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CULTURE AND SAVINGS: WHY DO ASIANS SAVE MORE?

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It is a basic consensus that culture affects savings, but the empirical evidence is inadequate. This paper investigates the relationship between culture and savings by using the Hofstede cultural indices, and macro data across 48 countries over the period 1990–2013. The results show that country-fixed effects are highly significant, even if traditional variables are controlled for. We discover that culture can explain much of these individual effects and thus is very important in explaining differences in savings across countries. We use the method of Relative Importance Analysis (RIA) to measure the relative importance of the various cultural dimensions in affecting saving rates. We find that culture-related variables are among the most important saving determinants, along with other variables more commonly used in the economics literature, such as economic growth, social security, and demographics.

Keywords: Culture; saving rates; Hofstede cultural indices; long-term orientation; relative importance analysis.

JEL Classifications: D14, household saving

1. Introduction

The contribution of saving to capital accumulation, in the long run, exerts a strong influence on economic growth and development. There exists a sharp contrast in saving

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ratios between Western countries like the US and Asian countries/economies like China. According to the World Bank, net national/regional saving rates (as % of GNI) in the year of 2015 were 9.96% for the world average. However, on the one hand, we have 3.3% for North America, 4.9% for the European Union, 5% for OECD countries, 5.5% for Australia, 2.5% for Canada, 2.8% for France, 3.4% for the US, minus 0.2% for the UK but on the other hand, we have 20.8% for South Asia, 18.4% for East Asia and Pacific, 24.7% for East Asia and Pacific (excluding high-income countries), 15.9% for Korea, 25.3% for China, 33.5% for Singapore and 55.2% for Macau.[1] The damages of the imbalance on the world economy were highlighted by the global financial crisis and the subsequent recessions after the year 2008–2009 (partly caused by the imbalance of savings between different countries). How to explain the differences in saving rates across countries and offer effective measures to address the imbalance are thus very important issues.

There are several main theories about savings in the literature: the Keynesian absolute consumption hypothesis (Keynes, 1936), the life cycle hypothesis (Modigliani, 1954), the precautionary savings theory (Leland, 1968; Carroll and Samwick, 1998; Sarantis and Stewart, 2003; Baiardi *et al.*, 2011), and the liquidity constraints theory (Deaton, 1991; Loayza *et al.*, 2000a; Sarantis and Stewart, 2003; Bryan and Rafferty, 2017). They focus on factors like income, dependency ratios, social security, and financial market development. These factors are very important in explaining saving behavior, but the explanatory power is still limited (Bosworth, 1993; Hung and Qian, 2010). This is also confirmed by the following empirical results.

We find that high saving ratios are concentrated in Confucianism countries of East Asia, and low saving ratios in developed countries in the West. An intuitive conjecture is that cultural differences lead to differences in saving rates across countries. However, this research path has not been well followed. The current literature on the role of culture focuses on micro consumption behavior (McCracken, 1986), or macro saving phenomena in each individual country (Carroll and Rhee, 1994; Carroll *et al.*, 1999; Guin, 2017; Horioka, 2018). Empirical analysis of culture and cross-country macro saving phenomena are very limited. In particular, are cultural factors more important relative to economic factors? How importantly does culture affect savings? These questions have not been addressed. This paper attempts to partially fill this gap.

We test the hypothesis empirically, using the Hofstede cultural indices and macro data across 48 countries over the period 1990–2013. In a basic specification, we follow steps of the previous literature by regressing the saving-rate variable on traditional variables such as income, dependency ratio, financial market development, etc., which gives a low R-squared (0.345). Then we use a fixed-effect panel data model and find R-squared increasing to 0.785. This indicates that there exist significant individual effects. Given the fact that culture is an important component of country fixed effects, we then replace the country dummies with culture variables and get high values of R-squared such as 0.435. This indicates that cultural factors have important explanation power on the differences in saving rates across countries. This is seldom mentioned in the literature.

[1] *Source*: World Bank Development Database 2017.

In order to further accurately examine the influence of culture on saving, and to compare the importance of culture relative to traditional explanatory variables including economic factors, we use the method of "Relative Importance Analysis" of all explanatory variables including traditional and cultural variables, and then test the contribution of each explanatory variable to the *R*-squared of the regression equation. The results show that when doing regression analysis with the traditional variables, the *R*-squared values of the regression equation for most cultural variables are very high relative to others, the highest reaching 28.10% and rank first overall the regression variables.[2] These results are robust, even after controlling for traditional economic, institutional and demographic factors. This shows that cultural variables generally have very strong explanatory power for the national differences in saving rate, and are among the most important saving determinants, along with other variables more commonly used in the economics literature, such as economic growth, social security, and demographics.

The paper contributes to several strands of the saving the literature.

First, this paper uses new cultural indices to test the culture-saving hypothesis. Carroll and Rhee (1994), Carroll *et al.* (1999) and Al-Awad and Elhiraika (2003) use country dummy variables to indicate culture. Our paper replaces the dummy variable by the Hofstede indices which are widely used in international business and economic studies (Reuter, 2011). Compared with country dummy variables, the Hofstede cultural indices are more powerful in distinguishing cultural differences, with the additional advantage of continuity (Chui and Kwok, 2008).

Second, the Hofstede cultural indices used in this paper have another advantage in that, the five dimensions in the Hofstede cultural index system allow us to test the various mechanisms of cultural effects on saving behavior.[3] These results may provide a benchmark to more detailed research on the effects of culture on savings in the future.

Third and very importantly, we not only demonstrate the significant relationships between various cultural dimensions and savings but also provide various measurements of the degrees of influence. Apart from demonstrating the important contributions of various cultural factors from the angle of *R*-squared variation, we try to quantitatively estimate the explanatory power of each cultural variable on national differences of the saving rate using the method of Relative Importance Analysis, and then compare it with traditional macroeconomic variables such as income and social security. This provides new evidence on the effects of cultural dimensions on saving and partly helps to answer why the Asians save more.

The paper is arranged as follows. Section 2 discusses the literature on saving theory; and then Section 3 analyzes different dimensions of culture; Section 4 describes the model, data and measures; followed by Section 5 analyzing the empirical results; Finally, Section 6 draws conclusions.

[2] The *R*-squared values of the regression equation for the Individualism (IDV) dimension index reach 28.10% and rank first over all the regression variables, whereas Power Distance index (PDI) rank second, Long-term Orientation (LTO) index and the Uncertainty Avoidance index (UAI) rank third.

[3] Shoham and Malul (2013) discuss how culture affects national saving but they only analyze one dimension — Long Orientation and national control variables are limited in the regression equation.

2. The Literature on Saving

Under the assumption of expected utility maximization with a given utility function, the life cycle hypothesis and the permanent income hypothesis emphasize that people should smooth their consumption during their life cycles (Modigliani and Brumberg, 1954; Friedman, 1957). In practice, however, most people do not completely follow this in their savings and consumption, thus leading to different patterns of saving behavior across countries, including inadequate savings in countries in the West and excessive savings in countries in the East, as shown in Table 1.

To explain country-level differences in saving rates, previous studies focus on three aspects: economic factors, demographic factors and institutional factors.

2.1. *Economic factors*

Economic factors mainly include incomes, interest rates and inflation rates. According to the Keynesian absolute consumption hypothesis, the consumption ratio is negatively correlated to the income level, that is, the consumption ratio decreases with a higher income level, while the saving ratio increases (Collins, 1991; Edwards, 1995). Loayza *et al.* (2000b) conclude that per capita income is a determinant of consumption, and this factor has a more significant influence on developing countries than developed countries. For interest rates, there may exist two different effects: the substitution effect and the income or wealth effect. An increase in the real rate of interest increases the price/reward for saving, and may hence increase savings; this is the substitution effect: substituting future consumption for current consumption. On the other hand, an increase in the real rate of interest increases the overall wealth (for the normal case with positive net savings) and hence may increase current consumption which reduces savings. Looking somewhat differently, a higher real interest rate reduces the amount of current savings needed to generate the same amount of future consumption; this may also reduce savings, especially for those with some target future consumption. Thus, the effects of changes in interest rates depend on the relative strengths of the substitution and wealth effects. The inflation rate indicates people's expectation of the uncertainty in the future (Loayza *et al.*, 2000b) and thus may be positively related to saving rates.

Table 1. Net Savings Ratios in Main Countries (%)

	1990	1996	1999	2002	2006	2007	2009	2011	2013	2014	2015
USA	7.13	8.69	9.97	7.02	6.96	1.71	1.75	3.28	5.87	3.49	3.50
UK	1.09	7.23	6.56	6.41	5.70	2.44	2.19	5.49	3.56	−0.03	−0.19
Korea	20.79	17.43	13.64	15.67	17.05	15.95	17.39	19.83	19.02	14.90	15.90
China	21.79	26.59	24.59	25.05	30.57	34.88	33.06	26.51	29.35	26.09	25.05

Note: Net savings ratio = net national savings/total national income.
Source: World Bank Development Database.

2.2. *Demographic factors*

The life cycle hypothesis (Modigliani and Brumberg, 1954) deems that consumers, taking account of their expected total incomes, smooth consumption over the whole life cycle. Hence, they will have positive net savings during the working life (aged 15–65), but have negative net savings before 15 and after 65. Thus, for countries with high dependency ratios, the saving ratios will be low. In addition, rural residents are more conservative or have fewer opportunities for consumption than urban residents, which implies that the degree of urbanization should be negatively related to saving rates (Edwards, 1996; Hung and Qian, 2010).

2.3. *Institutional factors*

The precautionary savings theory deems that people will make precautionary savings decisions to hedge for future uncertainty (Leland, 1968; Carroll and Samwick, 1998). If people think that future uncertainty is high, they will be more willing to save more. With a good social security system, people will have a greater sense of security for the future and lower expectations for future uncertainty. So the better the social security system, the less they will save (Carroll and Samwick, 1998). The transition from socialism to a market economy may thus explain the desire for accumulating wealth in China (e.g., Meng, 2007). The liquidity constraints theory deems that consumers will be restricted by liquidity when buying expensive items. Therefore, the more mature the financial market, the easier people can borrow from the bank, thus the higher the consumption ratio. On the other hand, in the lack of borrowing options, people may have to save in advance in order to consume expensive items later (Deaton, 1991; Loayza *et al.*, 2000b). Besides, other factors influencing savings include insurance, habits persistence, relative consumption and so on (Harbaugh, 2013).

According to the discussion above, the income and demographic factors are in line with the savings situation in East Asian countries such as Japan and Singapore but cannot explain the difference between China and developed countries. On the other hand, the precautionary savings theory and liquidity constraints theory can simultaneously explain very high consumption in Western countries and very low consumption in China. In particular, they are powerful in explaining the high savings rate in China (Kraay, 2000; Meng, 2003; Chamon *et al.*, 2010). However, both theories have difficulties in explaining why Japan, Korea and Singapore, with their mature social security systems and financial markets, also encounter the problems of low consumption and high savings.[4] So it is desirable to add other factors in the analysis in order to better understand the consumption/savings behavior.

Culture is thought to be an important factor concerning savings but with little empirical support. Since Hofstede (1980) came up with culture indices, there have been many studies investigating how culture affects financial decisions, including cross-border mergers and

[4] In analyzing the saving rates of the developed countries in Asia, Horioka and Terada-Hagiwara (2012) show that the age structure of the population (especially the aged dependency ratio), income levels and the level of financial sector development are the most important factors, but the effects of these factors are sometimes not linear.

acquisitions (Morosini *et al.*, 1998), trading decision (Grinblatt and Keloharju, 2001), capital structure (Chui *et al.*, 2002), dividend policy (Fidrmuc and Jacob, 2010), financial system design (Kwok and Tadesse, 2006) and insurance purchase (Chui and Kwok, 2008). But little has been done with saving decisions.

A few papers relevant to the thesis of "culture and savings" used country dummy variables to measure national culture and the results are mixed. Using Canada and American immigrant family expenditure data, Carroll and Rhee (1994) find that different cultural background does not have significant effects on the savings decisions of immigrants. In contrast, Al-Awad and Elhiraika (2003) find that the cultural background had important effects on savings with the United Arab Emirates (UAE) immigrant data. Using the household survey data of Japan, Horioka (2018) shows that the influences of culture and social norms on the savings motivation are not significant using the Japanese sample. However, he also mentions that this does not mean that culture and social norms are unimportant for savings: "Culture and social norms matter but that they change over time largely in response to changes in the socioeconomic and policy environment such as public pension reform."

This paper combines these two streams of the literature and examines the way national culture affects macro saving ratios across countries, using the Hofstede culture indices. In particular, we do not yet have any quantitative comparison of the importance of cultural factors relative to the traditional factors in affecting savings. This paper makes an exploration on this.

3. The Expected Relationship Between Cultural Dimensions and Saving Rates

Hofstede and Bond (1988) defined culture as "the collective programming of the mind that distinguishes the members of one category of people from those of another. Culture is composed of certain values, which shape behavior as well as one's perception of the world". Such behavior probably includes the research object of this article: saving behavior. Until now, various methods have been used to capture cultural characteristics. The early literature usually used some variables such as language, religion, national virtual variables to measure national cultures (Carroll and Rhee, 1994; Stulz and Williamson, 2003). However, the measures of these cultural indicators tended to be indirect, most of which were dummy variables; the degree of differentiation may be low (e.g., because of the same language and similar religion, the United States and Britain might get the same score), thus, the conclusion would be relatively coarse as well. After that, people started to summarize the cultural differences among people by using large sample questionnaire surveys, and then formed multinational culture indices, and the Hofstede cultural index is one of the most famous cultural indices.

Hofstede and his coauthors classified national culture into five dimensions based on the survey on 53 IBM branches across the world in 1970s (Hofstede, 1980; Hofstede and Bond, 1988), namely, individualism, power distance, masculinity, uncertainty avoidance and Confucian dynamism, to measure the attitudes of people to group, power, gender, uncertainty and future. The cultural indices are widely used in the research field of economics, business and finance (Reuter, 2011).

As an intertemporal strategy, saving is closely related to people's time preferences and risk appetite; their representatives in the cultural indices are "long-term orientation" and "uncertainty avoidance", which are the cultural indices most directly and closely related to the savings rate. In addition, individualism is regarded as the most representative cultural dimension (Hofstede, 1980; Hofstede and Bond, 1988). Other dimension indices are also likely to affect people's risk preferences and time preferences in different degrees, and thereby indirectly affect people's savings decisions. This paper focuses on the impacts of "long-term orientation", "uncertainty avoidance" and "individualism" on saving rate, at the same time also hopes to understand the empirical relationships between other cultural indices and savings rates, and finds the ways to comprehensively understand the influence of culture on saving.

We discuss these indices below.

3.1. *Long-term orientation*

This dimension reflects the degree of the willingness to delay immediate satisfaction for the benefits of the long-term (Hofstede and Bond, 1988). The index actually measures the time preference from the opposite perspective: the more people are concerned for the future, the lower the rate of time preference; the more attention to the current, the higher the rate of time preference. Asian countries score higher on this indicator, while the scores of European and American countries are likely to be lower. Hofstede and Bond (1988) even stated that the dimension was the Confucian dimension, the countries scored higher were the Confucian culture countries, and lower ones were countries of non-Confucian cultures.

In the countries with East Asian Confucianism, people are educated to have a long-term vision ("Those who do not plan for the future will find trouble at their doorstep"); be patient and tolerable ("A little impatience spoils great plans") for the future further development. East Asian countries pay much more attention to education because education is considered to be the most valuable of a long-term investments ("It takes three generations to make a gentleman"). As a result, they tend to have long-term orientation. However, in the European and American countries, people's life rhythm is so fast that they have to pay more attention to short-term profits. Take the corporate value evaluation problem as an example, Western people focus on the share price performance. Their concern with the future is less obvious. There is a negative relation between long-term orientation and the rate of time preference while time preference rate is inversely proportional to the saving rate. Therefore, we expect that the sign between long-term orientation and saving rates is positive.

3.2. *Uncertainty avoidance*

This cultural dimension refers to the lack of tolerance for ambiguity and uncertainty and the social behavior to deal with this psychology (Hofstede, 1980). To a certain extent, it reflects people's risk aversion attitudes.

In the countries with high uncertainty avoidance, people are more likely to be risk aversion, not willing to take risks and reject new things. For the uncertainty of the future

consumption, people are more inclined to construct elaborate employees guarantee conditions and the social security system to smooth the inter-temporal risk. On the other hand, in the low uncertainty avoidance society, people could accept uncertainty with ease and show a bigger tolerance with the unknown situations, ideas, and figures (Kwok and Tadesse, 2006).

In deciding on the path of consumption, a consumer does not only consider the amount of permanent income but also the risks or variation involved (Caballero, 1990). If the consumer considers future incomes are risky or with high variation, to smooth future consumption, she may have more precautionary savings (Dynan, 1993). Given the degree of uncertainty regarding future incomes, the higher the degree of risk aversion, the higher the amount of precautionary savings. Hence, the correlation between UAI and saving rates may be positive. When consumers think that there is uncertainty in future income, he will make precautional savings in order to smooth future consumption. When the uncertainty of the future is certain, the higher the risk aversion of the residents, the more savings will be prepared for the future.

However, on the other hand, people who are more willing to take risks are not necessarily those who lack control. Rather, given that they are more willing to take risks, they may look for insurance to hedge those risks. Saving is a natural way of self-insurance. Thus, if those with lower UAI engage in more risky activities but also take more self-insurance of higher savings, the correlation between UAI and saving rates may be negative. Therefore, we take that the sign between uncertainty avoidance and saving rates is uncertain, to be revealed by the regression results.

3.3. *Individualism*

This dimension is mainly used to denote the correlation between individuals and groups (Hofstede, 2001). Individualistic cultures pay great attention to individual goals. On the contrary, collectivist cultures put more emphasis on collective goals. "Individualistic society" refers to a kind of loosely coupled social organization structure, and everyone pursues personal values and desires, relying on individual efforts to seek benefits for themselves. An interpersonal relationship is relatively unimportant, keeping a kind of spiritual independence of the collective. By contrast, "collectivistic society" refers to a kind of closely combined social organization, collective preferences are more important than individual preferences, and consensus and collaboration are more valuable than individual action and effort.

The countries with the Confucian culture score relatively low in this cultural dimension of individualism. Confucian culture emphasizes "deny self and return to propriety", "repress the private for the public", and therefore requires the gentleman to keep the consistent coordination between themselves and the public, refraining from the selfish desire, in particular, highlighting the cultivation of the individual capability and the promotion of self-control, including restraint on consumption. The European and American countries have higher scores, European and American cultures emphasize individual self-realization and pursuit, with more extrovert and differential personalities, and these pursuits are

usually expressed through instant consumption behavior. In other words, they do not go to restrain their consumption impulse to meet the specification of the outside world in the face of the temptation of consumption. With the guidance of this consumption attitude of "carpe diem", the people have a weakly saving will.

On the other hand, individualism may induce a lack of social protection and collective action, thus incentivizing the individual to save more (self-insurance rather than social insurance). Thus, we cannot know the net effect of individualism on consumption or saving.

The relationships of Masculinity (MAS) and Power distance (PDI) with saving rates are not direct and we take an open position regarding the regression signs, letting the data and the test show the results.

4. Data and Methodology

In order to verify the expected association between cultural dimensions and saving rates in Section 3, we regress saving rates on various culture indices by using the balanced panel data in 48 countries from 1990 to 2013.[5]

The dependent variables include net saving rates, the ratio of net national saving to GDP and Domsaving rates, the ratio of residents' domestic savings to GDP. The explanatory variables refer to cultural indices. We mainly take the mostly used Hofstede's culture indices in the main part, and take GLOBE culture indices for a robust test. Our conclusions are likely to face the challenge of omitted variables. Following previous literatures, we select control variables of three main types, which are, respectively, economic factors, demographic factors and institutional factors to mitigate the effect of omitted variables.

4.1. *Control variables*

4.1.1. *Economic factors*

Income. Generally, according to the Keynesian absolute income theory, the rate of savings is positively related to the level of income. Since saving equals the difference between income and consumption, as income increases, consumption rises too but at a slower rate than the former, leading to a higher saving rate. We measure income by per capita GDP.

Real interest rates for deposits and inflation rate. The real interest rate equals the difference between the nominal rate and the inflation rate. As explained above, the sign of the effect of real interest rates on saving rates is ambiguous. It depends on the relative strengths of the substitution and wealth effects. Inflation is regarded as the indicator of the uncertainty in the future which is positively related to precautionary saving (Loayza *et al.*,

[5] The 48 countries and regions includes: Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Colombia, Czech Republic, Egypt, Denmark, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, India, Indonesia, Iran, Ireland, Italy, Japan, Korea, Malaysia, Netherlands, New Zealand, Norway, Pakistan, Philippines, Poland, Portugal, Russia, Singapore, Slovak Republic, South Africa, Mexico, Spain, Sweden, Switzerland, Thailand, Turkey, England, Uruguay, US, Vietnam. These countries are selected according to the availability of the cultural data and macroeconomic data.

2000b), therefore, it may be positively related to saving rate. In this paper, we use the average of future five years' inflation rates to represent the expected inflation rate.

4.1.2. *Demographic factors*

Dependency ratio. The life cycle theory posits that, throughout one's lifetime, people are net consumer before about 15 years old but depositors in middle age with higher incomes, then change to have negative savings again when they get older (after 65 years old). So if the dependency ratio is high, the savings rate in the country will be low, and vice versa.

Rural population ratio or urbanization rate. As rural residents rely mainly on agricultural incomes, their income volatility is high. Moreover, since they engage in agricultural production, it is difficult for them to own assets qualified for mortgage loans, making their accessibility to credit poor. This is especially so for countries like China where land is owned collectively, not individually. If they want to buy big items, they have to save a long-time in preparation. So it would be expected that a country with a low urbanization rate, the rural population will pull up the whole country's savings rates. Another consideration is that in the empirical literature, urbanization rate is also regarded as variable related to uncertainty in that rural incomes are more uncertain than urban incomes (Edwards, 1996; Loayza *et al.*, 2000b). So it would be expected that countries with lower urbanization rates have higher savings ratios.

4.1.3. *Institutional factors*

Development of the financial market. People's consumption will be affected by the ability to pay, especially for large items of consumption. In the absence of a well-developed financial market, people with low incomes usually have to wait for many years to save enough in order to consume large items. But with a developed financial market, as long as there are stable incomes or cash flows, people do not have to save in advance. They can realize consumption by mortgage loans from the financial market, then use cash flows from incomes to pay by installment. Financial markets break through the limitation of consumer liquidity and make current consumption set expand. This convenience can help consumers rearrange life-time structure of spending and fulfill their consumption impulse, reducing the desire for savings. So in general, the degree of financial market development is inversely related to the savings ratio. In this paper, we use the ratio of "total domestic credit/GDP" to measure financial market development.

Social security. Precautionary saving is considered to be an important factor in explaining saving behavior. China, for example, is a transition economy and is changing its systems of providing for health care, education and housing from collective provision to private responsibility, making people form an intense expectation of future uncertainties. In order to hedge for this risk, people tend to save a lot. The main policy implication of this theory is that a way to increase consumption is to improve the social security system, so that people do not have to worry too much about the uncertainty of the future. This largely reflects the difference between China and American/European countries, and also is one of

the major factors of China's high saving rates. But even with this factor, it is difficult to explain the general tendency of high saving rates of the East Asian developed countries like Japan and Singapore. We believe that, in addition to this factor, cultural factors are also important. Therefore, we must control for this factor (social security), and eliminate this consideration of precautionary savings, in order to more accurately measure the impact of culture on saving rates. We use the government's social spending as a proxy variable of social security.

4.2. *Regression model*

According to the discussion above, we set up a regression equation as follows:

$$\text{NetSaving}_{it} = \beta_0 + \beta_1 \text{Culture}_i + \beta_2 \text{Controls}_{it} + \varepsilon_{it}, \quad (1)$$

where NetSaving_{it} is the saving rates for country i at year t. Culture_i are our explanatory variables coming from Hofstede (1983) and House *et al.* (2004). Controls_{it} indicates the vector of control variables, including: the natural logarithm of GDP (LnGDP), growth rate of real GDP per capita (GDPgrowth), the real interest rate (Rate), the inflation rate (Inflation), the dependency ratio (Depend), the financial development index (Finance), the urbanization index which equals the ratio of rural population to whole population (Ruralpop), the ratio of social security expenditure to whole government expenditure (Socialsecu).

Definitions and data sources of key variables are given in Table 2. Descriptive statistics and correlation matrix of key variables are presented in Tables 3 and 4, respectively.

We use panel data in 48 countries over the period from 1990 to 2013 to estimate Equation (1). We take three steps to do OLS regressions. On the first step, we run an OLS regression between national saving rates and control variables such as the levels of income, GDP growth, interest rate, inflation, dependency ratio, rural population rate, social security expenditure and financial development to test the explanatory power of traditional saving theories. In the second step, we add 47 country dummy variables into the regression to test whether there exist fixed effects which cannot be explained by the traditional variables. On the third step, we replace country dummy variables with cultural variables into the regression to test the effects of cultural variables on saving rates.

To avoid the potential endogeneity problem, we conduct 2SLS regression between saving and culture variables. We take English language as the instrument variable because Language is closed related to culture but cannot directly affect saving rate. We utilize language data from Stulz and Williamson (2003).

4.3. *Relative importance analysis*

The research aims to measure the explanatory power of culture of the national differences in saving rates. We are more concerned with the differences in the degree of the explanatory power of the cultural variables compared to traditionally explanatory variables. Furthermore, we wish to know which has the strongest explanatory power to explain the differences in saving rates out of the five cultural variables. At the technical level, we need

Table 2. Definitions and Sources of Variables

Variables Names	Definitions and Sources
Netsaving	The ratio of net national savings to GDP *Source*: World Bank Development Database (WBDD)
Domsaving	The ratio of residents' domestic savings to GDP *Source*: WBDD
Hofstede cultural indices	The LTO, UAI, IDV index, PDI, MAS *Source*: Hofstede and Bond (1983)
GLOBE cultural indices	The future orientation index (FOI_G), uncertainty avoidance index (UAI_G), institutional collectivism (INC_G), in-group collectivism (ING_G), Assertiveness (ASI_G), power distance (PDI_G), performance (POI_G), humane (HOI_G), gender differentiation (GDI_G) *Source*: House *et al.* (2004)
Finance	Financial development: the ratio of credit supplied by banks sector to GDP *Source*: WBDD
GDP	GDP per capita in constant 2000 US dollars *Source*: WBDD
GDPgrowth	Growth rate of real GDP per capita (lagged one year)
SocialSecu	Social security: the ratio of Social security expenditure to government expenditure *Source*: IMF Government financial statistics
Rate	Real interest rate: one year deposit rate — inflation rate *Source*: WBDD
Inflation	Expected inflation rate, the average of future five year's inflation rate *Source*: WBDD
Ruralpop	The ratio of rural population to total population *Source*: WBDD
Depend	Dependency ratio: the ratio of the population over age 65 to the population ages 15–65. *Source*: WBDD
English	Dummy variable: English = 1 if a country's main language is English, and 0 otherwise. *Source*: Stulz and Williamson (2003).

to know the specific contribution of Hofstede's five cultural indices to the *R*-squared of the regression equation. Therefore, the Relative Importance Analysis method, which is commonly used in management, psychology and sociology (Grömping, 2007; Tonidandel and Lebreton, 2011; Ye *et al.*, 2015), may be applied in this research.

The simple comparison of the *R*-squared of OLS regression may easily lead to biases in estimating the effects of the cultural variables. For example, we may get the *R*-squared, R_a^2, and then we add the cultural factors and regress with respect to saving rates to get R_b^2. Suppose R_b^2 is larger than R_a^2. Can we use $\Delta R^2 = R_a^2 - R_b^2$ to measure the total explanatory power of cultural variables on saving rates? Not necessary. This simple calculation is based on the presumption that the cultural variables are not related to other traditional

Table 3. Descriptive Statistics

Variables	Mean	SD	Min	Max	*N*
Netsaving	12.98	6.78	0.06	37.22	572
Domsaving	25.47	9.82	−5.34	54.29	572
Finance	83.31	47.46	9.218	206.30	572
LnGDP	26.31	1.59	22.75	30.24	572
GDPgrowth	0.04	0.03	−0.14	0.20	572
SocialSecu	26.31	17.24	0.02	62.02	572
Rate	7.42	7.29	0.26	48.71	572
Inflation	6.10	9.42	0.01	101.9	572
Ruralpop	30.87	17.14	2.41	73.55	572
Depend	53.00	10.53	33.41	92.36	572
LTO	50.28	23.31	13	100	510
UAI	60.38	25.16	8	112	572
IDV	48.75	27.29	6	91	572
PDI	53.22	22.21	13	104	572
MAS	48.78	19.77	5	95	572
FOI_G	3.91	0.47	3.10	4.80	484
UAI_G	4.26	0.60	3.52	5.42	484
INC_G	5.03	0.74	3.46	6.14	484
ING_G	4.30	0.45	3.41	5.26	484
ASI_G	4.08	0.32	3.41	4.66	484
PDI_G	5.12	0.36	4.14	5.69	484
POI_G	4.16	0.40	3.34	5.04	484
HOI_G	4.13	0.43	3.30	4.96	484
GOI_G	3.38	0.32	2.45	4.02	484

explanatory variables. This presumption is usually not satisfied. Thus, using such a simple calculation of the explanatory power of cultural factors may give biased results. The model of Relative Importance Analysis is a method that could objectively analyze the contribution of each variable (even if related to other explanatory variables) to the *R*-squared of the whole regression equation. Compared with traditional methods, the method of Relative Importance Analysis could comprehensively compare all sub models derived from the full model, and predict the relative importance between variables. Grömping (2007) also believes that the dominance analysis is based on the comparison of all subset regression,[6] and would be the most effective tool to calculate the contribution of explanatory variables or sets of explanatory variables in the regression model.

Thus, our empirical idea is as follows: Comparing first the R^2 of OLS regression results to preliminarily demonstrate the important effects of cultural variables in explaining the individual country effects in the differences of saving rates. Moreover, using the method of Relative Importance Analysis to compare the relative importance of cultural factors versus

[6]For example, if there are j variables, then there will be 2^{j-1} subsets.

Table 4. Correlation Matrix

	Control Variable Correlation Matrix								
	Netsaving	Finance	lnGDP	GDPgrowth	SocialSecut	Rate	Inflation	Ruralpop	Depend
Panel A									
Domsavingn	0.57*								
Finance	0.33*	0.00							
lnGDP	0.27*	−0.04*	0.40*						
GDPgrowth	0.36*	0.45*	−0.11*	0.08*					
SocialSecu	−0.13*	−0.33*	0.20*	0.30*	−0.36*				
Rate	−0.31*	−0.25*	−0.37*	−0.23*	−0.11*	0.08*			
Inflation	−0.26*	−0.16*	−0.42*	−0.29*	−0.03	−0.15*	0.39*		
Ruralpop	−0.09*	0.41*	−0.28*	−0.20*	0.21*	−0.51*	−0.07*	0.16*	
Depend	−0.61*	−0.08*	−0.46*	−0.31*	−0.04*	−0.26*	0.30*	0.35*	0.39*

	Culture Variable Correlation Matrix					
	Netsaving	Domsaving	UAI	LTO	IDV	PDI
Panel B						
Domsaving	0.57*					
UAI	−0.24*	−0.42*				
LTO	0.29*	0.49*	0.06*			
IDV	−0.32*	−0.12*	−0.22*	−0.26*		
PDI	0.30*	0.15*	0.12*	0.21*	−0.67*	
MAS	−0.08*	−0.07*	0.00	0.12*	0.06*	0.20*

Note: *Represents significant at 5% level or above.

other traditional explanatory variables, so as to demonstrate the explanatory power of cultural variables on the individual country effects in the differences in saving rates more accurately and objectively.

5. Results

5.1. *OLS results*

5.1.1. *Baseline regression results*

The OLS results are detailed in Tables 5–8.

For the first step, we report the effects of the traditional explanatory variables on saving rate. Among them, dependency ratio and social security are mostly significantly negative related with saving rates, which is consistent with the life cycle hypothesis theory and the precautionary saving theory. Rural population has a significant and positive correlation with the savings rates, as consistent with the literature. The coefficient of interest rate is significant negative, it seems that the substitution effect is stronger than wealth effect in our sample. GDP has a significant and negative correlation with the savings rates, being inconsistent with the Keynesian theory. Financial development is positive related with saving rates, which is inconsistent with liquidity constraints theory. The coefficient of inflation is negative, being inconsistent with the literature. In particular, the adjusted R^2 for these control variables is small at only 0.345. It seems that the explanation power of the traditional variables is limited in our samples.

For the second step, we add 47 dummy variables to proxy for individual country fixed effects. The results are shown in column 2 of Table 5. The adjusted R^2 increases to 0.780. This indicates the existence of significant country fixed effects which do not vary with time significantly. We further add the year dummies, and find that they are not jointly significant. The adjusted R^2 increases from 0.780 to 0.784 relative to column 2. This indicates that saving behavior is stable in our samples. If we take country dummies as the proxies for culture (see Carroll and Rhee, 1994; Mouawiya and Elhiraika, 2003), the results mean that culture is an important factor affecting saving. The results are consistent with Mouawiya and Elhiraika (2003).

For the third step, we replace country dummy variables by the cultural indices into the regression model. For example, in column 5, we add the LTO index into the basic regression equation specified in column 1, and find that there is a significant increase in the adjusted R^2 (from 0.345 to 0.435). It means that culture may actually be an important component of the country's fixed effects accounting for the differences in saving rates across countries. We then control for the time effects and find that the results do not change much. In fact, the time effects are not statistically significant, implying that the results vary little between years, and the culture's effects are very stable. The other culture indices such as PDI, IDV, UAI and MAS can also significantly increase R^2. These results demonstrate that cultural variables are important explanatory variables.

Table 5. National Culture and Net Saving Rates

	(1) OLS	(2) FE	(3) FE+Year	(4) OLS+Year	(5) OLS+Year	(6) OLS+Year	(7) OLS+Year	(8) OLS+Year	(9) OLS+Year
Finance	0.003	−0.008	−0.003	−0.000	0.016**	0.011*	0.006	0.012*	0.010
	(0.42)	(−0.88)	(−0.37)	(−0.07)	(2.27)	(1.71)	(1.01)	(1.81)	(1.46)
lnGDP	−0.190***	9.557***	12.750***	−0.141*	−1.393***	−0.234***	−0.282***	−0.213***	−1.161***
	(−2.66)	(7.28)	(7.74)	(−1.80)	(−5.70)	(−3.22)	(−3.75)	(−2.92)	(−4.42)
GDPgrowth	70.530***	42.859***	41.387***	74.263***	71.971***	66.968***	73.341***	73.669***	63.268***
	(8.70)	(7.43)	(6.37)	(8.19)	(8.11)	(7.39)	(8.15)	(8.17)	(7.41)
SocialSecu	−0.026	−0.139***	−0.140***	−0.038*	−0.011	0.018	−0.019	−0.037*	0.017
	(−1.25)	(−4.39)	(−4.38)	(−1.74)	(−0.53)	(0.75)	(−0.86)	(−1.73)	(0.71)
Rate	−0.086**	−0.042	−0.085**	−0.073*	−0.111***	−0.167***	−0.133***	−0.102***	−0.094**
	(−2.35)	(−1.20)	(−2.16)	(−1.80)	(−2.84)	(−4.07)	(−3.35)	(−2.61)	(−2.26)
Inflation	−0.102***	0.028	0.024	−0.091***	−0.105***	−0.124***	−0.102***	−0.087***	−0.075**
	(−3.49)	(1.21)	(0.88)	(−2.94)	(−3.23)	(−4.05)	(−3.35)	(−2.85)	(−2.31)
Ruralpop	0.115***	0.448***	0.405***	0.099***	0.115***	0.077***	0.072***	0.114***	0.041*
	(5.86)	(6.83)	(5.95)	(4.91)	(6.09)	(3.74)	(3.35)	(5.73)	(1.75)
Depend	−0.097***	−0.058	−0.045	−0.097***	0.030	−0.090***	−0.112***	−0.089***	−0.002
	(−3.35)	(−0.95)	(−0.71)	(−3.28)	(0.82)	(−3.10)	(−3.79)	(−3.03)	(−0.04)
UAI				−0.032**					−0.098***
				(−2.56)					(−5.96)
LTO					0.087***				0.089***
					(7.39)				(6.73)
IDV						−0.072***			−0.043*
						(−4.84)			(−1.94)
PDI							0.057***		0.054***
							(3.95)		(3.20)
MAS								−0.046***	−0.031**
								(−3.66)	(−2.27)

Table 5. (*Continued*)

	(1) OLS	(2) FE	(3) FE+Year	(4) OLS+Year	(5) OLS+Year	(6) OLS+Year	(7) OLS+Year	(8) OLS+Year	(9) OLS+Year
Constant	18.895***	−4.283	5.461	18.604***	37.741***	24.001***	20.203***	20.577***	42.129***
	(6.67)	(−0.83)	(0.83)	(2.84)	(5.10)	(3.67)	(3.11)	(3.15)	(5.53)
Country Dummies	No	Yes	Yes	No	No	No	No	No	No
Year Dummies	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	539	539	539	539	478	539	539	539	478
adj$-R^2$	0.345	0.780	0.784	0.338	0.435	0.359	0.349	0.346	0.504

Notes: This table reports the results of the pooled OLS regressions of the net saving rates (Netsaving) on LTO, UAI, IDV, PDI and MAS and some control variables over the years from 1990 to 2013. The t statistics are in parentheses. ***, ** and * represent significant at 1%, 5% and 10% levels, respectively.

In the last column of Table 5, we add all cultural variables together into the regression. The results show that the directions of regression coefficients remain consistent with the previous regressions. This shows that the influence of culture is rather stable.

After controlling for the traditional variables such as income, social security, and dependency ratios, we still find that cultural indices and saving rates are significantly correlated. Specifically, LTO which measures time preferences has larger values of adjusted R^2 (see column 5 in Table 5), it is significantly positively related to saving rates. It seems that LTO is more powerful than other cultural indices in explaining the saving rate differences.

In Section 4, we are not sure about the effects of UAI, IDV, PDI and MAS. The empirical result shows that the coefficients of UAI, IDV and MAS are negative and significant (columns 4, 6 and 8), the coefficients of PDI is positive and significant (column 7). It seems to indicate that people have to ensure against their own risk preference and individualistic freedom, and that power distance may lead to more self-control, and women's risk aversion is important in the family's saving decision. However, these conclusions have to be confirmed by the endogeneity test.

5.1.2. *Contrasting Asian countries with Western developed countries*

We further contrast Asian countries with Western-developed countries. We first divide these two groups of countries or regions. The Asian group includes 12 economies of China, Hong Kong (China), India, Indonesia, Iran, Japan, Korea (South), Malaysia, Pakistan, the Philippines, Singapore and Vietnam. The Western group includes 14 economies of Australia, Canada, Denmark, Finland, France, Germany, Holland, Italy, Norway, Spain, Sweden, Switzerland, UK and US. We first do the *t*-test on the saving rates and cultural values of these two groups, to verify if the average values are significantly different. The results are reported in Table 6.

As shown in Table 6, there are significant differences in the saving rates and all the cultural dimensions.

Last, to further quantify whether the differences in saving rates are due to cultural variables, we do a simple simulation. Our procedure is that: (1) We calculate the fitted

Table 6. The Differences Between Asian and Western Developed Economies

Variables	Average Values of Asian Economies	Average Values of Western Economies	*t* statistics
Netsaving	19.76%	7.42%	−29.76***
LTO	71.00	33.00	−22.65***
UAI	50.09	59.18	6.13***
IDV	27.64	66.59	42.59***
PDI	72.91	42.86	−3.03***
MAS	55.82	49.00	−5.83***

Notes: ***Represents significant at 1% level.

Table 7. Changes in Saving Rates of Asian Economies Using the Cultural Values of Western Developed Countries: Simulated Results

Culture Variables	Level Changes in Saving Rates	Percent Changes in Saving Rates (%)
LTO	−4.590	−17.947
UAI	−2.967	−19.585
IDV	−3.332	−20.260
PDI	−2.394	−14.798
MAS	0.349	3.741

values of the saving rates of the various Asian economies in accordance with the regression results above (see Table 5). (2) According to Table 6, the cultural values of the dimensions of LTO, PDI and MAS for Asian countries are generally higher than those of the American–European countries, and those for UAI and IDV are generally lower. We replace the cultural values of the Asian countries with those of the American–European countries, and then calculate the matching saving rates.[7] (3) We obtain the matching values and coefficients of correlations of the main regression and then calculate the matching saving values after the replacement of cultural values. (4) We subtract the two-fitted values to get the differences in saving rates due to cultural differences. The calculated results are reported in Table 7.

Table 7 shows that, if the Asian economies were to assume similar cultural values as the Western economies, then according to our simulation, the saving rates of the Asian economies will decrease. For example, for the dimension of LTO, if Asian countries had American–European cultural values, the Asian saving rates would decrease 4.59% points, or that the decrease in saving rates would be 17.947%. For the dimension of IDV, the Asian saving rates would decrease by 3.332% points, or 20.260%. For the cultural dimension of MAS, as its regression coefficient in the main regression is negative, and the average MAS value for the Asian economies is larger than that for the West, the average saving rates for the Asian economies would actually slightly increase after assuming the MAS values of the West but the change is very small. This is so as the average MAS values of Asian economies are not much different from that of the West. Our analysis below also shows that MAS is the least important cultural dimension out of all dimensions examined here, in their effects on international differences in saving rates.

[7] We thank a referee for this suggestion. The specific replacement procedure of the cultural values is this: According to the cultural values of each dimension, we rank Asian countries and American–European countries separately, then we replace the Asian cultural values with the American–European ones by one-to-one correspondence. For example, for the cultural dimension of IDV, Japan ranks number one among Asian countries with a value of 46, followed by the Philippines with 27; For the American–European countries, the US ranks top with 91, followed by Australia with 90. The replacement consists in replacing the Japanese value of 46 by the US value of 91, and replacing the value of 27 of the Philippines into 90. Next, we use the replaced IDV values to calculate the matching saving rates.

5.1.3. *Robustness check*

For the robustness test, we try other indices of saving rate and culture. We first regress domestic saving rates (Domsaving) on Hofstede cultural indices (see Table 8), and then regress net saving rates (Netsaving) on GLOBE cultural indices (see Table 9). The results are nearly the same as those reported in Table 5.

To investigate whether our results are sensitive to cultural indices, we also use the GLOBE cultural indices to test the relationship between culture and saving rates.[8] We find that the estimated coefficients of GLOBE indices are all significant, and the inclusion of cultural variables into the regressions increases the adjusted R^2 too. Among the GLOBE cultural indices, the effect of future orientation which represents time preference on saving rates is significantly positive, the effect of Collectivism (the opposite of Individualism) is significantly negative, PDI is significantly positively related to saving rate, which is consistent with the results of the Hofstede cultural indices. However, the effect of Uncertainty Avoidance which represents risk aversion attitude is significantly positive, inconsistent with the Hofstede cultural indice.[9] Overall, the GLOBE cultural indices' results are basically consistent with Hofstede cultural indices' results.

5.1.4. *Endogenous issue*

To address the potential endogeneity problem between the culture and savings, we perform 2SLS regression and use the language dummy as the instrument variable of the culture variables. Language is used as the instrument variable as it is closely related to culture. Some studies examining the relationships between culture and economic variables directly use language as the proxy for culture (Stulz and Williamson, 2003). The results are shown in Table 10.

We first implement the weak instrument test using the method proposed by Montiel and Pflueger (2013).[10] The test rejects the null hypothesis of weak instruments when the effective F statistic exceeds a critical value. The F-Weak statistics reported in Panel A of Table 10 are significant at 1% level, which means the problem of weak instruments does not exist.

As shown in Panel B of Table 10, the culture variables are all still significantly related to saving in our 2SLS regression. LTO, PDI are both significantly positively related to saving, while IDV and MAS are both significantly negative related to saving. These results are consistent with our OLS test. UAI is significantly positively related to saving, inconsistent with the OLS results.[11] Overall, the 2SLS results are basically consistent with OLS results, and confirm that culture is an important factor of the saving rate difference across countries.

[8] We do not show this result to save space.

[9] Dieckmann (1996) shows that Hofstede's uncertainty avoidance index is significantly correlated to economic growth, and UAI is may not a good proxy variable of risk preference. Hofstede mentioned this as well. Hofstede (2001, p. 148) warns that "uncertainty avoidance does not equal risk avoidance".

[10] The Stata command for this test is weakivtest.

[11] One reason for this inconsistency could be the existence of endogeneity, like reverse causality and missing variables. A specific reason is as mentioned above that UAI may not be a good proxy variable of risk preference, as (Hofstede, 2001, p. 148) warns that "uncertainty avoidance does not equal risk avoidance". Chui and Kwok (2008, 2009) shows that the effect of Hofstede's Uncertainty Avoidance is inconsistent with people's usual intuition when they regress insurance and culture.

Table 8. National Culture and Domestic Saving Rates

	(1) OLS	(2) FE	(3) FE+Year	(4) OLS+Year	(5) OLS+Year	(6) OLS+Year	(7) OLS+Year	(8) OLS+Year	(9) OLS+Year
Finance	0.018**	−0.007	0.004	0.008	0.046**	0.032***	0.026***	0.034***	−0.036***
	(2.40)	(−0.95)	(0.55)	(1.08)	(6.51)	(4.32)	(3.64)	(4.46)	(−3.05)
lnGDP	0.235***	10.187***	17.478***	0.380***	−2.589***	0.115	0.035	0.133	0.404
	(2.82)	(11.06)	(15.77)	(4.52)	(−10.65)	(1.42)	(0.43)	(1.62)	(1.09)
GDPgrowth	75.936***	24.735***	19.037***	73.065***	70.955***	65.498***	72.666***	75.501***	32.285**
	(8.06)	(5.54)	(4.06)	(7.43)	(7.75)	(6.39)	(7.23)	(7.40)	(2.31)
SocialSecu	−0.128***	−0.114***	−0.097***	−0.105***	−0.074***	−0.043*	−0.080***	−0.144***	−0.029
	(−6.12)	(−4.44)	(−4.06)	(−5.14)	(−3.97)	(−1.67)	(−3.55)	(−6.92)	(−0.78)
Rate	−0.042	−0.013	−0.113***	−0.038	−0.183***	−0.214***	−0.179***	−0.123***	−0.246***
	(−0.96)	(−0.44)	(−3.82)	(−0.86)	(−4.46)	(−4.54)	(−3.97)	(−2.74)	(−3.71)
Inflation	−0.008	0.081***	0.026	−0.001	−0.108***	−0.065*	−0.034	−0.015	0.026
	(−0.23)	(4.28)	(1.29)	(−0.02)	(−3.12)	(−1.83)	(−0.99)	(−0.43)	(0.29)
Ruralpop	0.006	0.287***	0.158***	0.007	−0.029*	−0.030	−0.039**	−0.002	−0.017
	(0.29)	(5.65)	(3.29)	(0.38)	(−1.76)	(−1.56)	(−2.03)	(−0.10)	(−0.84)
Depend	−0.539***	0.098**	0.172***	−0.520***	−0.517***	−0.526***	−0.554***	−0.544***	−0.408***
	(−16.20)	(2.04)	(3.80)	(−16.62)	(−14.61)	(−16.39)	(−17.48)	(−16.86)	(−8.75)
UAI				−0.100***					−0.160***
				(−7.97)					(−8.55)
LTO					0.099***				0.063***
					(8.01)				(3.44)
IDV						−0.097***			−0.217***
						(−5.92)			(−6.60)
PDI							0.097***		−0.180***
							(6.28)		(−4.15)
MAS								−0.067***	−0.046**
								(−4.60)	(−2.37)

Table 8. (*Continued*)

	(1) OLS	(2) FE	(3) FE+Year	(4) OLS+Year	(5) OLS+Year	(6) OLS+Year	(7) OLS+Year	(8) OLS+Year	(9) OLS+Year
Constant	47.330***	−268.817***	−462.175***	58.362***	115.584***	68.735***	62.820***	67.113***	68.851***
	(16.07)	(−9.92)	(−14.67)	(8.17)	(16.22)	(9.38)	(8.65)	(9.06)	(7.03)
Country Dummies		Yes	Yes	No	No	No	No	No	No
Year Dummies	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	572	572	572	572	510	572	572	572	290
adj–R^2	0.534	0.928	0.940	0.602	0.647	0.582	0.585	0.571	0.787

Notes: This table reports the results of the pooled OLS regressions of the domestic saving rates (Domsaving) on LTO, UAI, IDV, PDI and MAS and some control variables over the years from 1990 to 2013. The *t* statistics are in parentheses. ***, ** and * represent significant at 1%, 5%, and 10% levels, respectively.

Table 9. National Culture (GLOBE cultural indices) and Net Saving Rates

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS	(7) OLS	(8) OLS	(9) OLS	(10) OLS
Finance	−0.029***	−0.025***	−0.005	−0.010	−0.007	−0.008	−0.010	−0.013	−0.006	−0.033***
	(−3.66)	(−3.17)	(−0.64)	(−1.33)	(−0.92)	(−0.98)	(−1.18)	(−1.62)	(−0.75)	(−3.88)
lnGDP	−0.662***	−0.637***	−0.945***	−0.863***	−0.823***	−1.009***	−0.763***	−0.879***	−0.877***	−0.676***
	(−2.84)	(−2.69)	(−3.78)	(−3.72)	(−3.22)	(−4.17)	(−2.89)	(−3.61)	(−3.50)	(−2.76)
GDPgrowth	68.536***	62.125***	69.430***	58.082***	68.622***	65.294***	69.525***	65.921***	68.184***	48.297***
	(7.25)	(6.46)	(6.87)	(6.02)	(6.83)	(6.55)	(6.93)	(6.58)	(6.75)	(5.28)
SocialSecu	−0.064***	−0.104***	−0.050*	−0.022	−0.047**	−0.014	−0.039	−0.052**	−0.052**	−0.001
	(−2.81)	(−4.09)	(−1.87)	(−0.95)	(−1.98)	(−0.56)	(−1.60)	(−2.23)	(−2.17)	(−0.03)
Rate	−0.239***	−0.238***	−0.287***	−0.195***	−0.284***	−0.283***	−0.280***	−0.271***	−0.283***	−0.154***
	(−4.64)	(−4.54)	(−5.30)	(−3.71)	(−5.27)	(−5.33)	(−5.19)	(−5.06)	(−5.24)	(−3.19)
Inflation	−0.181***	−0.200***	−0.193***	−0.151***	−0.189***	−0.187***	−0.178***	−0.192***	−0.194***	−0.125***
	(−4.35)	(−4.81)	(−4.49)	(−3.69)	(−4.42)	(−4.44)	(−4.12)	(−4.53)	(−4.54)	(−3.14)
Ruralpop	0.165***	0.118***	0.115***	0.172***	0.104***	0.122***	0.108***	0.120***	0.122***	0.140***
	(8.10)	(5.87)	(4.84)	(8.10)	(4.85)	(5.96)	(5.15)	(5.83)	(5.68)	(4.01)
Depend	−0.105***	−0.073**	−0.164***	−0.142***	−0.165***	−0.145***	−0.163***	−0.155***	−0.164***	−0.037
	(−2.84)	(−1.99)	(−5.05)	(−4.66)	(−5.17)	(−4.55)	(−5.11)	(−4.88)	(−5.14)	(−0.99)
FOI_G	4.519***									3.181***
	(6.33)									(2.61)
UAI_G		3.094***								4.325***
		(5.52)								(4.45)
ING_G			−0.028							2.373**
			(−0.04)							(2.54)
INC_G				4.629***						2.919***
				(7.04)						(2.85)
ASI_G					−1.606*					1.918
					(−1.71)					(0.98)

Table 9. (*Continued*)

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS	(7) OLS	(8) OLS	(9) OLS	(10) OLS
GDI_G						−3.318***				−6.051***
						(−3.73)				(−5.80)
HOI_G							1.334*			1.471
							(1.85)			(1.39)
POI_G								2.647***		−3.511***
								(3.10)		(−2.87)
PDI_G									−0.969	0.392
									(−1.34)	(0.38)
Constant	11.032	16.261*	42.412***	15.486	46.249***	52.110***	31.778***	28.911***	45.467***	−7.195
	(1.16)	(1.73)	(4.50)	(1.63)	(4.88)	(5.52)	(2.94)	(2.86)	(4.78)	(−0.43)
Year Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	428	428	440	440	440	440	440	440	440	428
adj–R^2	0.499	0.487	0.426	0.489	0.430	0.445	0.431	0.439	0.429	0.596

Notes: This table reports the results of the pooled OLS regressions of the net saving rates (Netsaving) on GLOBE cultural indices (FOI_G, UAI_G, ASI_G, INC_G, ING_G, GDI_G, HOI_G, FDI_G, POI_G) and some control variables over the years from 1990 to 2013. The *t* statistics are in parentheses. ***, ** and * represent significant at 1%, 5% and 10% levels, respectively.

Also, Loayza *et al.* (2000) use GMM estimation to mitigate the problem of endogeneity. Accordingly, we use the dummy variable of language and the control variables lagged one year as the instrument variables, and use the method of GMM to deal with endogeneity. The empirical results are shown in Table 11, which are consistent with our basic regression results and also consistent with those of the regression using language as the instrument variable.

Table 10. Culture and Saving (2SLS Test, IV: English Language Dummy Variable)

	(1) UAI	(2) LTO	(3) IDV	(4) PDI	(5) MAS
Panel A: First Stage					
English	−18.199***	−35.479***	31.604***	−16.345***	13.806***
	(−7.48)	(−18.96)	(21.91)	(−8.24)	(6.34)
Control Variables	Yes	Yes	Yes	Yes	Yes
Constant	−63.508***	−61.274***	60.534***	5.952	51.399**
	(−2.71)	(−3.06)	(4.36)	(0.31)	(2.45)
N	572	510	572	572	572
adj–R^2	0.341	0.573	0.803	0.438	0.145
F–weak	275.373***	406.656***	632.319***	82.218***	52.174***
	(1) 2SLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) 2SLS
Panel B: Second Stage					
Finance	0.047***	0.021***	0.013*	0.006	0.079***
	(2.82)	(2.98)	(1.74)	(0.71)	(3.92)
lnGDP	−0.783***	−2.414***	−0.067	−0.463***	−0.120
	(−4.47)	(−10.78)	(−0.60)	(−3.66)	(−1.05)
GDPgrowth	97.123***	66.645***	64.640***	70.197***	70.189***
	(4.88)	(5.76)	(5.93)	(6.61)	(4.72)
SocialSecu	−0.342***	−0.191***	−0.032	0.007	−0.302***
	(−7.01)	(−8.53)	(−1.17)	(0.18)	(−8.73)
Rate	−0.282***	−0.076*	−0.252***	−0.290***	−0.096*
	(−3.43)	(−1.78)	(−5.45)	(−5.57)	(−1.70)
Inflation	−0.128**	−0.049	−0.090***	−0.033	0.084**
	(−2.07)	(−1.32)	(−2.60)	(−1.10)	(2.11)
Ruralpop	−0.008	0.068***	−0.001	−0.079***	0.092***
	(−0.19)	(3.70)	(−0.06)	(−2.72)	(2.63)
Depend	−0.323***	−0.078	−0.161***	−0.230***	−0.165***
	(−5.05)	(−1.55)	(−4.50)	(−5.26)	(−3.22)
UAI	0.353***				
	(6.54)				
LTO		0.167***			
		(8.95)			

Table 10. (*Continued*)

	(1) 2SLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) 2SLS
IDV			−0.208***		
			(−11.91)		
PDI				0.405***	
				(8.16)	
MAS					−0.501***
					(−6.33)
Constant	32.410***	71.697***	32.012***	15.693***	44.499***
	(5.43)	(10.23)	(8.71)	(3.54)	(9.31)
N	572	510	572	572	572
F-Endog	257.823***	25.1986***	44.135***	64.074***	101.593***

Notes: *F*-Weak is the statistic of the weak instrument variable test, given by Montiel and Pflueger (2013). *F*-Endog is the statistic of the endogeneity test to determine whether endogenous regressors in the model are in fact exogenous. The *t* statistics are in parentheses. ***, ** and * represent significant at 1%, 5% and 10% levels, respectively.

Table 11. Culture and Saving (GMM Regression)

	(1) GMM	(2) GMM	(3) GMM	(4) GMM	(5) GMM
Finance	0.053***	0.027***	0.027***	0.016	0.049***
	(4.72)	(3.96)	(4.38)	(1.16)	(4.27)
lnGDP	−0.994***	−1.508***	−0.422***	−1.129***	−0.334***
	(−6.05)	(−7.33)	(−3.55)	(−4.46)	(−2.75)
GDPgrowth	98.428***	81.498***	63.027***	76.909***	68.684***
	(6.25)	(7.33)	(5.35)	(3.82)	(5.59)
SocialSecu	0.038	−0.006	0.133***	0.145***	−0.054*
	(0.95)	(−0.38)	(4.62)	(2.62)	(−1.89)
Rate	−0.584***	−0.121***	−0.449***	−0.844***	−0.189*
	(−3.74)	(−3.32)	(−4.42)	(−3.49)	(−1.81)
Inflation	−0.186**	−0.091***	−0.136***	−0.129	0.036
	(−2.46)	(−3.15)	(−2.99)	(−1.60)	(0.80)
Ruralpop	0.130***	0.097***	0.004	−0.252***	0.118***
	(4.88)	(5.72)	(0.17)	(−2.72)	(4.64)
Depend	−0.117**	0.098**	−0.118***	−0.307***	−0.130***
	(−2.11)	(2.01)	(−3.30)	(−4.05)	(−3.45)
UAI	0.252***				
	(7.45)				
LTO		0.146***			
		(8.79)			

Table 11. (*Continued*)

	(1) GMM	(2) GMM	(3) GMM	(4) GMM	(5) GMM
IDV			−0.188***		
			(−9.65)		
PDI				0.503***	
				(4.80)	
MAS					−0.228***
					(−5.60)
Constant	4.499	31.865***	25.217***	11.104	26.348***
	(0.59)	(4.56)	(4.83)	(1.02)	(5.12)
N	478	424	478	478	478

Notes: The *t* statistics are in parentheses. ***, ** and * represent significant at 1%, 5% and 10% levels, respectively. IV: English language dummy variable and control variables lagged one year.

Table 12. Culture and Saving: Relative Importance Analysis of Table 5

	(3)	(4)	(5)	(6)	(7)	(8)
Finance	0.25% [8]	0.99% [8]	0.96% [8]	0.85% [8]	0.50% [9]	0.57% [9]
lnGDP	0.83% [7]	1.04% [7]	10.12% [4]	0.59% [9]	0.90% [8]	0.82% [7]
GDPgrowth	31.40% [2]	26.51% [2]	23.05% [2]	23.67% [3]	24.43% [3]	30.31% [2]
SocialSecu	45.18% [1]	35.85% [1]	38.20% [1]	26.30% [2]	28.55% [1]	44.85% [1]
Rate	4.50% [5]	3.07% [6]	3.88% [7]	6.10% [5]	4.93% [5]	4.47% [5]
Inflation	0.91% [6]	0.58% [9]	0.49% [9]	1.65% [7]	0.95% [7]	0.82% [8]
Ruralpop	7.85% [4]	7.18% [4]	8.07% [5]	5.04% [6]	4.85% [6]	7.85% [4]
Depend	8.81% [3]	6.43% [5]	4.17% [6]	7.69% [4]	8.64% [4]	8.40% [3]
UAI		18.36% [3]				
LTO			11.05% [3]			
IDV				28.10% [1]		
PDI					26.25% [2]	
MAS						1.92% [6]
Combinations	255	511	511	511	511	511

Notes: This table presents Relative Importance Analysis results corresponding OLS results reported in Table 5. In each column, the indicator of Relative Importance (RI) of each variable and the relative ranking are reported. RI is defined by broken down the model *R*-squared into shares from individual regressors and, the RI of the *j* variable is its share in explaining the dependent variable variance. See Grömping (2007) for details.

5.2. *Relative importance analysis*

To know which has the strongest explanatory power to explain the differences in saving rates out of the five cultural variables, and to compare the relative importance of the cultural variables and traditional explanatory variables, we use the Relative Importance Analysis proposed by Grömping (2007) and Tonidandel and Lebreton (2011) to

compare and order the various degrees of explanatory power. The results are shown in Table 12.

It shows that the GDP growth and the expenditures of social security have strong explanatory power in every regression equation, basically rank in the top three. This shows that GDP growth and social security are the most important variables to explain national differences in saving rate, which is consistent with the precautionary savings theory and Keynesian theory.

The explanatory power of IDV dimension to savings rate is 28.10%, which exceeds all explanatory variables and ranks the first. PDI explains the overall regression at 26.25%, is only slightly lower than the expenditure of social security, ranking second among all variables. The cultural variables of UAI and LTO rank third, and MAS ranks sixth out of all variables. Overall, the contribution of the cultural variables to *R*-squared of the regression equation is outstanding, which reconfirms that culture has important explanatory power on the national differences in saving rate.

6. Conclusion

This paper utilizes Hofstede's cultural indices and the macro panel data in 48 countries from 1990 to 2013, empirically confirms the important effects of culture on saving rates by using a series of multiple regression analyses such as OLS, 2SLS, GMM and Relative Importance Analysis.

The OLS regression results show that cultural variables are significantly related to saving rates. After controlling for traditional variables such as income, the conclusion is robust. Instrumental variable is used to conduct a two-stage regression and deal with potential endogeneity problems, and the results are almost in line with that of OLS. To compare the relative importance of the cultural variables among the various explanatory variables, we also conduct Relative Importance Analysis and find that the contribution of cultural variables in all variables is ranked first, second or third. We may conclude that culture is a very important factor in explaining differences in saving rates.

This paper also explores some mechanisms of the effects of culture on saving behavior. The empirical results show that culture affects the household saving behavior mainly through influencing time and risk preferences of residents, and also through the consumption attitude formed by personality characteristics of consumers, and finally affecting the macro savings phenomenon. This will facilitate a more comprehensive understanding of the saving patterns of the various countries around the world.

The practical implications of this paper are mainly manifested in the following aspects. Our empirical results show that even if we control for the traditional variables of income, financial market development, the social security system and other explanatory variables, cultural variables are still significant and powerful factors affecting saving rates, and this effect is very stable over time. For a long-time, most countries use fiscal policies (such as taxes or subsidies) to stimulate or inhibit people's consumption or savings. This policy may work through the effects on the consumption of "hard" variables such as income and the social security system. However, it may have little effect on soft factors such as culture. In

this paper, the empirical results confirm the important role of culture in influencing savings. Thus, to affect consumption/savings more effectively, we may need to consider how to influence the "soft" variables which affect consumption/savings. However, the desirability of doing so is another question.

There are some limitations to this empirical analysis. (1) The culture indices used in this paper are static, but the national savings rates or consumption rates are changing, so culture can only reflect the long-run trend effects. If we want to test the dynamic effects of the culture on savings behavior, we need to use experiments or more detailed dynamic surveys. (2) At present we can only verify that culture does have significant effects on the saving behavior, and that this effect is mainly realized through time preference, risk preference, and consumption attitude. However, the specific mechanisms have not been explained in detail yet. This may require further theoretical analysis and empirical study.

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