Can Trust Explain Patience?

A Cross-Country Analysis*

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ABSTRACT: Variation in trust positively explains variation in patience. Across countries this paper finds that a one standard deviation increase in the variation of *Trust* leads to an increase of at least 10 percent of variation in *Patience*. The implication of this result is that generating and maintaining a trustful environment is fundamental to encourage patience and other economy enhancing behavior. The results of this study confirm that generating and maintaining an environment of trust is essential to encourage patience for the advancement of economic prosperity.

Keywords: Trust, Patience, Endogeneity, IV Regression

JEL Codes: A12, A13, D91, O50

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List of Abbreviations

BBC	British Broadcasting Corporation
CIA	Central Intelligence Agency
DU	Discounted Utility
GDP	Gross Domestic Product
GPS	Global Preferences Survey
GSS	General Social Survey
HLR	Heteroscedastic Linear Regression
LR	Likelihood Ratio
MEL	Money Earlier or Later
OLS	Ordinary Least Squares
UN	United Nations
US	United States of Amerika
WPR	World Population Review
WVS	World Value Survey
2SLS	Two-Stage Least Squares

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"Ye who wish to reach the end of your journey, hurry not on; practise my advice, and learn deliberation. The Arab horse makes a few stretches at full speed, and is broken down; while the camel, at its deliberate pace, travels on night and day, and gets to the end of his journey."

Sa'di (1258 CE). *The Gullistan.* Chapter 6, part 4.

Introduction

This paper investigates the link between trust and patience. It builds on the positive correlation reported in earlier work from behavioral economics and other related disciplines. Trust and patience are crucial for economic prosperity in capitalist economic systems. The Dutch played a pioneering role in the development of the capitalist economy. Trust was associated with religion[1], while patience was enforced by the fact that the Dutch supremacy in world trade originates from skills necessary to sail the oceans by only the force of wind. Doing research to understand better the relationship between trust and patience in modern economies is encouraged by the potential connection described in the literature (Cohen *et al.*, 2020).

Patience and economic growth are intertwined. The roles of schooling (Becker & Mulligan, 1997) and saving behavior (Carroll *et al.*, 2000) are considered to be crucial, but patience is also linked to comparative development. About 40 percent of per capita income variation can be explained by patience, while controlling for country fixed effects, one standard deviation increase in patience leads to a 15 percent increase of saving probability (Falk *et al.*, 2018).

There can be no trade without trust, says Arrow (1974). A modern lucent example of this statement is the role of trust in local Indian society. The combination of high poverty, distrust in the government, and densely populated cities has transformed personal relationships into a form of currency. According to BBC reporter Nayantara Dutta '*paisa vasool*' or 'value for money' brings local shops and inhabitants together. [2] Shop owners actively forego or delay payment as investment for a future loyal customer relationship. Customers are willing to pay a higher price for honesty: If the shop owner next door has the product a customer seeks, your trusted shop owner will make you aware of it. If the customer is short of money and is allowed to pay sometime in the near future, the customer is bestowed with trust that is repaid by returning to the shop regularly. In a *paisa vasool* economy, money is only a minor part of any transaction.

[1] "*God zij met ons*" (*In God we trust*) was written on the side of the Dutch Florin (guilder).

[2] See http://www.bbc.com/travel/story/20210528-how-the-indian-economy-is-built-on-generosity

When patience is measured experimentally, trust is often assumed to be constant or of trivial effect. An important psychological study of patience is the Marshmallow project, proposed by Mischel and Ebbesen in the 1970s. In short, children that were able to delay gratification for more sweets are shown to fare better later in life, both economically and in terms of health and well-being (Mischel *et al.*, 1989). The goal of investigating the relationship between patience and trust econometrically is to show that trust has a significant effect on patience. A part of measured impatience from such experiments can then be explained by participants' distrust. In studies that are concerned with the effect of patience, trust is often assumed to be either constant, given, or considered an alternative preference measure or belief variable. In such studies trust may be a confounding variable and the studies' outcomes may be biased. When the effect of patience varies with the level of trust, or impatience with distrust, results of studies on patience may be subject to omitted variable bias when trust is left out of the equation.

Although the precise magnitude of the association is not well known, patience accrues faster in trustful environments. But, to what extent does variation in trust explain variation in patience? In fact, surprisingly little is known about the possible relevance of the economic relationship between patience and trust. To date, no theoretical framework exists to explain the connection, whereas the empirical relationship has not been thoroughly investigated either.

For the empirical analysis the main data source consists of survey data. The same individual answers questions regarding patience and trust. The data are of high quality. However, the answers people give to questions on patience and trust may be based on information not observed by the researcher. Examples of confounders are fatigue, addiction, hunger, financial or personal stress at home, and other frame of mind related factors. Consequently, the data may suffer from an endogeneity problem in a similar vein as Becker and Mulligan (1997) showed how time preferences are determined endogenously. Valid and strong instrumental variables are needed to correct for possible endogeneity bias. This will be tested and forms the primary reason of why an instrumental approach (2SLS) will be used.

The paper is organized as follows. Section 2 consists of the definition and essential literature for patience. Section 3 presents the definition and literature for trust. Section 3 describes the shared findings of patience and trust. Section 4 summarizes the data. Section 5 presents the econometric strategy and the tests used to analyze the results in section 6. Section 7 concludes.

1. Patience

Patience is defined as "*the capacity, habit, or fact of being steadfast despite opposition, difficulty, or adversity*" (Merriam-Webster[3]). A patient person can withstand the temptation of direct gratification in favor of a higher payoff at a later point in time.

A large literature exists on the effects of patience and its defining factors on economic outcomes. Countries with more patient populations appear to have higher per capita output and higher steady state capital stock (Falk *et al.*, 2018). Some theoretical models of economic growth account for patient behavior, while others do not. The Ramsey-Cass-Koopmans growth model was first introduced by the mathematician Ramsey (1928). Cass (1965) and Koopmans (1965) extended this model introducing the micro foundation of household consumption with an endogenous saving rate. It is this saving rate, which can be interpreted as a proxy for time preference. Solow 's (1956) model of long-term growth also assumes that technological progress is exogenous. The difference between the Ramsey-Cass-Koopmans and the Solow model of economic growth, however, is that the first assumes growth through endogenous household savings, while the latter assumes that growth comes from the exogenous accumulation of random technology shocks. The positive correlation between patience and economic growth is also present in Romer's model of endogenous growth, where scientists and innovators act dynamically and optimally in the presence of technologically innovative opportunities. (Romer, 1990).

There is a strong and positive correlation between saving and economic growth. According to Carroll *et al.* (2000) the causal path is increased growth which leads to more saving and not the other way around. This phenomenon, contradicting macroeconomic Solow-type growth models, is explained by the effect of habit formation. Individuals can acquire more utility with a stable amount of spending due to growth. Thus, maintaining the level of -- before growth -- utility leaves the individual with more money to spare. The theory of Strulik (2012) builds on the findings of Carroll *et al*. (2000), extending the endogenous growth model with wealth-dependent time preference states. The model predicts that more wealth gives rise to more patience. Strulik's economy with "endogenous patience" explains both long-run change in saving behavior as well as economic growth. Hübner and Vannoorenberghe, (2015) use an instrumental approach to investigate the effect of patience on long-run income. The way future

[3] "Patience." *Merriam-Webster.com Dictionary*, Merriam-Webster, https://www.merriam-webster.com/dictionary/patience.

events are marked per spoken language is used as an instrument for patience . They report a strong positive effect of patience on productivity, capital stock, and income per worker.

Christopher Columbus discovered the Americas in 1492. The "Columbian" exchange of crops, domestic animals, and peoples between the new and the old world began soon after. Trade has flourished across the Atlantic Ocean ever since. Europe got to know some new staple crops this way, such as the potato. Crops discovered in Africa, for example sugar and coffee, were introduced into the Americas (Nunn & Qian, 2010). Galor and Özak (2016) argue that higher crop yield in the past leads to higher agricultural investment in future generations. They use the Columbian Exchange as a natural experiment to support this claim. A positive experience in agricultural investing encourages learning processes of adaptation, selection, and long-term orientation. According to the authors, individuals who happen to have ancestors from such beneficial geographical regions are characterized by more optimal time discounting today (higher patience). The Columbian Exchange has an additional positive effect on the crop yield effect on future investment, albeit solely for the regions where the new staple crop exceeds historical crop yield. Their findings are robust against controlling for other geographical characteristics such as elevation, an island dummy, and a landlocked dummy. Variation in land quality for the cultivation of different staple crops turned out to be the key variable in explaining the long-lasting effect of early agricultural investment on long-term orientation in consecutive generations. Consequently, time preferences appear historically to be partly determined by culture and geographical conditions. Maintaining a farm takes time. Bridging the time between harvesting seasons requires patience.

Frederick *et al.* (2002) presents a critical overview of time-preference and intertemporal decision-making processes. The importance of intertemporal decision making, both for individual income as well as for national wealth, has been addressed early on by Adam smith. The first ideas in economics heavily relied on findings from a psychological point of view. Early perspectives on intertemporal decision making are described as a 'joint product of many conflicting psychological motives' (Frederick *et al.*, 2002, p.351).

The very first widely accepted economic model in this subject was introduced by Paul Samuelson in 1937. He introduced the discounted utility (DU) model. At the time this model was praised for its descriptive representation of human behavior and applicability for normative policy. The key ingredient of the DU model is the discount parameter, reducing all differing reasons for intertemporal decision making into a single parameter. This single parameter describing a multi-faceted decision process is no longer considered valid. a big portion of actual behavior can not be described by the DU model. Empirical observed discount rates seem not to be constant over time but decline instead. Losing something you have is more painful than getting something that is financially worth as much (Thaler, 1981).[4]

The findings of DU-anomalies sparked the search for other models that better describe actual behavior. One of these alternatives is the quasi-hyperbolic discounting model with a modified discount function. [5]

$$U_t = u_t + \beta(\delta u_{t+1} + \delta^2 u_{t+2} + \delta^3 u_{t+3} + \cdots) = u_t + \beta \sum_{x=1}^{\infty} \delta^x u_{t+x} \qquad (1)$$

Present bias exists if $\beta < 1$. Without present bias ($\beta = 1$) equation 1 becomes the standard economic model of intertemporal choice.[6] In this model, total utility today (U_t) is directly affected by today's utility gain (u_t) and future expected utility, weighted by β and δ.[7] The long-run discount factor (δ) expresses mental distance of time (Ericson & Laibson, 2019). In this context, high patience implies that $\beta = 1$ and δ is close to one. The perfectly rational homo economicus , characterized for example by Persky (1995), is characterized by the combination $\beta = \delta = 1$.

Imagining the future is part of most school curricula (Becker & Mulligan, 1997).[8] A schoolteacher's main duty is to prepare students for perils and difficulties as an adult. Hypothetical scenarios are discussed and interpretated repeatedly. Accordingly, imagination of abstract future enjoyment, a key ingredient for exerting patience, is trained at school. In other words, additional schooling potentially increases an individual's β in the quasi-hyperbolic discounting model (1). The main caveat of schooling as a predictor is that solely sitting in a class does not enhance the qualities school is meant for. The quality of schooling is a decisive factor (Oreopoulos & Salvanes, 2011). Solely years of (high-) quality schooling has the positive effect mentioned above.

The Money Earlier or Later scheme (MEL), has been the working horse experimental design for approximating patience, since its introduction by Richard Thaler (1981). Participants are asked to state their preference between a sum X at T_1 or a sum Y at time T_2, where X < Y and

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[4] See Loewenstein and Thaler (1989) for additional anomalies.

5 See Phelps and Pollak (1968) Laibson (1997) and O'Donoghue and Rabin (1999).

6 See Ramsey (1928) and Samuelson (1937).

7 $\beta, \delta \in [0,1]$

8One example given by the authors is history: This is covered to understand how society got where we are today and learn from the past for improved decision making in the future.

$T_1 < T_2$. Experimenters have the option to vary A: the amount of money, such that the monetary gain of waiting changes or B: the time element, changing the distance between direct and delayed gratification. Experimental results indicate that individuals are prune to time-inconsistent and present-biased behavior (Ainslie, 1991) and that technological development, improving liquidity does not help, because it eliminates personal commitment devices (Laibson, 1997). An example is only withdrawing cash once a week to avoid temptations of overspending. now you can pay contactless with debit - and credit cards as well as smartphones and -watches.

Psychologists, including Walter Mischel, argue that defining a person's patience measured as a single number may not suffice.[9] Patience does not only depend on one's current mental state. It is also affected by the environmental setting this person happens to be in. Based on experimental evidence, Muraven *et al.* (1998) show that patience is not fixed but instead depends heavily on the level of fatigue. Just like walking and swimming, resilience against temptation appears to be a physical exercise.

Other examples of the variability of patience include stress eating, sadness, and emotional gratitude. Stress eating can be considered as a sign of reduced self-control (Stutzer *et al.*, 2016). Stress eating in this context means that an individual is more likely to consume unhealthily when in stressful situations. Mofitt *et al.* (2011) observe individuals over a long period of time and conclude that patience is linked to economical and health related factors.
Research addressing strategies of increasing self-control includes Duckworth *et al.* (2018). Sadness decreases patience; a person that feels miserable is more likely to focus on getting money as soon as possible (Lerner *et al.*, 2013). Guided by this adverse role of sadness, DeStano et al. (2014) study the effects of gratitude on patience and conclude that it has a positive effect.

Intertemporal decision making is influenced by the magnitude, timing, and the sign of potential outcomes (Thaler, 1981). The order in which delayed gratification and early consumption are compared has an effect on the revealed outcome (Loewenstein, 1988). This hypothesis is confirmed experimentally by Weber *et al.* (2007). When costs of delaying are high, Reuben *et al.* (2015) show experimentally that highly impatient people are more likely to procrastinate. Toussaert (2018) shows that individuals fare better 'temptation wise' by abstaining from appealing low self-control options. Moreover, patience is found to be positively related with cognitive ability (Dohmen *et al.*, 2010). Related present-day research includes working papers

[9] This is one of the main results from the Marshmallow Tests: See Mischel & Ebbesen (1970) for the presentation of the test and Mischel et al. (1989) for the longitudinal study results.

and work in progress of Sunde *et al.* (2020), finding an empirical correlation between patience and accumulation of both human as well as physical capital, and Falk *et al.* (2019) studying a correlational link between patience and longevity.

According to Cohen *et al.* (2020) the academic world has noticed the absence of other factors, including distrust, as a possible answer to the question why individuals choose immediate rewards over promised delayed but higher returns. A person's interpretation of promise may depend on other mental factors than patience. One such factor is trust, which most likely develops quite differently in different individuals. However, the role of trust, or distrust rather, explaining present biased decision making in a MEL setting is unprecedented. Variation in patience, which has been found an important explanatory variable in, for example, per capita income (Falk *et al.*, 2018) may well be correlated with variation is trust. Hence, empirical strategies for the measurement of factors such as trust, which are independent of patience, are yet to be developed. Consequently, the empirical role of trust in understanding time-preference is not yet clear.

2. Trust

Trust is ever-present to almost all economic actions (Arrow, 1974). The definition of trust, according to Merriam-Webster[10] is "*assured reliance on the character, ability, strength, or truth of someone or something*." But what effect trust has economically is still under discussion.

On the one hand, trust and trust dependent behavior are circumstantial and could therefore not be comprised by a single number (*eg.* Evans and Krueger, 2009). On the other, trust and trustworthiness depends on ethics (Banerjee *et al.* 2006). Hence, pinning down an individual's level of trust in a single number is difficult at best.

The economic importance of trust and a fair society in general is undisputed. Scarcity of goods instigates this importance: Assuming abundance of all goods means that there is no struggle for resources. No other will try to take what is yours and 'perfect' allocation is not an issue (Casson & Della Giusta, 2006). Whom to bestow with the goods necessary to produce optimally is ex ante unknown and can ex post not be checked. This is where Reputation -- of being trustworthy and capable -- becomes valuable in in the presence of scarcity. Brand name and certificates

[10] "Trust." Merriam-Webster.com Dictionary, Merriam-Webster, https://www.merriam-webster.com/dictionary/trust.

have value attached only if this ‘badge’ is considered trustworthy. Gaining and keeping a good reputation is worth real money: Once considered selfish, others will consider and weigh carefully to accept an offer and actively search for the catch in any deal of an untrustworthy individual or firm. A bad reputation can be bad for business. The negative reputation impact of Monsanto on Bayer after the latter incorporated the first is a striking example. Bayer shares lost 10.4% value on the German stock market after Monsanto products were linked to a cancer case in the US.[11]

In a study among Italian individuals Guiso *et al.* (2004) show that in combination with low education and failing jurisdiction, trusting and being trustworthy becomes more important in an economic sense. In the absence of law enforcement, an (informal) contract is based on trust. In other words, as soon as (unofficial) contracts no longer suffice to enforce and maintain quality, reputation of trustworthiness takes over.

Economic research on trust is often conducted in experimental settings. Houser *et al.* (2010) show that in an investment game trust and risk are not rigorously attached to each other. The authors assure that *“(i) aggregate investment distributions differ significantly between trust and risk environments, and (ii) risk attitudes predict individual investment decisions in risk games but not in the corresponding trust games.”* (Houser *et al.*, 2010, p.72). Brülhart and Usernier (2012) use an experimental setting to distinguish trust from altruism. The outcomes of their financial trust-game, which was conducted among university students, show that no connection exists between their conception of trust and wealth accumulated earlier in the experiment. Falk *et al.* (2013) show that, in a trust game setting, students return less generously compared to non-students. This indicates a selection bias when experiments are conducted only in a university lab, and hence shows that trust may depend on the environmental setting or on the selection of subjects among which trust is being measured. The significance of this result is lost when controlling for demographics, which suggests that the type of personality rather being a university student explains this observation.

Besides experiments, research on trust is mainly conducted by means of surveys. Participants are asked to rate statements on a scale from one [I entirely disagree with this statement] to ten [I entirely disagree with this statement]. Example statements are “*Most people can be trusted.*” or “*You can’t be too careful in dealing with people.*”.[12] Algan and Cahuc (2010) analyze

[11] See https://www.bbc.com/news/world-europe-45167906

[12] Ben-Ner and Halldorsson (2010) quote the general social survey (GSS) and world value survey (WVS).

American immigrants' country of origin, and argue that trust is inherited. Inherited trust has an important effect on growth; the level of trust at the origin of one's (grand-) parents is shown to have a lasting effect on the next generations' aptitude to trust. This result is emphasized by findings from the former Hapsburg Empire of long-lasting effects on trust and corruption (Becker *et al.,* 2016). In a sample of Eastern European countries where the Hapsburg Empire border crosses current country territories, households within and outside the empire borders are compared. This multi-ethic empire is renowned for a respected and well-functioning bureaucracy. The Hapsburg dynasty and bureaucracy ceased to exist in 1918 but living within the former borders of the Hapsburg domain today is still connected with higher trust in the local juridical system and lower willingness to commit bribery. The Hapsburg empire was vast and long-lasting. It contained multiple modern countries; the 1918 eastern border crosses through Montenegro, Poland, Romania, Serbia, and Ukraine. Becker *et al*. (2016) use country fixed effects and a geographic regression discontinuity approach to filter out underlying and unobserved fixed effects.

Ethnic homogeneity within a society has a positive effect on social trust (Delhey and Newton, 2005). Based on US Census data Putman (2007) finds that when homogeneity increases, self-reported inter-racial, intra-racial, and neighbor trust increases. The exact process and timing of human evolution is under debate, but scientists can say with certainty that the origin of the human being is somewhere in Central Africa (Diamond, 1997). When peoples disperse, those who think alike travel together. Accordingly, holding other things constant, heterogeneity within a society diminishes when some people move away while others stay. There is a tradeoff between advantages of diversity and drawbacks of preference heterogeneity (Alesina & La Ferrara, 2005). Diversity, through different abilities shaped by culture and experience, is a thriving factor for innovation and creativity. Pure uniformity of tackling an issue within a team has a negative effect on innovative capacity. The drawback of preference heterogeneity is that conflict through diversity can lead to minority oppression. Oppression in any form can lead to political unrest. Civil war is the ultimate consequence of (long lasting) political instability. The caveat is that people did not stay put. Slave trade in particular pushed a large part of an entire generation into migration, which altered the genetic landscape until today (Micheletti *et al.,* 2020). Globalization and the mass migration from Europe (1850 - 1913) was partly enhanced due to the change from sailboat to steam engine, which reduced traveling time to the new land significantly (Chriswick & Hatton, 2003). Both mass (forced) displacement and globalization have altered the global pre-industrialization genetic distribution worldwide.

3. Patience and Trust

An exemplary situation of patience and trust going hand in hand is going to school. Patience can be partly taught or enhanced in school and individuals can learn to trust and be trustworthy. Additional years of (voluntary) schooling is correlated with more patience[13] and higher ability to trust[14] (Oreopoulos & Salvanes, 2011). Spending time in a learning facility is costly because time spent learning could be used making money. Students (and their sponsors) are willing to forego an income now because it is to be expected that the signal of a degree means higher earnings in the future. Hence, going to school depends on patience and on trust related to the value of the earned certificate.

The relationship between patience and trust has been investigated primarily in psychology. The absence of a father has a negative effect on patience at a young age, probably caused by the lack of confidence (Mischel, 1961). Michaelson *et al.* (2013) test the effect of social trust on delaying gratification. The experiment used different character vignettes and faces that varied in trustworthiness. The study's finding *"[...] provide the first demonstration of a causal role for social trust in willingness to delay gratification, independent of other relevant factors, such as self-control or reward history"* (Michaelson *et al.*, 2013, p. 1). McGuire and Kable (2013) introduce the idea that seemingly observed impatience can be explained by a rational trade-off when uncertainty of payment in magnitude and/or timing is introduced.[15] Kidd *et al.* (2013) extends the Marshmallow Tests (Mischel & Ebbesen, 1970) by considering 'environmental reliability' and shows that children in a trustworthy environment wait significantly longer. Michaelson *et al.* (2016), conducted a novel test to determine the effect of social trust on a children's ability to delay gratification. After observing an adult acting untrustworthy a child is generally less likely to wait, compared to a child who observes an adult behaving in a trustworthy fashion.

4. Data

This section describes the data used in this research. The main data source on patience and trust is the Global Preference Survey (GPS), which is a globally representative dataset on risk and

[13] See Oreopoulos & Salvanes, (2011) Figure 4A.
[14] See Oreopoulos & Salvanes, (2011) Figure 3D.
[15] The idea is as follows: we will wait for X minutes: if the high-utility product is not handed over by then We will opt for the low-utility product available on the spot.

time preferences.[16] Control variables and potential instruments are gathered from various sources, including CIA World Factbooks, World Population Review, World Bank, Spolaore and Wacziarg (2018), and Ashraf and Galor (2013).

4.1. Global Preference Survey (GPS)

The GPS data were collected as a part of the 2012 Gallup World Poll. The collection process contains four parts. First, survey items were selected using an experimental validation process followed by translating the survey and fine-tuning numerical quantities to guarantee cross-country comparability. Thirdly, a pre-test of the selected survey items was implemented in several culturally diverse countries to ensure applicability in a multi-cultural sample. In the final step, the interviews were held by means of telephone where possible, using either a random-digit-dial method or nationally representative list of phone numbers. In (developing) countries with less than 80% of the population having access to a phone, face-to-face interviews were conducted in randomly selected households using the data collection mechanisms recurrently used by Gallup.[17] In this study countries are selected to maintain a representative global sample. All continents and all (climatic) regions are included, favoring non-neighboring and culturally different countries. Based on these criteria 76 countries are part of the GPS survey.[18]

4.1.1 Patience:

An individual's level of patience results from the following weighting function:
"*Patience = 0.7115185 × Staircase patience + 0.2884815 × Will. to give up sth. today*" (Falk *et al.* 2018 online appendix p. 20) with the weighting of patience measuring elements depending on z-scores per survey item (individual level) resulting from the experimental validation procedure (Falk *et al.*, 2016). Sums of weights are set to equal to one.
[Staircase patience] is a quantitative survey element, where the individual is asked to state binary MEL preferences for five consecutive times. Since the amount asked depends on the previous answers given, there are $2^5 = 32$ possible outcomes.

[16] See https://www.briq-institute.org/global-preferences/home
[17] See https://www.gallup.com/178667/gallup-world-poll-work.aspx for further details.
[18] see Table 1 in Falk *et al.* (2018) online appendix for detailed country sample descriptions.

[Will. to give up sth. today] is a qualitative survey element, where the individual is asked to state on a 1-10 scale how likely he or she is to postpone a smaller benefit today for a greater benefit in the future.

4.1.2 Trust:

An individual's level of trust is based on a single qualitative survey item, where the individual is required to state on a 1-10 scale how well the following statement describes him- or herself: "I assume that people have only the best intentions" (Falk *et al.*, 2016, p. 42).
No additional weighting is required.

On the individual level, raw data has been transformed such that (A) the preference measure has mean zero and (B) standard deviation is equal to one. This way, the preference measures, including patience and trust, have been normalized for comparison purposes. Hence, values smaller than zero are below average and values above zero are above average. For a detailed data description, I refer to Falk *et al.* (2018).

4.2. The World Factbook by the CIA.

The World Factbook is produced and maintained by the US Central Intelligence Agency (CIA). It has a multitude of sources either part of or linked to the US government.[19] From this database I use the following data:

- Literacy rate: The percentage of people that have reached the age of 15 and are capable of reading;
- ln(Imports): The Imports data in US dollars has been transformed in STATA. Imports data is defined as the total US dollar amount of produce imports based on exchange rate;
- ln(Exports): The Exports data in US dollars has been transformed in STATA. Exports data is defined as the total US dollar amount of produce exports based on exchange rate;
- Landlocked: From the list of landlocked countries a dummy variable has been created. A landlocked country is characterized by sharing no borders with a navigable water mass as passageway to another country. 100 percent of the border leads directly into another country;

[19] See https://www.cia.gov/the-world-factbook/about/copyright-and-contributors/ for a full description and listing of sources.

- Island: From the list of islands a dummy variable has been created. An Island, as direct opposite of a landlocked country, shares the entire border with a Sea or Ocean. It is impossible to travel into another nation by means of transport via land;

4.3. World Population Review (WPR)

The WPR relies on data from the UN and the US census bureau.[20]

- Urban Population: The percentage of the population living in an urban area.
  An urban area is defined as an inhabited space with no wide gaps between structures. The majority of the population is not engaged in fishing or agriculture;
- ln(GDP per Capita): The GDP per Capita data in US dollars has been transformed in STATA;
- Density: The number of people per square kilometer;
- Population Growth Rate: The percentage change in population from 2019 to 2020.

4.4. Genetic Distance

Spolaore and Wacziarg (2018) provide a dataset[21] on ancestral distance with direct comparison between countries. populations are matched with countries, using country ethnic composition data. Weighted genetic distance is defined as the expected genetic distance between two random individuals of two countries. The key ingredient, different in the updated dataset, is the microsatellite data from Pemberton *et al.* (2013) on genetic relationship between peoples and different chimpanzees at the population level. Using the Pemberton *et al.* (2013) data, enables finer matching in some Asian and African countries, compared with the original dataset used in Spolaore and Wacziarg (2009).

Genetic distance is based on gene form (allele) and is equal to zero if and only if the genetic distributions are identical across populations. The longer two peoples are separated, the more the genes can evolve in different directions, either by means of random drift or natural selection. Genetic "distances […] are based on heterozygosity, the probability that two alleles at a given locus selected at random from two populations will be different." (Spolaore & Wacziarg, 2009,

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[20] See https://worldpopulationreview.com/about for a full statement on data presentation and accessibility.
[21] See Spolaore and Wacziarg (2009) for the old genetic distance dataset and a detailed analytical framework.

pp. 480-f.) All countries, enlisted, are compared directly. I choose Nicaragua, the country with the lowest average patience in the Gallup dataset, as the comparison country.

4.5. Bio-geographical Variables

Ashraf and Galor (2013) provide a rich dataset on country-level "bio-geographical" variables. All the quotes from this section can be found in the online appendix from this paper where not noted otherwise.

4.5.1 Variation in suitable land

"*The standard deviation of [a geospatial index of the suitability of land for agriculture, based on ecological indicators of climate suitability for cultivation, such as growing degree days and the ratio of actual to potential evapotranspiration, as well as on ecological indicators of soil suitability for cultivation, such as soil carbon density and soil pH] across half degree grid cells that are located within a country's national borders.*" (p.4)
The United Arab Emirates is characterized by the lowest variation in suitable land (0.003). It is a country that is entirely covered by desert sand[22]. Mexico, meanwhile, is the country with the highest variation (.396). This country consists of desert regions in the north, rainforests in the south, and varies in between.[23]

4.5.2 Variation in elevation

"*The standard deviation of elevation [of a country, in thousands ok kilometers above sea level, calculated using geospatial data at the 1-degree resolution] across the grid cells (at a 1-degree solution) that are located within a country's national borders*." (p.4) The country with the lowest variation in elevation is Estonia (.031). The one with the highest variation is China (6.176).

4.5.3 Percentage of arable land

[22] Source: CIA Factbook
[23] Source: CIA Factbook

"*The fraction of a country's total land area that is arable, as reported for the year 2000 by the World Bank's World Development Indicators online*" (p. 5) Botswana is the country with the lowest percentage of arable land (0.007 %). Bangladesh is the most heavily cultivated country (0.621 %).

The world bank definition of arable land:
"Arable land includes land defined by the [Food and Agriculture Organization of the United Nations] (FAO) as land under temporary crops (double-cropped areas are counted once), temporary meadows for mowing or for pasture, land under market or kitchen gardens, and land fallow. Land abandoned as a result of shifting cultivation is excluded". Arable land is fit for crop cultivation does not mean the amount of landmass that is possibly cultivatable.

4.5.4 Distance to waterways

"*The distance, in thousands of kilometers, from a geospatial grid cell to the nearest ice-free coastline or sea-navigable river, averaged across the grid cells that are located within a country's national borders.*" The country with the lowest average travelling distance to a waterway is the Phillipenes, a country consisting of many Islands (0.027). The country with the highest average is Russia (2.386).

4.5.5 Old world

The indicator variable is equal to 1 if the country is known to western civilization (Europe, Asia, or Africa) before the discovery of the Americas, dubbed the new world.

5. Theoretical Framework

5.1. Correlation and OLS

The first step for inference is correlation. To study whether or not trust may explain patience, We will examine the relationship between trust and patience within the Gallup dataset, the authors have made available upon request.[24] Hence, as a first step, the correlational

[24] URL: https://www.briq-institute.org/global-preferences/downloads

investigation of patience, trust, potential instruments, and control variables are reproduced and extended. After concluding the correlational investigation, Ordinary Least Squares regressions are estimated. The model is as follows

$$Y_i = \alpha + \beta T_i + \boldsymbol{\gamma}' \boldsymbol{X_i} + \varepsilon_i. \qquad 2$$

It's estimated parameters form the basis of further analysis. Expected general patience in country i is denoted by Y_i. The main element of the regression, trust, is denoted by T_i. Control variables ($\boldsymbol{X}$) include geographical and social controls. Estimates include the constant (α), the parameter for trust (β), a vector of parameters for control variables (γ), and an error term (ε_i). The error term captures all remaining variation not included in the model.

One issue with the current data set is that of a relatively small (aggregated) sample consisting of only 76 country-average observations. One more concern in the data is heteroscedasticity.

5.1.1 Test for heteroscedasticity

The Breusch-Pagan (1979) test for heteroscedasticity is based on the Lagrangian multiplier test statistic.[25] This test investigates whether the values of regressors (T_i & $\boldsymbol{X}$) influence the variance of the estimates errors, resulting from the (OLS) regression. Under the null of homoscedasticity (constant error terms), the test statistic is asymptotically chi squared distributed. This test can be performed directly in relevant statistical software such as STATA (Cameron & Trivedi, 2009). Cook and Weisberg (1983) advise not to solely rely on numerical statistics. Thus, I shall display and interpret plotted residuals against predicted patience values in combination with the Breusch Pagan test Statistic. As a final check I shall run heteroscedastic linear maximum likelihood regressions (HLR), where the variance is modelled as an exponential function of *Trust* (the specified variable). The key test is the likelihood-ratio (LR) test of the null hypothesis that the restricted model does not outperform the unrestricted OLS regression. In other words, the LR test of $\ln(\sigma^2) = 0$ is χ^2 distributed under the null. The rejection thereof tells us that the model of squared variance fits the data better than the OLS with constant variance.[26]

5.2. Instrumental approach (2SLS)

[25] Cook and Weisberg (1983) independently designed a similar test procedure.
[26] see https://www.stata.com/features/overview/heteroskedastic-linear-regression/

In the 2012 Gallup World Poll survey dataset participants have given answers to both time preference related questions and the single trust measuring question. When, in our data, *Patience* and *Trust* are set by the respondents on the basis of information not observable to the researcher that is correlated with *Trust* as well as with the error term in equation (2), the OLS regression results will most likely suffer from endogeneity bias. The endogeneity of *Trust*, the fact that *Trust* is not determined exogenously, but determined along with *Patience* (Y_i), can be tested using a two stage least square (2SLS) regression model with valid and strong instrumental variables (Stock & Watson, 2012). The following 2SLS model

$$Y_i = \alpha + \beta_i Z_i + \boldsymbol{\gamma}' \boldsymbol{X_i} + \varepsilon_i \qquad (3)$$

will be estimated. As in the OLS model, expected general patience in country i is denoted by Y_i. The main difference is the inclusion of the instrumental variable, Z_i, instrumenting *Trust* and thereby replacing T_i in (2) with the intention to filter out the endogenous part.

Endogeneity concerns with cross-country data is not new, especially in absence of time series data. Wang *et al.* (2016) have conducted an international large-scale survey on time-preference in universities across 53 countries. The authors also address endogeneity concerns in their regression models because of endogenous preferences that can be confounded by cultural and societal factors.

For an instrumental variable approach, two assumptions must hold. Firstly, the instrument (Z_i) is exogenous $(cov\{Z_i, \varepsilon_i\} = 0)$ and secondly, Z_i is relevant $(cov\{Z, T_i\} \neq 0)$. In other words, Z_i is no explanatory variable in the original OLS regression. Relevance can be statistically tested, making use of the first stage result in a 2SLS setting. A single instrument is considered relevant or informative, if the first stage F statistic is greater than ten. [27] For multiple combined instruments, this rule of thumb is not applicable. Validity of individual instruments can not be tested because the assumption on $cov\{Z_i, \varepsilon_i\}$ depends on unobservable residuals (ε_i). Hence, the validity argumentation relies on economic identification (Murray, 2006).

The 2SLS estimation occurs in two steps, hence the name. At first, the endogenous variable (T_i) is decomposed into a challenging component that is potentially correlated with the error term

[27] This rule of thumb is introduced by Staiger and Stock (1997).

and an exogenous component. Secondly, the exogenous component is then used to estimate β_i anew. The first stage begins with the following regression,[28]

$$T_i = \pi_0 + \pi_1 Z_i + \nu_i \quad (4)$$

connecting T_i (endogenous) and Z_i (exogenous). This is a simple regression with a constant (π_0), an error term (ν_i), and a slope parameter for the single independent instrumental variable (π_1). The two components are derived from equation (4). The part of T_i that can be predicted by Z_i is equal to $\pi_0 + \pi_1 Z_i$. Here, the exogeneity of the instrument is crucial ($cov\{Z_i, \varepsilon_i\} = 0$). The second, problematic, component is ν_i, that is correlated with ε_i ($cov\{\nu_i, \varepsilon_i\} \neq 0$). The motivation behind a 2SLS regression is to use the first, useful, part $\pi_0 + \pi_1 Z_i$ of T_i and discard the second, problematic, part ν_i. The impediment here is that the parameters π_0 and π_1 must be estimated because they are unknown. Therefore, the first stage applies OLS to equation (4). The second stage is another OLS, regressing Y_i on estimated $T_i = \hat{\pi}_0 + \hat{\pi}_1 Z_i$. The 2SLS estimators are the estimates resulting from the second stage.

5.2.1 Identification of instruments

As mentioned above, statistical testing for the validity of a specific instrument is not possible. This part is dedicated to the instruments ln(Exports), ln(Imports), and genetic distance from Nicaragua, with reduced form F statistics greater than 10.

The logarithmic mass in Exported and Imported goods is used as a proxy for international trade. Trade existed before international law came into existence and (oversee) transport of traded goods started long before the era of global communication. Trust in form of family, common language, or cultural bounds is what ties both ends of a transactional partnership if relying on legal enforcement of a contract in not an option. Renown examples include Genoese and Jewish traders who were able to communicate in a uniform language and settle disputes among themselves. These peoples dispersed over the 'known' world and settled in, or generated, trading hubs in strategic locations (Pomeranz & Topik, 2017). As an economy grows, so does the demand for currency within a country and abroad. The speed of mining (precious) medals is a bottleneck for growing economies after departure from pure exchange trade. Fiat money or IOUs is lighter and less material intensive. It is a safer and more convenient means of payment

[28] Equation (4) is nearly identical to equation (12.2) in Stock and Watson (2012)

compared with hard currency (coins) but has the disadvantage that this too relies on trust. A piece of parchment is only worth what it can be exchanged for in real goods. with a disruption such as inflation caused by printing or a (political) war, the theoretical value of this document reduces to zero (Pomeranz & Topik, 2017).

Genetic distance from Nicaragua is a proxy for within country homogeneity. While patience can up to a certain degree be taught or learned in a place of mental training such as a school as mentioned above, the ability to trust is engrained on a deeper neurological level (Fareri *et al., 2015*). Shocking events, especially negative ones, have a significant impact on one's ability and willingness to trust. Based on European data, Guiso *et al.* (2009) argue that bilateral trust depends on cultural closeness, measured by religious, genetic, and semantic likeness between the pair next to typical trust related aspects such as the pairwise history of conflict, national debt repayment and other forms of contract fulfillment. Bilateral trust is positively related to trade, bilateral portfolio investment, and direct investment. In other words, Guiso *et al.* (2009) claim that "[…] *perceptions rooted in culture are important (and generally omitted determinants) of economic exchange*" (p.1095). Economic exchange leads to tax income. Tax income enables and leads to education expenditure (Bastian & Michelmore, 2018). As described above, proper schooling and the development of trust(-worthiness) are entwined.

5.2.2 Overidentification test

The null of the Sargan (1958) score and Basman (1960) test is validity of all instrumental variables. The "overidentification test" requires more instruments than endogenous regressors. If the null hypothesis is rejected this occurs either (1) because the error terms of the endogenous variable(s) and the instruments are uncorrelated (invalid instrument), or (2) because the structural equation is mis-specified. Not rejecting the null hypothesis does not guarantee the validity and thus does not suffice as proof of validity.

Under the null hypothesis of valid instruments, the test statistic is asymptotically χ^2 distributed with $m - k$ degrees of freedom. Here, m is equal to the number of instruments and there are k potentially endogenous variables.

5.2.3 Test for endogeneity

Whether the presumed endogenous variable (*Trust*) is indeed endogenous is tested under the assumption that the instrument is valid. An instrumental variable estimator is consistent given

that the moment conditions identify the relevant parameters uniquely (the variance covariance matrix Σ_{zx} is finite and invertible) and the instrument is exogeneous ($E\{\varepsilon_i Z_i\} = 0$).
If the OLS estimator is also statistically consistent ($E\{\varepsilon_i T_i\} = 0$), then the IV and OLS differ only because of sampling error. In other words, the IV estimators may still be consistent but significantly less efficient than OLS.

Two tests for endogeneity will be used. One test is referred to as the Durbin (score) $\chi^2(r)$ statistic, which is based on an auxiliary regression to investigate the *r* exclusion restrictions (Wooldridge, 2008, p.177). The second test is Wu-Hausman statistic, which is based on the reduced form residuals. Significance of this *F*-test indicates that at least one of the *r* instrumental variables is endogenous rendering IV estimation less efficient than OLS estimation (Wooldridge, 2008, p.527-f.). The Durbin χ^2 test and Wu-Hausman *F*-test differ in the underlying assumptions upon which the tests have been derived. The χ^2-test uses an estimate of the error term's variance assuming exogeneity of the *r* instrumental variables. The *F*-test uses an estimate of the error variance assuming endogeneity.[29]

6. Results

This section contains correlational evidence and results from multiple regressions and affiliated tests. All procedures are described in the previous chapter.

6.1. Correlation with patience

Some of the variables, which emerged from surveying the relevant literature, are endogenous or may be subject to reversed causality. Instrumental variables may be effective to tackle the issue of endogeneity. This section discusses correlations with *Patience* of all these variables, which are presented in Appendix C, Tables 5, 6, and 7.

6.1.1 Trust

[29] See https://www.stata.com/manuals13/rivregresspostestimation.pdf for further details

The correlation between *Patience* and *Trust* is positive and equal to 0.190. In the GPS dataset, a country with a higher capacity of being steadfast also seems to have more within population reliance.

6.1.2 Controls

All control variables that are significantly correlated with *Patience* are most likely endogenous, or subject to reversed causality.[30] These variables are directly or indirectly affected or determined entirely by politics. Political power is directly or indirectly distributed by choice. Hence, as argued by Aghion *et al.* (2004), these variables are therefore earmarked as endogenous. Most of these correlational relationships are difficult to explain. Is it, for example, the case that general patience induces individuals to invest in schooling, or is patience a (by-) product from proper schooling? The correlation between *Patience* and *Education Expenditure* as percentage GDP is high and significant. But causality of such correlations needs additional investigation and is beyond the scope of this paper.

Other control variables, [31] are exogenous. They will be included into the econometric model later. *Landlocked* and *Island* are positively correlated with *Patience*, though negatively correlated with *Trust*. *Distance-to-Waterway* is negatively correlated with both *Patience* and *Trust*. Belonging to the *Old World* (Europe, Asia, or Afrika) is positively correlated with both. Population *Density* is positively correlated with *Patience* and negatively correlated with *Trust*. The percentage of *Arable* land within a country is hardly correlated with *Patience* and negatively correlated with *Trust*. *Variation in elevation* is negatively correlated with both *Patience* and *Trust*. The relationship between *Variation in land quality* and *Patience* is positive. *Variation in land quality*, that is land that can be, but is not necessarily transformed into arable land, is negatively correlated with *Trust*. It is the only statistically significant correlation.

The finding that *Patience* and *Trust* are not significantly correlated with most of the exogenous controls indicates they are not predetermined by natural features and geographic conditions within a country. *Arable Land* and *Variation in land quality* form the elements with direct effects on early agricultural development. Note also the close to zero correlation between *Arable Land* and *Patience*. The observed differences in the correlational relationships of suitable and arable land may indicate that higher variation drives “early” specialization, maybe

[30] See Appendix C, Table 5 for the full pairwise correlation table of Patience, Trust, and the control variables potentially subject to reversed causality.
[31] See Appendix C, Table 6 for the full pairwise correlation table of Patience, Trust, and the control variables.

resulting from the necessity for having to think more carefully about the best possible way and the most optimal moment to produce and transport goods to make a living.[32]

6.1.3 Instruments

Finally, we will address the correlational relationships of the instrumental variables with *Patience* and *Trust*.[33] All correlations are at least significant at the five percent significance level. *ln(Export)* and *ln(Imports)* are positively correlated with both *Patience* and *Trust*. *Genetic Distance* is negatively correlated with *Patience* and *Trust*. Obviously, the high correlation (0.973) between *ln(Export)* and *ln(Imports)* is to be expected. The infrastructure necessary for international trade enables importing as well as exporting goods (Francois & Manchin, 2013). Many trade relationships are bilateral with products travelling up and down the same route[34]. One possible caveat is that both international trade indicators have higher correlations with *Patience* than with *Trust*. This may jeopardize the validity of log transformed international trade indicators. From a correlational point of view *Genetic Distance* may be a more promising IV. We will investigate the validity of instruments below.

6.2. OLS regressions

The results of ordinary least squares regression (OLS), executed in three distinct settings, are included in Table 1. The first, simple, regression to investigate the direct relationship between *Trust* and *Patience* is without any control variables. As robustness check, the second, full, OLS regression includes all control variables. The estimates, resulting from this full OLS regression will be informative of the variation in *Patience* that is truly explained by *Trust*. The third set of results is the outcome of OLS stepwise regression. It includes only a selective set of control variables to avoid over-identification and will be used to identify the best model to explain the variance of *Patience*, conditional on a combination of *Trust* with possible combinations of all other explanatory variables.

As described above in the data section, both *Patience* and *Trust* have been normalized on the individual level with expectancy equal to zero and variation equal to one. Hence, a positive

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[32] This is in line with Davies (2015), who discusses the effect of short distanced dissimilar natural zones on economic specialization.
[33] See Appendix C, Table 7 for the full pairwise correlation table of Patience, Trust, and the instrumental variables.
[34] According to ourworldindata.org, 57.76% of the world's country pairs have bilateral trade arrangements, while 25.58% are characterised as non-trading pairs, and only 16.66% have unilateral trade arrangements in the year 2014.
See https://ourworldindata.org/grapher/distribution-of-bilateral-and-unilateral-trade-partnerships?country=~OWID_WRL

(negative) country average value should be interpreted as a higher (lower) level of *Trust* / *Patience*, compared with the overall average.

On its own, the simple relationship without any statistical interference, *Trust* has a positive effect on *Patience*, a result which has already been found in the correlation analysis. The Breusch-Pagan/Cook-Weisberg test for heteroscedasticity, with the null hypothesis of constant variation, is rejected at the one percent level ($P > \chi^2(1) = 0.0008$). The fitted error scatterplot (Figure 1) displays a cone shape distribution, characteristic for the heterogeneous effect of trust on patience. This indicates that trust and patience do not go hand in hand, but that general trust seems a pre-requisite for patience. The presence of heteroscedasticity is confirmed by the heteroscedastic linear maximum likelihood regression (Table 1, HLR 1). The Likelihood-Ratio test clearly rejects constant variance ($\text{LR} - \text{test}\,\chi^2(1) = 12.90$; $P > \chi^2(1) = .000$). The expectation that the variance of *Patience* increases with *Trust*, which is supported by the regression results and the test outcomes (Table 1, OLS 1).

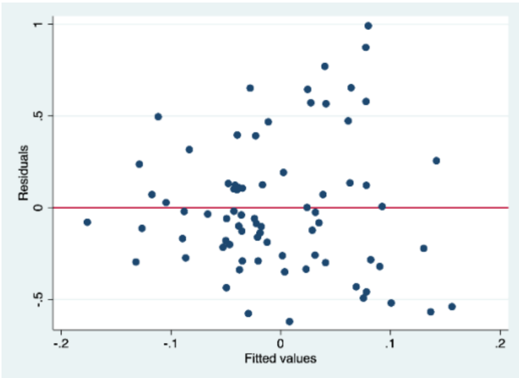

Figure 1: OLS (1) residuals

When including only a single instrument (See Table 8 in Appendix D), *Trust* loses its significant explanatory power when adding the *Old World* dummy, *Variation in Elevation*, and *Distance to Waterway* variables. *Trust* remains significant when holding constant for the other control variables. *Variation in Land Quality* is the only control variable next to *Trust* that has a significant effect on *Patience*.

Compared to the simple OLS, including the full set of control variables into the linear regression model (OLS 2) increases the estimated *Trust* parameter's significance and magnitude, although still little variation of *Patience* is explained with the adjusted R^2 hardly improving. Once again, the Breusch-Pagan/Cook-Weisberg test for heteroscedasticity and fitted error scatterplot (Figure 2) point into the same direction as in the simple regression described above.

Heteroscedasticity is not filtered out by the inclusion of the full control variable set. The heteroscedastic linear regression once again outperforms OLS. Note that in the OLS setting one of the control variables, *Variation in land quality*, has a positive and significant effect on *Trust*. The other control variables, including *Landlocked, Island, Old World,* (dummies) *Population Density, Variation in Elevation, Distance to Waterway,* and *Arable Land* as percentage of total country surface, are not significantly different from zero.

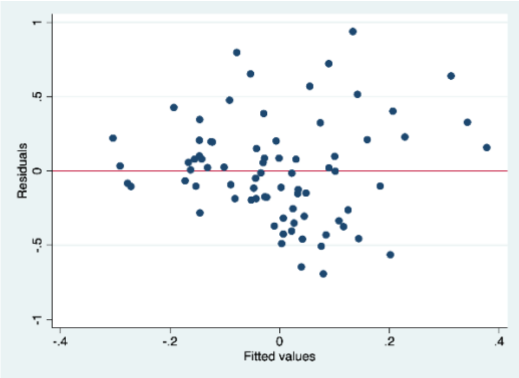

Figure 2: OLS (2) residuals

In order to avoid issues of over-identification and inclusion of unnecessary explanatory variables a subset of the full control variables set (OLS 3) is included in Table 1 in addition to the full set. Exclusion of explanatory variables is done by means of the following stepwise procedure.[35] Starting with the full model, the variable with the highest p-value (worst significance) is dropped (*Island*). This variable selection procedure is repeated until only those control variables remain with p-values of 0.2 and lower.

Supporting the use of the control variable subset is the Wald test with the null hypothesis that the selected model (OLS 3) fits the data at least as good as the unrestricted model (OLS 2) can not be rejected at the standard significance level ($P > \mathrm{F}(6,66) = .897$). In addition, it is noteworthy that the adjusted R^2 of the restricted model is more than double the size compared with the unrestricted model. In the selected model an increase of one standard deviation in *Trust* is associated with an increase in *Patience* of .091.[36] One additional standard deviation in suitable land variation leads, other things equal, to an increase in *Patience* of 0.108. One additional standard deviation in the variation in land elevation leads to a decrease in *Patience* of 0.019. The Breusch-Pagan/Cook-Weisberg test for heteroscedasticity, fitted error scatterplot (Figure 3), and heteroscedastic linear regression outcomes are again similar to the findings in the previous regressions.

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[35] *Trust* remains locked in, meaning that this particular explanatory variable can not be excluded by this procedure, regardless the p-value.
[36] Std(*Trust*) = .278 ; $\hat{\beta} = .328$, such that $\Delta = \text{Std}(Trust) * \hat{\beta} = .091$

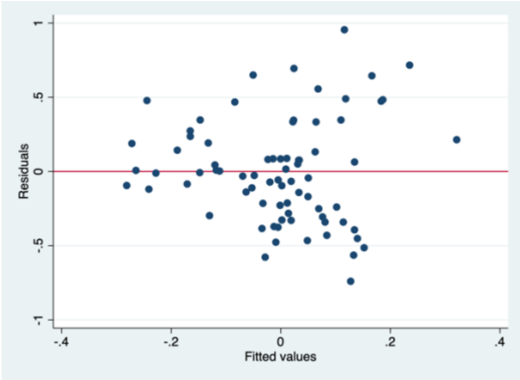


Figure 3: OLS (3) residuals

Table 1: Ordinary Least Squares Regressions and Heteroscedastic Linear Regressions

Patience (dep. var)				
	OLS 1	OLS 2	OLS 3	OLS 3 b
Trust	.253* (.152)	.339** (.161)	.328** (.151)	.327** (.149)
Landlocked (D)		.073 (.118)		
Island (D)		.030 (.232)		
Old World (D)		.049 (.123)		
Population Density		.000 (.000)		
Variation in Land Quality		1.361** (.569)	1.234** (.529)	1.478*** (.532)
Variation in Elevation		-.220 (.142)	-.215* (.127)	-.257** (.126)
Distance to Waterway		-.050 (.108)		
Arable Land		-.401 (.376)		
Constant	.002 (.042)	-.201 (.169)	-.170 (.111)	-.182* (.109)
$\overline{R^2}$	.023	.023	.074	.105
P>F	.100*	.314	.036**	.014**
Root MSE	.365	.365	.356	.349
Obs. (df)	76 (75)	76 (67)	76 (73)	**72** (68)
Heteroscedasticity test [a]				
$\chi^2(1)$	11.20	6.81	10.80	7.76
$P > \chi^2(1)$	.001	.009	.001	.005
Wald test [b]				
F(6,66)			0.37	
$P >$ F			.897	

* significant at 10%, ** significant at 5%, *** significant at 1%

Notes:
Standard errors in parentheses;
The difference between OLS 3 and OLS 3b is that the comparison country and missing observations for *Genetic Distance* (IV) are dropped in OLS 3b.

a) Heteroscedasticity test: Breusch-Pagan/Cook-Weisberg - H_0: Constant variance
b) The Wald test for OLS is a nested test that compares the full model (OLS 2) with the restricted model (OLS 3).

Table 1 (Qtd): Heteroscedastic Linear Regressions

Patience (dep. var)				
	HLR 1	HLR 2	HLR 3	HLR 3 b
Trust	.302** (.132)	.435*** (.139)	.320** (.129)	.345*** (.128)
Landlocked (D)		.174** (.087)		
Island (D)		.123 (.087)		
Old World (D)		.069 (.102)		
Population Density		.000 (.000)		
Variation in Land Quality		.652 (.483)	.634 (.500)	.895* (.511)
Variation in Elevation		-.166 (.126)	-.219* (.114)	-.259** (.114)
Distance to Waterway		-.117 (.089)		
Arable Land		-.230 (.304)		
Constant	.0058 (.163)	-.095 (.148)	-.038 (.110)	-.054 (.109)
Wald $\chi^2(i)$	5.24 (i = 1)	17.26 (i = 9)	9.47 (i = 3)	12.43 (i = 3)
$P > \chi^2$	.022**	.045**	.024**	.006***
Obs.	76	76	76	**72**
$\boldsymbol{ln(\sigma^2)}$ [a]				
Trust	2.176*** (.590)	2.659*** (.670)	2.124*** (.619)	2.008*** (.621)
Constant	-2.162*** (.162)	-2.284*** (.163)	-2.214*** (.163)	-2.260*** (.167)
Likelihood-Ratio test of $\boldsymbol{ln(\sigma^2) = 0}$				
$\chi^2(1)$	12.90	14.36	10.63	9.52
$P > \chi^2$	.000***	.000***	.001***	.002***

* significant at 10%, ** significant at 5%, *** significant at 1%

Notes:
Standard errors in parentheses;
HLR is short for Heteroscedastic Linear Regression
The difference between HLR 3 and HLR 3b is that the comparison country and missing observations for *Genetic Distance* (IV) are dropped in HLR 3b.

a) Coefficients of the exponential model for the variance.

6.3. 2SLS regression

The Gallup survey participants are responsible for both the *Patience* and *Trust* measures, leading to country averages. Consequently, when trying to determine the effect of *Trust* on *Patience*, We will account for possible endogeneity issues using the two stage least square regression (2SLS). The following variables, identified in the previous chapter, are potential first stage instruments for *Trust*:

- *ln (Exports)* and *ln (Imports)*: -- International -- trade predominantly relies on (bilateral) trust. The mass of goods exported and/or imported indicate the ability to trust (be trusted) besides a strong economy as well as a good jurisdiction.

- *Genetic Distance* as a proxy for within country homogeneity: People tend to trust like-minded individuals. The probability of coming across a person with a similar cultural background decreases with the within-country genetic distribution.

Results of the 2SLS regressions are presented in Table 2. Trust is instrumented (*Trust-IV*) -- with control variables -- by *Genetic Distance, ln (Exports), ln (Imports)* and all together. The first three columns represent estimated coefficients with single instruments for *Trust-IV*. In the fourth and last column *Trust-IV* is instrumented by all three instruments at the same time. The estimated parameters for *Trust-IV* and *Variation in Land Quality* are positive and significant. The estimated parameter for *Variation in Elevation* is significant as well, albeit negative. These overall findings are in line with the correlational analysis, described above.

There are only 72 observations for the instrumental variable *Genetic Distance*. Nicaragua is the comparison country, and three more values are missing, namely for Bosnia-Herzegovina, Serbia, and Tanzania. For the sake of comparability, We will henceforth only use this limited dataset for analyzing the 2SLS results. The impact of the reduced sample on the OLS and HLS estimates are presented in OLS 3b and HLR 3b, respectively.

After having filtered out the endogeneity of *Trust* through substitution with the variation of the instrumental variable *Genetic Distance*, the estimated coefficient of *Trust-IV* (Table 2, IV 1) is larger in magnitude compared with the estimated coefficient for *Trust* in the OLS regression (OLS 3b). This indicates that OLS estimates are subject to downward bias.

The Wald $\chi^2(3)$ statistic testing the null hypothesis that all three coefficients are zero is equal to 10.75 significantly rejecting this assumption at the five percent level. The first stage F-statistic is equal to 15.833. This means that the instrument can be considered strong as it satisfies the rule of thumb of weak instruments ($F < 10$). A by-product of using an instrumental approach is to get rid of heteroscedasticity in the error terms. The Breusch-Pagan / Cook-Weissberg test is no longer significant at the five percent level. Using this instrument (*Genetic Distance*) has been successful in resolving the issue of heteroscedastic errors. This is also visible in the fitted errors scatter plot (Figure 4). Given the available data, the null hypothesis of exogenous variables in the Durbin and Wu-Hausman test can not be rejected at any significance level.

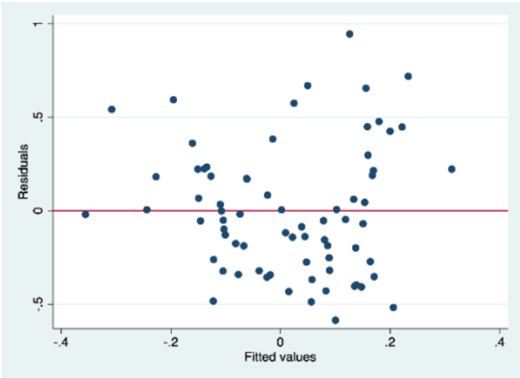


Figure 4: IV (1) residuals

The estimated parameter for *Trust-IV*, after using one of the two log transformed international trade indicators, is high compared with the IV results for *Genetic Distance*, described above. *ln(Imports)* as IV for *Trust* makes the parameter for *Trust-IV* jump to 1.484 (Table 2, IV 3). This is roughly double the size compared with the previous IV. Estimates for *Variation in Land Quality* and *Variation in Altitude* move increase in size as well, but not nearly as much. The test results are even more promising than the results for IV 1. The null hypothesis of all parameters being equal to zero is rejected at the one percent level (Wald $\chi^2(3) = 14.40; P > \chi^2 = 0.002$). Again, the instrument satisfies the single strong instrument rule of thumb (first stage F-statistic = 16.270 > 10). According to the Breusch-Pagan / Cook-Weissberg test, there is even less concern for heteroscedasticity ($\chi^2(1) = 1.98; P > \chi^2 = 0.160$). This statement is supported by Figure 5, the graph depicting the errors in combination with the fitted values. In contrast to the test results for exogenous variables with *Genetic Distance* as instrument (IV 1), the Durbin and Wu-Hausman tests here are both significant at the one percent level (Durbin = 15.155; $P > \chi^2 = 0.000$ and Wu-Hausman = 17.862; $P > \chi^2 = 0.000$). These results suggest that *ln(Imports)* statistically outperforms *Genetic Distance* as instrumental variable.

Estimates for *ln (Exports)* as instrumental variable for *Trust-IV* (Table 2, IV 2) differ only slightly from the estimated parameters for *ln(Imports)* (Table 2, IV 3). This of course is not a big surprise given the high correlation between *ln (Exports)* and *ln (Imports)* discussed in the correlation section above. The only difference between the results of the two models is the test statistic for heteroscedastic errors. Although the test rejects the null hypothesis of homogeneity for the two instruments, the outcome for IV2 is weaker than that of IV 3.

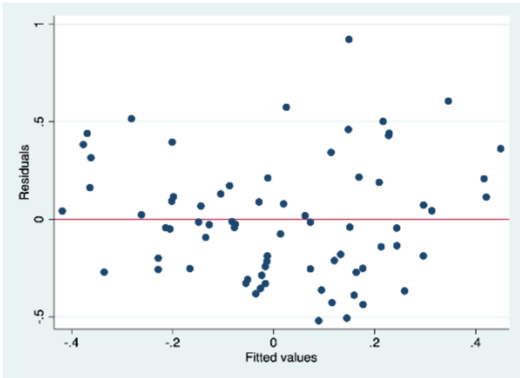


Figure 5: IV (3) residuals

The 2SLS protocol with all potential instruments simultaneously bring the above-mentioned estimates closer together. The estimated parameter for *Trust-IV*, after using all three instruments is equal to 1.115 and lies between the estimate from IV 1 and IV 2 (See Table 2, IV 4). The same convergence is observable in estimated parameters for *Variation in Land Quality* and *Variation in Altitude*, the control variables. The Wald statistic outperforms the other -- single instrument – regressions in rejecting the null hypothesis of all parameters being equal to zero (Wald $\chi^2(3) = 16.30$; $P > \chi^2 = .001$). The rule of thumb for strong instruments (F>10) is no longer applicable because this unofficial rule only holds for 2SLS estimation with a single instrument. Instead, the Sargan - Basmann test for overidentification with two degrees of freedom is used instead (df = number of instruments - number of endogenous variables). These tests, with the null hypothesis of valid instruments, are not rejected at any significance level (Sargan $\chi^2(2)$ = 3.099; $P > \chi^2 = 0.212$ and Basmann $\chi^2(2)$ = 2.968; $P > \chi^2 = 0.227$). The validity of the instruments can not be rejected with the available data nor is it hereby guaranteed that they are valid. The Breusch-Pagan / Cook-Weissberg test for heterogeneity is not statistically significant at the five percent level. Hence, the null hypothesis of constant variance is not rejected ($\chi^2(1) = 3.72; P > \chi^2 = 0.054$). Both the Durbin score and Wu-Hausman test for endogeneity are rejected at the one percent significance level. The null hypothesis of exogeneity is significantly rejected.

Both the OLS and HLR estimates for *Trust* are positive, yet the latter regression is a better fit for the data. The Breusch-Pagan and Cook-Weisberg test results for heteroscedasticity in the OLS regressions and the maximum-likelihood test results in the HLR verify the presence of heteroscedasticity in the data. Heteroscedasticity is indeed featured visually by the cone shaped error terms, which depict increases in variance as *Trust* grows (see Figures 1,2, and 3). The issue of endogeneity, however, is not explicitly solved by the switch from OLS to HLR. Consequently, an additional analysis including instrumental variables is necessary to rule out the existence of or to control for endogeneity effects on the parameter estimates. The Durbin and Wu-Hausman test results show that endogeneity plays a major role in the data generating process. From these test results I conclude that the data can be described best by means of an IV regression approach. Pivotal is a precise determination of valid and exogenous instruments and the effect that different potential IVs have on the final estimated coefficients.

6.4. The reduced-form model

The three potential instruments that subsist statistical testing for exogeneity and economic reasoning for relevance have been presented and compared above. In short, both the OLS and 2SLS results indicate that a positive effect is found of *Trust* on *Patience*. The estimated coefficient of *Trust* increases notably after the inclusion of control variables.

First, a model is discussed with only statistically significant parameter estimates. The reduced model with the best fit of the data is (IV 1) with *Genetic Distance* as instrument for *Trust*. In order to better understand the outcome of the heteroscedasticity test in the results with *Genetic Distance* as instrumental variable the following additional analysis has been performed. The correlation between *Variation in Land Quality* and *Variation in Elevation* is .408. *Variation in Land Quality* may be more difficult to measure and can therefore be subject to measurement error more than *Variation in Elevation*. When removing *Variation in Land Quality* as explanatory control variable, the test for endogeneity becomes significant. This discrepancy in test outcomes can possibly be explained to result from small sample bias or bias induced by the stepwise selection of control variables.

6.4.1 Economic interpretation

The model with *Genetic Distance* as instrumental variable is the model for which economic interpretation follows next. Note that in the following the IV regression refers to IV 1 in Table

2 and the OLS regression refers to OLS 3b in Table 1. Based on the 72 observations used for the IV regression the country average patience can be computed as follows.

$$\overline{Patience_i} = \hat{\beta}_0 + \hat{\beta}_1 \overline{Trust - IV_i} + \hat{\beta}_2 \overline{Variation\ in\ Land\ Quality_i} + \hat{\beta}_3 \overline{Variation\ in\ Elevation} + E\{\epsilon_i\} \quad (5)$$

$$= -0.230 + 0.754 * (-0.017) + 1.795 * (0.212) + -0.286 * (0.430)$$

$$= 0.015$$

The estimated parameter for *Trust-IV* is 0.754 and is significantly different from zero. This is more than double the size compared with the non-instrumented estimated parameter 0.327 for *Trust*. A one standard deviation increase in Trust for the average country leads to an increase in Patience of 0.101, keeping everything else constant.[37] For the average person, this means that the expected level of *Patience* increases from 0.015 to 0.116.

The estimated IV parameter of *Variation in Land Quality* ($\hat{\beta}_2$) is significantly larger than zero. Countries with high mixtures of possible options for land use are characterized by higher patience as reported by their own citizens. This finding could be explained by location-specific human capital accumulation Michalopoulos (2012) and positive spillover. Protean lay of the land makes individuals learn better to cope with local issues for which patience can be beneficial. In countries with little land variation people deal with similar issues for miles to come. They don't need to learn a lot from their direct neighbors. Conversely, in the case of high land variation, people living in close proximity are dealing with a variety of different problems. Hence, the spill-over effect originates from people with different location-specific human capital with only little travel distance between them that could be obliged to solve a common problem learning from each other in the process.

The parameter of *Variation in Elevation* ($\hat{\beta}_3$) is negative, significant, and is practically the same as in the OLS regression. One possible explanation of this finding is when reaching out is more difficult, people living relatively close by have historically communicated less among one another. Traveling the same air-distance in a mountainous environment takes longer than in areas with less elevation. Greater variation in elevation within a certain area leads to more dialects according to Michalopoulos (2012), who claims that local linguistic variation is

[37] $\hat{\beta}_1 * \Delta Trust - IV = 0.754 * 0.134 = 0.101$

positively correlated with elevation. This suggests a reduction of communication amongst people when *Variation in Elevation* is large.

6.4.2 Robustness of results

One shortcoming of model selection based purely upon statistically significance of control variables is the fact that not significant variables still might be confounders for both patience and trust. This subsection is concerned with the difference in estimated parameters and test results, comparing the estimated parameters of the reduced 2SLS model (Table 2) with those of full control variable 2SLS model in the Appendix (Table 9), which includes all variables deemed important in the literature reviewed above.

Regardless the instrument, when *Landlocked* (dummy), *island* (dummy), *old world* (dummy), *population density*, and *Arable Land* are included in addition to the already discussed *Variation in Land Quality* and *Variation in Elevation*, all *Trust-IV* estimated parameters are somewhat higher. When all control variables are included, the test for heteroscedasticity remains significant at the 5 percent level, with one exception. When *ln (Imports)* is used as the instrument for *Trust*, the heterogeneity test is insignificant, signaling an underperformance of the model with a full set of controls. The test for endogeneity with *Genetic Distance* as instrument for *Trust* is the only test in which the full control performs better than the reduced set. As described above, this discrepancy with the reduced model is driven by *Variation in Land Quality* .

The 'additional' control variables present in the full model but not in the reduced model are of theoretical importance, but of econometric insignificance. It is possible that these results may be driven by small sample bias. The GPS dataset includes only three Island states. Therefore, little variation can be explained by this particular dummy variable. Exclusion of it as control variable renders *Landlocked*, the exact opposite fruitless as well. Ashraf and Galor (2013) shows that *Arable Land* is of economic importance, yet it is heavily affected by *Variation in Land Quality* as the latter is deterministic for the possibility of *Arable Land*. High quality soil can, but does not have, to be transformed into land for farming. This is confirmed by the analysis using the GPS data.

In summary, both the OLS and 2SLS results indicate that there is a positive effect of *Trust* on *Patience*. The estimated coefficient increases after the inclusion of control variables. It makes no significant difference whether the full set of controls or the restricted set is applied. Moreover, the 2SLS estimates and test results indicate that the OLS results for *Trust* is subject to downward bias. Moreover, Table 2 shows that in comparison with other IV regression estimates, including the combined-IV (IV 4), the IV parameters of the reduced model are lower bound estimates. This, in combination with signals of heteroscedasticity, indicates that the relationship is not straight forward and needs careful statistical scrutiny.

6.5. What do the results imply for existing and future research on patience and trust?

Trust is a building block of economic partnerships (Arrow, 1974), while patience is a cornerstone of economic prosperity (Dynen *et al.*, 2004). Disentangling trust and patience might accelerate understanding time preferences. Educational programs in developed countries are generally focused on patience. Society and the functioning of modern democratic government systems, however, rely on trust. Evidence in this paper suggests that lack of trust is detrimental for patience. Classroom interventions targeting patience are shown to have a long term positive effect on socioeconomic status (Alan & Ertac, 2018). Individuals that are characterized by high patience and high self-control are more likely to have good careers and live healthier. Considering that these results indicate a positive relationship between patience and trust, it may be important to account for and create an environment of trust when increasing patience is the goal of an intervention.

Findings from studies such as the long-term observation of the Marshmallow project participants (Mischel *et al.*, 1989) might over-evaluate the positive effect of patience. Because trust might explain at least a part of decisions requiring future orientation, omitted variable bias is likely to have occurred. Results from MEL experiments (Thaler 1981), conducted to investigate the determination and effect of time-preferences, may unintentionally have include trust as well as patience. The notion that trust explains patience puts findings such as the ability to delay gratification among children and adolescents being linked to health and economy related self-control (*e.g.* Sutter *et al.* (2013)) in a new perspective, and opens up the possibility for more research to better understand observed individual heterogeneity.

The anomaly of choice reversal caused by time difference (Dasgupta & Maskin, 2005) might be reconsidered as well. Say an individual chooses x1 in T1 over x2 in T2, when T1 is now and T2 in the near future. When this same individual prefers x2 over x1 when both T1’ and T2’ are in the future but the distance is the same. Literature suggests that this inconsistent behavior through time is primarily driven by impatience. The important difference, however, is the departure from T1 = 0 (T1' > 0). Then both decisions rely on trust and can thus be subtracted from the decision making process. If there is a jump in choice for later higher payment in the future when departing from the zero, this is indicative therefore that trust indeed plays a role in the decision making process.

Consider an individual chooses amount $€_1$ in T1 over $€_2$ in T2, with T2 > T1 = 0. This same individual prefers $€_2$ over $€_1$ when both T1' and T2' are in the future, even when the distance in time is the same ($T1' > 0 \wedge T2 - T1 = T2' - T1'$). The economic theory of choice and the preference reversal phenomenon (Grether and Plott, AER 1979) suggests that this time-inconsistent behavior is primarily driven by impatience (Halevy, Econometrica 2015). The important difference between the two cases is the departure from T1 = 0 (T1' > 0). Let τ be the value of trust, which I assume to be independent of time. Then both decisions rely on "a trust value", which is however cancelled out in the later preference. In this case it holds that $U(T1) = €_1 > U(T2) = €_2 - \tau$, while $U(T1') = €_1 - \tau < U(T2') = €_2 - \tau$. Hence, the value of trust τ will cancel out in the later decision making process. If T1' – T1 = T1' is very small and a jump in choice for later higher payment in the future will still be observed, then this is indicative for (the value of) trust to play a decisive role in the decision making process.

Table 2: 2SLS (Reduced Set of Control Variables)

Patience (dep. var.)				
	IV_1	IV_2	IV_3	IV_4
Instr. Var:	**Genetic Distance [a]**	**ln_Exports**	**ln_Imports**	**All_IVs (3)**
Trust-IV	.754** (.353)	1.477*** (.454)	1.484*** (.453)	1.115*** (.331)
Variation in Land Quality	1.795*** (.596)	2.333*** (.769)	2.336*** (.770)	2.064*** (.648)
Variation in Elevation	-.286** (.131)	-.334** (.169)	-.335** (.170)	-.310** (.146)
Constant	-.230* (.118)	-.311** (.152)	-.311** (.153)	-.270** (.130)
Wald $\chi^2(3)$	10.75	14.29	14.40	16.30
$P > \chi^2$	.013**	.003***	.002***	.001***
Root MSE	.359	.464	.465	.403
$F\ (n_1, n_2)$	F (1,68)	F (1,68)	F (1,68)	F (3,66)
Obs	72	72	72	72
Min. eigenvalue	15.833	16.069	16.270	8.199
Breusch-Pagan / Cook-Weisberg Test for Heteroscedasticity (2nd stage OLS)				
$\chi^2(1)$	3.79	3.44	1.98	3.72
$P > \chi^2$	.051*	.064*	.160	.054*
Endogenous test: H0 = exogenous				
Durbin	2.014	14.853	15.155	11.005
$P > \chi^2$	.156	.000***	.000***	.001***
Wu-Hausman	1.928	17.414	17.862	12.088
$P > F$	.170	.000***	.000***	.001***
Overidentification test: H0 = valid (only possible with more than one instrument)				
Sargan $\chi^2(2)$				3.099
$P > \chi^2$				.212
Basmann $\chi^2(2)$				2.968
$P > \chi^2$				.227

* significant at 10%, ** significant at 5%, *** significant at 1%
Note: Standard errors in parentheses

a) The comparison country for *Genetic Distance* is Nicaragua.

7. Conclusion

This paper investigate the relationship between trust and patience, two crucial elements of economic prosperity and trade. Economic growth and welfare thrives with in a trade-friendly environment. Being patient only pays off if there is trust in attaining the increased utility from waiting. Distrust is disadvantageous for economic processes.

Experiments and surveys with the goal to investigate time preferences (patience, self-control) might unintentionally report findings that at least in part are driven by trust and trustworthiness. Policies based on these findings might therefore be misguided and may target symptoms of impatience that are actually driven by distrust. Participants in MEL or marshmallow test style experiments that choose direct gratification are per se considered (highly) impatient. But they might lack trust in truly acquiring the promised higher (financial) reward and will therefore get hold of what is in front of them rather than take the risk of missing the opportunity to acquire a free lunch, even when this individual is in fact generally a patient person.

Looking closely at the correlation between trust and patience, a positive, but heteroscedastic relationship is observed. As trust grows, so does the variation in patience. OLS regressions confirm both the positive relationship and the heteroscedasticity. The patience and trust data used in this paper have been obtained from the 2012 Gallup World Poll survey dataset. Individual participants give answers to relevant questions about both concepts. This may give rise to concerns about endogeneity. These concerns are dealt with by instrumental variable analysis. The main challenge of IV regression is to find the right instruments. Three instruments have been chosen that passed the logical and statistical tests of scrutiny. They are *Genetic Distance*, *ln (Exports)*, and *ln (Imports)*. Genetic distance is a proxy for country-average homogeneity. The other highly correlated instruments represent international trade.

The key finding of the paper is that that proper econometric analysis is a prerequisite to accurately measure the extent of the relationship between patience and trust. The results show an unconditional correlation between trust and patience of 0.190 across a large number of countries. Controlling for variations in country-level early agricultural development resolves the data's heteroscedasticity, while raising the correlation to 0.345. An instrumental variable estimation approach based on within country homogeneity removes endogeneity bias from the empirical relationship, and results in a final correlation of 0.754. Thus, variation in trust is positively correlated with variation in patience. On average, a one standard deviation increase in the variation of *Trust* leads to an increase of at least 10 percent of variation in *Patience*. From a policy point of view, the implication of this result is that generating and maintaining an environment of trust is essential to encourage patience and other economy enhancing behavior. The results of this study confirm that generating and maintaining an environment of trust is essential to encourage patience for the advancement of economic prosperity.

Research on the relationship between trust and patience brings forth many related questions. Examples include: Are people who live in urban areas more or less patient and trusting than people living in rural areas? Are people who in a coastal area any different from people living near a country border? Is there an econometrically distinguishable connection between trust and distance to the state's capitol? Are there other explanatory variables that shape one's aptitude to be patient? And: How much of one's ability to trust is shaped by the environment one happens to be born into? These are detailed and personal questions. Finding answers to these questions are complicated by issues such as self-selection and the dynamic influences through time. The currently available dataset is not sufficiently rich to answer these important questions. More and better (and longitudinal) individual data are needed to become available for a wide range of different countries.

The micro-foundation of the results described above is potential future work. Digging deeper into regional, rather than national, circumstances, may be done at the cost of global representativeness. As of yet, informative and reliable regional data are only publicly and electronically available for certain countries. Focusing solely on those countries might reduce the external validity of the results due to, for example, non-response bias. Causal research on trust and patience at a regional level in combination with country fixed effects could be fruitful future research when more relevant data become available. This would enable comparing people living in different circumstances to investigate the impact of nurture and nature on the relationship between trust and patience. With more and better data, more control variables could be included while statistically results remain meaningful. The current limited number of observations (76 countries, reduced to 72 observations due to missing values) makes the results and interpretations described above vulnerable to critique about external validity. Extension of the GPS Gallup survey to other countries would enable redoing this analysis, also in a panel data setting.

This paper confirms that trust is a vital part of patience. Building bridges are necessary to increase the size of markets. Solid bridges are generally not built in a single day. It takes trust, and patience. Future research may help further identifying the true value of trust on patience.

Literature

Aghion, P., Alesina, A., & Trebbi, F. (2004). Endogenous political institutions. *The Quarterly Journal of Economics*, *119*(2), 565-611.

Ainslie, G. (1991). Derivation of" rational" economic behavior from hyperbolic discount curves. *American Economic Review*, *81*(2), 334-340.

Alan, S., & Ertac, S. (2018). Fostering patience in the classroom: Results from randomized educational intervention. *Journal of Political Economy*, 126(5), 1865-1911.

Alesina, A., & Ferrara, E. L. (2005). Ethnic diversity and economic performance. *Journal of Economic Literature*, *43(3)*, 762-800.

Algan, Y., & Cahuc, P. (2010). Inherited trust and growth. *American Economic Review*, *100*(5), 2060-92.

Arrow, K. J. (1974). *The Limits of Organization*. WW Norton & Company.

Ashraf, Q., & Galor, O. (2013). Genetic diversity and the origins of cultural fragmentation. *American Economic Review*, *103*(3), 528-33.

Banerjee, S., Bowie, N. E., & Pavone, C. (2006). An ethical analysis of the trust relationship in Bachmann, R., & Zaheer, A. (Eds.), *Handbook of Trust Research* (pp. 303-317). Edward Elgar Publishing.

Basmann, R. L. (1960). On finite sample distributions of generalized classical linear identifiability test statistics. *Journal of the American Statistical Association*, *55*(292), 650-659.

Bastian, J., & Michelmore, K. (2018). The long-term impact of the earned income tax credit on children's education and employment outcomes. *Journal of Labor Economics*, *36*(4), 1127-1163.

Becker, S. O., Boeckh, K., Hainz, C., & Woessmann, L. (2016). The empire is dead, long live the empire! Long-run persistence of trust and corruption in the bureaucracy. *The Economic Journal*, *126*(590), 40-74.

Becker, G. S., & Mulligan, C. B. (1997). The endogenous determination of time preference. *The Quarterly Journal of Economics*, *112*(3), 729-758.

Ben-Ner, A., & Halldorsson, F. (2010). Trusting and trustworthiness: What are they, how to measure them, and what affects them. *Journal of Economic Psychology*, *31*(1), 64-79.

Breusch, T. S., & Pagan, A. R. (1979). A simple test for heteroscedasticity and random coefficient variation. *Econometrica: Journal of the Econometric Society*, 1287-1294.

Brülhart, M., & Usunier, J. C. (2012). Does the trust game measure trust?. *Economics Letters*, *115*(1), 20-23.

Cameron, A. C., & Trivedi, P. K. (2009). *Microeconometrics Using Stata*. College Station, TX: Stata press.

Carroll, C. D., Overland, J., & Weil, D. N. (2000). Saving and growth with habit formation. *American Economic Review*, *90*(3), 341-355.

Cass, D. (1965). Optimum growth in an aggregative model of capital accumulation. *The Review of Economic Studies*, *32*(3), 233-240.

Casson, C., Della Giusta, M. (2006). The economics of trust. In *Handbook of Trust Research* (pp. 332-354). Edward Elgar Publishing.

Chiswick, B., & Hatton, T. J. (2003). International Migration and the Integration of Labor Markets. In *Globalization in historical perspective* (pp. 65-120). University of Chicago Press.

Cohen, J., Ericson, K. M., Laibson, D., & White, J. M. (2020). Measuring time preferences. *Journal of Economic Literature*, *58*(2), 299-347.

Cook, R. D., & Weisberg, S. (1983). Diagnostics for heteroscedasticity in regression. *Biometrika*, *70*(1), 1-10.

Davies, M. I. (2015). Economic specialisation, resource variability, and the origins of intensive agriculture in Eastern Africa. *Rural Landscapes: Society, Environment, History*, *2*(1), 1-18.

Dasgupta, P., & Maskin, E. (2005). Uncertainty and hyperbolic discounting. *American Economic Review*, 95(4), 1290-1299.

Delhey, J., & Newton, K. (2005). Predicting cross-national levels of social trust: global pattern or Nordic exceptionalism? *European Sociological Review*, *21*(4), 311-327.

DeSteno, D., Li, Y., Dickens, L., & Lerner, J. S. (2014). Gratitude: A tool for reducing economic impatience. *Psychological Science*, *25*(6), 1262-1267.

Diamond, J (1997). Guns, germs, and steel: the fates of human societies. *NY: WW Norton & Company*.

Dohmen, T., Falk, A., Huffman, D., & Sunde, U. (2010). Are risk aversion and impatience related to cognitive ability? *American Economic Review*, *100*(3), 1238-60.

Duckworth, A. L., Milkman, K. L., & Laibson, D. (2018). Beyond willpower: Strategies for reducing failures of self-control. *Psychological Science in the Public Interest*, *19*(3), 102-129.

Dynan, K. E., Skinner, J., & Zeldes, S. P. (2004). Do the rich save more?. *Journal of Political Economy*, 112(2), 397-444.

Ericson, K. M., & Laibson, D. (2019). Intertemporal choice. In *Handbook of Behavioral Economics - Foundations and Applications 2* (pp. 1-67). North-Holland.

Evans, A. M., & Krueger, J. I. (2009). The psychology (and economics) of trust. *Social and Personality Psychology Compass*, *3*(6), 1003-1017.

Falk, A., Becker, A., Dohmen, T. J., Huffman, D., & Sunde, U. (2016). The preference survey module: A validated instrument for measuring risk, time, and social preferences. IZA Discussion Paper No. 9674

Falk, A., Becker, A., Dohmen, T., Enke, B., Huffman, D., & Sunde, U. (2018). Global evidence on economic preferences. *Quarterly Journal of Economics*, 133 (4), 1645–1692.

Falk, A., Hermle, J., & Sunde, U. (2019). Longevity and patience.

Falk, A., Meier, S., & Zehnder, C. (2013). Do lab experiments misrepresent social preferences? The case of self-selected student samples. *Journal of the European Economic Association*, *11*(4), 839-852.

Fareri, D. S., Chang, L. J., & Delgado, M. R. (2015). Computational substrates of social value in interpersonal collaboration. *Journal of Neuroscience*, *35*(21), 8170-8180.

Francois, J., & Manchin, M. (2013). Institutions, infrastructure, and trade. *World Development*, *46*, 165-175.

Frederick, S., Loewenstein, G., & O'donoghue, T. (2002). Time discounting and time preference: A critical review. *Journal of Economic Literature*, *40*(2), 351-401.

Galor, O., & Özak, Ö. (2016). The agricultural origins of time preference. *American Economic Review*, *106*(10), 3064-3103.

Grether, D. M., & Plott, C. R. (1979). Economic theory of choice and the preference reversal phenomenon. *American Economic Review*, *69*(4), 623-638.

Guiso, L., Sapienza, P., & Zingales, L. (2004). The role of social capital in financial development. *American Economic Review*, *94*(3), 526-556.

Guiso, L., Sapienza, P., & Zingales, L. (2009). Cultural biases in economic exchange?. *The Quarterly Journal of Economics*, *124*(3), 1095-1131.

Halevy, Y. (2015). Time consistency: Stationarity and time invariance. *Econometrica*, *83*(1), 335-352.

Houser, D., Schunk, D., & Winter, J. (2010). Distinguishing trust from risk: An anatomy of the investment game. *Journal of Economic Behavior & Organization*, *74*(1-2), 72-81.

Hübner, M., & Vannoorenberghe, G. (2015). Patience and long-run growth. *Economics Letters*, 137, 163-167.

Kagel, J. H., & Roth, A. E. (Eds.). (2016). *The handbook of experimental economics* (Vol. 2). Princeton University Press.

Kidd, C., Palmeri, H., & Aslin, R. N. (2013). Rational snacking: Young children's decision-making on the marshmallow task is moderated by beliefs about environmental reliability. *Cognition*, *126*(1), 109-114.

Koopmans, T. C. (1965). On the concept of optimal economic growth. *The Economic Approach to Development Planning. North Holland, Amsterdam*, 225-287.

Laibson, D. (1997). Golden eggs and hyperbolic discounting. *The Quarterly Journal of Economics*, *112*(2), 443-478.

Lerner, J. S., Li, Y., & Weber, E. U. (2013). The financial costs of sadness. *Psychological Science*, *24*(1), 72-79.

Loewenstein, G. F. (1988). Frames of mind in intertemporal choice. *Management Science*, *34*(2), 200-214.

Loewenstein, G., & Thaler, R. H. (1989). Anomalies: intertemporal choice. *Journal of Economic Perspectives*, *3*(4), 181-193.

McGuire, J. T., & Kable, J. W. (2013). Rational temporal predictions can underlie apparent failures to delay gratification. *Psychological Review*, *120*(2), 395.

Michaelson, L., De la Vega, A., Chatham, C., & Munakata, Y. (2013). Delaying gratification depends on social trust. *Frontiers in Psychology*, *4*, 355.

Michaelson, L. E., & Munakata, Y. (2016). Trust matters: Seeing how an adult treats another person influences preschoolers' willingness to delay gratification. *Developmental Science*, *19*(6), 1011-1019.

Micheletti, S. J., *et al*. (2020). Genetic consequences of the transatlantic slave trade in the Americas. *The American Journal of Human Genetics*, *107*(2), 265-277.

Michalopoulos, S. (2012). The origins of ethnolinguistic diversity. *American Economic Review*, *102*(4), 1508-39.

Mischel, W. (1961). Father-absence and delay of gratification. *The Journal of Abnormal and Social Psychology*, *63*(1), 116.

Mischel, W., & Ebbesen, E. B. (1970). Attention in delay of gratification. *Journal of Personality and Social Psychology*, *16*(2), 329.

Mischel, W., Shoda, Y., & Rodriguez, M. I. (1989). Delay of gratification in children. *Science*, *244*(4907), 933-938.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., ... & Sears, M. R. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences*, *108*(7), 2693-2698.

Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self-control as a limited resource: regulatory depletion patterns. *Journal of Personality and Social Psychology*, *74*(3), 774.

Murray, M. P. (2006). Avoiding invalid instruments and coping with weak instruments. *Journal of Economic Perspectives*, *20*(4), 111-132.

Nunn, N., & Qian, N. (2010). The Columbian exchange: A history of disease, food, and ideas. *Journal of Economic Perspectives*, *24*(2), 163-88.

O'Donoghue, T., & Rabin, M. (1999). Doing it now or later. *American Economic Review*, *89*(1), 103-124.

Oreopoulos, P., & Salvanes, K. G. (2011). Priceless: The nonpecuniary benefits of schooling. *Journal of Economic Perspectives*, *25*(1), 159-84.

Persky, J. (1995). The ethology of homo economicus. Journal of Economic Perspectives, 9(2), 221-231.

Phelps, E. S., & Pollak, R. A. (1968). On second-best national saving and game-equilibrium growth. *The Review of Economic Studies*, *35*(2), 185-199.

Pomeranz, K., & Topik, S. (2017). *The world that trade created: Society, culture, and the world economy, 1400 to the present*. Routledge.

Putnam, R. D. (2007). E pluribus unum: Diversity and community in the twenty-first century the 2006 Johan Skytte Prize Lecture. *Scandinavian Political Studies*, *30*(2), 137-174.

Ramsey, F. P. (1928). A mathematical theory of saving. *The Economic Journal*, *38*(152), 543-55.

Reuben, E., Sapienza, P., & Zingales, L. (2015). Procrastination and impatience. *Journal of Behavioral and Experimental Economics*, *58*, 63-76.

Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy*, *98*(5, Part 2), S71-S102.

Samuelson, P. A. (1937). A note on measurement of utility. *The Review of Economic Studies*, *4*(2), 155-161.

Sargan, J. D. (1958). The estimation of economic relationships using instrumental variables. *Econometrica: Journal of the Econometric Society*, 393-415.

Solow, R. M. (1956). A contribution to the theory of economic growth. *The Quarterly Journal of Economics*, 70(1), 65-94.
Spolaore, E., & Wacziarg, R. (2009). The diffusion of development. *The Quarterly Journal of Economics*, *124*(2), 469-529.

Spolaore, E., & Wacziarg, R. (2018). Ancestry and development: New evidence. *Journal of Applied Econometrics*, *33*(5), 748-762.

Stock, J. H., & Watson, M. W. (2012). *Introduction to Econometrics* (Vol. 3). New York: Pearson.

Strulik, H. (2012). Patience and prosperity. *Journal of Economic Theory*, *147*(1), 336-352.

Stutzer, A., & Meier, A. N. (2016). Limited self-control, obesity, and the loss of happiness. *Health Economics*, *25*(11), 1409-1424.

Sunde, U., Dohmen, T., Enke, B., Falk, A., Huffman, D., & Meyerheim, G. (2020). Patience and Comparative Development∗.

Sutter, M., Kocher, M. G., Glätzle-Rützler, D., & Trautmann, S. T. (2013). Impatience and uncertainty: Experimental decisions predict adolescents' field behavior. *American Economic Review*, 103(1), 510-31.

Thaler, R. (1981). Some empirical evidence on dynamic inconsistency. *Economics letters*, *8*(3), 201-207.

Toussaert, S. (2018). Eliciting Temptation and Self-Control Through Menu Choices: A Lab Experiment. *Econometrica*, *86*(3), 859-889.

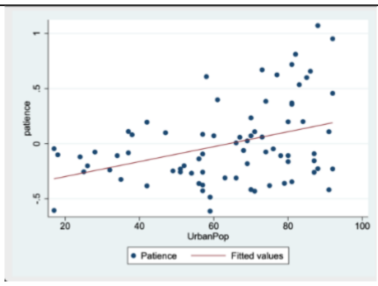
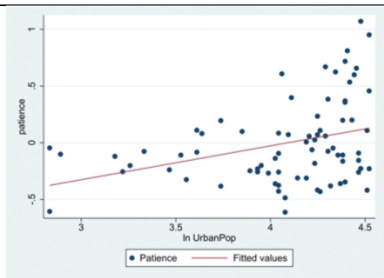
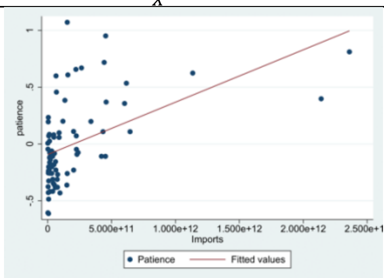
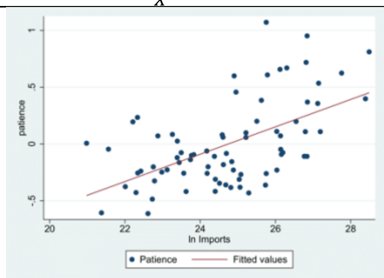
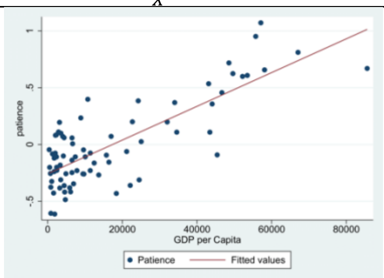
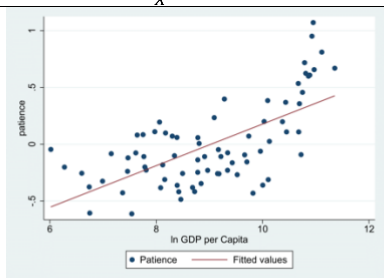
Wang, M., Rieger, M. O., & Hens, T. (2016). How time preferences differ: Evidence from 53 countries. *Journal of Economic Psychology*, *52*, 115-135.

Weber, E. U., Johnson, E. J., Milch, K. F., Chang, H., Brodscholl, J. C., & Goldstein, D. G. (2007). Asymmetric discounting in intertemporal choice: A query-theory account. *Psychological Science*, *18*(6), 516-523.

Wooldridge, J. M. (2008). *Introductory Econometrics: A Modern Approach, 4th Edition* . South-Western.

Appendix A: Scatterplots

Table 3: Scatter plots

Figure 6: Scatter Plots	
 *(A) better fit*	 *(B) worse fit*
$F_Y = 12.33$	$F_Y = 9.54$
$R_Y^2 = 0.14$	$R_Y^2 = 0.11$
$R_X^2 = 0.08$	$R_X^2 = 0.09$
 *(C) worse fit*	 *(D) better fit*
$F_Y = 23.59$	$F_Y = 33.34$
$R_Y^2 = 0.24$	$R_Y^2 = 0.31$
$R_X^2 = 0.05$	$R_X^2 = 0.13$
 *(E) worse fit*	 *(F) better fit*
$F_Y = 125.19$	$F_Y = 56.46$
$R_Y^2 = 0.63$	$R_Y^2 = 0.43$
$R_X^2 = 0.07$	$R_X^2 = 0.09$

An independent variable is plotted against the dependent variable (patience) in the original form and in a logarithmically transformed form. The better fit is chosen. This procedure is repeated for all independent variables. Images 1-6 include three examples. The Scatterplots were generated using STATA16.

Appendix B: Summary Statistics

Table 4: Summary Statistics

Variable	**Obs**	**Mean**	**Std. dev.**	**Min**	**Max**
Patience	76	- .0034225	.3696629	-.61252	1.07145
Trust	76	-.0221458	.2777946	-.70644	.60902
Landlocked	76	.1842105	.3902316	0	1
Island	76	.0394737	.1960129	0	1
Old World	76	.7894737	.4103913	0	1
Population Density	76	139.1447	166.0657	3	1105
Variation in Land quality	76	.2148816	.0870854	.0033592	.3957673
Variation in Elevation	76	.4259937	.3560829	.0313992	1.738993
Distance to Waterway	76	.3161919	.4369561	.0273757	2.38558
Arable Land	76	.1898724	.1495548	.0067	.621
Ln (Exports)	76	24.53501	1.926012	20.47992	28.40113
Ln (Imports)	76	24.71651	1.709676	20.98023	28.49011
Genetic Distance (*)	72	.0375525	.0104895	.027283	.0633103

(*) Genetic distance from Nicaragua

Appendix C: Full Correlation Tables

Table 5: Pairwise Correlations of Patience, Trust and the Control Variables potentially subject to endogeneity or reversed causality

	Patience	Trust	Lit. Rate	Pop. Growth Rate	Urban Pop.	ln (GDP p. C.)	Health Expenditure	Education Expenditure
Patience	1							
Trust	0.1899 (.1004)	1						
Literacy Rate	.3670*** (.0011)	.1707 (.1404)	1					
Population Growth Rate	-.1976* (.0870)	-.1398 (.2284)	-.6920*** (.0000)	1				
Urban Population	.3779*** (.0008)	.2765** (.0156)	.6129*** (.0000)	-.3970*** (.0004)	1			
ln (GDP per Capita)	.6578*** (.0000)	.3059*** (.0072)	.7495*** (.0000)	-.5697*** (.0000)	.7507 (.0000)	1		
Health Expenditure	.5085*** (.0000)	.0004 (.9973)	.3247 (.0042)	-.3070*** (.0070)	.3229*** (.0044)	.493*** (.0000)	1	
Education Expenditure	.4593*** (.0001)	.1248 (.3218)	.3983*** (.0010)	-.1922 (.1252)	.4670*** (.0001)	.3976*** (.0010)	.3821*** (.0017)	1

Significance levels: * = 10%, ** = 5%, *** = 1% . Note: Standard errors in parentheses

Table 6: Pairwise Correlations of Patience, Trust, and the Control Variables

	Patience	Trust	Landlocked	Island	Old World	Density
Patience	1					
Trust	.1899 (.1004)	1				
Landlocked (D)	.0034 (.9770)	-.1684 (.1460)	1			
Island (D)	.0215 (.8537)	-.0900 (.4396)	-.0963 (.4078)	1		
Old World (D)	0.0461 (.6927)	.0313 (.7883)	.1621 (.1617)	.1047 (.3681)	1	
Density	.1021 (.3803)	-.0967 (.4062)	-.0494 (.6718)	.2292** (.0464)	.2393** (.0373)	1
Variation in suitable land	.1572 (.1751)	-.1997* (.0837)	.0188 (.8721)	-.1009 (.3856)	-.2562** (.0255)	.0135 (.9080)
Variation in elevation	-.0903 (.4380)	-.0082 (.9440)	-.0011 (.9923)	-.0593 (.6108)	-.3699*** (.0010)	-.1347 (.2459)
Distance to waterway	-.0744 (.5232)	-.0216 (.8529)	.2763** (.0157)	-.1311 (.2588)	.0270 (.8166)	-.2051* (.0755)
Arable Land	.0021 (.9859)	-.1413 (.2234)	.1288 (.2676)	-.0541 (.6426)	.3714*** (.0010)	.4739*** (.0000)

	V. suitable land	V. in elevation	Distance to WW	Arable Land
Variation in land quality	1			
Variation in elevation	.4082*** (.0003)	1		
Distance to Waterway	-.0284 (.8076)	.1550 (.1812)	1	
Arable Land	.0959 (.4098)	-.2646** (.0209)	-.2548** (.0264)	1

Significance levels: * = 10%, ** = 5%, *** = 1%. Note: Standard errors in parenthesis

Table 7: Pairwise Correlations of Patience, Trust, and the Instrumental Variables

	Patience	Trust	ln (Exports)	ln (Imports)	Gen. Dist.
Patience	1				
Trust	0.1899 (.1004)	1			
ln (Exports)	0.5657*** (.0000)	0.3458*** (.0022)	1		
ln (Imports)	0.5573*** (.0000)	0.3541*** (.0017)	0.9733*** (.0000)	1	
Genetic Distance	-.2921** (.0128)	-.3759*** (.0011)	-.4340*** (.0001)	-.4728*** (.0000)	1

Significance levels: * = 10%, ** = 5%, *** = 1% . Note: Standard errors in parentheses

Appendix D: Regressions

Table 8: OLS Regressions for Patience (dep.) with Trust as independent variable, including one single control variable

	Patience							
Trust	.261* (.155)	.257* (.153)	.251 (.153)	.268* (.152)	.307** (.153)	.252 (.152)	.250 (.153)	.258* (.143)
Landlocked	.035 (.110)							
Island		.073 (.217)						
Old world			.036 (.103)					
Population Density				.000 (.000)				
V (suitable land)					.863* (.487)			
V (elevation)						-.092 (.119)		
Distance to WW							-.060 (.097)	
Arable land								.073 (.287)
Constant	-.004 (.047)	-.001 (.043)	-.026 (.092)	-.035 (.055)	-.182 (.112)	.041 (.066)	.021 (.052)	-.012 (.069)
P>F	0.249	.247	.246	.150	.057	.194	.217	.253
Root MSE	.368	.368	.3676	.365	.360	.366	.367	.368
Obs (df)	76 (73)	76 (73)	76 (73)	76 (73)	76 (73)	76 (73)	76 (73)	76 (73)
Breusch-Pagan / Cook-Weisberg Test for Heteroscedasticity: H0 = constant variance [a]								
χ_1^2	12.50	9.99	10.90	9.15	6.72	14.50	10.78	10.98
$P > \chi^2$	.000	.002	.001	.003	.010	.000	.001	.001

* significant at 10%, ** significant at 5%, *** significant at 1%. Notes: Standard errors in parentheses.

a) All p-values are significant at 1%

Table 9: 2SLS (Full control variable set)

Patience (dep. var.)								
Instr. Var:	**Genetic Distance {NIC}**		**ln_Exports**		**ln_Imports**		**All_IVs**	
Trust-IV	1.010** (.467)	.930** (.373)	2.177*** (.772)	1.971*** (.577)	2.094*** (.731)	1.921*** (.539)	1.446*** (.487)	1.338*** (.365)
controls	No	Yes	No	Yes	No	Yes	No	Yes
Constant	.032 (.050)	-.236 (.178)	.0448 (.076)	-.411 (.261)	.0430 (.073)	-.405 (.255)	.039 (.059)	-.284 (.204)
Wald $\chi^2(i)$	4.67 (i=1)	14.20 (i=9)	7.96 (i=1)	14.46 (i=9)	8.20 (i=1)	15.62 (i=9)	8.81(i=1)	19.36 (i=9)
$P > \chi^2$	.031	.115	.005	.1068	.0042	.075	.003	.022
Root MSE	.420	.369	.642	.545	.623	.535	.495	.427
$F(n_1, n_2)$	F (1,70)	F (1,62)	F (1,74)	F (1,66)	F (1,74)	F (1,66)	F(3,68)	F(3,60)
Min. eigenvalue	11.522	14.876	10.047	13.723	10.612	15.513	4.99	7.360
Obs.	72	72	76	76	76	76	72	72
Breusch-Pagan / Cook-Weisberg Test for Heteroscedasticity (2nd stage OLS): H0 = constant variance								
$\chi^2(1)$	4.86	4.98	3.99	5.69	1.93	3.80	3.55	4.13
$P > \chi^2$	.028**	.026**	.046**	.017**	.164	.051*	.060*	.042**
Endogenous test: H0 = exogenous								
Durbin $\chi^2(1)$	4.290	3.882	22.387	24.705	21.652	26.254	14.092	16.913
$P > \chi^2$	.038**	.049**	.000***	.000***	.000***	.000***	.000***	.000
Wu-Hausman	4.371	3.476	30.482	31.306	29.083	34.305	16.791	18.729
$P > \chi^2$	.040**	.067*	.000***	.000***	.000***	.000***	.000***	.000
Overidentification test: H0 = valid (only possible with more than one instrument)								
Sargan $\chi^2(2)$							2.912	3.332
$P > \chi^2$							.233	.189
Basmann $\chi^2(2)$							2.866	2.911
$P > \chi^2$							.239	.233

* significant at 10%, ** significant at 5%, *** significant at 1%. Notes: Standard errors in parentheses; Controls include: Landlocked (D), Island (D), old world (D), Population Density, Variation in Land Quality, Variation in Elevation, Arable Land; NIC is short for Nicaragua, the comparison country for *Genetic Dist*