WP-2019-031

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Taniya Ghosh, Prashant Mehul Parab, Sohini Sahu

Indira Gandhi Institute of Development Research, Mumbai
November 2019

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Email(corresponding author): taniya@igidr.ac.in

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The paper analyzes how the citizens' attitude towards future, obtained using big data, affects the relationship between the nation's financial development and economic growth. All financial development indicators, except for one, show significant negative growth effects. We find that individual's attitude towards future as captured by future orientation index (FOI) plays a significant role in affecting this relation. In particular, FOI interacts with financial development, and weakens the negative effect of financial development on nation's economic growth.

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November 4, 2019

Taniya Ghosh (Corresponding Author)

Indira Gandhi Institute of Development Research (IGIDR), Gen. A. K. Vaidya Marg, Film city Road Mumbai, 400065, India, Email Add.: taniya@igidr.ac.in

Prashant Mehul Parab

Indira Gandhi Institute of Development Research (IGIDR), Gen. A. K. Vaidya Marg, Filmcity Road Mumbai, 400065, India, Email Add.: prashant@igidr.ac.in

Sohini Sahu

Department of Economic Sciences, Indian Institute of Technology Kanpur, Kanpur 208016, India

Email Add.: ssahu@iitk.ac.in

The authors would like to thank Siddhartha Mahapatra for data-related assistance.

Abstract

The paper analyzes how the citizens' attitude towards future, obtained using big data, affects the relationship between the nation's financial development and economic growth. All financial development indicators, except for one, show significant negative growth effects. We find that individual's attitude towards future as captured by future orientation index (FOI) plays a significant role in affecting this relation. In particular, FOI interacts with financial development, and weakens the negative effect of financial development on nation's economic growth.

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1. Introduction

Understanding the fundamental relationship between financial development and economic growth is important. A bulk of previous studies (Beck and Levine (2004), King and Levine (1993a,b), Levine, Loayza, and Beck (2000)) have found that financial development positively contributes to growth. However, more recent studies have found otherwise (Anwar and Sun (2011), Arcand, Berkes, & Panizza (2012), Cecchetti & Kharroubi (2012), Asteriou and Spanos (2019) etc).

Our paper extends the existing research by investigating how peoples' forward orientation, obtained from big data, affects the sensitivity of economic growth to financial development. Individuals' fundamental personal values like attitude towards the future strongly influence their decisions on savings, investment, new ventures and entrepreneurial activities. One of the primary objectives of 'financial development' is encouraging, mobilizing, and facilitating such savings and investments, the success of which is intrinsically linked to individuals' attitudes towards the future. Hence, people seeking more information about the future are more cautious about newer projects, more aware of future contingencies, are engaged in more planning and execution, and are more instrumental towards country's financial development and hence, economic growth. Moreover, more people looking forward is indicative of better existing infrastructure (internet etc.), which in turn, is conducive to financial development and growth of the economy.

Quantification of people's social behavior through the use of Internet search queries such as the Google search engines has become increasingly popular as strong links are established between the social behavior of people and the economic variables. Preis et al. (2012) introduced the future orientation index (FOI) which quantifies the degree to which Internet users seek more information about the future compared to the past. They have found a strong correlation between

a country's FOI and its per capita GDP. Similarly, many other studies from the sociological literature has established a high correlation between the society's forward orientation and its per capita GDP; and its happiness, confidence, innovativeness etc. On the other hand, Petutschnig (2015) using the FOI data in a panel study of 58 countries found an inverse relation whereby a country's tax system negatively affects peoples' attitudes towards the future.

In order to capture the effect of future orientation on finance-growth relation, we estimate panel data growth regressions (random effects and 2SLS) with linear interaction term between FOI and financial development for three samples comprising all the nations, developing nations and developed nations covering the period 2008-2017. Although stock market capitalization has a significant positive effect on economic growth, we find that most of the other financial development indicators show significant negative effects, in line with the current literature (Rousseau & Wachtel (2011), Asteriou and Spanos (2019)) that emphasizes the relation has become negative after the recent financial crisis. But, we find that, for the overall sample and the sample of developed countries, the strength of the negative effect weakens if the country is more future oriented. The result is robust to the two estimation techniques and multiple financial development indicators used. However, the effect of future orientation is insignificant for the low-income countries, possibly due to low English-speaking population and less internet penetration.

2. Data and Methodology

The model specification is:

$$\Delta Y_{it} = \alpha_i + \beta_1 BASE\_Y_i + \beta_2 \pi_{it} + \beta_3 INV_{it} + \beta_5 TRADE_{it} + \beta_6 FD_{it} + \beta_7 (FD * FOI)_{it} + u_{it}$$

Where i = 1,…, 57 countries and t = 1,…, 10 years. ΔY_{it} is the annual growth rate in GDP per capita, $BASE\_Y_i$ is the initial GDP per capita (in logarithms) in 2008 for the ith country, π_{it} is the

rate of inflation based on Consumer Price Index, TRADE is the ratio of total volume of trade (exports + imports) to GDP, FD is the financial development indicator and FOI is the future orientation index. All the variables are taken from WDI-World Bank. FOI is authors' own calculations from Google trends data. Following Preis et al. (2012), the FOI for a given year (say 2018) and a given country is constructed as follows:

$$FOI_{2018} = \frac{Volume\ of\ searches\ including\ "2019"}{Volume\ of\ searches\ including\ "2017"}$$

The main advantage of using internet search queries is that huge volumes of automatically gathered data can be made available for analysis.

We use five measures of financial development from GFD-World Bank – PRIVY (Private credit by deposit money banks to GDP (%)), DEP (Deposit money bank assets to deposit money bank assets and central bank assets (%)), STK (Stock market capitalization to GDP (%)), BANK (Bank deposits to GDP (%)) and PRIVALL (Private credit by deposit money banks and other financial institutions to GDP (%)).

FD and FOI are centered on mean for the analysis. When both the variables used in an interaction term are continuous, centering them makes the results more meaningful and easier to interpret. The marginal effect of FD on economic growth for different levels of FOI is given by:

$$\frac{\partial \Delta Y_{it}}{\partial FD_{it}} = \hat{\beta}_6 + \hat{\beta}_7 * FOI_{it}$$

We estimate a random effects (RE) model and as well as the instrumental variables approach of two stage least squares. We use instruments for π_{it}, INV_{it}, $TRADE_{it}$ and FD_{it}. There is a possibility of correlation between either or all of these variables with the error term at time *t*. Hence, we use one year lags as the instruments to avoid any endogeneity issues.

3. Results

Table 1 presents RE and 2SLS estimation results for the full sample, developed countries (high income) and middle- and low-income countries respectively[1].

Table 1 – Random Effects and 2SLS

	PRIVY		DEP		BANK		STK		PRIVALL	
	RE	**2SLS**	**RE**	**2SLS**	**RE**	**2SLS**	**RE**	**2SLS**	**RE**	**2SLS**
					FULL SAMPLE					
BASEGDP	-0.74***	-0.04	-0.94***	0.00	-1.02***	0.07	-1.01***	0.01	-0.73***	-0.02
GFCF	0.16***	0.14***	0.17***	0.17***	0.12***	0.04	0.13***	0.14***	0.16***	0.13***
INF	-0.13***	-0.18***	-0.12***	-0.15***	-0.97***	-0.11***	0.00	-0.19***	-0.13***	-0.19***
TRADE	0.01***	0.00	0.02***	0.01*	0.01***	0.00	0.02***	0.00	0.01***	0.00
FD	-0.02***	-0.02***	-0.1***	-0.12***	-0.006**	-0.01*	0.01*	-0.02**	-0.02***	-0.02***
FD*FOI	-0.01**	-0.01	-0.22***	-0.06	-0.01*	-0.02**	-0.01	0.02	0.00	0.00
CONS	4.38**	-0.70	5.81***	-2.35**	7.71***	-0.20	7.00***	-1.21	4.41**	-0.64
					DEVELOPED					
BASEGDP	-0.66*	0.38**	-1.01***	0.45**	-1.02***	0.39**	-1.31***	0.49**	-0.72*	0.48**
GFCF	0.01	-0.04	0.03	-0.11	0.00	-0.04	-0.07	-0.05	0.01	-0.09
INF	-0.09	-2.31***	-0.04	-2.48***	-0.01	-2.08***	0.03	-2.71***	-0.07	-2.33***
TRADE	0.02***	0.01	0.03***	0.01*	0.02***	0.01*	0.03***	0.01	0.01**	0.00
FD	-0.02***	-0.21**	-0.11**	0.19*	-0.01	0.00	0.02***	-0.02	-0.01*	-0.02**
FD*FOI	-0.02	-0.06**	-0.33**	-0.80***	-0.02	0.01	-0.02	-0.01	0.00	-0.05*
CONS	6.39	0.57	8.51**	-0.55	9.40**	-1.15	12.62***	-0.19	7.21*	1.50
					MIDDLE- & LOW-INCOME					
BASEGDP	-0.51	-0.12	-0.18	-0.06	-0.66**	0.03	-0.63**	-0.12	-0.44	-0.14
GFCF	0.29***	0.15***	0.26***	0.17***	0.18***	0.07	0.20***	0.14***	0.29***	0.17***
INF	-0.12***	-0.12**	-0.15***	-0.21**	-0.11***	-0.17***	-0.01	-0.19*	-0.13***	-0.12**
TRADE	0.02**	-0.01	0.01	0.00	0.00	-0.01	0.00	-0.01	0.02**	0.00
FD	-0.03**	0.01	-0.12**	-0.07	-0.01	-0.01	0.02*	0.01	-0.03***	0.01
FD*FOI	0.04	0.06*	-0.01	0.14	-0.03	-0.04*	0.05	0.06*	0.04	0.06**
CONS	-1.51	1.49	-2.24	0.15	4.24	1.58	3.21	2.18	-2.52	0.86

Level of significance – '***', '**' & '*' – 1%, 5% and 10%

Negative effects of initial GDP and inflation and positive effects of trade are in line with the existing literature (King and Levine (1993 a, b), Beck and Levine (2004)). Effects of investment on GDP are mixed in literature (negative in Narayan and Narayan (2014); positive in Tang et al

[1] Same countries are used as Petutschnig (2015) excluding Taiwan.

(2008)). A negative effect of FD is observed in many recent studies. A negative significant interaction term implies that the negative effect of FD on growth rate of GDP per capita is stronger at lower level of FOI as is evident from the results of PRIVY, DEP and BANK for full sample of countries and PRIVY, DEP and PRIVALL for the sample of developed countries.

Table 2 displays the marginal effects of FD on growth for different levels of FOI across the three samples.

Table 2 – Marginal Effects of FD on GDP growth

	PRIVY		DEP		BANK		STK		PRIVALL	
	RE	**2SLS**	**RE**	**2SLS**	**RE**	**2SLS**	**RE**	**2SLS**	**RE**	**2SLS**
					FULL SAMPLE					
1	-0.02***	-0.02***	-0.10***	-0.12***	-0.01***	-0.01*	0.01**	-0.02***	-0.02***	-0.02***
4	-0.02***	-0.02***	-0.17***	-0.14***	-0.01**	-0.01**	0.01*	-0.01**	-0.02***	-0.02***
8	-0.03***	-0.03***	-0.26***	-0.16	-0.02**	-0.02**	0.01	0.00	-0.01	-0.02*
					DEVELOPED					
1	-0.02***	-0.02***	-0.11**	0.18*	-0.01*	0.00	0.02***	-0.02	-0.01*	-0.02***
4	-0.02***	-0.04***	-0.21***	-0.06	-0.01**	0.00	0.02***	-0.02*	-0.01**	-0.04***
8	-0.03***	-0.07***	-0.35***	-0.38***	-0.02	0.01	0.01	-0.02	-0.02	-0.06***
					MIDDLE- & LOW-INCOME					
1	-0.03**	0.01	-0.12**	-0.07	-0.01	-0.01	0.02*	0.01	-0.03***	0.01
4	-0.02	0.03	-0.12	-0.03	-0.02	-0.03*	0.03**	0.03	-0.02	0.03
8	-0.01	0.06*	-0.13	0.03	-0.03	-0.04*	0.05*	0.05	-0.01	0.05*

Level of significance – '***', '**' & '*' – 1%, 5% and 10%

Marginal effects of FD on economic growth vary for the full sample; especially where negative and significant, it implies that with decrease in FD, economic growth increases as FOI increases. This is true for almost all cases in Table 2, except for STK where the marginal effect is positive up to FOI equal to four and becomes insignificant for higher values of FOI. A comparison of the marginal effects across developed and lower income countries indicates that the negative effect of FD on economic growth is mitigated by developed countries with higher FOI, while this marginal effect is mostly insignificant for low-income countries for higher levels of FOI, possibly due to low English-speaking population and less internet penetration.

4. Conclusion

This paper analyzes how the citizens' attitude towards the future, obtained from big data, affects the relationship between the nation's financial development and economic growth. The negative effect of financial development on economic growth persists across countries (except for one indicator of financial development) and this negative impact is somewhat mitigated by higher forward orientation of developed countries, while this impact of forward orientation is absent in low-income countries.

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