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Patience and long-run growth

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ABSTRACT

Complementing research on the effect of patience on individual behavior, we present empirical evidence that patience is an important determinant of long-run income differences between countries. To account for a potential endogeneity bias, we instrument patience by information on how languages spoken in the countries of our sample require speakers to encode time. The economic impact of patience and growth is sizable. Our results suggest that increasing patience by one standard deviation raises per-capita income by between 34% and 78%.

1. Introduction

An important question in economics is why income levels vary across countries. Over time, economists have identified a number of political, economic and institutional factors that are robustly related to economic growth (see for instance Barro and Sala-i Martin, 2004, Ch. 12). Comparatively little attention has so far been given to cultural factors that might explain cross-country differences in income. In one of the most recent papers on the impact of culture on growth, Gorodnichenko and Roland (2010) provide strong evidence of a causal effect of individualism on income per worker, total factor productivity and innovation. Using an empirical strategy almost identical to theirs, we provide evidence for the impact of a further cultural variable on income per worker: patience.

Patience, or the inverse of the time preference rate, is a central variable in theoretical models of economic growth. In the Ramsey–Cass–Koopmans growth model with exogenous technical progress and an endogenous saving rate, more patient countries have a higher steady state capital stock and higher output per worker. In models with endogenous technical change, patience is also associated with higher growth rates as more patient countries save more and make more resources available for research and development and innovation (e.g. Romer, 1990).

Using a panel of 89 countries and three different measures of patience, we document a strong positive impact of patience on income per worker, total factor productivity and the capital stock. To account for a possible endogeneity bias arising from the fact that patience might itself depend on income levels, we use information on how the languages spoken in the countries of our sample require speakers to mark future events as an instrument for patience. The economic impact of patience and growth is sizable. Our results suggest that increasing patience by one standard deviation raises per-capita income by between 34% and 78%.

Our paper relates to two strands of the economic literature. Firstly, we contribute to the empirical literature identifying the impact of time preferences on behavior. While patience seems an important predictor of individual behavior, such as health outcomes, school performance (Golsteyn et al., 2014), the likelihood of having credit card debt (Meier and Sprenger, 2010) or individual savings (Sutter et al., 2013), the literature on the impact of time preferences on macroeconomic outcomes is still scant. The few existing studies on this topic do not go much beyond testing for mere correlations (Hofstede and Minkov, 2010; Wang et al., 2011; Preis et al., 2012; Marcheggiano and Miles, 2013). To the best of our knowledge, the only more in-depth study is Chen (2013), who argues that more patient countries have higher savings rates.

Second, we contribute to the empirical studies on the relationship between culture and growth. So far, the literature has looked at the relationship between ethnic diversity and growth (Easterly and Levine, 1997), mutual trust and growth (Knack and Keefer, 1997), and individualism, power distance, masculinity and uncer-

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Table 1
Summary statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
Wait	53	0.63	0.18	0.08	0.89
Hofstede's long-term	92	0.46	0.24	0	1
Future Orientation Index	44	0.76	0.30	0.24	1.32
Real income per worker	92	31 580	25 737	1317	103 209
Total factor productivity	74	0.68	0.30	0.14	1.28
Capital stock per worker	92	88 776	72 560	1587	255 513
Patents	68	80.4	183.88	0.001	1274.53
Innovation performance index	68	6.51	2.16	1.44	10

Summary statistics calculated over all countries with data for at least one proxy for patience.

tainty avoidance and growth (Gorodnichenko and Roland, 2010, 2011). The closest work to ours is a contemporaneous study by Dohmen et al. (2015), who also examine the link between patience and long run income in a cross-country framework. Using data on patience coming from an international survey, they find evidence for a correlation between patience and different measures of long-run economic performance. Dohmen et al. (2015)'s work and ours can be seen as complement in that we use different measures of patience and different instrumentation strategies to come to a very similar and key conclusion, namely that patience is a determinant of long-run economic growth.

2. Data and empirical strategy

Our empirical strategy follows Gorodnichenko and Roland (2011) as closely as possible. To identify the impact of patience on long-run growth we estimate the following model in a cross-section of 89 countries:

$$y_i = \alpha P_i + \beta X_i + \epsilon_i. \quad (1)$$

In Eq. (1), the variable y_i takes on various economic outcomes related to long-run growth that are potentially influenced by the time preference rate. P_i is a measure of patience for country i and X_i is a vector of control variables. Our vector X_i comprises the geographical and religious control variables of Gorodnichenko and Roland (2011). Our measures of long-term growth, y_i, are also almost identical to those considered in Gorodnichenko and Roland (2011) and include the logarithm of real output per worker for the year 2000 (at purchasing power parity) from the Penn World Tables, the logarithm of total factor productivity from Hall and Jones (1999) as well as two measures of innovation; i.e. the logarithm of the Innovation Performance Index (IPE) and the log of the number of patents per million population from the Economist Intelligence Unit (Economist Intelligence Unit, 2007, 2009). In addition to the variables considered by Gorodnichenko and Roland (2011) we also use the capital stock per worker, calculated from the Penn World Tables (Version 8) as a dependent variable.

There are a number of reasons for using levels instead of growth rates as dependent variables. Hall and Jones (1999) argue that there is only a low correlation between differences in growth rates across decades. In Jones (1995), growth is determined endogenously by resources devoted to research and development, but these variables only affect the level of income and not the growth rate in the steady state.

Our variable of interest is the average degree of patience in an economy (P). We employ three different proxies for this variable. The first proxy stems from a large scale international survey on time discounting, comprising roughly 6000 students in 52 advanced and developing countries (Wang et al., 2011). The survey contains a binary choice question asking participants whether they prefer an immediate monetary reward over a higher payoff in the future. The precise wording of the question[3] was:

Which offer would you prefer?

A. *a payment of $3400 this month*
B. *a payment of $3800 next month.*

The payoffs in this question were adjusted to each country's purchasing power parity. For each country, we use the share of participants who decided to wait for the higher monetary reward in the future, option B, as a proxy for patience (*Wait*).

Our second proxy of patience is Hofstede's Index of Long-Term Orientation, which is calculated from the answers to specific questions in the World Value Survey (Minkov and Hofstede, 2010). As a third measure we use the Future Orientation Index of Preis et al. (2012). For each country, this index reports the number of internet search engine queries for the next year (e.g. "2013" in 2012) relative to the search engine queries containing the previous year (e.g. "2011" in 2012). Our preferred measure of patience is the variable *Wait* as it is determined with methods most commonly used to elicit time preferences. The other two variables are significantly correlated with our preferred measure of patience with a correlation coefficient of around 0.3, indicating that all three variables measure indeed the same concept. Following Gorodnichenko and Roland (2011) we normalize our measures of patience to have zero mean and a standard deviation of one. Our central hypothesis is that the coefficient of interest, α is positive for all three proxies of patience.

Our empirical strategy is potentially prone to an endogeneity problem. As patience may itself be dependent on the level of income, estimations of Eq. (1) by OLS may be biased due to reverse causality.[4] Omitted variable biases or measurement errors may also be an issue for the concept of patience, which is hard to elicit. To address these problems, we instrument for the three measures of patience using Chen (2013)'s data on the grammatical structure of languages spoken in each country. Chen (2013) argues that people speaking a language that has the property of strong future term reference (*strong FTR*) and hence does not strongly require speakers to distinguish grammatically between the future and present, discount future consumption to a lesser extent. Our instrument is the population weighted average of the *strong FTR* dummy for the languages spoken in a country. We expect the *strong FTR* variable to be negatively related to our measures of patience. The exclusion restriction for our IV strategy is that the grammatical structure of a country's language(s) is correlated with the patience of its inhabitants but not directly with long-run growth.

[3] The question refers to a hypothetical situation and no payments are actually made. See Wang et al. (2011) for details. Marcheggiano and Miles (2013) use the same data to explore the link between time preferences and the fiscal multiplier.

[4] Irving Fisher already noted that …*the smaller the income, the higher the preference for present over future income, that is the greater the impatience* …(cited in Thaler, 1997).