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THE CULTURE IN ECONOMIC OUTCOMES

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Contents

Abstract

Yesterday, economists have been reluctant to rely on culture as a possible determinant of economic phenomena. Today, it is popularly believed that culture has a significant effect on economic performance.

If in the past, the definition of culture in economic context was so equivocal. Nowadays, thanks to better techniques and to the opportunity of accessing more complete database, it is possible to identify systematic differences in people's preferences and to relate them to various measures of cultural legacy. These measures can be tested and are able to enrich our understandings of economic phenomena.

The main element of my dissertation is *culture*. I investigated this element in economic context, the study is conducted to explore the effects of cultural diversity at the macro level: on international trade flows and on innovation output. This PhD thesis is divided into three essays.

First, the goal is to distill the common lesson contained in the papers that have used culture to explain economic phenomena and show the broad applicability of culture to diverse areas of economics. Furthermore, to trace the effects of culture through the economic channels several papers use different instruments and it is very important know the main tools.

Next, using a theory based on gravity model equation, we evaluate the consistency of Huntington's Clash of Civilizations theory from an economic point of view. We assess whether culture plays a critical role as envisaged in Huntington (1993) or whether other social, political and economic factors may explain international trade flows. The gravity specification is used to establish the determinants of bilateral trade. We carry out our analysis starting from a simple model when only economic and geographic variables are used. Subsequently, we write our specification employing political and cultural variables. The novelty of this research is that the explanatory variables listed above were not all together studied in the same regression, but only separated so far. Additionally, in the previous studies cultural components like language and religion have been highly simplified (for example, the linguistic links between countries are treated as a dummy variable). In our research, for a more accurate estimation we use index of linguistic and religious distance among countries: these measures reflect varying understandings of the term itself. To further corroborate our findings, we make use of different estimators. Our results do not vary qualitatively.

Finally, I investigated the links between cultural diversity and innovation. In recent decades, the ethnic composition of the population has changed substantially, leading to a rapid increase of cultural diversity. Recent research deals with economic costs and benefits of cultural diversity stemming from immigration. The third chapter investigates the impact of cultural diversity of the workforce on innovation output using a panel of US States for the period 2000–2010. The testing results show a different impact of workforce level on the performance for two dominant ethnic groups, i.e., Whites and Blacks.

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1. Literature review: culture in economics

1.1 Introduction

The paste economic literature has been reluctant to rely on culture as a possible explanatory variable. Much of this reluctance is because the notion of culture is so broad. The concept of culture enters into the economic discourse through channels so ubiquitous; of particular interest are the diverse ways in which it is conceptualized and measured. The role of culture in economics is developed through many valid hypotheses, but empirically most of these are not testable because we have no data that are correlated with cultural categories. This is because group identities are complex.

Nowadays, it is popularly believed that culture has a significant effect on economic performance (Buruna, 1999).

In recent years, there has been increasing interest in the role of cultural diversity in many aspects of society. Economists have paid increasing attention to the role of cultural diversity in explaining the variability of economic outcomes across societies. Several papers (Alesina and Glaeser, 2004; Fernandez and Fogli, 2005; Guiso, Sapienza, Zingales, 2003 and 2004a, b; Roland, 2005; Tabellini, 2005) have used culture to explain economic outcomes. These studies display a shared element that is a narrower meaning about culture, which minimizes the risk of endogeneity and facilitates the elaboration of refutable hypotheses.

The goal of this paper is to show the use of the concept of culture in economic literature and its broad applicability to diverse areas of economics.

Due to economic disparities, economists have begun to take a closer attention on the role of culture in explaining global variability in economic behaviour and outcomes. Whilst some economic historians are sympathetic to the hypothesis that culture has a significant effect on economic outcomes (i.e., Easterly and Levine, 1997; Landes, 1998; Alesina et al., 2003), most scholars challenge this conclusion (i.e., Collier, 2001; Fearon, 2003).

The employment of culture in economic context has roots in the nineteenth century. John Stuart Mill underlines like cultural constraints as sometimes more important than even the pursuit of personal interest. According to him, cultural heritage is the main element through which people decide about own life. Indeed, in the “System of Logic” (1843, p. 484), he wrote: “I insist on what is true of all

rulers, viz., that the character and the course of their actions is largely influenced (independently of personal calculations) by the habitual sentiments and feelings, the general modes of thinking and acting, which prevails throughout the community of which they are members; as well as by the feelings, habits, and modes of thought which characterize the particular class in that community to which they themselves belong."

Therefore, there is a causal relationship between culture and personal behaviour. If in Mill culture affects economic relations, Karl Marx inverted this direction of causality. He argued that the underlying technology determines the type of social structure prevailing and even the dominant culture.

Polanyi (1905) looked at culture as a factor in moderating the excesses of the marketplace.

Gramsci (1949) recognizes the role played by culture in history, arguing that not only economic interests, but also the dominant culture can explain political outcomes. He establishes a clear link between the dominant culture and political outcomes, because he thinks that human history is the product of cultural evolution. For Gramsci, the transmission of the system of values influences the worldview of the social and political role.

To better trace the effects of culture through the economic channels, it is necessary a narrower definition of culture that makes easier to identify a causal link between cultural and economic outcomes. In our study, we take in consideration the notion of culture used by Guiso et al. (2006); they defined it as "those customary beliefs, values, and social constraints that ethnic, religious, and social groups transmit fairly unchanged from generation to generation". This definition leaves out many aspects that ordinary people would identify as culture (like food and dress habits), but it offers an approach that can identify a causal effect of culture on the economic issues. It emphasizes a direct impact of culture on expectations and preferences; consequently, it shows that those beliefs and preferences have an impact on economic outcomes. Culture can affect economic choices and economic equilibrium outcomes also because, through the socialization process, it affects individual preferences.

Culture can affect potentially a very large set of preferences economically relevant. For instance, using place of birth like a proxy for cultural heritage, Ichino and Maggi (2000) found that in Italy preferences for shirking on the job depend by on place of birth. Giuliano (2004) shows that living arrangements of US families are affected by also cultural heritage. Further, culture can influence the fertility of American women, many studies show that cultural heritage affects work and fertility

choices of American women (Fernández Olivetti and Fogli, 2004; Fernández and Fogli, 2005).

Culture can also affect behavior and outcomes through its effect on political preferences, i.e., how much governments should intrude in economic life, redistribute income across individuals, whether they should promote competition, run a social security program, regulate the market. For instance, Alesina and Gleaser (2004) attribute the cultural basis of beliefs to political indoctrination. Yet, Alesina and Angeletos (2005) show that different beliefs in what determines individual incomes across countries affects the size of social spending in a country, but do not inquire whether differences in beliefs are driven by culture. Theoretically, differences in beliefs about social justice lead to differences in equilibrium redistribution.

Culture may be regarded as an intangible public good, shared by the members of a social group. Culture may be a good because it has intrinsic value, or because it is instrumental towards some other purpose. Cultural values and beliefs can be shared, which indicates that culture has the property of a public good (Reisman, 1990). The fact that one person holds certain beliefs does not preclude another person from holding these same beliefs too.

Culture may be considered as a durable asset: values and beliefs are memorized by individuals and are transmitted to the next generation through parenting and education. Education is strengthened when culture is put down in books, embodied in art and artifacts and embedded in rituals and turns. Culture is acquired from early childhood when critical faculties are undeveloped.

The key difficulty in estimating a causal effect of culture is that it is endogenous to economic development. Indeed, to trace the effects of culture, through the economic channels, several papers use some exogenous source of variation in culture like religion, ethnicity, trust, language, genetic distance, etc. The modernization theory said that economic development has predictable effects on culture and social life (Inglehart and Baker 2000). Hence, to identify a causal effect of culture on economic development, we have to find some exogenous source of heterogeneity in culture. Economists have tried solving the problem of reverse causality and omitted variables in several ways: Gorodnichenko et al. (2013a, 2013b), Guiso et al. (2009) and Alesina et al. (2013) used instrumental variables. Further, using country fixed effects to capture omitted cross-country differences, Tabellini (2010) and Duranton et al. (2009) constructed cultural variables at the regional level. Alesina et al. (2013) went one-step further, not only examining variation across countries and subnational districts, but also using within-country variation controlling for subnational-district fixed effects.

Beside individual differences between people, culture is the main driving force that separates humans into groups.

1.2 Defining culture

Defining culture is a hard work. There is not an only definition because the concept is often not straightforward. We start by providing a distinction between empirical papers, where values and beliefs combine in the same definition, and theoretical one, in which values and beliefs are treated differently.

Most empirical papers, like ours, follow the definition adopted by Guiso, Sapienza, and Zingales (2006), where culture is defined as "those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged, from generation to generation." On the theoretical side, several authors have conducted studies in which culture means beliefs about the consequences of one's actions, but where these beliefs can be manipulated by earlier generations or by experimentation. For example, Guiso, Sapienza, and Zingales (2008b), using an overlapping generation model, show how the culture is handed down from father to son and how it slowly upgrade during this passage. Indeed, individual beliefs are initially acquired through cultural transmission and then, thank to experiences, it transmits upgraded to a new generation.

In the scientific studies, there is no commonly accepted definition of the word culture. More than 50 years ago, Kroeber and Kluckhohn (1952) found 164 distinct definitions of culture. Subsequently, other reviews indicate that the number of definitions are increasing (Hofstede, 2001; Soudijn et al., 1990). Moreover, the construct of culture has been studied in many disciplines under different names. Despite the great complexity of the construct of culture scholars often define and operationalize culture overly simplistically, which can contribute to troubles. There are numerous examples when culture is simply equated to nationality or citizenship (Offermann and Hellmann, 1997) and measure with the passport status, others with the country of origin (Trubisky et al., 1991). According to Schaffer and Riordan (2003), approximately 79% of cross-cultural studies published between 1995 and 2001 used the country as a proxy for culture. Different models of culture and consequently different instruments for measuring culture focus on different aspects (i.e., values, practices, observable artifacts and rituals, underlying implicit assumptions) and different levels (i.e., national, organizational, individual).

Culture scholars from different fields tend to focus on different elements of culture.

More broadly, the word culture is used to refer to the statistical distribution of beliefs, values and modes of thinking that shape behaviour among a group of people. Ethnicity is related to symbolically marked groups (i.e., marked by language, dialect or clothing). Race is like ethnicity, except the "markers" are genetically transmitted (i.e., physical characteristics; Gil- White, 2001).

In our study, we did not give a different meaning to the effects of culture, ethnicity and race; in our empirical analysis, they are substituted. Thus, we will use the term "cultural differences" to describe the heterogeneity that result from differences in culture, ethnicity or race. What economists call "culture" in analyses of economic behaviour is best viewed as a residual category. By controlling for differences in behaviour that stem from heterogeneity in the socioeconomic attributes of our subjects, we attribute to "cultural differences" any remaining heterogeneity in behaviour across cultural groups.

Culture is defined as a highly complex, multidimensional and multi-level phenomenon. A single numeric index or a few dimensions cannot provide a comprehensive description of culture. The nature of the relationship between different elements of culture is still to be determined and until today the economic culture, drawing parallels and generalizing findings across cultures facets (i.e., language, values, practices) and levels (i.e., individual, national). Thus, it is very important to specifically define which elements of culture are the focus of a model and avoid unjustified generalizations of the findings to facets of culture that are not directly measured in the study.

Three main elements characterize the notion of culture. First, it is generally agreed that culture is a complex multi-level construct. Second, culture is shared among individuals belonging to a group or society. Third, culture is formed over a relatively long period and it is relatively stable.
For the purpose of the current study: culture is a group's shared set of distinct basic assumptions, values, practices, and beliefs that are formed and retained over a long period.

1.3 Measures

Culture is a popular construct. Although the concept of culture is centuries old, first attempts to quantify it were not undertaken until the middle of the twentieth century (i.e. England, 1967; Haire et al., 1966; Kluchhohn and Strodtbeck 1961; Kuhn and McPartland 1954; Rokeach 1973). Although, various aspects of culture can be traced further back in time, it was only thanks to the publication of Hofstede's "Culture's Consequences", in 1980, that we register an explosion of interest in the issue of culture measurement.

The Hofstede's IBM study is popular for two reasons: because can be partly credited to its large international sample and to the fact that it was the first one to employ relatively advanced, for its time, research designs and statistical analysis tools. The result of this study was a coherent theoretical model and a concise set of quantitative indices describing and ranking cultural values along several dimensions. Following it, several alternative models of culture and their corresponding instruments gained recognition and popularity, such as those offered by Trompenaars (1993), Schwartz (1994), Maznevski and DiStefano (1995), Inglehart (1997) and the GLOBE team (House et al., 2004).
In recent years, a great number of scholars chose to create their own alternative measures of culture. This trend suggests that in the years to come more models of culture and tools for measuring culture will be offered.

Economists have measured culture in different ways: by using survey data, by collecting experimental evidence and by looking at second-generation immigrants to isolate the impact of culture. The most common tool for measuring culture is through survey questions. For instance, the World Values Survey is the tool most commonly used for cross-country comparison. Other barometers, for example, focus on specific regions of the world (the Latino Barometer, Asian Barometer, Eurobarometer, and Afrobarometer). In the United States, it is the General Social Survey. Usually, the answers of these surveys are aggregated at the country level to measure values and beliefs. These country-level summaries then correlate with economic outcomes (see Knack and Keefer, 1997, for the relationship between trust and income).

It is extremely difficult to create a model that effectively and efficiently captures all aspects of such a complex phenomenon as culture. The number of dimensions has been growing from four, later five in Hofstede's original model to seven in the model offered by Trompenaars (1993), ten in the model offered by Schwartz (1994), six tri-dimensional constructs in the model offered by Maznevski and DiStefano (1995), and eighteen dimensions (nine dimensions of cultural values and nine dimensions of practices, each measured separately at the organizational and national levels) in the GLOBE model of culture (House et al., 2004). However, despite the great variety of dimensions, it is still too early to claim that every aspect of culture is captured by any single model or even by all existing models taken together. As noted by Bing (2005), it is tempting to claim that the questionnaires and associated databases provide the coordinates for the entire map of culture, but we do not yet know the complete map of culture, nor are we likely to in the near future.

1.4 Collecting data for measuring culture

The sample size and sampling procedures have varied greatly across studies. The vast majority of studies were conducted using different types of samples. For instance, Hofstede's model has been developed based on a survey of employees representing international subsidiaries of a single organization for which he worked as a consultant at the time.

Further, the most of the studies developed and validated in economic literature about cultural diversity using student samples (Garcia E.E., 1999; Marshall P.L., 2002) or researchers samples (Banks J.A., 2015).

In a few studies, however, every attempt has been made to focus on a very specific theoretically justified target group. For example, because of the study's focus on leadership and organizations, only middle-level managers were surveyed in the GLOBE project, a group that theoretically seems most relevant to the research questions of the study (House et al., 2004).

Alternatively, the Schwartz's model of general cultural values was developed based on a sample of teachers. As Schwartz (1992) explains, “teachers play an explicit role in value socialization [and] they are presumably key carriers of culture” and hence the choice of the target group.

Relevant to our work, several researchers have used samples of workers (Lazear, 1999; Fujita and Weber, 2004; Alesina et al., 2013).

The major sampling-related challenge when comparing cultures is the issue of data availability. By definition, a culture-comparison study requires data from multiple societies, countries or regions. A large and random sample representing the target population from every existing society is preferred, but collecting such data is very costly and usually impossible with the available resources. Lack of infrastructure and limited resource availability often leaves no choice but to use a convenience sample. This imposes serious limitations on the validity and generalizability of the obtained data.

1.5 In which ways culture enter into the economy

Restricting the attention to the effects of culture on economic equilibria, the inherited components of culture become the most exogenous component of culture that can explain economic behaviour rather than being explained by it. It is true that culture are transmitted upgraded to a new generation through

the changes that individuals experience during their lifetime, but it is worth pointing out that culture is not continually altered; it is a society - wide optimization process. In empirical studies, this definition of culture gives researchers the possibility to reduce the risks of reverse causality problem in regressions that explore the impact of culture on economic outcomes. It is possible because this definition focuses on the dimensions of culture that are inherited, rather than voluntarily accumulated by an individual; leaving out aspects like technology progress that could influence cultural components. As Becker (1996) writes, "Individuals have less control over their culture than over other social capital. They cannot alter their ethnicity, race or family history, and only with difficulty can they change their country or religion. Because of the difficulty of changing culture and its low depreciation rate, culture is largely a "given" to individuals throughout their lifetimes."

The key difficulty in estimating a causal effect of culture is that it is endogenous to economic development. As stressed by the so-called modernization theory, economic development has predictable effects on culture and social life (Inglehart and Baker 2000). Hence, to identify a causal effect of culture to economic development, we have to find some exogenous source of variation in culture. A typical model of culture is usually represented by a set of dimensions that capture a range of cultural values, attitudes or practices. Usually a proxy measures culture by quantifying values, assumptions or practices. We conducted a comprehensive literature review for the most famous existing proxies for measuring culture. Further, we use all of it in our studies.

1.5.1 Individual Traits

1.5.1.1 Language

In economic research, the linguistic diversity and linguistic distance between languages has been shown to be a crucial determinant of real economic outcomes, due to its impact on communication and language skills, and it has been used in studies of immigrant language skills and labour market integration (see, i.e., Chiswick and Miller 1999, 2005, and 2011). This influence on the micro level might accumulate to substantial costs on the macro level, by affecting international trade flows (see, i.e., Hutchinson 2005, Lohmann 2011). Several papers provide evidence about the vast relationship between linguistic and cultural distance on trade and financial flows (Melitz, 2008; Melitz and Toubal, 2012; Guiso, Sapienza and Zingales, 2009 and 2016; Egger and Toubal, 2015).

The operationalization of linguistic distance is quite difficult. There are various approaches to compute linguistic distances (the lexicostatistic method, Levenshtein distances, distances based on

language trees, phonetic distances, the ASJP project and distances based on learning scores) as well as distances between groups.

· LEXICOSTATISTIC METHOD

This measure of linguistic distance is based on lexicostatistics, the branch of quantitative linguistics classifying language groups based on whether the words used to convey some common meanings - such as “mother” or “table” - are cognate, i.e. stem from the same ancestor word. Two languages with many cognate words are linguistically closer than those with non-cognate words.

For instance, the words “tavola” in Italian and “table” in French both stem from the common Latin term “tabula”. They are therefore cognate. Replicating this over a large number of meanings, the percentage of cognate words are a measure of linguistic proximity.

· LEVENSHTEIN DISTANCES

Levenshtein (1966) introduced a simple way of measuring the similarity of character strings by counting the number of operations to transfer one character string into another. The linguistic interpretation of this Levenshtein distance is based on an approach developed by the German Max Planck Institute for Evolutionary Anthropology.

· DISTANCE based on LANGUAGE TREES

The classification of languages into trees is based on a methodology borrowed from cladistics. Linguists group languages into families based on perceived similarities between them. For instance, in one commonly used classification of languages, from Ethnologue, French is classified as “Indo-European - Italic - Romance - Italo-Western - Western - Gallo-Iberian - Gallo-Romance - Gallo-Rhaetian - Oil - Francais.” Similarly, Italian is classified as “Indo-European - Italic - Romance - Italo-Western - Italo-Dalmatian.” This can serve as the basis for characterizing the linguistic distance between French and Italian, because Italian shares four nodes with French. French and Italian, for instance, share no common nodes with non Indo-European languages, and are therefore at a higher linguistic distance from them than they are with each other.

· PHONETIC DISTANCE

The purely descriptive measure of phonetic similarity is based on the automatic comparison of the pronunciation of words from different languages having the same meaning. A first application of this measure in the analysis of language acquisition of immigrants can be found in Isphording and Otten (2011).

· ASJP

The so-called Automatic Similarity Judgement Program (ASJP) is based on lexical similarity. It aims at automatically evaluating the phonetic similarity between all of the world's languages. Comparing pairs of words having the same meaning in two different languages according to their pronunciation, the program obtains the measure of lexical distance, which is useful, for instance, for classifying a language group and for inferring its age of divergence.

· AVERAGE TEST SCORE

The construction of that measure is based on average test scores of native US foreign language students (Chiswick and Miller, 1999, 2001, 2005). This approach assumes the difficulty of learning a foreign language for students to be determined by the distance between the native and foreign language, these test scores is used as a summary statistic for the dissimilarity between languages. Unfortunately, the disadvantage of this measure is in its strongly restricted use. Indeed, so far the test-score-based measures are only available for the distances towards the English language.. They assume that the lower the average score, the higher is the linguistic distance between English and the foreign language. The measure has been applied in migration economics (Chiswick and Miller 1999, 2005, 2011) and international trade (Hutchinson 2005). Following this idea, Ku and Zussman (2010) have used TOEFL test data to compute a similar measure.

1.5.1.2 Religion

There are two schools of thought about religion as cultural element. In the previous literature, some results indicate that sharing a common religion is not necessarily trade promoting. Identifying the reasons behind the different effects of a common religion on trade is difficult. In numerous empirical studies, which use a gravity model approach, religion is included only as a control variable. These studies conclude that sharing a common belief has a small or no effect on trade (Mehanna, 2004; Guo, 2004). Differences in religion as a measure of cultural differences has been criticized. This does not imply countries that have substantial cultural differences may not share the same religion. Vice versa, the same religion may not include a single culture.

On the other side, few studies use religion as a determinant of trade. Religion had (and still has) a great impact on the economic relationship among countries (Helbe, 2006). Religious beliefs can influence trading behaviour in mainly two ways. First, sharing the same religious belief often implies sharing similar values. A common religion may therefore enhance trust between trading partners and reduce transaction costs. Second, each religion has its own ethical standpoint towards the activity of

trading.

The basic idea is that two countries with the same religion tend to have similar cultures and for this reason tend to have more trade. Sharing a religion certainly should increase trust. Consider that religion may even be more influential for the human behaviour. Many religious beliefs encompass rules for every aspect of daily life. For example, one finds rules on nutrition in nearly all world religions.

1.5.1.3 Trust

Trust is another crucial component in determining economic relationships. Especially, in those societies where the economic exchanges between individuals are regulated by informal institutions and behaviour rules, such as social norms, trust becomes particularly important (Guiso et al., 2009). Following the guidelines of political science, economists started to study the impact of trust on economic outcomes. The most studied cultural trait is generalized trust toward others, where others refer to people the respondent does not know. The importance of this trait cannot be overemphasized. In 1972 Arrow writes, "Virtually every commercial transaction has within itself an element of trust, certainly any transaction conducted over a period of time. It can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence."

Usually, the variable of trust is measured using surveys and laboratory experiments. In surveys, there are typically question that are submit to the sample, like "Generally speaking, would you say that most people can be trusted or that you can't be too careful when dealing with others?"; that's a multiple-choice question "Most people can be trusted" or "Need to be very careful." The most famous surveys, as the World Values Survey (WVS), the General Social Survey (GSS), and the European Social Survey, and in most of the Barometers (the Latino Barometer, the Afrobarometer, the Asian Barometer, etc.) use this typology of questions.

Trust travels less well across town within racial or nationality groups. The level of trust is lower in ethnically diverse U.S. cities (Alesina and La Ferrara, 2000, 2002) and neighbourhoods (Putnam, 2000). In addition, people tend to trust members of their own nationality more than they trust foreigners (Guiso, Sapienza, and Zingales 2009).

Trust can affect potentially a very large set of preferences economically relevant. For a recent review of the impact of trust on various economic outcomes, see Algan and Cahuc (2013). Trust affects economic development (Knack and Keefer, 1997), individual performance (Butler et al., 2014),

financial development, participation in the stock market, and trade (see Guiso, Sapienza, and Zingales, 2004, 2008a, 2009), innovation (Fukuyama, 1995), and firm productivity (Bloom, Sadun, and Van Reenen, 2012; La Porta et al., 1997).

1.5.1.4 Genetic Distance

A number of recent studies use the genetic distance as a proxy for differences in culture between countries (Giuliano et al., 2006). Genetic distance is a quantitative measure of genetic divergence between populations. In particular, it measures the time since two populations have shared common ancestors; it is useful for reconstructing the history of populations. The assumption is that populations that share more recent common ancestors had less time to diverge in a wide range of characteristics, which are transmitted across generations (Spolaore and Wacziarg, 2009a; 2009b).

To capture the degree of relatedness between countries, the recent economic literature used measures of genetic distance. Genetic distance is such a summary measure. There are different economic studies that use measures of genetic and cultural distances between populations to shed light on economic and political outcomes (Spolaore and Wacziarg, 2009, 2012, 2013), international wars (Spolaore and Wacziarg, 2015) fertility transition (Spolaore and Wacziarg, 2014) and stability of political borders in Europe (Desmet at al. 2011).

It is important to note that genetic distance is not strongly correlated with only a small and specific subset of differences in cultural traits. On the contrary, genetic distance tends to be broadly and significantly correlated with a vast range of differences in cultural traits. Thus, while specific correlations with individual sets of traits are typically moderate in magnitude, there is an overall relation between ancestry and culture, consistent with a conceptual framework in which a broad range of cultural traits are transmitted with variation across generations over time. Genetic distance is a useful summary statistic capturing differences in this broad range of cultural traits.

1.5.2 Macroeconomic Traits

1.5.2.1 Institution

Several studies in political economics have looked at the historical effects of cultural and ethnic diversity in the formation and quality of institutions (i.e., Easterly and Levine, 1997). Some of these studies have shown that higher ethnic diversity is not necessarily harmful to economic development (i.e., Lian and Oneal, 1997). Collier (2001) finds that, as long as institutions are democratic,

fractioned societies perform better in the private sector than more homogeneous ones. Framed within efficient institutions, diversity may serve as a valuable asset for society.

There are different measures of institutions that have been widely used to investigate culture. One of the most common measures of formal institutions is an index of protection against expropriation (see Acemoglu et al., 2001). These data are collected for Political Risk Services and the index value can range between 0 and 10 for each country and year, where 0 corresponding to the lowest protection against expropriation. However, not everyone considers this index like a measure of institutions, for example, Glaeser et al. (2004) object to this variable arguing that it is an equilibrium outcome and not an institution. For example, democracies and dictatorships can exhibit the same level of "protection of property rights."

Others standard measures of formal political institutions include constraints on the executive and indices of democracy. The efficiency of the bureaucracy and the control of corruption have also been constructed to measure the "quality of government". It is necessary to think of these measures like variables that measure well-functioning of the public sector.

The legal system represents another way to measure institution. La Porta et al. (1997, 1998) provided a measure of legal rules governing investor protection in many countries using national commercial (primarily corporate and bankruptcy) laws. The authors argue that legal rules protecting investors varied systematically among legal traditions or origins, with the laws of common-law countries (originating in English law) being more protective of outside investors than the laws of civil-law (originating in Roman law), particularly French civil-law, countries. Subsequent research showed that the influence of legal origins of laws and regulations is not restricted to finance. Government ownership of banks (La Porta et al., 2002), the burden of entry regulations (Djankov et al., 2002), labour market regulations (Botero et al., 2004) vary systematically across legal families.

Finally, to better aggregate data about regulatory institutions, the OECD, the World Bank, Djankov et al. (2002), and Botero et al. (2004) have been coded and assembled it. These datasets contain information about labour-market regulations, regulations of markets for goods and services, antitrust laws, and various regulatory-environment indices.

The WGI (World Bank's Worldwide Governance Indicator I) is an aggregate and individual governance indicators. It reports on six dimensions (voice and accountability; political stability and

absence of violence; government effectiveness; regulatory quality; rule of law and control of corruption) of governance in 215 countries from 1996 to 2011, found that institutional features are strongly correlated-at least 0.8 among the various WGI indicators. Easterly and Levine (2003) also show that they are strongly correlated with the standard measure of protection of property rights.

These measures of institutions have been widely used. However, for Glaeser et al. (2004) these constitutional measures present some conceptual problems - they measure neither policy constraints nor are they stable; rather, they are measures of policy choices-and suggest ways to improve the way institutions are measured. At the same time, they note "it is possible that these constitutional measures are noisy, and it is certain that 'rules on the books' are different from what actually takes place in a country. But this is precisely the point: the institutional outcomes that scholars have used as measures of constraints have little to do with the constitutional constraints, raising doubts about the effectiveness of changing political rules."
From this proposition, it therefore seems that one should measure both de jure and de facto institutions and asses when they deviate. Glaeser et al. (2004) suggest some measures of institutions that could be appropriate: to dealing with electoral systems ("plurality" and "proportional representation") and two dealing with judicial constraints on government ("judicial independence" and "constitutional review"). The first two measures are motivated by the work of Persson and Tabellini (2003), and the second two are taken from La Porta et al. (2004). These objective measures are also only weakly correlated with the other institutional measures that the authors themselves criticize.

1.5.2.2 Legal Origins

In the last decade, economic literature explains that the legal origins of a country are highly correlated with economic outcomes.

Legal origin theory traces the different strategies of common and civil law with different ideas about law and its purpose that England and France developed centuries ago. These broad ideas and strategies were incorporated into specific legal rules, but also in the organization of the legal system, as well as the human capital and beliefs of its participants. Through the mechanisms of conquest and colonization, the common and civil law was transplanted into much of the world. In addition, legal ideologies were transplanted as well. Despite the evolution of the legal system, during the time, the fundamental assumptions of each legal system survived and have continued to exert substantial influence on economic outcomes. Indeed, "the style of a legal system may be marked by an ideology, that is, a religious or political conception of how economic or social life should be organized" (Konrad

Zweigert and Hein Kötz, 1998).

Legal origins or traditions present a key example of such often involuntary transmission of different bundles of information across human populations.

1.5.2.3 Workplace and R&D

Culture became also a key element in labour literature. In particular, cultural diversity is a broad concept that has attracted the attention of both economists and social scientists.

This concept found different application. There are analysis of ethnic 'segregation' in the US, as well as their impact on economic discrimination and the achievements of minorities (Card and Krueger, 1992 and 1993; Cutler and Glaeser, 1997; Eckstein and Wolpin, 1999; Mason, 2000).
Others studies control for black-white composition issues (Ottaviano and Peri, 2016).
More closely related to our analysis is the literature concerning the impact of immigration on the US labour market. Several contributions by George Borjas (notably Borjas, 1994, 1995, 1999, 2001 and 2003) focus on the issue of US immigration as a whole, and its effect on native workers.
Similarly, important contributions by David Card (notably, Card, 1990; Butcher and Card, 1991; Card and Di Nardo, 2000; Card, 2001) analyse the wages and reactions of domestic workers to inflows of new immigrants by exploiting the geographic variation of immigration rates and wages across US states or US cities. Further, the labour literature estimates the relative effect of immigration within labour markets segmented by skills; for instance, Ottaviano and Peri (2006) find that the (positive) empirical effects of migration on the average wage of US-born workers are very close to the theoretically calculated effects from the diversity of skills generated by immigrants.

Our approach takes into consideration in the labour literature the impact of different cultural background of workers into innovation output at the macrolevel. We believe that 'heterogeneity of culture' can be a feature that differentiates individuals in terms of their attributes, and that this differentiation may have positive or negative effects on the productivity. Relevant to our work, several researchers in the social sciences, which have related diversity of team work. For instance, Cox (1991) said that increasing cultural heterogeneity leaded to "greater creativity and innovation and more successful marketing to different types or customers." Berliant and Fujita (2004) model 'assimilation' as a result of team work. They refer to the significance of cultural diversity for knowledge creation and transfer: the very process of cooperative knowledge creation reduces the heterogeneity of team members through the accumulation of knowledge in common. In this respect,

a perpetual reallocation of members across different teams may be necessary to keep creativity alive.

R&D is another sector where the benefits of cultural diversity might be of particular importance, since the costs of a diverse labour force might easily outweigh the positive effects. For instance, Alesina and La Ferrara (2005) argue that cultural diversity may lead to innovation and creativity since it involves variety in abilities and knowledge. Fujita and Weber (2004) argue that cultural backgrounds influence knowledge production, which relies heavily on talents and skills of employees. The nature of R&D activity calls for interaction between different workers and a pooling of different ideas and abilities. Berliant and Fujita (2004) also refer to the significance of cultural diversity for knowledge creation and transfer. The heterogeneity of people is important for the creation of new ideas.

We think that cultural diversity matter because it can benefit a workplace. People with different backgrounds have different interpretations of events. They contribute unique perspectives. That allows the group to look at problems from all angles and create innovative results.

1.6 Concluding remarks

In recent years, economists have introduced cultural elements making economic discourse richer, better able to capture the nuances of the real world, and ultimately more useful. They apply their analytical frameworks and empirical tools to the issue of culture to the study of economic outcomes. Now, thanks to better techniques and expanded data it is potential to identify systematic differences in people's preferences.

From an economic point of view, several papers have investigated whether a culturally diversified society is more or less efficient than a culturally homogenous one. The answer is not univocal. On the one hand, cultural diversity creates potential benefits in terms of variety of goods, services and skills available for consumption, production and innovation (Lazear 1999; O'Reilly Williams and Barsade 1998; Ottaviano and Peri 2005 and 2006a; Berliant and Fujita 2004). On the other hand, cultural diversity generates potential costs as it may entail racism and prejudices resulting in open clashes and riots (Abadie and Gardeazabal 2003), as well as conflicts of preferences leading to a suboptimal provision of public goods (Alesina, Baqir and Easterly 1999; Alesina, Baqir and Hoxby 2004).

In this study, we provided a framework to advance our understanding of the way in which culture affects economic outcomes. Our study clearly demonstrates that culture can matter in explaining variability in economic outcomes, in different ways.

Before exploring the effects of cultural diversity on economic outcomes, we also explain the arduous work of defining culture, how quantify various aspects of culture and the issue of data availability.
We have witnessed some progress in the way culture has been conceptualized and measured. However, our review indicates that the progress in measuring culture is mainly made by adding new dimensions to existing models and offering new presumably refined sets of cultural indices and rankings.
More developments that are notable included attempts to go beyond studying culture exclusively as values as well as to refine the measurement of cultural dimensions by further narrowing measures to specific facets of culture.

2. International trade and Clash of Civilization: An Empirical Analysis

2.1 Introduction

The future of trade and economic growth depends on a range of factors. In the last decade, there was widespread agreement on the importance of culture into international trade. Cultural dissimilarity/similarity affects in a negative/positive way bilateral trade of countries.

Cultural differences play an important role in economic interactions between countries (Felbermay and Toubal, 2010; Guiso et al., 2009; Melitz, 2008; Rauch and Trindade, 2002), since they are considered a source of informational costs and/or a source of uncertainty that acts as a barrier in bilateral trade relations between countries. Cultural distance reflects the differences between two countries' norms and beliefs.

The link between international trade and cultural differences and evolution of such relationship over time has not been interesting only for economists but in general for social scientists. In fact, this paper presents an empirical evidence to support the idea that trade flows are determined by common cultural traits among other things, consistently with Huntington (1993) hypothesis.

As Huntington (1993) points out: "[… (the great divisions among humankind and the dominating source of conflict in the post- Cold War era will be cultural. […] At micro level, the violent struggles among peoples will result as a consequence of the fault lines between civilizations, however, at the macro level, states from different civilizations will compete for economic and political power". Therefore, he had not only military clashes in mind, but also economic and political clashes.

Following this theory, we should observe a monolithic Western bloc opposed to an equally compact Islamic World. Indeed, according to him cultural dissimilarity between countries is, by and large, a trade barrier. However, actually these two systems so culturally different trade with each other and they support each other. In other words, according to the Huntington's thesis today we should assist to clashes between West World and Islamic World, but the trade relations between these two geopolitical entities have never failed instead if increased over time. Such an evidence casts doubts on whether cultural traits may explain trade flows.

The aim of this work is to evaluate the consistency of Huntington (1993) theory to the current development of trade among countries. In this context, cultural differences are considered a source of costs that acts as a barrier in bilateral trade relations between countries. More specifically, other

things being equal, we want to assess whether culture plays a critical role as envisaged by Huntington (1993) or whether other social, political and economic factors may explain the direction of trades among countries. We do it by estimating a theory-based gravity model of international trade and by using a comprehensive set of cultural variables that allow us to look at different aspects of culture.

The innovation of this research is that the explanatory variables used in this study were not analysed all together in the same regression, but only separated so far. In this way, we can compare the effect of different variables on international trade and we can understand what influences more international exchanges. Furthermore, in the previous studies, cultural factors have been simplified, probably because the cultural components are only treated as complementary variables to other more important determinants of trade. The question is how to measure cultural similarity/dissimilarity; there are several methods of measurement. The simplest method is to use a dummy variable: that is one for countries that are culturally linked with one another and zero for countries that are not. Therefore, in our study, we use a more accurate measure of cultural distance based on trees (linguistic and religious trees).

This study seeks to shed new light examining cultural, economic and political values in forty-five countries including Islamic ones, utilizing data from 1980 to 2010.

This paper is organized as follows. In Section 2, we have a brief summary of previous literature. Section 3 lays out the methodology and describes the data. Section 4 provides estimation results. Section 5 concludes.

2.2 Related Literature

Now nobody doubts about the role of cultural factors in international trade. Quantitative studies, however, have not been conducted until the 1990s, when the Cold War ended (see, for example, Havrylyshyn and Pritchett, 1991; Foroutan and Pritchett, 1993; Frankel and Wei, 1995; Frankel et al., 1997; and Rauch, 1999). These studies, in which linguistic links are used as explanatory variables, consistently show that the estimated coefficients for linguistic similarity among trade partners provide possible evidence of increased language (cultural components) barriers to trade. There is a consistent interpretation that the estimated coefficients on linguistic links exhibit a trend whereby trade in the post-war period took place among countries being linguistically similar to each other, or in other words, they interpret this as possible evidence of increased cultural barriers to trade.

Beside individual differences between people, culture is the main driving force that separates humans into groups. Out of the many elements that define culture, only two have been extensively analysed:

language and religion. Language is not only a tool of communication; it also transmits ideas, customs, and values. Religion may even be more influential for the human behaviour.

Many studies have been undertaken to show the impact of language on trade (Melitz, 2008). The ease of communication facilitates trade rather through the ability to communicate directly than through translation. Notwithstanding, direct communication appears about three times more effective than indirect communication in promoting trade.

Furthermore, the existing literature omits a cultural variable, religion, which could play at least in some cases a more important role in economic affairs than the linguistic variable (Guo and Hwang, 2002). Only a few studies use religion as a determinant of trade. Religion had (and still has) a great impact on the economic relationship among countries (Helbe, 2006). The basic idea is that two countries with the same religion tend to have similar cultures and for this reason tend to have more trade. However, differences in religion as a measure of cultural differences has been criticized because, religion has relatively more recent roots than the language. This does not imply countries that have substantial cultural differences may not share the same religion. Vice versa, the same religion may not include a single culture. Indeed, as an instance criticisms have challenged the notion of a single Islamic culture, pointing to substantial contrasts found among one billion people living in different Islamic nations - such as Pakistan, Jordan, Azerbaijan, Indonesia, Bangladesh, and Turkey - and the differences between Muslims who are radical or moderate, traditional or modern, conservative or liberal, hard-line or revisionist (Hunter 1998; Esposito 1997; Fuller 2002). The differences within the Islamic World due to historical traditions and colonial legacies, ethnic cleavages, levels of economic development, and the role and power of religious fundamentalists in different states, claiming that it is not correct to lump together people in a single Islamic culture.

For this reason, a number of recent studies use the genetic distance as a proxy for differences in culture among countries (Giuliano et al., 2006). Genetic distance measures the time since two populations have shared common ancestors. The assumption is that populations that share more recent common ancestors had less time to diverge in a wide range of traits and characteristics, such as implicit beliefs, customs, habits, biases and conventions, which are transmitted across generations (Spolaore and Wacziarg, 2009a; 2009b).

Trust is another crucial component in determining economic relationships, including trade. Trust is particularly important in those societies where informal institutions, such as social norms, regulate economic exchanges between individuals (Guiso et al., 2009). Consistently with political science, economists started to study the economic payoff of trust. Cultural aspects, measured by religious, genetic and physical similarities, and by the history of conflicts, affect bilateral trust (and, hence,

trade) between countries; in particular, bilateral trust between pairs of countries leads to higher trade between them.

Huntington (1993) argues that cultural diversity would matter more in the post-Cold War era compared with the Cold War period; an intriguing question is whether it is supported by the data. A recent study offers an affirmative response (Gokmen, 2012). Using a gravity model that includes different measures of culture like religion, ethnicity, language, civilization and genetic distance, the research show that cultural dissimilarity (similarity) negatively (positively) affects bilateral imports of countries. More specifically, the paper examines Huntington's the Clash of Civilizations hypothesis and provides evidence that the impact of cultural heterogeneity on trade flows is far more accentuated in the post-Cold War period than during the Cold War. In the post-Cold War period, two countries that belong to different civilizations have 41 percent lower mean imports than those of the same civilization, whereas the reduction is a much lower 10 percent in the Cold War period. Alternatively, in the post-Cold War era, the average bilateral imports of a country pair sharing the same majority religion, ethnicity and language are 76 percent higher than those that do not share the same heritages, whereas this effect is not significantly relevant in the Cold War era. The influence of cultural differences on trade has increased over time: therefore, it is more prominent in the post-Cold War era than during the Cold War.

2.3 Methodology and Data

In this section, we first lay out the theoretical set up and, accordingly, derive the empirical specification to be estimated. Subsequently, we give a description of the data set used in the analysis. Following the mainstream econometric approach in international trade, we will make use of a gravity model in our study. The gravity equation, so called because it is based on an analogy with Newton's law - the attraction between bodies is proportional to their respective masses and inversely proportional to their distance - is a standard tool used for several decades by economists to study the determinants of trade.

The first gravity models of international trade were introduced by Tinbergen in 1962, and Pöyhönen in 1963. Tinbergen and Pöyhönen developed basic models that estimated the amount of trade flows between two countries as a function of national incomes and geographical distance between them. In 1966, Linnemann added population of the trading countries as a third independent variable in the equation. Moreover, the evolution of the application of the model into international trade pass through Frankel et al. (1997) and Rauch (1999), and many others.

This model is based on the idea that trade volumes between two countries depend on their size in relation to their distance. Distance proxies transport costs and more generally trade costs.

At its most basic, the gravity model takes the following log-linearized form:

$$\log(X_{ij}) = b_0 + b_1 \log(Y_i) + b_2 \log(Y_j) + b_3 \log(D_{ij}) + e_{ij}$$

where X_{ij} represents the exports of country *i* to country *j*; Y_i and Y_j are national incomes in country *i* and *j* respectively; D_{ij} is the distance between country *i* and country *j*; and e_{ij} is the random shock.

Other variables are generally added to take account of specific features of the bilateral relationship and to capture trade costs. These include dummies for islands, landlocked countries and common borders. They are used to reflect the hypotheses that transport costs increase with distance and that they are higher for landlocked countries and islands, while are lower in neighbouring countries. Dummies for common language, adjacency (that is, the common land border shared by a country pair) or other relevant cultural features such as colonial history are used to capture information costs. Search costs are likely to be lower for trade between countries whose business practices, competitiveness and delivery reliability are well known to each other. Tariff barriers are generally included as a dummy to capture the existence of regional trade agreements. Very few studies use information on bilateral tariffs, due to the lack of data.

The basic form of the gravity model to be used in our empirical analysis is as follows:

$$\ln(TRADE_{ijt}+1)=\alpha_0+\alpha_1\ln(GDP_i)+\alpha_2\ln(GDP_j)+\alpha_3\ln(DISTANCE_{ij})+\alpha_4\ln(GEOGRAPHIC_{ij})+\alpha_5\ln(ECONOMIC_{ij})+\alpha_6\ln(CULTURAL_{ij})+\alpha_7\ln(POLITIC_{ij})+\varepsilon_{ij}$$

where $TRADE_{ijt}$ denotes nominal bilateral trade between countries *i* and *j* in year *t*; it is measured in thousand US dollar and it is obtained from UN Comtrade Database. In order to make the natural logarithm of TRADE mathematically meaningful when TRADE = 0, we use ln ($TRADE_{ijt}$ + 1) to approximately denote ln (TRADE). This seems to be reasonable since the size of TRADE is always far larger than 1.

The values of GDP, of the *i*th and *j*th countries (all in thousand US dollar), are from World Bank national accounts data, and OECD National Accounts data files.

It is commonly accepted that geographical features may be an approximation of all the economic barriers for international trade. Geographic characteristics are used as a proxy for transportation as well as information costs. The measure of DISTANCE represents the distance between the capitals of the *i*th and *j*th countries in kilometres.

We further augment the basic equation with other determinants of trade flows. We have fine-tune four categories, which contains different variables that will add to the gravity model: geographic, economic, cultural and political variables.

This model contains a range of geographic metric such as CONTIGUITY variable that takes the value one if there is a land or water contiguity between two countries, and zero otherwise. The variable DISTANCE is used to verify the hypothesis of contiguity, i.e. the further the countries are, the less likely they will trade. In addition, we use two other variables, LANDLOCKED[1] and AREA, to control for geographic characteristics of the countries. As regards the first one, we expect a negative relationship with our dependent variable, since the lack of water access may increase transportation costs, while, in the second case the bigger the country (as captured by AREA) the more it produces the more it can export; so, the correlation with trade will be positive. The size of the country affects the size of their markets. To the extent that larger economies and larger market increase productivity. We identify the variables DISTANCE and CONTIGUITY using data drawn from the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII), while information about LANDLOCKED and AREA are taken from the World Development Indicators - World Bank.

The values of exchange rates and the level of openness market compose the set of economic variables. OPENNESS MARKET refers to the economic openness degree of each country and it is calculated as [(Import + Export)/ GDP] (data from UNCTAD). It is expected that this variable have a positive effect on bilateral trade. The EXCHANGE RATE data are from Penn World Table MARK 7.1. Since trade is affected by fluctuations in the forex market, we expect a significant impact of that variable.

Regarding cultural variables, we use COLONIAL TIES, LINGUISTIC and RELIGIOUS DISTANCE that may play a role in explaining trade flows between countries. It should be noted that using a complete measure of linguistic and religious distance allows us to better quantify their impact on trade.

Cultural similarity can be measured in different ways. As we explained in the previous sections, we are most interested in the cultural factors that resist or aid international trade. We use LANGUAGE and RELIGION to express the extents to which countries *i* and *j* are linguistically and religiously close each other. Data are drawn from Spolaore and Wacziarg (2009). Some previous studies, such as those by Frankel et al. (1993, 1997), use dummies for linguistic links between countries. Therefore,

[1] As a rule, being landlocked creates political and economic constraints that access to the high seas avoids. For this reason, states large and small across history have striven to gain access to open waters, even at great expense in wealth, bloodshed, and political capital. The economic disadvantages of being landlocked can be alleviated or aggravated depending on the degree of development, language barriers, and other considerations.

in our study, we measure cultural similarity, in a most accurately way, through the LINGUISTIC DISTANCE INDEX[2] and the RELIGIOUS DISTANCE INDEX[3].

COLONY is a dummy variable taking the value of 1 if countries *i* and *j* share the same colonial origins, zero otherwise.

Several variables can be used to measure political distance. However, these measures are likely to be highly correlated. For instance, an index of democracy could be highly correlated to the degree of political freedom enjoyed by people. Indeed, using all of them in our estimation may give rise to a several problem of collinearity. To over come such probability, we preliminary run a factor analysis to identify those variables that display a better explanatory power than others. We select only those variables that show at least a 0.40 points of uniqueness.

[Table 2.1]

In panel (a) of Table 2.1, we present the factor analysis focusing on political variables. It can be noted that only the STOCK OF DEMOCRACY and the extent of CORRUPTION display a value of uniqueness that is longer than 0.40.

The set of political variables is composed by STOCK of DEMOCRACY - is a continuous variable: more high is the difference between countries more "politically" distance are them[4]; CORRUPTION - it ranges from 0 (high corruption) to 10 (low corruption)[5].

[2] "To capture linguistic distance, they employ two methods, one based on language trees, and the other based on lexicostatistics. […]They use data from Fearon (2003) and the linguistic trees provided in Ethnologue to capture the distance between these languages" (Spolaore, E. Wacziarg, R., Ancestry, Language and Culture, 2015, pag.11-12). Spolaore and Wacziarg calculate the number of common nodes between the plurality languages of each country in a pair, as well as expected number of common nodes. Finally, from the two measures of linguistic proximity, they use a transformation to obtain corresponding measures of linguistic distance ranging from 0 to 1.

[3] From the Spolaore and Wacziarg database we found two religious distance index because they use two different dataset: one is Mecham, Fearon and Laitin (2006) and the other is World Christian Database (2007, henceforth WCD). The approach consists on grouping religions into broad categories. These broad categories are further divided into finer classification. These are further refined into yet greater levels of disaggregation. The number of common nodes between religions is a metric of religious proximity. In our study, we prefer the Mecham, Fearon and Latin dataset because here there can be up to 5 common nodes between religions, while the WCD data is less finely disaggregated, so there can be up to 3 common nodes only (it is a finer level of disaggregation).

[4] The variable STOCK of DEMOCRACY concerns the temporally dependent role of democracy, its long-term potential to foster economic growth. It capture not only differences in degree of democracy-autocracy but also differences of duration. The authors (Gerring J., Bond P., Barndt W.T. and Moreno C.) propose therefore to measure democracy as a stock, rather than level, variable; that is, to measure the accumulation of democratic experience.

[5] The two main composite indicators of corruption are currently the CPI (Corruption Perceptions Index) by the NGO Transparency International and the CCI (Control of Corruption Index) by the World Bank.The CPI is based on perceptions of corruption by experts (business people and country risk analysts), both residents and non-residents, nationals and expatriates. Corruption is defined conventionally as "the abuse of public office for private gain".The CCI is designed to measure "the exercise of public power for private gain, including both petty and grand corruption and state capture." It is also a composite indicator of perceptions of corruption, combining different sources predominated by the opinions of experts and business people. Yet other types of perceptions, such as those formulated by households, are also taken into consideration. From this point of view, it is not as 'pure' as the CPI in that it includes primary sources with a greater

In order to measure the quality of the political system and whether countries involved in trade share the similar political institutions, we use the STOCK OF DEMOCRACY, constructed using the Polity2 variable taken from the Polity IV project. (Gerring et al., 2005). CORRUPTION is a variable that represents a measure of this phenomenon in the political system, taken from the Transparency Index.

In the last fifty years, the gravity model has been widely used to predict trade flows. After some additional discussions concerning its specification in the nineties, the debate has now turned to the performance of different estimation techniques. New estimation problems concerning the validity of the log linearization process of the gravity equation in the presence of heteroscedasticity and the loss of information due to the existence of zero trade flows have been recently explored.

extent of heterogeneity. We decide to use in our work CPI, because despite some shortcomings – firstly, the experts influence one another; secondly, experts, other things being equal, tend to give a higher score to the countries with the best economic performance - the choice of primary sources, which is largely based on the point of view of the experts and business people, reduces the weight accorded to 'discordant opinions' that other interest groups could voice. Furthermore, the CCI takes into consideration the assessment of governance problems by citizens, which has little correlation with the evaluation of experts. But careful studies show that their weight is marginal as these sources are not available in all countries.

This paper reviews the following linear estimation methods.

Estimation Method	Advantages	Disadvantages	References
OLS ($1+Trade_{ij}$)	- Simple - It deals with zero trade flow problem	- Biased coefficients	Linneman (1966), Bergeijk and Oldersma (1990); Wang and Winters (1991); Eichengreen and Irwin, 1995; Baldwin and Di Nino (2006) ; Linders and de Groot (2006)
Panel fixed effects	- Simple - It controls for unobserved heterogeneity	- Loss of information (constant terms in the regression are dropped) - Elimination of zero flows - Sample selection bias	Mátyás (1998); Egger (2000); Glick and Rose (2002); Egger and Pfaffermayr (2003); Micco et al. (2003); Andrews (2006); Henderson and Millimet (2008)

The first one is a simple OLS with the addition of one before taking the logarithm of the dependent variable. Zero-valued trade flows between pairs of countries in gravity models might be a source of concern as argued by different authors. In our dataset, for a high percentage of the observations the dependent variable takes a value of zero (no bilateral trade is recorded). Linders and de Groot (2006) showed that the solution to this potential problem is to omit zero flows from the sample and this approach often leads to acceptable results. However, omitting the zero values could lead to the possibility of selection bias. The simple approach used in the literature is to add one to the trade flows before taking the logarithm (Eichengreen and Irwin, 1995). This procedure allows us to do not drop zero trade.

In addition, a panel framework permits recognising how the relevant variables evolve through time and identifying the specific time or country effects. Over the last years, researchers such as Egger (2000), Rose and van Wincoop (2001, 2003), Mátyás (1998), Egger and Pfaffermayr (2003, 2004), Glick and Rose (2002), Brun et al. (2002), and Melitz (2007) have turned towards panel data. In our study, we use the fixed effects technique. The fixed effects estimator assumes the existence of an unobserved heterogeneous component that is constant over time and which affects each individual (pair of countries) of the panel in a different way. Using fixed effects, we impose time independent effects for each entity that are possibly correlated with the regressor. These variables are unobservable, because they do not correspond to any price indices collected by national statistical agencies. In the literature, as regards fixed-effects panel regression, there are also different point of views; Baldwin and Taglioni (2006) argue for the use of country-level dummy variables. Guiso et al. (2009) use both exporter and importer fixed effects, while Francois and Manchin (2007) use only importer fixed effects. All authors include year fixed effects.

Every method has advantages and disadvantages and it cannot be asserted that any one of them absolutely outperforms the others. For that reason, it has become a frequent practice in the literature to include several estimation methods for the same database. Recently, the works of Burger et al. (2009), Martin and Pham (2008), Martínez-Zarzoso et al. (2007), Siliverstov and Schumacher (2009) and Westerlund and Wilhelmsson (2009) have obtained divergent results when comparing alternative estimation methods (EG Herrera,2013). Instead, our results do not vary qualitatively.

Our research includes data for 45 countries: the 28EU, the United States of America and 16 Islamic countries. The time spans from 1980 to 2010. We make a comparison between pooled-OLS and fixed effects estimators. Summary statistics are show in Appendix 2.A. Data source are show in Appendix 2.B, and the countries included in the sample are show in the note of Table 2.1.

2.4 Estimation Results

2.4.1 Baseline Results

We start off with simple correlation coefficients between the dependent variables and our measures of culture.

[Table 2.2]

We observe in Table 2.2 that all the variables of culture indicate a negative relationship between trade flows and dissimilar cultural heritage. Correlations measure the strength and direction of the linear relationship between the two variables. The correlation coefficient can range from -1 to +1, with -1

indicating a perfect negative correlation, +1 indicating a perfect positive correlation, and 0 indicating no correlation at all. A variable correlated with itself will always have a correlation coefficient of 1.

Standard gravity model of bilateral trade assumes that the natural logarithm of trade is determined by the economic sizes of the countries and the log of their geographic distance and some border effects (see Anderson and van Wincoop, 2003 and Rose, 2004).

In Table 2.3, we reproduce the basic gravity equation regression before introducing our other variables.

[Table 2.3]

As we expected, bilateral trade is positively correlated to the size of the countries and negatively to the trade barriers between countries. Indeed, the DISTANCE and the CONTIGUITY reveal negative coefficients with a high level of statistical significance (1 percent confidence level), while the GDP strongly and positively affects trade. This finding supports the basic intuition that richer countries tend to trade more. By contrast, there is a strong negative correlation between TRADE and DISTANCE: country pairs that are geographically distant tend to trade less. The estimated coefficient of DISTANCE is statistically significant, across all specifications, and its magnitude does not vary. As regards the variable CONTIGUITY, we register a significant negative coefficient in the first column; while in the others, due the fixed effects, it loses statistical significance (because the variable is time-invariant).

2.4.2 Main Results

In this sub-section, we augment the set of regressors adding other determinants of trade. We gather them in four categories, which contains different variables that will add to the basic equation:

- Economic Variables;
- Additional Geographic Variables;
- Political Variables;
- Cultural Variables.

It is acknowledged that distance is a crucial determinant of trade flows between countries. However, the idea of distance can be modelled by considering several aspects. Indeed, we consider in this paper economic, geographic, political and cultural measures to take into account differences among countries.

Economic Distance. The wealth of a country and the income of consumers are the most important economic attribute that creates distance between countries, and they have a market effect on the levels of trade and types of partners a country trade with.

Geographic Distance. Geographic distance is not simply a matter of how far a country is in miles or kilometres. Other attributes that must be considered include the size of the country, the access to waterways and the ocean and the contiguity.

Political Distance. Historical and political roots greatly affect trade between countries. This measure is a complex result of different aspects like absence of colonial ties, absence of shared monetary or political association, political hostility, government policies, institutional weakness and so on. Political distance is defined as the difference in regulatory, cognitive, and normative aspects between two countries.

Cultural Distance. Differences in religious beliefs, race, social norms, and language generate distance between two countries an influencing, consequently, on trade.

In Table 2.4.a and 2.4.b, we want to compare the different categories to understand how much every perspective influences international trade.

[Table 2.4.a and 2.4.b]

In Table 2.4.a and 2.4.b we include the set of additional variables discussed above, the only difference is the estimation technique: in the first table, we use the pooled OLS while in the second one we use the fixed effects. The Tables are organized as follows: in the first model (GEO), we extend the basic specification by accounting for a full set of geographic characteristics of countries such as the log of the LAND AREA of countries and a dummy variable (LANDLOCKED) equal to 1 if the country is landlocked otherwise it takes the value zero. Furthermore, in our model we want to introduce purely economic elements like the EXCHANGE RATE and the ECONOMIC OPENNESS DEGREE of each country (ECO). Column 3 (POL) displays the estimation results with the inclusion of political variables, like the level of CORRUPTION, the STOCK of DEMOCRACY; while in the last one (CULT) we add cultural variables: indices of LINGUISTIC and RELIGIOUS DISTANCE, COLONY.

In Table 2.4.a, we notice that the inclusion of different variables does not alter the results of the basic equation, in other words; the inclusion of additional geographic, economic, politic and cultural features does not affect our previous results: GDP positively affects trade, while DISTANCE displays a negative impact. In addition, it is worth underling that all the additional variables have a big impact

on trade; all of them reveal a strong statistical significance. The only exception id CORRUPTION, it presents an insignificant estimated coefficient.

In Table 2.4.b, we can also notice the same trend for GDP and DISTANCE. In the first column (GEO) the two additional variables register a very positive and significant coefficients, while in the others, due the fixed effects, most of the features lose magnitude. For instance, the variable CONTIGUITY, due to its very little time variation, it loses statistical significance under fixed effects in all categories.

In the second column (ECO), only the variable of OPENNESS MARKET has a positive and significant relationship to bilateral transactions flows. In the political category (POL), variables have not statistical significance. In the last column, where we add cultural variables, unequivocally the LINGUISTIC DISTANCE INDEX is the most important value of cultural variables.

In both estimation techniques, it is worth highlighting that foreign trade had been more significantly influenced by cultural factors, which present the highest coefficients; in particular, the linguistic index causes a variation on international trade.

According to the existing empirical literature, socio – economic characteristics influence trade. In order to capture their role, we carry out a subsample analysis splitting our sample between Western and Islamic countries.

[Table 2.5]

The estimated coefficients of cultural variables show that the effects of language and religion have a central role on trade. The foreign trade of Islamic countries is more sensitive to the linguistic links with its trade partners than the Western countries. On the other hand, under the OLS regression model we notice that religion has almost the same impact in both macro-regions, while using fixed effects it loses magnitude. This result is unexpected because Islamic societies did display greater support for a strong societal role by religious authorities than do Western societies, so we would have expected a greater impact of religious distance than linguistic. From this, we deduce that the strength of religiosity is not simply reducible to the characteristics of people living in Islamic societies. Yet this preference for religious authorities is less a cultural division between the West and Islam than it is a gap between the West and many other types of less secular societies around the globe, especially in Sub Saharan Africa and, to a lesser extent, in Latin America.

In Table 2.6, we want to analyse the different impact of our variables between small and big countries.

[Table 2.6]

In the literature, land area is not a very well established variable (Rose and van Wincoop, 2001) and it does not produce consistent significant coefficients. Among the various geographical features, those that affect international trade, in an unequivocal way, are the borders, the mountains, the landlocked countries. Nevertheless, it is equally interesting to observe whether the behaviour of the economic, political and cultural components varies if the country is small or large (by land area). We notice that the values relative to the economic components are almost positive and significant through all specifications. Furthermore, the level of CORRUPTION is significant in an almost constantly way through the different estimation techniques; it is not the same for the STOCK of DEMOCRACY. For the cultural category, the LINGUISTIC and RELIGIOUS DISTANCE INDECES reveal a big impact on trade, while COLONY has a big magnitude only for smaller countries even if it present an opposite sign of coefficients between the two estimation technique.

More broadly, we notice the same level of significance between the two groups of countries.

The five largest countries (by population) in the world are China, India, the United States, Indonesia, and Brazil. Among them, only the United States is a rich country. By contrast, many of the richest countries in the world are small. Clearly, size and prosperity do not go hand in hand.

[Table 2.7]

Table 2.7 reveals how different behaviours of variables depending on the economic size of countries. Immediately we notice that all variables have an impact on trade in all the cases considered. Furthermore, it is worth noting that the poorest countries are those that have a significant level of OPENNESS MARKET, despite economic literature explain us that the countries with big economic dimensions have the possibility to trade more with other new partners. “The wealth or income of consumers is the most important economic attribute that creates distance between countries, and it has a marked effect on the levels of trade and the types of partners a country trades with. Rich countries, research suggests, engage in relatively more cross-border economic activity relative to their economic size than do their poorer cousins. Most of this activity is with other rich countries, as the positive correlation between per capita GDP and trade flows implies. But poor countries also trade more with rich countries than with other poor ones” (Ghemawat, 2001). These patterns result from the economic disparities in costs and quality of human resource, finance and other resources, fundamental economic regulations, and the structure of institutionalized system. It is easier and more efficient for countries to expand business to countries that have similar economic profile, rather than distant one. Another important finding is the coefficient of CORRUPTION: in the two estimation techniques, it follows almost the same trend: under OLS, it is statistically important in a negative way

for the all countries, while under the fixed effects it assumes a negative statistical significance only for rich countries. Wei (2000) argues that countries that have a "natural" propensity to trade, because of their small size (smaller nations trade more because fewer goods are domestically produced in small countries) and favourable locations, will "find it optimal to devote more resources to building strong institutions" that constrain corrupt behaviour. The same trend registered for STOCK OF DEMOCRACY.

In all specification, the basic elements of the gravity model (GDP and DISTANCE) follow the same trend. In the geographic category, under fixed effects, the variable AREA registers a negative and significant coefficient for rich countries; also, in OLS regression this component is much more important for rich countries. In Table 2.7, if we pay specific attention to the second and the last columns, we can express that we have almost a homogenous level of magnitude. The only difference between these two groups (POOR and RICH countries) is represented by two variables. The economic variable of CORRUPTION is statistically significant for all specifications, like EXCHANGE RATE.

In order to give robustness to the previous variables, we introduce other characteristics of the categories considered in this work.

[Table 2.8]

For the economic category we use the values of " TOTAL NATURAL RESOURCES RENTS (% GDP) " which are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents. Natural resources often provide fertile ground for corruption. Since a substantial number of partner countries in development cooperation are richly endowed with natural resources, the risk of corruption is very high and it cuts across several natural resource sectors, from non-renewable resources such as oil, gas, minerals and metals, to renewable resources such as forests, fisheries and land. Recent analysis emphasises the effects of resource rents on corruption (Arezki and Gylfason, 2013). Refer to the level of corruption, the fundamental obstacle faced by all measures of corruption is that they are trying to tap into a phenomenon that is usually a clandestine activity, where few of the people involved have an interest in reporting cases to the authorities or others (Johnston and Kpundeh 2002: 34). However, this does not mean that it is impossible to measure in some way. Several measuring instruments have been proposed, and a number of indicators have been developed.

For the cultural category, we add two variables: TRUST - a variable indicating the percentage of people in a country that are inclined to trust others; and GENETIC DISTANCE INDEX - is an index that capture global differences in gene frequencies between populations. It is very difficult obtain the dimension of TRUST because it is composed by many different elements; our variable is taken from

CANA database that collected them from a set of surveys conducted by the World Values Survey[6]. We expect a positive impact on trade because the larger is the fraction of people in a country that trust others, the easier the trade among countries. Trust is particularly relevant when transactions involve some unknown counterpart like a buyer or seller of goods in another country, when the transaction takes place over a period of time rather than being completed on the spot, and when the legal protection is imperfect. The variable called GENETIC DISTANCE INDEX[7] is used as a measure of genealogical relatedness between populations. The basic idea is that genetic distance captures divergence in characteristics that are transmitted across generations within populations over the very long run. The data are drawn from Spolaore and Wacziarg database (2009). The pioneering work by Cavalli-Sforza (1994) has introduced the use of genetic analysis in social sciences, including culture. Cavalli-Sforza's successful and convincing use of genetics to deal with social phenomena such as languages has attracted the attentions of scholars from other social sciences, including economists, who were looking for exogenous and quantifiable measures of cultural differences.

For the political category, we add two dummies variables: COMMON LAW and DEMOCRACY or DICTATORSHIP. In the last decade, economists have produced a considerable body of research suggesting that the historical origin of a country's law is highly correlated with a broad range of its legal rules and regulations, as well as with economic outcomes. We can claim that legal origins matter. A common legal system affects the costs of engaging in contracts, a consideration not unlike to the costs of misunderstanding that result from different languages. We take the variable COMMON LAW from CEPII database that built a 0-1 dummy for common legal system. Specifically, they assigned 1 to all country pairs that shared Civil law, Common law, or Muslim law and 0 to all the rest. Thus, they treated all countries with a Mixed legal system (often including Customary law) as not sharing a legal system with anyone. Another important new political variable (DEMOCRACY or DICTATORSHIP) is taken from Quality of Government database that uses dichotomous measure of democracy, classifying countries as either democracies or dictatorships. The study of democracy and democratization has constituted one of the most important areas of research in political science for several decades; several instruments for measuring the extent of democracy have been developed.

[6] TRUST represents the percentage of respondents who agree that "Most people can be trusted". A high degree of trust in others may reduce transaction costs, leading to a greater ability and willingness to engage in international trade.

[7] "Genetic distance measures genetic differences between two populations. The basic unit of analysis is the *allele*, which is a particular form taken by a gene. Following Cavalli-Sforza, Menozzi, and Piazza (1994), we use measure of F_{st} distance, also known as "coancestor coefficients." F_{st} distance, like most measures of genetic differences, are based on indices of heterozygosity, the probability that two alleles at a given locus selected at random from two populations will be different. F_{st} distance takes a value equal to zero if and only if the allele distributions are identical across the two populations, whereas it is positive when the allele distributions differ. A higher F_{st} is associated with larger differences." (The diffusion of Development, Spolaore E. and Waicziarg R., pag. 480-481).

The most widely used indices are the Freedom House index (2016), the Polity IV Project (1800 - 2013).

In Table 2.8, signs of all estimated coefficients of the independent variables are found to be as expected by the gravity model, where the log of GDP are positively significant, while DISTANCE is negatively significant. Furthermore, we reveal that the news variables are statistically significant; the only exception are the variable NATURAL RESOURCE RENT. Note that the estimated coefficient on GENETIC DISTANCE, 14.38, is statistically significant at 1 percent under OLS estimator, compared to the insignificant estimated coefficient of 3.624 under IV regression. COMMON LAW reveals the same trend.

To enable a comparison of the various impacts on trade, we compute standardized beta coefficients, which show the effect of a 1 standard-deviation change in the independent variable on the standard deviation of the dependent variable. We want to compare the strength of the effect of each individual independent variable to the dependent variable. The higher the absolute value of the beta coefficient, the stronger the effect.

[Table 2.9]

In both cases, it can be seen that the traditional gravity variables, GDP and DISTANCE, are more important. The other variables that sharing the same statistically significance, in the two estimation techniques, are: OPENESS MARKET, CORRUPTION, LANDLOCKED. We register two most important explanatory variable in explaining the trade - LINGUISTIC DISTANCE INDEX and RELIGIOUS DISTANCE INDEX – they reveal the highest coefficients.

2.4.3 Robustness checks

Since it is likely that cultural distance influences trade flows, and trade has an impact on cultural distance, causality may be difficult to establish and ordinary least squares will not provide consistent estimates. For example, if an omitted variable simultaneously causes a country trade flows to be high and cultural distance to be low, then trade and cultural distance will be correlated even if there is no direct relationship between them.

These specifications contain a potential problem: the reverse causality between trade and GDP. Indeed, it is worth underlining that high GDP causes high trade, but perhaps it is trade that instead causes GDP to be high. In this way, ordinary least squares will not provide consistent estimates because the gravity equation is misspecified for GDP will be correlated with the error term in the regression. What is needed are instrumental variables that are highly correlated with trade, but

uncorrelated with the error term. Different papers account for income's endogeneity include Wei (1996), who uses population and its square to instrument for income in a gravity model, and Harrigan (1996), who uses factor endowments to instrument for production in a fixed-effects model of importing spending. Hummels and Levinsohn (1995) follow Harringan's strategy by using factor endowments in their tests of a Helpman-style (1987) model of monopolistic competition.

We use like instruments continental dummies, our instruments should be interpreted as capturing the effects of GDP on bilateral trade. Moreover, spillover effects seem to be increasingly relevant in this situation of bilateral trade, so also for this we add a set of continental dummies.

The first robustness tests performed was the same estimations as in Table 2.5. The instruments pass the Hansen J-test for overidentifying restrictions, but it is worth highlighting that the test has also been highly unequal across regions. For Islamic countries, the Hansen J-test is equal to zero and this means that the equation is perfectly identified, because for those countries only Asia is used like instruments. Instrumental variables are strictly exogenous.

[Table 2.10]

The IV estimates are presented in Table 2.10; the factor accumulation variables are indeed highly significant in explaining trade. A requirement of good instruments is that they are uncorrelated with the error term. To address this concern, we compute the F-statistics for the joint hypothesis that the instruments' coefficients are zero in the first-stage regression and report it at the bottom of the table. However, it should be noted that the test of over – identifying restrictions is a very difficult test to pass.
Most of the coefficients are very similar in both size and significance to the results in Table 2.5. Most notably, also with this specification, cultural distance help to explain bilateral trade.

In addition, the bias to the trade coefficient may also bias the other coefficients in the equation; that is, it is also possible that another factor, such as trust, pushes up both GDP and trade.

Trust may affect trade because a high level of trust in others may reduce transaction costs, leading to a greater ability and willingness to engage in international transactions.

[Table 2.11]

The gravity variables that are most typically used to measure cultural or political aspects – linguistic distance, religious distance, trust, genetic distance, and corruption - are each correlated with trade, but only moderately. The correlation between trade and linguistic distance is -0.01, between trade and

religious distance -0.03, between trade and trust -0.01, between trade and genetic distance -0.05 and finally, between trade and corruption -0.03. Despite the moderate correlation, culture is a dynamic aspect. It is more amenable to change, since norms and beliefs held by individual residents of a country are likely to be updated continuously, while the other variables – like legal origin or common colony - are fixed in history.

2.5 Concluding Remarks

Until today, the existing literature proved that cultural dissimilarity between countries is a barrier to trade. In the next steps it was studied how these dissimilarities influenced international flows comparing the language and the religious component, but omitting from the same equation, for instance, the variable of trust, the degree of economic openness, the importance of the legal system, the regime type. All these additional variables could show us how the political-institutional factors influence trade. Therefore, the novelty of our work is to consider the influence of the economic, geographical and political variables jointly with the cultural factors.

The aim of this work was to evaluate the consistency of Huntington (1993) theory to the current development of trade among countries. More specifically, other things being equal, we wanted to assess whether culture plays a critical role as envisaged by Huntington (1993) or whether other social, political and economic factors may explain the direction of trades among countries.

Culture does matters, but in contrast to what Huntington said, it is not the cause of the struggles between countries. Culture leaves a distinct imprint on contemporary values.

According to the model that claims trade between countries decreases when their distance increases and the Huntington's thesis that says countries with a different civilization reduce their exchanges, we expected that the logical implication is countries so distant and with deeper cultural differences have not any relationship. If all this is true, Western world and Islamic world should not trade and support each other. However, the reality shows us a connection between the two societies. For the West, the Arab world is an attractive market where find rich buyers; on the other hand the West needs to import oil from this part of the world to maintain and supports their industries. All this shows that beyond the thesis of the "clash of civilizations", the financial elites of the Western countries have continued to engage, with these countries, forms of commercial exchange and business, strengthening both political regimes that their geopolitical position in the world.

There is not a clash of civilizations; rather there has been an increase in economic and diplomatic relations between Western countries and those of Muslim identity. The West has historically always had a big appetite for oil, coming from these countries, to support its economy. Today, there is also a

huge penetration of Arab capital in Western economies. The West provides the knowledge and technology products and often military. The main exporting countries of the Middle East, especially oil, are Saudi Arabia, United Arab Emirates, Iran and Iraq. While, the major trading partners in the Middle East are the United States, followed by China, Japan, Germany, United Kingdom, France, Italy, not necessarily in that order.

The most important distinctions among peoples are cultural. The cultural dissimilarity between countries has a big influence on trade, indeed the highest coefficients are registered in the cultural category. Therefore, after estimating a theory based gravity model of international trade and by using a comprehensive set of economic, geographic, political and cultural variables, that allow us to look at different aspects of trade, we see a predominant of cultural elements that influence exchanges. The paper establishes a link between cultural components and bilateral trade of international countries, highlighting how cultural differences matter into the world trade system.

In terms of political implications, it is necessary further reduction in internal barriers to trade. It is normal that there still exist so many differences in the norms and beliefs of individuals throughout the World, but this research implies that such differences will fade away over time as international trade flows allow for the full integration of production and consumption across the World.

Table 2.1: Factor analysis of political and cultural variables

Panel A	
Political Variables	**Uniqueness**
Democracy	0.0314
Autocracy	0.0823
Polity	0.0228
Corruption	0.4644
Politic rights	0.0561
Civil liberties	0.1064
Stock of democracy	0.4468

Table 2.2: Correlation coefficients

	Trade	Language	Religion
Trade	1.0000		
Language	-0.0152	1.0000	
Religion	-0.0426	-0.0366	1.0000

Table 2.3: Gravity model of bilateral trade: baseline results

	POOLED OLS		PANEL DATA
VARIABLES			
GDP importing country	2.380***	1.226***	1.004***
	(0.0260)	(0.0257)	(0.0830)
GDP exporting country	1.330***	1.110***	1.061***
	(0.0292)	(0.0246)	(0.0823)
DISTANCE	-3.040***	-1.387***	-1.399***
	(0.103)	(0.0963)	(0.205)
CONTIGUITY	-2.111***	-0.142	0.377
	(0.746)	(0.905)	(0.578)
Year Fixed Effects	NO	YES	YES
Importing Country Fixed Effects	NO	NO	YES
Exporting Country Fixed Effects	NO	NO	YES
Observations	24,474	13,428	13,428
R-squared	0.252	0.769	0.840

Note: The dependent variable is the log of trade +1. *significant at 10%, **significant at 5%, ***significant at 1%. Robust standard errors are in parentheses.

Table 2.4.a: Which category affects more bilateral trade?

VARIABLES	GEO	ECO	POL	CULT
GDP importing country	2.964***	2.947***	2.678***	2.656***
	(0.0299)	(0.0319)	(0.0362)	(0.0297)
GDP exporting country	1.377***	1.334***	1.848***	1.573***
	(0.0287)	(0.0327)	(0.0408)	(0.0337)
DISTANCE	-2.998***	-3.273***	-2.900***	-3.991***
	(0.100)	(0.125)	(0.153)	(0.122)
CONTIGUITY	-1.273*	-0.149	-1.399*	0.470
	(0.730)	(0.722)	(0.740)	(0.857)
AREA	-0.903***			
	(0.0271)			
LANDLOCKED	0.726***			
	(0.163)			
EXCHANGE RATE		0.359***		
		(0.0205)		
OPENNESS MARKET		4.267***		
		(0.125)		
CORRUPTION			-0.0870**	
			(0.0398)	
STOCK of DEMOCRACY			-0.494***	
			(0.218)	
LINGUISTIC DISTANCE INDEX				97.73***
				(6.345)
RELIGIOUS DISTANCE INDEX				48.53***
				(2.405)
COLONY				-1.350***
				(0.505)
Observations	24,459	19,143	13,787	20,089
R-squared	0.283	0.286	0.278	0.259

Note: The dependent variable is the log of trade +1. *significant at 10%, **significant at 5%, ***significant at 1%. Robust standard errors are in parentheses.

Table 2.4.b: Which category affects more bilateral trade?

VARIABLES	GEO	ECO	POL	CULT
GDP importing country	1.005***	1.098***	0.770***	1.036***
	(0.0829)	(0.0947)	(0.0969)	(0.0966)
GDP exporting country	1.062***	1.166***	0.996***	1.095***
	(0.0823)	(0.0936)	(0.136)	(0.0981)
DISTANCE	-1.402***	-1.675***	-1.905***	-1.402***
	(0.205)	(0.308)	(0.315)	(0.209)
CONTIGUITY	0.376	0.184	0.495	0.516
	(0.578)	(0.590)	(0.581)	(0.730)
AREA	1.050***			
	(0.260)			
LANDLOCKED	3.292***			
	(0.616)			
EXCHANGE RATE		-0.0151		
		(0.0364)		
OPENNESS MARKET		0.842***		
		(0.131)		
CORRUPTION			0.000936	
			(0.0288)	
STOCK of DEMOCRACY			-0.0186	
			(0.0408)	
LINGUISTIC DISTANCE INDEX				13.16*
				(7.408)
RELIGIOUS DISTANCE INDEX				3.333
				(3.035)
COLONY				-0.0404
				(0.239)
Year Fixed Effects	YES	YES	YES	YES
Importing Country Fixed Effects	YES	YES	YES	YES
Exporting Country Fixed Effects	YES	YES	YES	YES
Observations	13,428	10,586	7,801	11,309
R-squared	0.840	0.851	0.842	0.826

Note: The dependent variable is the log of trade +1. *significant at 10%, **significant at 5%, ***significant at 1%. Robust standard errors are in parentheses.

Table 2.5: Across macro-regions

	POOLED OLS		PANEL DATA	
VARIABLES	Western Countries	Islamic Countries	Western Countries	Islamic Countries
GDP importing country	2.547***	3.882***	1.173***	3.048***
	(0.0595)	(0.0605)	(0.178)	(0.130)
GDP exporting country	1.766***	1.437***	0.786***	-0.595***
	(0.0543)	(0.0547)	(0.121)	(0.229)
DISTANCE	-2.732***	-2.888***	-1.140***	-0.826**
	(0.192)	(0.207)	(0.323)	(0.344)
CONTIGUITY	-1.145	1.827*	0.253	0.270
	(1.098)	(1.108)	(0.681)	(0.680)
AREA	-1.059***	-0.863***	3.480	18.94***
	(0.0788)	(0.0374)	(3.068)	(3.948)
LINGUISTIC DISTANCE INDEX	74.06***	160.7***	16.06**	3.475
	(7.752)	(10.41)	(6.502)	(8.701)
RELIGIOUS DISTANCE INDEX	40.98***	31.62***	7.197	9.295*
	(3.522)	(3.784)	(4.545)	(5.541)
Year Fixed Effects	NO	NO	YES	YES
Importing Country Fixed Effects	NO	NO	YES	YES
Importing Country Fixed Effects	NO	NO	YES	YES
Observations	10,782	9,293	10,782	9,293
R-squared	0.236	0.311	0.799	0.689

Note: The dependent variable is the log of trade +1. *significant at 10%, **significant at 5%, ***significant at 1%. Robust standard errors are in parentheses.

Table 2.6: Area size

	POOLED OLS		PANEL DATA	
VARIABLES	Smaller Countries	Biggest Countries	Smaller Countries	Biggest Countries
GDP importing country	4.235***	3.329***	5.876***	3.114***
	(0.110)	(0.0726)	(0.589)	(0.343)
GDP exporting country	1.728***	1.975***	-1.255***	0.314
	(0.0712)	(0.0658)	(0.440)	(0.343)
DISTANCE	-1.377***	-3.264***	-0.581***	-1.578***
	(0.258)	(0.267)	(0.207)	(0.318)
AREA	0.203**	-1.612***	-23.22***	-257.6***
	(0.0963)	(0.141)	(8.008)	(56.58)
EXCHANGE RATE	0.462***	0.287***	0.0571	-0.262***
	(0.0640)	(0.0388)	(0.139)	(0.0613)
OPENNESS MARKET	3.772***	4.225***	2.029**	-0.361
	(0.316)	(0.263)	(0.987)	(0.306)
CORRUPTION	-0.947***	-0.247***	0.312	0.187*
	(0.0812)	(0.0591)	(0.196)	(0.112)
STOCK of DEMOCRACY	0.415*	1.087	-0.574	-0.765
	(0.227)	(1.134)	(0.432)	(5.070)
LINGUISTIC DISTANCE INDEX	113.3***	93.88***	9.621	0.473
	(15.55)	(11.92)	(6.446)	(5.108)
RELIGIOUS DISTANCE INDEX	-19.15***	69.72***	9.513**	-3.660
	(6.242)	(7.469)	(3.877)	(7.089)
colony	-1.554**	-0.676	3.148***	0.00848
	(0.683)	(0.513)	(0.878)	(0.200)
Years Fixed Effects	NO	NO	YES	YES
Importing Country Effects	NO	NO	YES	YES
Exporting Country Effects	NO	NO	YES	YES
Observations	4,692	6,214	4,692	6,214
R-squared	0.394	0.285	0.782	0.788

Note: The dependent variable is the log of trade +1.*significant at 10%, **significant at 5%, ***significant at 1%. Robust standard errors are in parentheses.

Table 2.7: Economic size

	POOLED OLS		PANEL DATA	
VARIABLES	RICH	POOR	RICH	POOR
GDP importing country	3.546***	3.043***	3.317***	3.234***
	(0.0973)	(0.160)	(0.387)	(0.643)
GDP exporting country	1.930***	1.133***	0.288	-1.280**
	(0.0618)	(0.0781)	(0.383)	(0.496)
DISTANCE	-3.562***	-2.359***	-0.957***	-1.340***
	(0.252)	(0.299)	(0.334)	(0.438)
AREA	-0.685***	0.895***	-669.6***	-9.411
	(0.0955)	(0.0779)	(62.48)	(8.261)
CONTIGUITY	3.137***	1.522	0.271	2.558***
	(1.040)	(1.377)	(0.288)	(0.844)
LANDLOCKED	-0.473	-8.498***	-3,149***	43.17
	(0.421)	(0.618)	(294.3)	(40.28)
EXCHANGE RATE	0.219***	1.314***	-0.452***	0.332***
	(0.0413)	(0.0689)	(0.0711)	(0.113)
OPENNESS MARKET	3.099***	8.764***	0.546	1.018**
	(0.263)	(0.353)	(0.578)	(0.422)
CORRUPTION	-0.275***	-1.095***	-0.797***	1.115***
	(0.0628)	(0.0682)	(0.153)	(0.153)
STOCK of DEMOCRACY	0.340	-3.743***	-1.137**	-2.371
	(0.265)	(1.273)	(0.486)	(2.109)
LINGUISTIC DISTANCE INDEX	121.0***	26.11	-2.893	-4.357
	(11.21)	(16.44)	(3.864)	(10.44)
RELIGIOUS DISTANCE INDEX	18.61***	75.36***	0.457	10.61**
	(6.457)	(7.165)	(5.072)	(5.029)
COLONY	-0.539	-3.365***	0.210	-2.070***
	(0.569)	(0.767)	(0.169)	(0.327)
Year Fixed Effects	NO	NO	YES	YES
Importing Country Fixed Effects	NO	NO	YES	YES
Exporting Country Fixed Effects	NO	NO	YES	YES
Observations	7,046	3,860	7,046	3,860
R-squared	0.251	0.290	0.769	0.746

Note: The dependent variable is the log of trade +1. *significant at 10%, **significant at 5%, ***significant at 1%. Robust standard errors are in parentheses.

Table 2.8: Additional variables

VARIABLES	Pooled OLS	Panel Data
GDP importing country	2.768***	2.969***
	(0.103)	(0.382)
GDP exporting country	1.817***	0.359
	(0.0693)	(0.338)
DISTANCE	-3.587***	-1.042***
	(0.280)	(0.395)
AREA	0.318**	-396.2***
	(0.158)	(87.58)
CONTIGUITY	1.829*	0.596*
	(1.056)	(0.327)
LANDLOCKED	-4.485***	-1,860***
	(0.419)	(412.8)
EXCHANGE RATE	0.457***	-0.449***
	(0.0436)	(0.0712)
OPENNESS MARKET	5.933***	-0.120
	(0.286)	(0.525)
CORRUPTION	-0.325***	-0.373***
	(0.0951)	(0.105)
NATURAL RESOURCES RENTS	-0.0250	0.0300
	(0.0365)	(0.0221)
TRUST	-7.470***	13.20***
	(1.359)	(2.698)
STOCK of DEMOCRACY	-0.898***	-0.350
	(0.316)	(0.515)
LINGUISTIC DISTANCE INDEX	95.51***	-6.062
	(10.53)	(6.671)
RELIGIOUS DISTANCE INDEX	21.76***	-1.457
	(6.068)	(5.870)
GENETIC DISTANCE INDEX	14.38***	3.624
	(5.021)	(2.727)
COLONY	-0.737	-0.205
	(0.581)	(0.257)
DEMOCRCY or DICTATORSHIP	5.202***	1.463***
	(0.299)	(0.497)
COMMON LAW	-2.378***	0.558
	(0.458)	(0.403)
Observations	6,513	6,513
R-squared	0.348	0.800

Note: The dependent variable is the log of trade +1. *significant at 10%, **significant at 5%, ***significant at 1%. Robust standard errors are in parentheses.

Table 2.9: Marginal impacts

	Model A	Model B
VARIABLES	Table 2.4.a POOLED OLS	Table 2.4.b PANEL DATA
GDP importing country	3.433***	3.507***
	(0.0556)	(0.167)
GDP exporting country	1.711***	-0.518***
	(0.0490)	(0.151)
DISTANCE	-3.446***	-1.103***
	(0.184)	(0.376)
CONTIGUITY	3.070***	0.458
	(0.913)	(0.614)
AREA	0.108*	-46.02***
	(0.0612)	(7.755)
LANDLOCKED	-1.750***	-209.0***
	(0.337)	(36.45)
EXCHANGE RATE	0.265***	-0.0281
	(0.0344)	(0.0332)
OPENNESS MARKET	4.917***	-0.472***
	(0.209)	(0.183)
CORRUPTION	-0.371***	0.286***
	(0.0461)	(0.0585)
STOCK of DEMOCRACY	-0.792***	-0.522*
	(0.251)	(0.308)
LINGUISTIC DISTANCE INDEX	108.8***	-1.216
	(9.560)	(7.606)
RELIGIOUS DISTANCE INDEX	39.67***	6.832
	(4.849)	(5.678)
COLONY	-1.201***	-0.181
	(0.459)	(0.352)
Year Fixed Effects	NO	YES
Importing Country Fixed Effects	NO	YES
Exporting Country Fixed Effects	NO	YES
Observations	10,906	10,906
R-squared	0.305	0.767

Note: The dependent variable is the log of trade +1. *significant at 10%, **significant at 5%, ***significant at 1%. Robust standard errors are in parentheses.

Table 2.10: Instrumental variables – Second stage

VARIABLES	Western Countries	Islamic Countries	Western Countries	Islamic Countries
GDP importing country	-3.572***	6.090***	-0.0561	7.086***
	(0.500)	(1.141)	(0.143)	(0.717)
GDP exporting country	2.782***	1.156***	0.728***	0.767***
	(0.103)	(0.153)	(0.0370)	(0.0567)
DISTANCE	3.016***	-1.973***	-0.154	-0.651***
	(0.529)	(0.512)	(0.172)	(0.217)
AREA	3.064***	-1.561***	0.860***	-1.878***
	(0.356)	(0.364)	(0.104)	(0.235)
CONTIGUITY	-3.629**	1.089	-0.585	1.403
	(1.434)	(1.183)	(0.722)	(1.012)
LINGUISTIC DISTANCE INDEX	27.42**	226.7***	-8.842*	241.4***
	(11.51)	(37.12)	(4.686)	(25.16)
RELIGIOUS DISTANCE INDEX	-45.22***	15.03**	-35.28***	-16.79***
	(8.006)	(7.619)	(2.965)	(3.566)
Hansen J statistic	0.815	0.000	0.327	0.000
Year Fixed Effects	NO	NO	YES	YES
Constant	-29.00***	-130.9***	-28.63***	-159.8***
	(3.774)	(23.85)	(1.697)	(14.78)
Observations	10,782	9,293	10,782	9,293
R-squared	0.420	0.243	0.747	0.317

Note: The dependent variable is the log of bilateral trade +1. *significant at 10%, **significant at 5%, ***significant at 1%. The test is calculated from the first-stage residuals of the estimation procedure. We also report the F-test of the excluded instruments. Robust standard errors are in parentheses.

First stage regression

VARIABLES	Western Countries	Islamic Countries	Western Countries	Islamic Countries
europe	-1.016***	0	-1.310***	0
	(0.446)		(0.033)	
north america	-0.122**	0	-0.180***	0
	(0.055)		(0.045)	
asia	0	-0.250***	0	-0.319***
		(0.033)		(0.250)
africa	0	0	0	0
Year Fixed Effects	NO	NO	YES	YES
Constant	6.118***	21.210***	9.050***	20.990***
	(0.329)	(0.236)	(0.293)	(0.216)
Observations	10,782	9,293	10,782	9,293
R-squared	0.420	0.243	0.747	0.317

Note: The dependent variable is the log of bilateral trade. *significant at 10%, **significant at 5%, ***significant at 1%. The test is calculated from the first-stage residuals of the estimation procedure. We also report the F-test of the excluded instruments. Robust standard errors are in parentheses.

Table 2.11: Correlation coefficients

	TRADE	CORRUPTION	TRUST	LINGUISTIC DISTANCE NDEX	RELIGIOUS DISTANCE INDEX	GENETIC DISTANCE
TRADE	1.000					
CORRUPTION	0.0451	1.000				
TRUST	0.0141	0.6355	1.000			
LINGUISTIC DISTANCE INDEX	-0.0064	0.0672	0.0332	1.000		
RELIGIOUS DISTANCE INDEX	-0.0386	-0.1033	-0.0816	-0.0263	1.000	
GENETIC DISTANCE	0.05643	-0.0623	-0.0986	0.1133	0.03092	1.000

Appendix 2.A

Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP importing country	26488	24.80749	1.77455	20.82022	30.33669
GDP exporting country	26487	24.80714	1.774645	20.81858	30.33907
TRADE	13791	17.59872	2.888007	4.762174	24.95737
TRADE+1	28768	8.436913	9.01688	0	24.96435
DISTANCE	28768	8.095223	0.4922361	5.495009	9.366057
LAND AREA	27853	11.49757	2.00994	5.768321	16.03057
CONTIGUITY	28768	0.0043103	0.655127	0	1
LANDLOCKED	28768	0.0862069	0.2806742	0	1
EXCHANGE RATE	27161	0.7632833	2.735382	-9.484278	9.23544
OPENNESS MARKET	22157	-0.5068867	0.5027604	-2.004073	0.8239373
CORRUPTION	23955	5.498032	2.068092	1.16714	10
STOCK DEMOCRACY	15624	2.277627	0.2989485	-9.21034	2.995732
LINGUISTIC DISTANCE INDEX	22971	-0.096456	0.0151155	-0.1116715	0
RELIGIOUS DISTANCE INDEX	23002	-0.0969365	0.304068	-0.2245695	-0.0293444
COLONY	28768	0.0301724	0.1710645	0	1

Notes. List of countries: Austria, Bahrain, Belgium, Croatia, Cyprus, Czech. Rep, Denmark, Egypt, Estonia, Finland, France, Germany, Greece, Hungary, Iran, Iraq, Ireland, Israel, Italy, Jordan, Kuwait, Latvia, Lebanon, Lithuania, Luxembourg, Malta, Netherlands, Oman, Palestine, Poland, Portugal, Qatar, Romania, Saudi Arabia, Slovakia, Slovenia, Spain, Sweden, Syria, Turkey, United Arab Emirates, United Kingdom, United States of America, Yemen.

* All the variables are taken in logarithmic form.

Appendix 2.B

Data source and definition

Variable	Source	Definition
TRADE	UNCOMTRADE	It is the sum of imp./exp. of country i into country y in year t.
GDP	World Bank national accounts data.	GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates. For a few countries where the official exchange rate does not reflect the rate effectively applied to actual foreign exchange transactions, an alternative conversion factor is used.
AREA	Food and Agriculture Organization.	Land area is a country's total area, excluding area under inland water bodies, national claims to continental shelf, and exclusive economic zones. In most cases the definition of inland water bodies includes major rivers and lakes.
EXCHANGE RATE	Penn World Table 7.1	Exchange rate: 1 US dollar = ? local currency.
OPENNESS MARKET	UNCTAD	Openness Indicator. (Import + Export)/GDP. PPP, 2000 USD.
CORRUPTION	Transparency International	Corruption Perception Index. Transparency International Index, ranging from 0 (High Corruption) to 10 (Low Corruption).
TRUST	World Values Survey	Most people can be trusted. Percentage of respondents who "agree" with this statement.
LANDLOCKED countries	World Bank	Dummy variable: if country is land-locked = 1, zero otherwise.
DISTANCE	CEPII	Simple distance between capitals (capitals, km).
CONTIGUITY	CEPII	Dummy variable: if countries are common border = 1, zero otherwise.

COMMON LAW	CEPII	Dummy variable: if countries are common legal system = 1, zero otherwise.
GENETIC DISTANCE	SPOLAORE	Weighted Fst Genetic Distance. Fst distance is based on indices of heterozygosity, the probability that two alleles at a given locus selected at random from two populations will be different. Fst distance takes a value equal to zero if and only if the allele distributions are identical across the two populations, whereas it is positive when the allele distributions differ. A higher Fst is associated with larger differences.
LINGUISTIC DISTANCE	SPOLAORE	Linguistic Distance Index, weighted. Spolaore and Wacziarg calculate the number of common nodes between the plurality languages of each country in a pair, as well as expected number of common nodes. Finally, from the two measures of linguistic proximity, they use a transformation to obtain corresponding measures of linguistic distance ranging from 0 to 1.
RELIGIOUS DISTANCE	SPOLAORE	Religious Distance Index, weighted, Fearon. The number of common nodes between religions is a metric of religious proximity.
STOCK OF DEMOCRACY		Index of stock of democracy.
NATURAL RESOURCES RENT (%GDP)	World Bank	Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.

3. Cultural diversity, at workplace, matters for innovation? Evidence from US States

3.1 Introduction

In the liberalized economic environment, management of mixed culture is all set to play a highly critical role in the process of business development.

As global competition intensifies and innovation becomes riskier and more costly, the business sector chooses to internationalize knowledge-intensive corporate functions, including R&D. Overall, the internationalization of business sector promises substantial benefits, but also creates serious challenges for many countries.

A result of globalization and internationalization is the heterogeneity of the labour force. The diversity at workplace is increasing very rapidly. Indeed, because of the boom of multinational companies and extension of businesses across the national boundaries, it has become a very common practice to see cross culture diversity at job site.

Business will need people with many different skills and experiences. By choosing people with different backgrounds, maybe the level of innovation in a country can benefit from the different experiences these people have gone through. If we have employees with a variety of backgrounds then we have people with a much different points of view.

We need to take into account that there are both the benefits and the costs of cross culture at the workplace. The diversity of the population in the workforce includes a discussion of the benefits of a diversity at workplace, such as improved problem-solving and decision-making, access to new consumer markets (Carton, 1988; Weinstein, 1994), enhanced product development, or the ability to compete in global markets (Barnum, 1992). On the other hand, several studies have concluded that heterogeneous groups perform less well than homogeneous ones (Pelled, Eisenhardt, Egan, & O'Reilly, 1992). Therefore, there are also costs of diversity arising from barriers to communication caused by different languages and cultures. Alesina and La Ferrara (2005) say that costs of diversity might also be due to an inability to agree on common public goods and public policies. The costs of cross cultures at workplace increases the conflict of interest.

Therefore, the advantages and disadvantages associated with workforce diversity put organizations in a position of managing a paradoxical situation. If they embrace diversity, they risk workplace conflict, and if they avoid diversity, they risk loss of competitiveness.

The objective of this paper is to provide evidence about the impact of cultural diversity on innovation within labour workforce using a panel of US States over the period 2000 - 2010. Our analysis differs from many previous studies that focus on labour market effects of immigration. In the field of cultural diversity at workplace, the majority of the literature analyse the micro level impacts (cultural diversity within the establishment's workforce), while we consider the aggregate level impacts of diversity. The main aim of this paper is to shed light on one important question: does cultural diversity, at workplace, matter for innovation? The second aspect that differentiates this analysis from other studies is that we did not restrict heterogeneity of labour force to the level of education only, but heterogeneity like results from differences in culture, ethnicity or race.

There are different studies on some aspects of the increasing diversity of the U. S. workforce, such as the immigration policy (Hirschman,2009), the changing demographics of the U.S. population and some others. Fujita and Weber (2004) argue that cultural diversity of the labour force might be of special importance for R&D activity since the generation of new products and ideas heavily relies on individual talents and skills from diverse educational and cultural environments. Consequently, we decided to focalise our attention on the R&D sector because the benefits of diversity might have a particular importance, whereas in specialized industries on more standardised forms of production the costs of a diverse labour force might easily outweigh the positive effects.

This paper is organized as follows. The next section reviews previous literature. In section three, we present the model and discuss our estimation and methodology. The following section presents the data. In section five, we discuss the results and section six concludes.

3.2 Related Literature

Cultural diversity at workplace is currently a hot topic. What are the performance effects of cultural diversity, at workplace? This question has recently attracted vast attention in the economics literature (Fujita and Weber , 2004; Ottaviano and Peri, 2006) and in related disciplines, as the populations in modern advanced societies became more heterogeneous along such dimensions as ethnicity, race, native language, religion. The large interest in studying diversity at workplace increased shortly after the publication of *Workforce 2000: Work and Workers for the 21st Century* (Johnston and Packer's, 1987). *Workforce 2000* legitimated the study of cultural diversity in organizations. It represents a shift to valuing differences at workplace rather than suppressing and denying them. This literature reveals how having a diverse workforce gives value to difference.

There are different academic articles that include definitions of key words like diversity, managing, diversity, multiculturalism (see, for example, Cox, 1991; Fine, 1995; Fernandez, 1991). The term

"diversity" encompasses a range of differences in ethnicity/nationality, gender, function, ability, language, religion, lifestyle or tenure (Kossek & Lobel, 1996). Additionally, "diversity" at workplace includes more than employees' diverse demographic backgrounds, and takes into account differences in culture and intellectual capability. It takes more than demographic or ethnic diversity to result in creativity that leads companies to perform better (Leonard & Swapp, 1999).

Latimer (1998) argued that diversity in terms of ethnicity, age, gender, personality and educational background promotes creativity and problem-solving capability. Increased diversity leads to lower levels of risk aversion and better decision-making and problem-solving capability. This arises because diversity promotes a more robust critical evaluation of the first solution to receive substantial support. Theorists have shown that heterogeneous groups have experiences more conflict, higher turnover, less social integration and more problems with communication than their homogeneous counterparts (Knight et al., 1999; O'Reilly et al, 1989; Williams and O'Reilly, 1998). Other studies have suggested lower levels of attachment to employing organizations on the part of individuals who perceive themselves to be different from their co-workers (Mighty, 1997; Tsui et al., 1992). These studies give a clear indication of the nature of the challenge confronting those seeking to promote commitment amongst diverse work groups.

In 1991, Cox said that increasing cultural heterogeneity leaded to "greater creativity and innovation and more successful marketing to different types or customers." According to him, the basic idea of this research is that cultural diversity is a regional input factor that positively affects a region's innovativeness and its growth potential consequently. This point of view can be invaluable to innovation. The cultures that people come from can provide company/universities with opportunities that the locals may have not seen or known about. It is expected that cultural diversity, at workplace, affects innovative activity: differences in knowledge and capabilities of workers from diverse cultural backgrounds can enhance the performance of the innovation sector.

Fujita and Weber (2004) argue that cultural diversity of the labour force might be of special importance for R&D activity since the generation of new products and ideas heavily relies on individual talents and skills from diverse educational and cultural environments. Berliant and Fujita (2004) also refer to the significance of cultural diversity for knowledge creation and transfer. The heterogeneity of people is important for the creation of new ideas. Alesina and La Ferrara (2005) argue that cultural diversity may lead to innovation and creativity since it involves variety in abilities and knowledge.

Recently, there are different studies that concentrate their attention on the link between cultural diversity and innovation (while several previous studies concentrated their attention on economic

performances and levels of productivity, at micro level); in particular, the new trend of the economic and migration literature proposes the idea that culturally different foreign workers can affect innovation. However, the trend does not converge towards a unique result.

From a theoretical point of view, Berliant and Fujita (2012) explicitly consider the positive effects of cultural diversity on the production of new knowledge. Lazear (1999) comments positive effects of diversity on the productivity of teams at the firm level. However, he also takes increasing costs of diversity into account. Ottaviano and Peri (2005, 2006) find empirical evidence of positive effects of cultural diversity on productivity using U.S. city level data. Nathan (2011) confirms these findings in UK. More generally, Alesina et al. (2013) establish a positive link between diversity and productivity, which translates into positive diversity effects on economic development using data on 195 countries. Focusing on European countries, Brenzel and Brunow (2011) find positive growth effects of ethnic diversity. With respect to the underlying mechanisms, Parrotta et al (2011) establish a link between cultural diversity and innovation at the firm level in Denmark. Niebuhr (2010) analyses diversity effects on the regional level. She finds that cultural diversity positively affects regional innovation activities. A more detailed overview over the literature on the effects of diversity is provided by Dohse and Gold (2013), including research focusing on the negative impacts of cultural diversity.

There are so many strands of research on cultural diversity in the workplace; example, different studies focus on the organizational behaviour of members of a particular cultural group (Treven, 2008), or on cultural diversity in organizations in general (Jonsson, 2013) or still, others focus the study on the individual employees (Lillevik, 2007) or individual establishments (Brunow, 2014).

In this research, we decide to study whether there is a possible impact of heterogeneity of labour force on innovation process across US states. The majority of the literature analyse the micro level impacts (cultural diversity within the establishment's workforce), while we consider the aggregate level impacts of diversity at workplace. The main aim is to understand if people with different ethnic groups (heterogeneity) have an impact on innovation performance across US states.

In our research, the cultural aspect is strongly influenced by the methods of collecting data on race and ethnicity. It is analysed taking into account the general categorical scheme that most researchers use in previous literature. Data are collected splitting employees in Whites, Blacks, Hispanics and Asians. For the first time, these general categories appeared in journals by the late 1970s and early 1980s (see, for example, Daniel & Smitherman, 1976; Stanback & Pearce, 1981). Foeman and Pressley (1987) document differences between Blacks and Whites at workplace: in particular, they redirected research away from comparing Blacks and Whites communication styles in the workplace. Asante and Davis (1989) offered an intercultural perspective as a way to understand

misunderstandings between Blacks and Whites in interracial organizations. While, the last application is in 2014 into an article, published on Journal of Business Diversity (vol. 14(1) 2014), which examines the impact of diversity on firm performance based on six different levels of workforce for three different ethnic groups (Choi, Jeong and Lee, 2014).

All researchers are aware that these general categories hide significant heterogeneity within each of these major groups (McKusick, 1969). Recent research have attempted to make distinctions by country of origin, nativity, and generation within the United States, but unfortunately, no database was completed. Therefore, the only possibility is to use the available data that include Whites, Blacks, Asians, Hispanics and American Indians employees.

The terms race, ethnicity and culture are sometimes still used interchangeably defining characteristics of research subjects, which are often allocated to racial or ethnic groups, arbitrarily. In most scientific research, however, controversy and confusion have surrounded its use (Fortney, 1977). Faced with the complexity of categorization, some researchers have used the term race like a scheme biologically determined, while ethnicity and culture as ideas derived from social theory. Although the use of the terms is inconsistent, depending on the contextual application, the classification, definition and recording of data by race have important implications and different meanings. Of particular interest are the diverse ways in which it is conceptualized and measured in research emphasizing health status and policy formulation (Wilkinson & King, 1987; Betancourt & Lopez, 1993; Pfeffer, 1998; Lamont & Small,2008; Sanderfur at all.,2017).

In our study, we assume that race is closely correlated with cultural heritage. The categories of race or ethnic group are rarely defined, the use of terms is inconsistent, and people are often allocated to racial or ethnic groups, arbitrarily. Thus, we will use the term “cultural differences” to describe heterogeneity that result from differences in culture, ethnicity or race.

3.3 Methodology

3.3.1 Empirical model and hypotheses

The aim of this paper is to investigate the impact of cultural diversity on innovation, at workforce.

Our initial hypothesis was the following: where the workforce is more heterogeneous, in terms of cultural background, we should observe a higher level of innovation. If the diverse workforce among states has a positive (negative) effects on innovation, we should observe that states with a heterogeneous body of workers will produce more (less) patents than states where the workforce is more homogeneous in term of cultural backgrounds. Nowadays, due to the lack of the data on the

labour distribution force by nationality, our goal is to understand if there is a cultural group of workers more innovative than other ones. In this study, the ethnic groups taken into consideration are Whites, Blacks and Hispanics.

Our focus would be to assess that differences in skills and capabilities of workers from diverse cultural backgrounds can enhance performance of local innovation output. We want to analyse whether a more diverse labour force fosters innovation or negative effects. The starting point of our analysis is the following regression equation:

$$\ln P_{it-1} = \alpha_{0} + \alpha_1 \ln(RD_{it-1}) + \alpha_2 \ln(DIV_{it}) + \sum_{n=1}^{N} \beta \ln X_{nit} + \mu_{it} \quad (1)$$

The left-hand side variable, P_{it}, represents the number of patents in state i and year t. Patents have fascinated economists for a long time. A patent is a property right to a knowledge asset; patent counts can be useful measures of innovative output. Indeed, we use it like a proxy of innovation. It is used in per capita terms because the number of patents is affected by the size of the regional economy. It enter into the model with a time lag of one year to diminish the possibility of reverse causality.

RD_{it} denotes R&D expenditures per capita. We investigate the link between patents and R&D input in per capita terms because the number of patents is affected by the size of the regional economy.

In our study, DIV is the variable of interest. It takes three different forms for each ethnic group: White, Black and Hispanic employees. We would have wanted to use the data on labour distribution force, according to nationality of workers in a given state, but we generally lack data on specific nationality groups.

X_{it} denotes observable characteristics. Furthermore, in order to avoid misspecification due to omitted variables, we add in the equation (1) some control variables. Controls comprise indicators for the sectoral composition of regional economies. The industry structure is considered because the propensity to patent is higher in manufacturing than in the service sector. According to Bode (2004), the propensity to patent might also be affected by the size of firms. In order to capture corresponding effects of firm size, we consider six additional variables. Moreover, an indicator for human-capital endowment of the region is included because human capital might foster the innovation process. The share of level of education measures human capital. Finally, we take into account number of international patent application under the PCT for each US state.

μ_{it} is the error term.

To investigate the robustness of our empirical results, a number of additional regression models are applied. Firstly, fixed effects panel data models is applied so as to control for unobserved time-invariant explanatory variables:

$$\ln P_{it-1} = \alpha_{0} + \beta_1 \ln(RD_{it}) + \beta_2 \ln(DIV_{it}) + \sum_{n=1}^{N} \beta \ln X_{nit} + \lambda_t + \nu_{it} \quad (2)$$

where λt captures unobservable time effects and ν it is a white noise error term.

In the models of this paper any observations has two indices: one that indicates the US state *i*; and another that indicates the time period *t* in which the observation is made. For example, $P_{i,t}$ denotes the number of patents in state *i* at time *t*.

Consequently, to assess the impact of cultural diversity at workplace on a state's innovation one has to take into account that the share of different cultures among a firm's employees may be a function of the firm's innovativeness.

Although, fixed effects have captured time invariant omitted variables. Yet, the results would still be biased if there were time-varying shocks simultaneously affecting innovation and cultural diversity at workplace. The selectivity can also affected in the matching of particular state and a particular cultural group of workers due to unobservable characteristics.

The impact of endogeneity of a cultural group of employees is therefore an empirical matter, which we address by applying a dynamic estimation strategy using System GMM methods popularized by Blundell and Bond (2000). This approach uses internal instruments constructed from time lagged variables.

Summing up, after running OLS estimation and fixed effects; the alternative strategy is "Difference" and "System" GMM. Arellano and Bond (1991) first introduced the difference GMM estimator. It eliminates the country fixed effects from the equation by differencing. In addition to eliminating the time-invariant country fixed effects, first differencing constructs instruments for the potentially endogenous regressors in the estimation. In addition, if these instruments are strong instruments, that is if they are uncorrelated with the error term and highly correlated with the original regressors, we avoid the inconsistency of the estimation caused by the endogeneity of the lagged level of the dependent variable. The difference GMM estimator as well as the system GMM estimator use instruments, which are given from within the data. The system GMM estimator combines the difference equations and the level equations to one greater system of equations. The Arellano-Bover/Blundell-Bond estimator augments Arellano-Bond by making an additional assumption, that first differences of instrumenting variables are uncorrelated with the fixed effects. This allows the

introduction of more instruments, and can dramatically improve efficiency. It builds a system of two equations—the original equation as well as the transformed one—and is known as "system GMM."″

The difference GMM and system GMM estimators are used for the econometric analysis in panel data. Panel data allows investigating dynamic relationships. This means that the current level of dependent variable depends not only on the list of specified regressors but also on the value of the dependent variable of the previous period. In modelling practice, dynamic relationships are characterized by the presence of a lagged dependent variable among the regressors. Including the lagged dependent variable introduces endogeneity with respect to this variable, and this means that simple linear OLS regression will yield inconsistent estimates. The difference GMM and system GMM estimators are strategies to resolve this endogeneity problem.

3.4 Data

Data were collected from several sources (see Appendix).

Although most national and local data collection efforts follow the federal guidelines, they vary in the way in which questions are constructed and in the order in which they appear in the questionnaire or interview schedule. Such seemingly trivial differences in measurement lead to different distributions of responses about racial and ethnic identity (Hirschman, Alba, and Farley, 2000). Most researchers are aware that these general categories of race disguise significant heterogeneity within each of these major groups and they are social constructions that have changed and will continue to change over time. Data sources use different criteria in the collection of racial and ethnic groups.

Our review revealed that a major problem with the available official statistics is the relative paucity of the data at nationality subgroup level in the US states. Data are not enough to examine specific origin groups or distinguish between the native born and the foreign born. From a survey of the Bureau of Labor Statistics, we take data from demographic groups, or rather, the number of employees divided by racial group: Whites, Blacks and Hispanics. Only fairly recently have data been available for Hispanics or Asians and these are often problematic because their groups are both numerically small and very diverse. For the lack of data, we decide to drop the Asians from our research; while, it is clear that Blacks and Whites represent the numerically larger and physically distinct racial populations.

In our experiment, we cannot differentiate the separate effects of culture, ethnicity and race; empirically, they are identical for our purposes. Thus we will use the term "cultural differences" to describe heterogeneity that result from differences in culture, ethnicity or race. As in previous literature that find relationships between an individual's culture, ethnicity or race and his or her behaviour or economic status, we can never be certain that what we describe as cultural determinants

are not actually non-cultural determinants (for which we have no data) that are correlated with our cultural categories. In this sense, what economists call “culture” in analyses of economic behaviour is best viewed as a residual category. By controlling for differences in behaviour that stem from heterogeneity in the socio-economic attributes of our subjects, we attribute to “cultural differences” any remaining heterogeneity in behaviour across cultural groups. The key difficulty in estimating a causal effect of culture is that it is endogenous to economic development. As stressed by the so-called modernization theory, economic development has predictable effects on culture and social life (Inglehart and Baker 2000). Hence, to identify a causal effect from culture to economic development, we have to find some exogenous source of variation in culture.

The data source where we download the information about the R&D output (patents) is the TAF database, maintained by the U.S. Patent and Trademark Office; it counts only utility patents. We decided to use this database because USPTO contains several different types of patent documents offering different kinds of protection and covering different types of subject matter. The utility patent are patents “issued for the invention of a new and useful process, machine, manufacture, or composition of matter, or a new and useful improvement thereof; it generally permits its owner to exclude others from making, using, or selling the invention for a period of up to twenty years from the date of patent application filing, subject to the payment of maintenance fees.” Approximately 90% of the patent documents issued by the USPTO in recent years have been utility patents, also referred to as "patents for invention".”. Patents represent the outcome of the inventive process and more specifically of those inventions, which are expected to have commercial impact. They are a particularly appropriate indicator to capture the proprietary and competitive dimension of technological change.

The R&D input is represented by the R&D expenditure per capita taking from the National Science Foundation. This variable includes expenditures per capita in R&D by all state departments, agencies, commissions, and dependent entities that funded R&D activities for state government; it involves every units with the capacity to perform or fund R&D.

To assess economic performance stemming from cultural diversity at workplace we take into account different exogenous regressors. We use the data of the U.S. Census Bureau to quantify how much establishments there are in according to their size and their sectors. Analyse the structural composition of regional economies became necessary because previous literature give us a portrait where it is clear that the propensity to patent is higher in some sectors rather than in others and it also be affected by the size of firms (Bode, 2004).

The quality of research is represented by the number of patent applications; the idea is that more efficient is the patent more applied it is. The data come from the WIPO. This allows us to assess the

technological impact of patents. In patent citation analysis, high citation counts are often associated with economically and technically important inventions, ones that are fundamental to future inventions.
From the PWSD (Public Workforce System Dataset) we take data that portray the level of education within US states. It is included because human capital might foster the innovation process.

3.5 Estimation results

3.5.1 Main Results

The starting point of our analysis is represented by a simple pooled OLS.

[Tab. 3.1]

Immediately, we notice that all coefficients have a high statistical significance; this means that all these variables impact with the production of patents (our proxy of innovation). The only variable that has a negative sign is referred to Black employees; it means that this cultural group of workers produce a negative impact on innovation than others. This result is very strange and it has no precedent in literature.

For this reason, we continue to investigate expanding the model by some control variables in order to avoid misspecification due to omitted variables. Controls comprise indicators for the sectoral composition of regional economies, firms' size, patent applications and years of schooling.

[Tab. 3.2]

Second step of regression analysis is a basic pooled model including all control variables. Table 3.2 shows the results of this basic model. Not in line with previous evidence, the variable of R&D input loses significance. The statistical impact of our variables of interest do not change.
Furthermore, some control variables appear with significant coefficients, indicating that structural characteristics of the States matter for innovative activity, as before patent applications register an high statistical significance.
Table 3.2, also, shows the relationship between innovation and sectoral composition of economy, testing results for these variables show a negative but statistically significant coefficient for the workers hire in construction.
A positive coefficient with a low level of statistical significance is registered for small firms, while large firms have a negative and statistically significant coefficient.
According to the previous literature, these results reveal us that, in both case, sectors and size of firms produce an impact on the variability of the dependent variable. The variables related to the level of education reports a strange output, by results we can say that a high level of education impact in a

negative way on innovation. On the other hand, a low level of year of schooling produce a positive influence on R&D output.

Fixed and random effects panel data models will be applied to control for unobserved time-invariant explanatory variables. We use the Hausman test to differentiate between fixed effects model and random effects model. In this case, fixed effects are at least consistent and thus preferred.

[Tab. 3.3]

We check whether unobservable effects are important and adversely affect the estimates of the pooled model. However, the results change a little bit in the fixed effects model. The impact of cultural diversity turns out to be stable: only the variable referred to Hispanic employees loses significance. The variables referred to the sectoral composition seem do not affect the output of our regression, in comparison with Table 3.2 the sector of construction loses magnitude. The levels of education have the same trend as previous estimation with a decline in magnitude. Not in line with the results of the previous table, firm size registers statistically significant coefficients in small firms.

The fixed effects eliminates some of the inconsistency of the OLS but it does not eliminate all of the inconsistency. The alternative strategy is “Difference” and “System” GMM.

[Tab. 3.4]

We focus our attention on the results that give us the second column. System GMM has been found to be more efficient, compared to Difference GMM. It has also been show to perform well in the presence of heteroscedasticity.

At the beginning, extremely important is the Hansen J test that does not reject the null of joint validity of all instruments. The test on autocorrelation of residuals in first differences cannot reject the null of no second order autocorrelation, which means that there is no first order autocorrelation in the level equation. Not all the variables are statistically significant. The empirical analysis reveals that States with more patent applications produce more innovation; using this strategy is confirmed that, at state level, there is a negative relationship between the innovation output and the presence of Black employees.

We find that OLS estimation yields the highest and fixed effects estimation the lowest coefficient. The coefficient obtained in the System GMM estimation almost ranges in between the other estimates.

Summing up, in all the previous estimations there is a constant: the variable of Black employees is always high statistically significant, in a negative way.

3.5.2 Sensitive Analysis

At the end, we can say that the results becomes less conclusive when we put our attention on the workforce of Black employees. This result could be the logical consequence of different inconsistencies that have troubled researchers. During the study, we understand that the results we had on black cultural group are due to two important things: first, the low hiring percentage in the companies. To better understand the phenomenon, we take into account the presence of Blacks in big know companies. It is worth underlining that all these companies register high level of innovation.
Google was one of the first big companies to release a report detailing its diversity. Google's ethnicity data refers to US employees only, and indicates 61% White, 30% Asian, 4% identifying as two or more races, 3% Hispanic, 2% Black, and 1% other. Apple's diversity report indicates the same global ratio as Google: Apple's US employees are 55% White, 15% Asian, 11% Hispanic, 7% Black, 2% as two or more races, 1% other, and 9% undeclared. Facebook also only released US ethnic data, which showed a workforce with more than half of the employees identifying as White. For tech jobs at Facebook, 41% of employees identified as Asian, with 3% identifying as Hispanic, and 1% identifying as Black. Pandora's overall workforce is 70.9% White, 12.3% Asian, 7.2% Hispanic, 5.7% two or more races, 3% Black, and 1% Native Hawaiian or Pacific Islander. HP's US workforce is 71.5% White, 14.22% Asian, 6.9% Black, 6.06% Hispanic, 0.74% two or more races, 0.48% Native American, and 0.10% Native Hawaiian or Pacific Islander.

Furthermore, we also understand that the presence of Blacks employees is mitigated by the skill requirements. An empirical observation is that the employment of Blacks is fairly uneven across firms. Firms where Blacks are in charge of hiring (or Black employers) are considerably more likely to employ Blacks than are firms where Whites are in charge of hiring (or White employers) (Stoll, Raphael and Holzer, 2001). This statement could justify the low percentage of Black workers within companies. Firms with high skill demands, low vacancy and turnover rates, or that generally hire few workers relative to the size of their workforce are associated with lower Black employment (Holzer, 1998b).

With this perspective, we can say that the results becomes less conclusive when we put our attention on the workforce of Black employees because their presence in firms are very low and then often Blacks make a job that not reflect their competence: they are under-estimated.

[Figure 3.1]

Therefore, we can reveal that minorities that work in the United States are represented at very low rates.

[Figure 3.2]

Looking at the entire sample, White innovators accounted for 75.6 percent of the sample. Individuals of Asian or Pacific Islander ethnicity made up the second largest group at 18.7 percent. Of the remainder, 3.3 percent were Hispanic; 0.4 percent were Black or African American; and American Indians and Alaskan Natives, and those listing two or more responses represented 1 percent each.

Moreover, self-employment represents an important component of the cultural diversity experience in the U.S. labour market. In fact, among large immigrant groups self-employment rates exceed 15 percent of the labour force (G. J. Borjas, 1986). Self-employment is an important factor in the economic advancement of immigrants. There has been a rapid increase in the self—employment rates experienced by immigrant of new generation as compared to earlier. These changes may have been caused by the relative decline of opportunities faced by immigrants in the salaried sector over the last decades. Although a good part of immigrants have a high level of education is usually not highly valued in the host labour market, immigrants successfully use this human capital to achieve business ownership (Sanders, M and Nee, V., 1996).

We ran some robustness and specification tests.

[Tab. 3.5]

In Table 3.5, we study the impact of the three major cultural groups on the level of innovation. We find that the impact is not consistent in the same way on different ethnic groups. One more time, the results support the presence of a negative relationship between the level of innovation and black workers. The simple conclusion could be that, at state level, the innovation output is not influenced by White or Asian employees, but from Black one in a negative way.

Furthermore, we want analyse the relationship between the cultural group and the level of education, because we want to investigate if the less innovation capability of Black workers can be dependent by their level of instruction. How much the education level impacts on Black employees? To corroborate this result we make a comparison with White employees.

[Tab. 3.6]

For testing whether parameters change across groups, we use interaction terms. Our interaction variables take into account the group of Black/White employees and the average level of instruction

of all US population, which is splitted into two variables: people who have less than high school and people who are high school graduates.

In the first column, there is not relationship between the cultural white group and the level of education, while it is worth putting attention in the second one. The results referred to Black employees give us a portrait where, when this cultural group interact with the average level of instruction of all US population, we can reveal a negative and statistically significant coefficient when we take into account high level of education; while, in the case where Black employees interact with less level of education the coefficient is positive and significant.

Therefore, Black employees who have got a high education perform lower than ones that have not. The result is a little bit curios, but it become clearer when we take into account an important information: Black workers with a higher level of instruction, but with low profile job, are not encouraged to produce. The problem is Blacks tend to be under-represented in top managerial positions. Indeed, a consistent observation is that black employers tend to hire blacks at greater rates than do their white counterparts. A poll found that black employers are more likely to hire blacks because they receive applications from blacks, and hire them out of the black applicant pool, at greater rates than do white employers. Thus, to the extent that there is concern over the persistent unemployment difficulties of blacks, having more blacks in positions with hiring authority within firms would help to alleviate this problem (Stoll at all. 2001).

According to the high statistical significance of the coefficients, we can affirm that the level of instruction is a main element.

Furthermore, we wanted to investigate the impact of the presence of Black employees in the different economy sectors. Previous literature shows how much simpler is register high percentage of innovation in sectors like construction or manufacturing, than in services. According to this statement, we thought that the negative impact of Black workers on innovation is due to the lower possibility to create innovations in fields in which is harder to do. These application fields are ones in which, by nature, is more difficult to make and create innovations.

3.6 Concluding remarks

This study is aimed to highlight the importance of influencing innovation performance over time by different ethnic groups. In our study, we wanted to make comparisons between the results of different estimation techniques. Various levels of diversity were analysed to investigate the impact of different ethnic groups on innovation: White, Black and Hispanic. The testing results show a different impact of workforce level on the performance.

Further, the conclusion becomes less conclusive when we focus our attention on Black employee workforce.

Therefore, we can see the collective power on the different strategies. We also find that the impact is not consistent in the same way on different ethnic groups.

Future studies, with additional data, could confirm the general results of this research. Furthermore, in the future research the results of Black employees can be do splitting this group into a different level of management: Black managers, Black professionals. Even, another aspect could be analysed: geographic location. The literature on spatial mismatch indicates that racial residential segregation combined with search and commuting costs and imperfect information limits the geographic distance workers are willing and/or able to travel, thus ensuring that Blacks and Whites work in different parts of the metropolitan area (Stoll, 1999; Stoll and Raphael, 2000; Holzer and Ihlanfeldt, 1996). Hence, firms located closer to Black communities receive a relatively larger number of applications from Blacks and will be more likely to hire Black workers as a result. By similar reasoning, such establishments may also be more likely to have Black employees in charge of hiring, creating a correlation between the race of the hiring agent and the race of recent hires.

Our results have potentially important policy implications. Currently, the public debate and also a large part of the academic literature on economic effects of migration focuses on the number of migrants and their education level, while compositional effects like the cultural diversity within that group are often not taken into account. According to the findings of our study, the heterogeneity of this group in terms of cultural and ethnic backgrounds is crucial when it comes to assessing the innovation effects spurred by policy of immigration. Further studies could investigate a dearth links between innovation and migrant diversity.

Table 3.1 Pooled OLS

VARIABLES	OLS
Patent_application	0.635***
	(0.0258)
R&D_expenditures_per_capita	0.102***
	(0.0254)
White_employees	0.493***
	(0.0402)
Black_employees	-0.128***
	(0.0130)
Hispanic_employees	0.0518***
	(0.0151)
Constant	-1.028***
	(0.267)
Observations	409
R-squared	0.967

Note: The dependent variable is the log of number of patents in per capita term. All the variables are taken in logarithmic form. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3.2 Control variables - OLS

VARIABLES	OLS
R&D_expenditures_per_capita	0.0138
	(0.0397)
White_employees	0.345***
	(0.0927)
Black_employees	-0.0849***
	(0.0205)
Hispanic_employees	0.0571***
	(0.0204)
Patent_applications	0.645***
	(0.0372)
Employees_in_constructuion	-0.246***
	(0.0754)
Employees_in_manufacturing	-0.0232
	(0.0606)
Employees_in_service	-0.0425
	(0.0838)
Employees_firm_size_0_4	-0.178
	(0.231)
Employees_firm_size _5_9	0.134
	(0.480)
Employees_firm_size _10_19	0.957*
	(0.550)
Employees_firm_size _20_99	0.422
	(0.397)
Employees_firm_size _100_499	-0.732***
	(0.208)
Employees_firm_size _500	-0.127
	(0.154)
Less_high_school	0.156***
	(0.0274)
High_school_graduate	-0.204***
	(0.0310)
Constant	-0.824
	(1.002)
Observations	320
R-squared	0.979

Note: The dependent variable is the log of number of patents in per capita term. All the variables are taken in logarithmic form. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3.3 Fixed effects

VARIABLES	Fixed Effects
R&D_expenditures_per_capita	0.162***
	(0.0473)
White_employees	0.271**
	(0.123)
Black_employees	-0.115***
	(0.0342)
Hispanic_employees	0.0113
	(0.0332)
Patent_applications	0.503***
	(0.0550)
Employees_in_constrctuion	0.0914
	(0.138)
Employees_in_manufacturing	0.0329
	(0.0946)
Employees_in_service	-0.0926
	(0.142)
Employees_firm_size_0_4	0.790**
	(0.347)
Employees_firm_size _5_9	-1.031
	(0.657)
Employees_firm_size _10_19	1.010
	(0.645)
Employees_firm_size _20_99	-0.214
	(0.446)
Employees_firm_size _100_499	0.0817
	(0.233)
Employees_firm_size _500	-0.172
	(0.184)
Less_high_school	0.0349
	(0.0285)
High_school_graduate	-0.0527
	(0.0336)
Constant	-3.885***
	(1.217)
Year Fixed Effects	YES
Country Fixed Effects	NO
Observations	320
Number of code_state_name	40

Note: The dependent variable is the log of number of patents in per capita term. All the variables are taken in logarithmic form. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3.4 Difference and System GMM

VARIABLES	Difference GMM	System GMM
Lagged_patent	0.421	0.804***
	(0.561)	(0.106)
R&D_expenditures_per_capita	-0.164	0.0213
	(0.294)	(0.0449)
Patent_applications	-0.203	0.142*
	(0.196)	(0.0741)
White_employees	0.995	0.106
	(1.238)	(0.0895)
Black_employees	-0.594	-0.0585***
	(0.723)	(0.0187)
Hispanic_employees	0.0960	0.0231
	(0.301)	(0.0142)
Constant		-0.0236
		(0.458)
Observations	325	380
Number of code_state_name	40	46
Number of instruments	29	37
Sargan p-value	0.000	0.022
Hansen J p-value	0.340	0.595
Hansen - diff	0.308	0.530
AR (1) p-value	0.271	0.007
AR (2) p-value	0.269	0.538

Note: The dependent variable is the log of number of patents in per capita term. All the variables are taken in logarithmic form. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3.5 Robustness checks

VARIABLES	System GMM - WHITES	System GMM - BLAKS	System GMM - HISPANICS
Lagged_patent	0.889***	0.912***	0.917***
	(0.0716)	(0.0362)	(0.0351)
R&D_expenditures_per_capita	0.0804	-0.0360	0.0130
	(0.0496)	(0.0216)	(0.0152)
Patent_applications	0.00983	0.127***	0.0589**
	(0.0500)	(0.0340)	(0.0233)
White_employees	0.127		
	(0.0942)		
Black_employees		-0.0507***	
		(0.0181)	
Hispanic_employees			0.0245
			(0.0323)
Constant	-0.531	0.595***	0.260***
	(0.557)	(0.147)	(0.0951)
Observations	498	397	439
Number of code_state_name	50	46	48
Number of instruments	51	51	51
Sargan p-value	0.402	0.000	0.316
Hansen J p-value	0.512	0.739	0.416
Hansen - diff	0.190	0.574	0.601
AR(1)	0.004	0.003	0.013
AR(2)	0.312	0.264	0.526

Note: The dependent variable is the log of number of patents in per capita term. All the variables are taken in logarithmic form. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 3.6 Level of instruction on Black/White employees

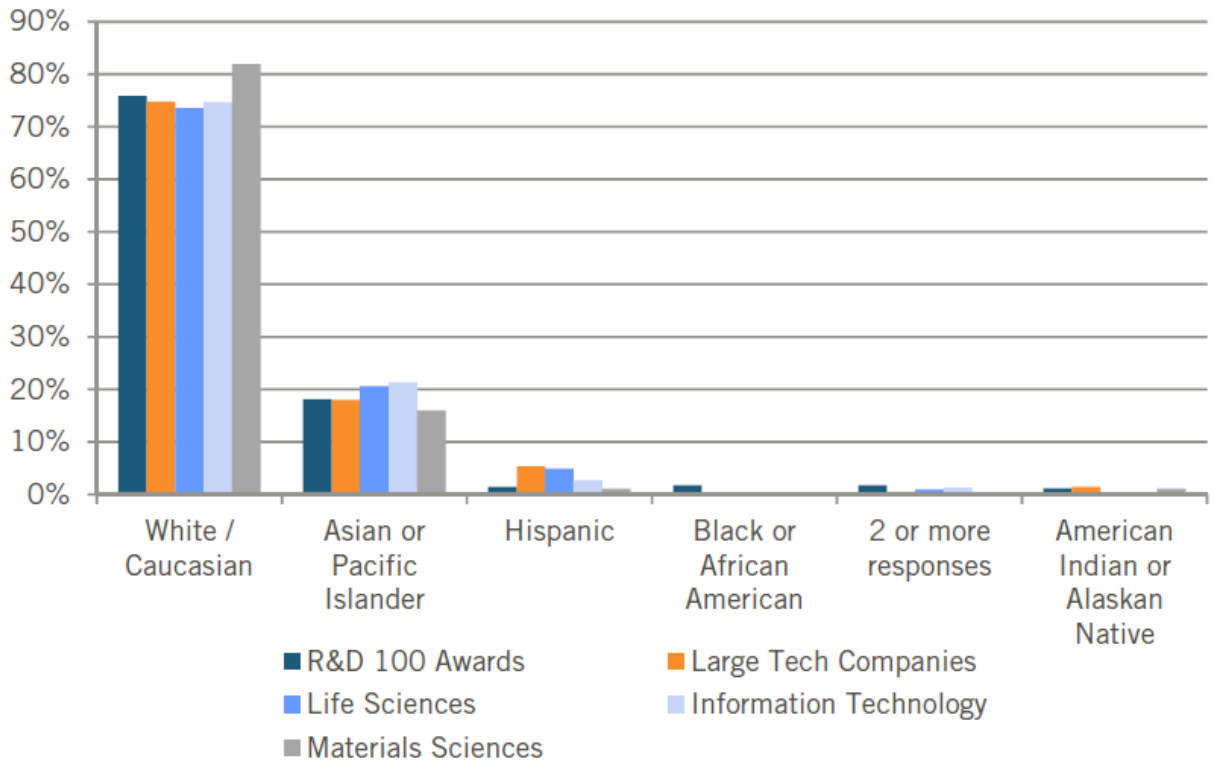
VARIABLES	SystemGMM_ WHITES	SystemGMM_ BLACKS
Lagged_patent	0.925***	0.764***
	(0.0728)	(0.0687)
R&D_expenditures_per_capita	-0.159	-0.193*
	(0.103)	(0.0966)
Patent_applications	0.148***	0.324***
	(0.0516)	(0.0819)
White_employees	-0.0179	
	(0.102)	
Interaction_White_edu_highlevel	-0.0124	
	(0.0151)	
Interacion_White_edu_lesslevel	0.0105	
	(0.0144)	
Black_employees		-0.00799
		(0.0529)
Interaction _blacks_edu_highlevel		-0.0320*
		(0.0182)
Interaction _blacks_edu_lesslevel		0.0275
		(0.0168)
Constant	0.965	1.261**
	(0.607)	(0.509)
Observations	397	310
Number of code_state_name	50	41
Number of instruments	38	39
Sargan p-value	0.000	0.000
Hansen J p-value	0.031	0.221
Hansen - diff	0.958	0.999
AR (1)	0.000	0.000
AR (2)	0.065	0.286

Note: The dependent variable is the log of number of patents in per capita term. All the variables are taken in logarithmic form. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Figure 3.1: U.S.-Born Share of U.S. Population and of Survey Respondents, by Ethnicity

Ethnicity of U.S.-Born Innovators	Percent of Innovation Sample	Percent of United States Population	Rate of Representation
White	59.6%	59.2%	1
Asian	1.5%	1.8%	0.8
Black or African American	0.3%	11.3%	0.0
Hispanic	1.4%	11.5%	0.1
Two or More Races	0.9%	1.9%	0.5
Native American	0.9%	0.9%	1.1
Total U.S.-Born	64.5%	86.5%	0.7

Figure 3.2: Ethnicity of Innovators, by Sample



APPENDIX

3.A Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
PATENTS	572	6.443945	1.502613	2.397895	10.21596
R&D expenditure per capita	548	6.546705	.7565719	4.72023	8.247535
WHITE employees	561	7.237915	1.046041	4.672829	9.502338
BLACK employees	448	5.240526	1.349439	1.098612	7.237059
HISPANIC employees	486	4.833778	1.41454	1.609438	8.663369
PATENT APPLICATION	561	5.772015	1.508421	1.658228	9.363338
CONSTRUCTION	561	11.26609	1.045919	8.624252	13.77306
MANUFACTURING	561	11.86763	1.335859	7.247793	14.4033
SERVICES	561	11.26385	1.165798	8.750366	13.99783
ENTERPRISES SIZE 0-4	561	11.19369	.9556533	9.507701	13.4981
ENTERPRISES SIZE 5-9	561	11.35975	.9384824	9.736666	13.61574
ENTERPRISES SIZE 10-19	561	11.57841	.9399859	9.927741	13.81551
ENTERPRISES SIZE 20-99	561	12.42877	.9780911	10.59708	14.77102
ENTERPRISES SIZE 100-499	561	12.22382	.9939825	10.14537	14.55745
ENTERPRISES SIZE 500	561	13.39512	1.113424	10.89804	15.71762
LESS HIGH SCHOOL	452	5.009321	1.534772	1.098612	9.174091
HIGH SCHOOL GRADUATE	456	5.009321	1.534772	1.098612	9.802451

Notes. List of US state: ALABAMA, ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, FLORIDA, GEORGIA, HAWAII, IDAHO, ILLINOIS, INDIANA, IOWA, KANSAS, KENTUCKY, LOUISIANA, MAINE, MARYLAND, MASSACHUSETTS, MICHIGAN, MINNESOTA, MISSISSIPPI, MISSOURI, MONTANA, NEBRASKA, NEVADA, NEW HAMPSHIRE, NEW JERSEY, NEW MEXICO, NEW YORK, NORTH CAROLINA, NORTH DAKOTA, OHIO, OKLAHOMA, OREGON, PENNSYLVANIA, PUERTO RICO, RHODE ISLAND, SOUTH CAROLINA, SOUTH DAKOTA, TENNESSEE, TEXAS, UTAH, VERMONT, VIRGINIA, WASHINGTON, WEST VIRGINIA, WISCONSIN, WYOMING.

* All the variables are taken in logarithmic form.

3.B Data source and definition

Variable	Definition	Source
PATENTS	This dataset counts only utility patents (i.e., "patents for invention") – in per capita term - granted by the U.S. Patent and Trademark Office during the period 01.01.1963 - 12.31.2015.	The source of the data used is the TAF database maintained by the U.S. Patent and Trademark Office.
R&D expenditures per capita	R&D Expenditure per Capita (Total R&D Expenditures per Capita). From 1998 to 2012.	National Science Foundation.
EMPLOYEES by CULTURE • **Blacks** • **Whites** • **Hispanics**	Data for demographic groups. From 1999 to 2016.	Bureau of Labor Statistics, Current Population Survey.
PATENT APPLICATION	Number of international patent application under the PCT. From 1990 to 2011.	WIPO - World International Property Organization.
FIRM SECTORS • **Construction** • **Manufacturing** • **Services**	This categorical variable classifies employees by the sector in which the establishment is classified. These are Standard Industrial Classification (SIC) codes. 15 CON Construction. 20 MAN Manufacturing. 70 SRV Services. From 1988 to 2011.	U.S. Census Bureau
FIRM SIZE • **0-4** • **5-9** • **10-19** • **20-99** • **100-499** • **500 or more**	Establishment Size (SIZE) – This categorical variable classifies employees by firm size in all sectors. Establishment size is defined as the average of year t-1 and year t employment. From 1988 to 2011.	U.S. Census Bureau
LESS HIGH SCHOOL	Less than high school at registration. From 1995 to 2008.	Public Workforce System Dataset (PWSD). United States Department of Labor - Employment and Training Administration.
HIGH SCHOOL GRADUATE	High school graduate at registration. From 1995 to 2008.	Public Workforce System Dataset (PWSD). United States Department of Labor - Employment and Training Administration.

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