity. This process seems like a vicious cycle where ethnic diversity affects economic development, but economic development, on its part, also affects ethnic diversity through the channel of government policies. In other words, they are mutually dependent.

Hypotheses

The existing literature represents the effects of ethnic diversity on economic development to be potentially favourable as well as unfavourable. Due to the lack of consensus regarding the nature of the relationship between both factors, two contrasting hypotheses have been created. The analysis aims to discover which hypothesis is most in accordance with reality in the case of low- and middle-income countries.

Hypothesis 1

"*Ethnic diversity has a negative relationship with regional economic development in low- and middle-income countries*".

Hypothesis 2

"*Ethnic diversity has a positive relationship with regional economic development in low- and middle-income countries*".

3. Model

In this research, a multilevel analysis is conducted in order to explore the effect of ethnic fractionalization on economic development. Ethnic fractionalization is measured using the Ethnic Fractionalization Index (EFI), whereas subnational economic development is measured using the Subnational Human Development Index (SHDI). This is done using panel data on 68 low- and middle-income countries in which 819 regions are present. It should be noted that the dataset consists of a range of data from the year 2000 to the year 2013, but that each country has its own starting- as well as ending point depending on the available data (See Appendix; *Table 5*). The analysis is of multilevel character since the data has a hierarchical structure where the independent variable (*Ethnic Fractionalization Index*) is on the national level, while the dependent variable (*Subnational Human Development Index*) as well as the control variables are on the subnational level. Although a one-level analysis where all variables are on the subnational level was most desirable, ethnic fractionalization data does only exist on the national level for the large set of countries under analysis. This has made multilevel modelling the most appropriate approach to this respective study.

Using the available data, in which regions are nested in countries, a single-level methodology would lead to estimation problems. This has to do with the fact that regions within the same countries tend to be more similar than regions across different countries, thereby implying that the residuals are not independent (Hox, 1998). Multilevel modelling, as opposed to OLS, controls for spatial dependence and corrects the measurement of standards errors (Snijders & Bosker, 2011). This reduces the risk of type I errors and provides more reliable results. Another benefit is that the variables at different levels are not add-ons to the same single-level equation. Rather, they are linked together in a way that makes the simultaneous existence of the different levels explicit. This ensures that the variability in random coefficients as well as random slopes can be explained (Bickel, 2007).

The reason behind the limited timespan is due to the lack of recent data on ethnic fractionalization with the year 2013 being the last year on which data could be found. This provides the disadvantage of being unable to draw conclusions about recent developments but allows us to explore a possible general pattern in the relationship between ethnic fractionalization and economic development (SHDI). In this study, the effect of ethnic fractionalization on SHDI is observed for each country for an average period of 5 years depending on the available data. Since the years for which data is obtainable are not consistent throughout the different countries in the dataset, the most recent data for each individual country is selected (See Appendix; *Table 5*).

Considering the longitudinal nature of the data, the (on average) 5 years of time form the first level of analysis, while regions and then countries form the second and third level of the hierarchy. The multilevel modelling specification treats time as a source of randomness at any level, both in the intercepts as well as slopes. Moreover, based on general acceptance in previous literature, a selection of control variables is included in order to assess the relative relationship between ethnic fractionalization and SHDI. This has led to the following model with which the dependent variable can be predicted:

$$y_{t\,i\,j} = \beta_{0\,i\,j} + \beta_1\,X_{t\,j} + \beta_2 P_{t\,i\,j} + \delta_{i\;j}\,Time + e_{t\,i} \qquad [1]$$

$$t = year$$

$$i = region$$

$$j = country$$

In this regression, $y_{t\,i\,j}$ refers to the vector of the estimated dependent variable, being the Subnational Human Development Index (SHDI) in year *t*, region *i*, and country j. $\beta_{0\,i\,j}$ is the intercept, whereas β_1 is the slope coefficient of the independent variable. In other words, The SHDI depends on the independent variable *X* in year *t* and country *j*. This is the Ethnic Fractionalization Index (EF-Index). Similarly, a set

of control variables, P, on the subnational level are used. Their slope coefficient is denoted by β_2. δ_{ij} is the slope associated with the time variable, and e_{ti} is the random error term. This error term does not only capture the residual variable, as is the case OLS estimation, but also captures potential group-to-group variability in the random intercepts and slopes of the model (Peugh, 2010).

The parameters β_{0ij} and δ_{ij} of equation [1] vary across regions and countries. This can be modeled as follows:

$$\beta_{0ij} = \gamma_{00j} + u_{0ij} \quad \delta_{ij} = \delta_{0j} + u_{ij} \qquad [2]$$

Substituting equation [2] into equation [1], gives the following model:

$$y_{tij} = \beta_{0ij} + \beta_1 X_{tj} + \beta_2 P_{tij} + \delta_{ij} Time + e_{ti}$$

$$= (\gamma_{00j} + u_{0ij}) + \beta_1 X_{tj} + \beta_2 P_{tij} + (\delta_{0j} + u_{ij}) Time + e_{tij}$$

$$= \gamma_{00j} + u_{0ij} + \beta_1 X_{tj} + \beta_2 P_{tij} + \delta_{0j} Time + u_{ij} Time + e_{tij} \qquad [3]$$

At the same time, γ_{00j} as well as δ_{0j} of equation [3] can be expressed in the following manner:

$$\gamma_{00j} = \gamma_{000} + u_{00j} \qquad [4]$$

$$\delta_{0j} = \delta_{00} + u_{0j} \qquad [5]$$

By substituting equation [4] and [5] in equation [3], the full mixed model is obtained [6]:

$$y_{tij} = \gamma_{000} + \beta_1 X_{tj} + \beta_2 P_{tij} + \delta_{00} Time + u_{00j} + u_{0ij} + u_{0j} Time + u_{ij} Time$$

$$+ e_{tij} \qquad [6]$$

In the final mixed model of equation [6], γ_{000} represents the overall mean. u_{0ij} is the random departure from the overall mean due to the *i-th* region, meanwhile u_{00j} is the random departure from the overall mean due to the j-th country. On the other hand, u_{ij} represents the departure from the common linear trend due to the i-th region and u_{0j} is the departure from the common linear trend due to the j-th country. At last, $e_{tij} \sim N(0, \sigma_e)$ is the deviation as a result of time effect (Snijders & Bosker, 2011).

Important to note is that this econometric model [6] consists of a deterministic part as well as a stochastic part. The deterministic part - $\gamma_{000} + \beta_1 X_{tj} + \beta_2 P_{tij} + \delta_{00} Time$ - entails all the fixed coefficients. Meanwhile the stochastic part, which consists of the u-terms and e_{tij}, represents the random part of the model. Apart from e_{tij}, this random part consists of randomness associated with level 2 of the model - $u_{0ij} + u_{ij} Time$, as well as randomness associated with level 3 of the model - $u_{00j} + u_{0j} Time$- (Snijders & Bosker, 2011).

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4. Data

Independent variable

The independent variable in this analysis is the ***Historical Index of Ethnic Fractionalization*** (HIEF). The index corresponds to the probability that two randomly drawn individuals within a country are not from the same ethnic group. This is calculated based on the annual percentage of ethnic groups within each country and by using the most commonly applied formula in the existing literature. Namely, a decreasing transformation of the *Herfindahl concentration index* (Rhoades, 1993):

$$EF_c = 1 - \Sigma_{i=1}^{n} Si^2$$

In this formula EF_c represents the degree of ethnic fractionalization in country c. Whereas i represents the ethnic groups and Si, the proportion of the population in country c belonging to ethnic group i (i = 1, …, n). The ethnic fractionalization index ranges from 0 to 1. With 0 portraying a state in which there is no ethnic fractionalization, and all individuals belong to the same ethnic group, and where 1 portrays a state in which all individuals belong to their own respective ethnic group (Bossert, D'ambrosio, La Ferrara, 2011).

The dataset was retrieved from the Harvard Dataverse[3], which is a data repository where various types of datasets can be accessed freely for the purpose of research. Originally, this data was collected from the Composition of Religious and Ethnic groups (CREG) project[4], which was led by the Cliner Center for Democracy at the University of Illinois. However, the original dataset contained several inconsistencies, which had to be checked and corrected for. The dataset found on the Harvard Dataverse is the improved version of the original dataset initially published by the University of Illinois (Drazanova, 2019).

Dependent variable

The sub-national data used for this analysis originates from the Global Data Lab[5] of the Institute of Management Research at Radboud University. This is an initiative aimed at developing instruments as well as databases for the purpose of monitoring and analysing the status and progress of societies. The distinctive feature of this data source lies in its provision of subnational indicators that draw a more accurate picture of development in a broad range of fields. This is of particular interest for research on less developed countries where the local administrative systems are not as capable of publishing statistical information that is both reliable and representative (Smits, 2016).

The dependent variable, being the ***subnational human development index*** (SHDI), is a measure of overall achievement in terms of social and economic wellbeing. It is a translation of the UNDP's human development index (HDI)[6] from the national to the subnational level and can be retrieved from the Sub-National Human Development Index database of the Global Data Lab[7]. The distinctive feature of this measure is its disaggregate nature. The UNDP's human development index (HDI) is appropriate for measuring cross-country differences in development but leaves within-country differences undiscovered. In the case of middle- and low-income countries, there is significant variation in the level of development between regions, which is not reflected in the national value of HDI. The SHDI, therefore, provides us with more detailed information concerning the development within a given country (Smits & Permanyer, 2018).

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[3] https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi%3A10.7910%2FDVN%2F4JQRCL
[4] https://clinecenter.illinois.edu/project/Religious-Ethnic-Identity/composition-religious-and-ethnic-groups-creg-project
[5] https://globaldatalab.org/
[6] http://hdr.undp.org/en/data
[7] https://globaldatalab.org/shdi/

SHDI consists of three dimensions: health, education, and standard of living. The measure uses life expectancy at birth as an indicator for the health dimension. For the educational dimension, the expected years of schooling as well as the mean years of schooling of adults aged 25+ are used. Lastly, (the log of) gross national income is used to measure the standard of living. The index constructed is an average of the subnational values of these three dimensions (Smits & Permanyer, 2018).

The choice behind the use of the sub-national human development index (SHDI) as the dependent variable lies in the multidimensional nature of economic development. Development is not solely about income per capita growth but entails all the changes and improvements around it. It covers various aspects of society, ranging from the monetary aspects to the social, political, and institutional aspects. For this reason, GDP per capita growth cannot be the only factor being discussed when measuring economic development (Trabold-Nübler, 1991. Lind, 2004). This is also the rationale behind the introduction of the Human Development Index (HDI) in 1990; to point out that - aside from economic growth - people and their capabilities create the most accurate picture of a country's development ((McGillivray& White,1993. Anand & Sen, 1994).

Control variables

Similarly, a significant number of control variables originate from the Global data lab, specifically from the Area Database[8]. This provides the benefit of being able to obtain data for the same set of countries and regions. The database was created by aggregating data from household surveys. These surveys were not conducted in consecutive years, which explains the gaps in the observations within the control variables (Smits, 2016).

Firstly, the ***total fertility rate*** in a given region is used. This is an important factor when discussing long-term development. Statistics show high fertility rates in developing countries as opposed to low ones in developed countries, thereby implying a negative relationship between the rate of fertility and development (Goldstein et al., 2009). Theory, on the other hand, provides us with a number of channels through which the fertility rate affects economic development (Ziaie & Alizadeh, 2006). Changing fertility rates, and thus changing demographic structures, have a significant impact on labor force growth (Esping-Andersen & Billari, 2015). Relatively high fertility rates in the present are an indication of a larger market size in the future, which may lead to higher investment rates as foreign businesses seek to expand to larger markets. However, it may also result into more unemployment. The latter may occur when there is a significantly large young population, but insufficient working positions (Myrskylä, Kohler, & Billari, 2009). Moreover, fertility rate affects economic development through the channel of household savings. The more children in a household, the less the parents are able to save. This indicates that when in unfortunate circumstances, poverty is harder to escape (Attanasio & Szekely, 2001). Similarly, a relatively high rate of fertility indicates a low education level of women. When highly educated, women are faced with opportunity costs for child-rearing, the result is a higher participation rate of women in the job market, and smaller households. This means that the (male) partner is not the sole provider of income, and that a higher standard of living can be ensured (Li, 2016).

Secondly, ***the percentage of the population living in urban areas*** is controlled for. This is a measure of the degree of urbanization, which allows for the possibility of capturing its effect on regional human development. Urbanization not only refers to the transformation of the agricultural population into a non-agricultural one, but also refers to the transformation of the relative importance of agricultural industries as opposed to non-agricultural ones (Lian & Yang, 2019). Moving towards highly urbanized societies goes hand in hand with a change of the primary industry from agricultural tot non-agricultural (e.g. services industry). People, resources, as well as wealth come to cluster within cities and it is exactly

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[8] https://globaldatalab.org/areadata/

this agglomeration that contributes to growth. It is known to create job opportunities, infrastructure services, health facilities, and increased income (Moomaw & Shatter, 1996. Chen et al., 2014). According to Brückner (2012) – who focused on developing countries – urbanization has been found to have a positive effect on economic growth as well as on the wellbeing of residents. When zooming in on the Human Development Index (HDI) specifically, Huang and Jiang (2017) have found evidence supporting the idea that urban districts enjoy higher scores of HDI in comparison to rural counties within the same national borders. Similarly, Kopczyński & Sobechowicz (2016) have come to the conclusion that the level of urbanization has a significant effect on people's health (measured by stature and BMI). Urban population has proven to be healthier than those living in the countryside. All in all, there is substantial evidence pointing towards the positive effect of urbanization on development, which is why it is considered as one of the most important strategies for development of the 21st century (Shen & Zhou, 2014).

Another variable that is accounted for is the ***percentage of women in paid employment***. The involvement of women in economic activities can strengthen the process of economic development and allow for inclusion of both genders in the labor force. This can improve the efficacy of the labor force and expand the growth potential of the economy (Kieran et al., 2017). Moreover, an increase in female labor participation helps with dealing with shocks. In times of crises, women are often required to engage in paid employment in order to smooth household consumption (Achakpa & Radović-Marković, 2018). In a way, a high percentage of women in paid employment can either be a reflection of poverty or an increased education level, with the former applying mostly to developing countries while the latter applies more to developed ones (Verick, 2014).

However - and although the economy can prosper as a whole - the benefits of female participation in the labor force might not be reflected in the level of human development (Burroway, 2017). In many developing countries, the emphasis is put on maintaining a competitive position in the world market rather than maintaining good labor conditions. This has translated into downward pressure on women's wages as well as their segregation into jobs that do not provide any security nor an appropriate working environment. The effect of an increase in the number of women in paid employment might therefore be more beneficial to a country's GDP than it is to human wellbeing (Menon & van der Meulen, 2017). The result is what Loper (2018) calls exploitative growth. Meaning that some countries with a high degree of women in paid employment grow at the expense of vulnerable women's quality of life.

In addition, the ***mean age difference between husband and wife*** serves as a control variable. This difference in age between spouses tends to be larger in relatively less developed countries that are of patriarchal character (Carollo, Oksuzyan, Drefahl, Camarda, Ahrenfeldt, Christensen, & van Raalte, 2019). This has to do with the more traditional task distribution within households, which requires women to perform unpaid labor within the house and take care of the children (Panda & Agarwal, 2005). In such societies, younger brides are preferred as they are seen as more capable of their role as housewives. These women are typically given low social and economic status, which makes it difficult to break the status quo and engage in economic activities (Williams,2019). Similarly, in more modern societies, in which women have significant social and economic status, the age difference is smaller as husbands and wives are seen as equal partners. Women are - therefore - more likely to receive education and take part in the labor market (Panda & Agarwal, 2005).

On the other hand, the effect of the ***household size*** is taken into account. Unlike most of the other variables in the model, the relationship with economic development is not as straightforward. The United Nations Children's Fund (1999) stressed that when the average household size decreases, this contributes to accelerated development as well as a reduction of poverty. Similarly, Mullahy and Wolfe (2000), have found that the lack of access to basic needs results in the disability of large households to function as an effective unit. This makes them vulnerable and subject to severe poverty. The same conclusion is drawn by Widyanti, Suryahadi, & Sumarto (2010) as they have stated that family size is an indication of the number of units among which the available resources need to be distributed; the

larger the household the less owned per capita. However, more recent research has shown that a larger household size does not necessarily form an obstacle in the path towards development. Its effect can be ambiguous depending on the relative strength of size economies as against the force of diminishing returns to scale (Bogale & Korf, 2009). In Pakistan - for example - very large households have been found to have a negative effect on poverty. This has to do with the fact that large households have more potential earners, which can reduce poverty through greater participation in the labor force (Rahman, 2013).

A topic on which there is less ambiguity is the relationship between ***access to electricity*** and economic development. In this case access to electricity is measured using the percentage households with electricity in a region. The benefits of having access to this type of energy are recognized in the literature as it is seen as a critical element in the process of development (Kanagawa & Nakata, 2008). According to González-Eguino (2015) access to electricity is the fuel behind fundamental economic activities, which makes it a key precondition for alleviating poverty. In the same type of reasoning, Drupady and co-author (2016) state that a lack of access to electricity ensures that modern public services - such as healthcare and education - cannot be delivered to their beneficiaries, thereby leading to limited improvement to the standards of living. This is the case in many developing countries where power supply is known to be unreliable and has high disruption costs. The result is a negative force on production efficiency as well as competitiveness (Emodi & Yusuf, 2015).

Overview of the variables in the model

The variables presented in this section eventually come together to produce the analysis under investigation and form the multilevel model. Due to the considerable number of variables and the multilevel nature of the data, it is important to get a grasp on the structure of the analysis. Therefore, a brief overview (*Table 1*) is created in order to facilitate the understanding of the structure.

Table 1: A summary of the variables under analysis

	Independent variable	**Dependent variable**	**Control variables**
Name	*- Historical Index of Ethnic Fractionalization*	*- Subnational Human Development Index*	*- Total fertility rate* *- Percentage of the population living in urban areas* *- Percentage of women in paid employment* *- Mean age difference between husband and wife* *- Household size* *- Access to electricity*
Level	- National	- Subnational	- Subnational
Source	- Harvard Dataverse	- Sub-National Human Development Index database (*Global Data Lab*)	- Area Database (*Global Data Lab*)

5. Estimation and Results

Descriptive statistics

Table 2 provides the descriptive statistics of the dependent and independent variable, as well as the control variables chosen. The table shows that there is significant variation in the number of observations between the main variables and the control variables, with the latter lacking various observations. The data for the control variables results from multiple household surveys that are taken in specific non-consecutive years, meaning that it is naturally characterized by data gaps. Moreover, data on the variables chosen is not always simultaneously present.

However, in order to minimize the effect of the missing data, the interpolation technique is used. This is a method in which new data points are estimated within the range of a set of known data points. In other words, the gaps in the control variables are filled by estimating unknown values that lie between two existing values. This is called linear interpolation, resting on the assumption that the rate of change between the known observations is constant and can be calculated by use of a rather simple slope formula (Noor, Al Bakri, Yahaya, & Ramli, 2015). Applying this technique did increase the number of observations for the control variables, but not to the point that it matches the number of observations of the dependent and independent variable *(See Table 2)*. Another way of dealing with the gaps in our data is the dummy adjustment method. Here, dummy variables are created in order to indicate when values are missing in the dataset (Hardy,1993). These dummies are part of the regression as an adjustment mechanism but do not show in the descriptive statistics or the final output.

Moreover, the data is characterized by significant dispersion, with differing minimum and maximum values. The sample has countries where the Ethnic Fractionalization Index (EF-Index) has a value of 0.02, and countries where its value is 0.8. The same holds for the Subnational Human Development Index (SHDI), where some regions are relatively underdeveloped with a score of 0.2. Meanwhile other regions obtain a score of 0.9 on their SHDI. In addition, the mean fertility rate is 4.3. This is relatively higher than developed countries where the mean fertility rate is below 2 (World Bank Database[9], 2018). This explains the (on average) larger households in developing countries as opposed to developed ones. The dataset shows that the average household size, in the 68 developing countries that are concluded, is approximately 6.1. This is relatively high when comparing it to – for example – European countries where the average household size is 2.3 members (Eurostat[10], 2019).

Table 2: Descriptive statistics

| Variable	Obs	Mean	Std.Dev.	Min	Max
SHDI	5145	.563	.14	.205	.91
EF-index	5145	.559	.263	.025	.884
Women in paid employment	3030	50.382	20.412	2.57	95
Age difference husband and wife	4913	6.028	2.548	.87	14.3
Electricity	4281	55.833	37.948	.22	100
Fertility Rate	3264	4.329	1.643	.87	8.67
Household Size	4484	6.164	1.92	2.59	20.4
% Urban population	4897	42.714	27.823	.32	100

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[9] https://databank.worldbank.org/reports.aspx?source=2&series=SP.DYN.TFRT.IN&country=

[10] https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_lvph01&lang=en

Scatter graphs

In attempt of discovering the nature of the relationship between the Ethnic Fractionalization Index (EF-Index) and the subnational Human Development Index (SHDI), several scatterplots have been generated. As the variables are not on the same level, the national mean of the SHDI is taken in order to be plotted against the national values of the EF-Index. Moreover, only a random subset of the countries in the dataset have been selected in order to alleviate the issue of overplotting. Data points of 4 countries for the available years have been used, where the national mean of the SHDI is on the x-axis and the EF-Index on the y-axis.

Figure 1: Scatterplots SHDI on EF-Index [4 countries]
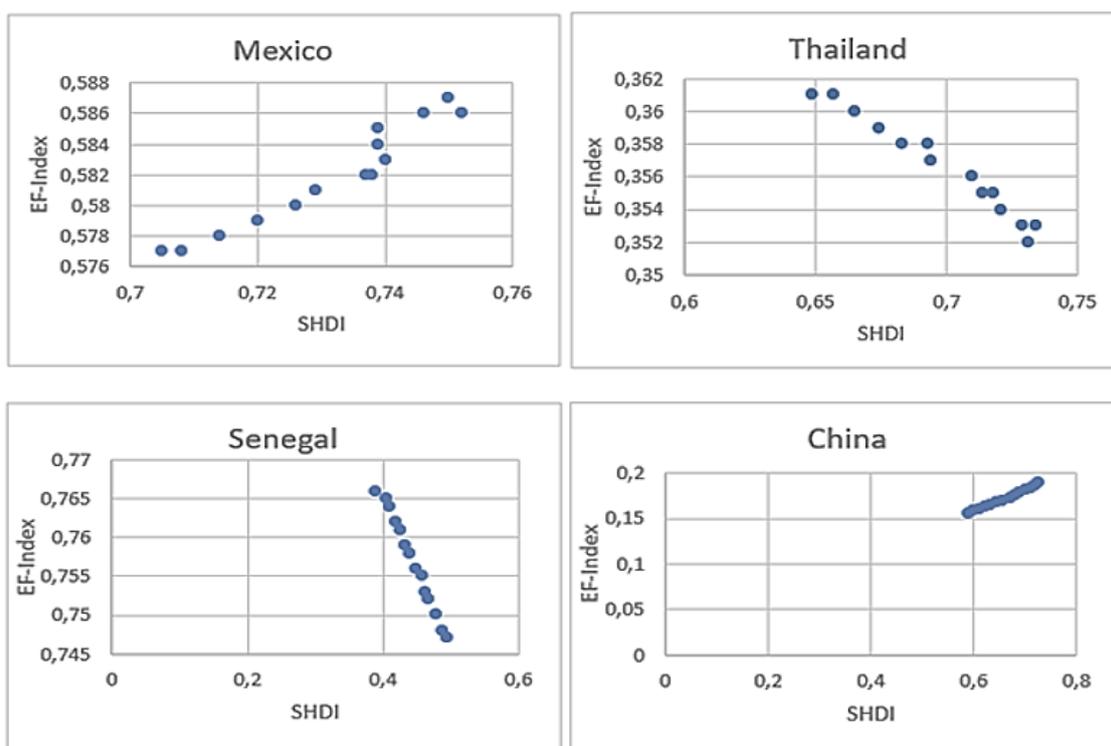
Noticeable when analysing the scatterplots is that there is no general trend that holds for all the four countries. We see that Mexico, as well as China, are characterized by a positive linear relationship between the EF-Index and the national mean of SHDI. This indicates that greater Ethnic fractionalization is accompanied with a higher degree of human development. On the contrary, a negative linear relationship is observed in Thailand and Senegal, which indicates that the lower the ethnic fractionalization, the higher the human development. This leads us to the conclusion that - based on this data visualisation - no general statement can be made that describes the relationship between ethnic fractionalization and human development in a universal manner.

Multilevel Estimation

The general idea behind the analysis is that subnational human development - measured by SHDI – is the result of ethnic fractionalization on the national level as well as other subnational conditions. Output shows that there is a negative relationship between the **EF-Index** and **SHDI** that is the significant at the 1% level. With a coefficient of -0.097, the results indicate that – holding all other factors constant - for every one unit increase in the Ethnic Fractionalization Index, the Subnational Human Development Index decreases by 0.097 unit. This is in support of *Hypothesis 1*, which anticipates a negative relationship between the Ethnic Fractionalization Index and the Subnational Human Development Index in developing countries. Naturally, *Hypothesis 2* is rejected.

Similarly, the coefficients for the control variables also correspond to the initial expectations. A significant, and negative, relationship is observed between the percentage of women in paid employment and SHDI. This means that a one percentage point increase in the *rate of women in paid employment* corresponds to a 0.0551 unit decrease in SHDI. As stated earlier, a high degree of women as part of the labor force can be a sign of poverty rather than a sign of accelerated development. The relationship between the *age difference between husband and wife* and SHDI is also characterized by a negative sign. Holding all other factors constant, a one unit increase in the age difference between husband and wife is associated with a 0.019 decrease in the level of SHDI.

Moreover, the nature of the relationship between *the total rate of fertility* and SHDI appears to negative as well. An increase in the rate of fertility by one unit corresponds to a 0.009 decrease in the level of SHDI. The same applies to *household size*, where a one unit increase is associated with a 0.007 decrease in SHDI. On the contrary, the relationship between the *percentage of households with electricity* and the dependent variable is positive. A one percentage point increase in the percentage households with access to electricity in a region is accompanied with a 0.163 unit increase in the level of SHDI. The same type of relationship exists between the *percentage of people living in urban areas* and SHDI. Here we see that a one percentage point increase in the percentage of people living in urban areas has a positive relationship with the level of SHDI and corresponds to an increase of 0.058.

Table 3: Multilevel regression output

	SHDI
EF-Index	-0.0971**
	(-3.00)
Women in paid Employment	-0.000551***
	(-6.75)
Age difference husband and wife	-0.0189***
	(-17.35)
Electricity	0.00163***
	(19.13)
Fertility Rate	-0.00930***
	(-6.95)
Household Size	-0.00688***
	(-7.72)
% Urban population	0.000587***
	(8.79)
Constant	0.710***
	(30.79)
N	2294
t statistics in parentheses * $p<0.05$, ** $p<0.01$, *** $p<0.001$	

Robustness check

With the goal of testing the robustness of the main analysis, a robustness check has been performed. This is used in order to illustrate a model's ability to perform effectively when its assumptions or variables are altered. In this case, the dependent variable **SHDI** is removed and proxied by the variable **International Wealth Index (IWI)**. This is an asset-based measure of material wellbeing in a given region that proves to be highly correlated with human development (Smits & Steendijk, 2011) and obtainable from the from the Area Database of the Global Data Lab[11]. It takes into account a household's material possessions, ranging from durables and access to basic services, to specific characteristics of the homes in which the household resides. The measure runs from 0 to 100, indicating a situation in which a household has all durables and access to the highest quality housing and services when IWI has a value of 100. Along the same line of reasoning, an IWI of 0 indicates a situation in which a household lacks the specific material assets that are part of this measure (Smits & Steendijk, 2011).

These assets consist of seven consumer durables. Namely, a TV, phone, refrigerator, car, bicycle, cheap utensils, and expensive utensils. Moreover, access to water and electricity are included, as well as three characteristics of the housing. These include the number of sleeping rooms, the quality of toilet facilities, and the quality of the floor material. These assets all have weights, which are eventually used in a the IWI formula in order to obtain the IWI scores. Important to note is that when households are assigned the same IWI value, it does indicate an identical possession of material assets. Different asset portfolios can lead to the same level of material satisfaction since the scale is of additive nature (Smits & Steendijk, 2011. Smits & Steendijk, 2015).

As the regression output of the robustness check shows (*see Table 4*), the **Ethnic Fractionalization Index (EF-Index)** has a negative – but insignificant – relationship with the International Wealth Index (IWI). On the other hand, the **percentage of women in paid employment** has remained significant, although the effect is larger. The same holds for **the percentage households with access to electricity** and **the household size**. As opposed to the prior estimation *(Table 3)*, **the age difference between husband and wife, the fertility rate,** as well as **the percentage of urban population** have appeared to be insignificant.

Table 4: Regression output for the Robustness check

	IWI
EF-Index	-4.745
	(-1.10)
Women in paid Employment	-0.109**
	(-3.23)
Age difference husband and wife	0.0547
	(0.14)
Electricity	0.492***
	(15.45)
Fertility Rate	-0.342
	(-0.59)
Household Size	0.985**
	(-2.72)
% Urban population	0.0407
	(1.46)
Constant	29.10***
	(5.94)
N	2294
t statistics in parentheses * p<0.05, ** p<0.01, *** p<0.001	

6. Conclusion and discussion

This paper has attempted to investigate the effect of ethnic fractionalization using the Ethnic Fractionalization Index on economic development. The latter is measured using the Subnational Human Development Index (SHDI), which takes into account life expectancy, education, as well as the standard of living. While existing studies have already addressed this relationship, they did so by focusing on the material aspect of development (Obeng-Odoom, 2015). Namely, topics such as overall GDP-growth, GDP/capita growth, and so on (Nwachukwu, 2017). This respective study differs in that it takes a human approach to development by selecting the Subnational Human Development Index as the dependent variable. Moreover, looking at the subnational values of HDI, rather than the national ones, helps creating a more detailed picture of the potential relationship between ethnic fractionalization and development.

Results show – in accordance with popular belief – a negative relationship between ethnic fractionalization and subnational human development. Hereby, the first hypothesis of this study, which predicts a negative relationship between the variables at hand, is confirmed. This suggests that the existence of a relatively large number of ethnicities within the same national boundaries may work as an obstacle in the process of enhancing human development. As stated in the literature, this can be due to several reasons ranging from ethnic conflict to the lack of agreement on public policies (Ziller, 2015. Gerring, Thacker, Lu, & Huang, 2015). The existence of a strong ethnic identity as opposed to a national identity causes individuals within the same country to have heterogenous preferences, thereby leading to inefficiencies (Staveren & Pervaiz, 2017).

Nevertheless, this research has several limitations, which raises the question of whether its results manage reflect reality in an accurate manner. Firstly, the fact that the Ethnic Fractionalization Index is on the national level means that there is no variation in its yearly value among the different regions. In other words, the within country variation is not accounted for. This means that each region has the same level of ethnic diversity, which – by reason – cannot be true for all of them. Moreover, there is the issue of reversed causality where the dependent variable could be affecting the independent variable rather than vice versa. This is an important issue to consider, since a significant amount of the literature has called for the possibility of the existence of a mutual dependency, in which both variables may influence one another (Essen, Brochu, Dickson, 2012. Ahlerup, 2016. Van Staveren & Pervaiz, 2017). In addition, the linear interpolation technique was used in order compensate for the non-available data for the control variables. Although this method is commonly used, it does not always reflect reality. The estimates might have been biased towards a direction that is inaccurate, thereby negatively affecting our data reliability. Finally, there is the issue of structural validity. The structural validity of our model has been put into question by performing a robustness test. Results have shown that the Ethnic Fractionalization Index (EF-Index) has no significant effect on the International Wealth Index (IWI), thereby implying that the model is not robust.

Nevertheless, and although it holds true that the variation in human development, or economic development, is largely affected by other macroeconomic variables, the effect of ethnic diversity should not be forgotten. Many developing countries are characterized by relatively high ethnic fractionalization, which explains the importance of acknowledging its effect on economic development (Essen, Brochu, Dickson, 2012. Ahlerup, 2016). This research confirms the existence of a negative and significant relationship between the two main variables, which contributes to the existing literature that has brought forward similar findings.

7. Recommendations

The way ethnic diversity affects human development is an interesting phenomenon. Especially in the case of low- and middle-income countries. When the relationship between the two variables is more thoroughly analysed, policy makers can generate policies that take into account the level of ethnic fractionalization as it could potentially improve the process of human development. This can eventually work in the benefit of a country as whole in the longer term. Further research should focus more on collecting ethnic fractionalization data on the regional level. This can help bringing forward studies that explain the role of ethnic fractionalization in development research while taking into account within-country variations. The lack of an appropriate and accessible database makes drawing conclusion on this topic - at the regional level - rather difficult. Therefore, future research should seek to generate such databases and investigate the relationship further.

8. Appendix

Table 5: Countries in the dataset and the periods under analysis (68 countries)

Country	Period of Analysis	Country	Period of Analysis
Albania	2005-2009	Senegal	2011-2013
Algeria	2002-2013	Serbia	2010-2013
Armenia	2000-2010	Sierra Leone	2008-2013
Bangladesh	2011-2013	Somalia	2006-2011
Benin	2006-2011	Sudan	2010-2013
Bolivia	2003-2008	Tajikistan	2005-2012
Bosnia Herzegovina	2006-2011	Tanzania	2004-2012
Botswana	2011-2013	Thailand	2006-2012
Brazil	2000-2010	Togo	2006-2013
Burkina Faso	2003-2010	Turkey	2008-2013
Burundi	2005-2010	Uganda	2006-2011
Cambodia	2010-2013	Ukraine	2007-2012
Central African Republic CAR	2006-2011	Uruguay	2007-2013
Chad	2004-2010	Vietnam	2010-2013
China	2011-2013	Yemen	2006-2013
Colombia	2005-2010	Zambia	2007-2013
Congo Brazzaville	2005-2011	Zimbabwe	2006-2011
Congo Democratic Republic	2010-2013		
Cote d'Ivoire	2005-2011		
Dominican Republic	2007-2013		
Egypt	2008-2013		
Ethiopia	2005-2011		
Gabon	2000-2011		
Gambia	2006-2013		
Ghana	2008-2013		
Guatemala	2007-2012		
Guinea	2005-2012		
Guinea Bissau	2006-2013		
Guyana	2006-2009		
Haiti	2005-2012		
Honduras	2005-2011		
Indonesia	2007-2012		
Iran	2006-2011		
Iraq	2006-2011		
Jordan	2007-2012		
Kazakhstan	2006-2010		
Kenya	2008-2013		
Kyrgyzstan	2006-2013		
Lesotho	2010-2013		
Malawi	2000-2010		
Mali	2006-2013		
Moldova	2005-2012		
Mongolia	2005-2010		
Namibia	2006-2013		
Nepal	2006-2011		
Niger	2006-2012		
Nigeria	2008-2013		
Pakistan	2007-2012		
Peru	2006-2012		
Philippines	2008-2013		
Rwanda	2005-2010		

Table 6: Pairwise correlations

Multilevel analysis variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) SHDI	1.000						
(2) EF-index	-0.435	1.000					
(3) Fertility Rate	-0.778	0.406	1.000				
(4) Women Employment	-0.363	0.359	0.366	1.000			
(5) Age Difference	-0.683	0.293	0.505	0.017	1.000		
(6) Household Size	-0.574	0.278	0.509	0.003	0.666	0.590	
(7) Electricity	0.889	-0.238	-0.760	-0.451	-0.556	-0.424	1.000

Robustness Check variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) IWI	1.000						
(2) EF-index	-0.234	1.000					
(3) Fertility Rate	-0.505	0.326	1.000				
(4) Women Employment	-0.159	0.139	0.210	1.000			
(5) Age Difference	-0.621	0.293	0.399	-0.094	1.000		
(6) Household Size	-0.543	0.265	0.392	-0.043	0.586	1.000	
(7) Electricity	0.729	-0.285	-0.641	-0.280	-0.571	-0.412	1.000

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