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Revisiting the financial development and economic growth nexus: Evidence from south Korea

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Abstract

This study revisits the financial development and economic growth nexus in South Korea using quarterly data from 1983Q1 to 2021Q3. Due to the dynamic nature of the relationship between economic growth and the financial development in South Korea over the study period, the recursive evolving window procedure of the time-varying Granger causality test is used for the estimation. Considering the possible negative effect of financial development on economic growth, the directions of the cause and effects are also calculated over different episodes. Positive causality episodes from growth to financial development are detected in the period leading to the financial crisis in 1997 and the ending period of drastic liberalization measures in the early 2000s. Interestingly, the positive effect of economic growth on financial development vanished, and the effect of financial development on real economy became negative in mid 2000s.

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1. Introduction

What contributed to the miraculous structural transformation in the Republic of Korea (South Korea) over the last six decades? In 1960, GDP per capita was around $158, ranking South Korea one of the poorest countries in the world. However, by 2019, GDP per capita had risen to more than $31,000 (The World Bank DataBank). South Korea showed an incredible structural transformation. The country went from an agricultural-based economy in 1960s to the 12th largest industrialized economy in terms of GDP ranking in 2019 (Santacreu and Zhu, 2018). South Korean economic growth also has been remarkable. Specifically, the annual average real GDP growth was around 7.3% over the period 1960-2019, which was accompanied by a significant poverty reduction. The promising growth performance was also paired with a strong financial structure during which savings and investments rose to 34.7% and 29.8% of GDP respectively. Additionally, the share of domestic credit to GDP rose to 151.6% from 5.7% over the same period (the World Bank DataBank).

Given the close association between financial performance and economic performance, policymakers have focused their attention on whether financial development is an engine to promote economic growth, or vice versa. There are ample empirical studies devoted to the Korean case to understand the interaction between these two variables. A large number of these studies finds that the direction of causality is from financial development to economic growth (Gupta, 1986; Choe and Moosa, 1999; Liu and Hsu, 2006; Yang and Yi, 2008; Jung, 2017; Kalayci and Ozden, 2020; Hwang 2020), whereas little evidence is found in favor of this positive causality proposition (Chiou-Wei et al., 2010). However, these studies have ignored the potential time-varying (henceforth TV) relationship between financial development and economic growth to the best of our knowledge. Given the fact that the interaction may differ by development level of financial institutions and markets as well as monetary and fiscal policies implemented by authorities, the structure of this relationship should not be necessarily static and can vary over time. Indeed, by ignoring the possibility of TV nature, the results may be inconsistent and biased.

Over the years, the Korean economy has experienced several structural changes. Specifically, during the period from the late 1980s to the early 1990s, the South Korean government gradually implemented several financial market liberalization programs, moving to a more market-oriented economy. In line with the early 1980s financial liberalization, the government established several commercial banks and lowered the requirements for establishing non-financial institutions to increase the competition between banking and non-banking financial institutions (Kim and Shu, 1998). Further, the government encouraged and promoted foreign direct investment, allowed foreigners to invest in the Korean stock market, and joined the World Trade Organization (WTO) and the Organization of Economic Cooperation and Development (OECD) in the early 1990s. These measures encouraged capital inflows into the South Korean economy, making its financial market more open to foreign investors. Even though the 1997-1998 financial crisis was a major interruption to the South Korean economy, the South Korean government resumed financial market liberalization policies, focusing heavily on the lifting the unnecessary restrictions on foreign exchange transactions. To do so, the managed-floating exchange rate system was adopted. The implementation of drastic financial liberalization policies accelerated rapidly from 1999-2005. Therefore, understanding the underlying relationship between financial development and economic growth in South Korea requires the adoption of the Granger causality robust tests to handle the trending properties of the economic variables over different time periods. Thus, the traditional Granger causality tests are likely to be inconsistent in the presence of

instabilities in the parameters. Hence, our study contributes to this strand of literature in two directions.

First, this paper examines the TV nexus between financial development and economic growth in the Korean economy over the period from 1983Q1-2021Q3. To this end, the TV causality based on the recursive evolving window algorithm proposed by Shi et al. (2020), is used. With this approach, any structural changes or regime shifts throughout the causal relationship within the economic variables are incorporated. Therefore, the casual relationship is analyzed in a time-varying fashion where the causality between financial development and economic growth changes over different time periods. Second, this study also contributes to the literature by identifying the direction of causality effect between financial development and economic growth, where a positive or negative causality is identified over different episodes.

Our study confirms the positive impact of economic growth on financial development at an earlier period when the ratio of broad monetary aggregate, M2 to GDP is proxied for the financial development. However, the negative impact of financial development on growth has been continuously present since 2015, regardless of the financial proxies used in this study indicating "too much finance" in the Korean economy.

The rest of our research is summarized as follows: Section 2 provides a background of the finance-growth literature. The empirical model and data are described in Section 3. The methodology and empirical results are presented in Sections 4 and 5, respectively. Finally, the concluding remarks elaborate an empirical finding for possible policy implications.

2. Finance-Growth Literature

Since the seminal studies by Bagehot (1893) and Schumpeter (1911), the importance of a well-developed financial system has been accepted as a crucial driver for promoting economic development. There are two mainstream growth theories addressing the role of the financial system. First, the neoclassical growth theory treats technology as exogenous and assumes that it is the only exogenous factor affecting long-run growth rate. Therefore, the level or type of financial development could affect the long-term growth rate only through very limited channels if there is a direct link to the rate of technological advancement (Tsuru, 2000). Second, the endogenous growth theory provides several channels in which financial development (especially financial intermediation) affects economic growth. Funneling savings to firms, improving the allocation of capital, enabling investors to share risks and saving rates are the important financial intermediary functions that influence capital accumulation and technological innovation, which in turn affect economic growth (Pagano, 1993).

Irrespective of the mechanism, however, another important issue is the direction of the causality between financial development and economic growth. A great number of researchers assert that financial systems play an important role in effecting savings rates, investment decisions, and technological innovation, along with mitigating market frictions, and therefore, long-run economic growth (see study by Levine (2004) for an extensive literature review). Equally prominent researchers on the other side assert that since the financial system only responds to changing demand stemming from the real economy, the role of the financial sector on economic development is overemphasized (Robinson, 1952; Patrick, 1966; Lucas, 1988; Jung, 1986; Ireland, 1994; among others). These two contradictory views between financial development and economic growth are categorized by Patrick (1966) as a supply-leading hypothesis and a demand-following hypothesis. The *supply-leading hypothesis* indicates that financial development causes economic

growth whereas the *demand-following hypothesis* reveals that financial development responds to economic growth.

A large body of empirical literature has investigated these competing hypotheses. The study by Beck et al. (2014) showed that financial development has a positive effect on economic growth only up to a point. However, if financial deepening is beyond a certain threshold, further financial deepening may have no impact on economic growth. Islam and Stiglitz (2000) empirically shows the negative effect of financial development when the domestic credit to the private sector (% of GDP) reaches to 100%. The study suggests that a large financial sector may overshadow the real economy creating a suboptimal allocation of productive resources and increasing output volatility. Meanwhile, the recent studies (see, for example Mishra and Narayan, 2015; Boyreau-Debray, 2003; among others) find that banking development might have a negative impact on economic growth, indicating the significance of the direction of causality effect. Specifically, Narayan and Narayan (2013) assert that developing countries with weak capital markets are at a greater risk of banking restrictions, which in turn affect economic growth negatively through three channels: (i) stimulation of current consumption through low interest rates, which discourages savings; (ii) due to low interest rates, prospective lenders may engage in relatively low-yielding investment activities by opting out of depositing money back in the banking system, and (iii) misallocation of borrowed funds at low interest rates.

Due to the existence of strong externalities of financial intermediation[1], the causal relationship between financial development and economic growth is very sensitive to data samples and time span. In addition, both internal and external shocks may affect the nature of this relationship over a particular period of time. Therefore, the TV relationship between these two variables can only be resolved through empirical applications.

3. Empirical Model and Data

Following the studies by Polat et al. (2015), Mankiw, et al. (1992), a Cobb-Douglas production function is considered to explore the relationship between real output and financial development:

$$Y_t = A_t K_t^{\alpha}{}_t L_t^{1-\alpha} \tag{1}$$

where t = time; Y_t denotes domestic output in period t; A_t, K_t and L_t represent technological progress, capital stock and the number of employed in civilian labor force in period t, respectively. Both α and $1-\alpha$ represent the marginal products of capital and labor, respectively. Following the study by Polat et al. (2015), it is assumed that the technological advancement is determined by the development of the financial market and trade openness of the economy. Therefore, the following is assumed:

$$A_t = \emptyset T_t^{\beta} F_t^{\gamma} \tag{2}$$

where $\emptyset$ is a constant, T and F are indicators of trade openness and financial development, respectively. The following equation is obtained by simply substituting Equation 2 into Equation 1:

$$Y_t = \emptyset T_t^{\beta} F_t^{\gamma} K_t^{\alpha} L_t^{1-\alpha} \tag{3}$$

The following equation is obtained by dividing both sides of Equation 3 by L:

1 Although many of them are positive such as information and liquidity acquisition, some might be negative especially during systematic financial crises specific to market systems.

$$\frac{Y_t}{L_t} = \emptyset T_t^{\beta} F_t^{\gamma} \left(\frac{K_t}{L_t}\right)^{\alpha} \quad (4)$$

The natural logarithm functional form of Equation 4 is used for the estimation purposes. This implies

$$Y\_REAL_t = \pi_1 + \pi_2 TRADE_t + \pi_3 FINANCE_t + \pi_4 CAPITAL_t + \epsilon_t \quad (5)$$

where $\pi_1 = \ln(\emptyset)$, Y_REAL_t is the log of output per capita $\frac{Y_t}{L_t}$; $TRADE_t$ is the log of T_t; $FINANCE_t$ is the log of F_t; and $CAPITAL_t$ is log of capital stock per capita $\frac{K_t}{L_t}$ and ϵ_t is an error term.

This study utilizes quarterly data for South Korea from 1983Q1 to 2021Q3. The data are retrieved from the Bank of Korea Economic Statistics System, the Bank of International Settlements and the FRED data base. Data on real GDP per capita[2] and real gross fixed capital formation per capita are used for *Y_REAL* and *CAPITAL* in Equation 5. The nominal exchange rate between won/dollar is used to express nominal GDP and gross fixed capital formation in dollars. Real values of these variables are calculated by dividing them by the GDP implicit price deflator. Then, both Y_REAL and CAPITAL are obtained by simply dividing them by the employed population aged 15 and over. The data on nominal values of export, import, and GDP are used to construct a trade openness indicator (TRADE), a ratio of exports plus imports of goods and services divided by GDP. There are various measures of financial development proxies used in the existing literature (Polat et al., 2015; Adusei, 2014; Levine et al., 2000; Kim and Shu, 1998). In our study, consistent with the literature (see Demetriades and Hussein, 1996 for an extensive discussion), two well-known proxies for financial development ($FINANCE$) are used, namely the ratio of broad monetary aggregate, M2 to GDP (M2/GDP) and the ratio of credit to non-financial sector from all sectors to GDP (CREDIT/GDP), respectively. Since the time varying procedure used in this study provides effective outcomes with high frequency data, the quarterly data is used in this study which limits us from including multiple financial development proxies. All data are seasonally adjusted, and all variables are in natural logarithm form.

4. Methodology

The TV Granger causality test is used to analyze time-varying causality relationships between South Korea financial development and real GDP per capita. To this end, Shi et al. (2018, 2020) propose three causality procedures (forward expanding window, rolling window and recursive evolving window (henceforth RE)). Shi et al. (2018) suggest that these procedures are applicable for testing a Granger causality in the case of a stationary VAR model. Additionally, Shi et al. (2020) show the application of these causality procedures in the LA-VAR (Lag Augmented VAR) approach proposed by Toda and Yamamoto (1995) in case of the nonstationarity.

Shi et al. (2018, 2020) show the superiority of the power of the RE algorithm over the other algorithms using the Monte Carlo simulation. Therefore, the recursive TV Granger causality test is used for this study. Let the LA-VAR model for a $n-$dimensional vector $\mathbf{x}_t = (x_{1t}, x_{2t}, \dots, x_{nt})'$ be expressed as follows:

$$\mathbf{x}_t = \sum_{i=1}^{k+d} \mathbf{A}_i \mathbf{x}_{t-i} + \boldsymbol{\varepsilon}_t t = 1,2, \dots, T \quad (6)$$

[2] Following the studies by Roubini and Sala-a Martin, 1992, Demetriades and Hussein, 1996, the economic development is proxied by real GDP per capita (Y_REAL).

where d is the maximum order of integration in the level VAR system and the error term vector $\boldsymbol{\varepsilon}_t = (\varepsilon_{1t}, \varepsilon_{2t}, \dots, \varepsilon_{nt})' \sim (\mathbf{0}, \Sigma_\varepsilon)$ is a white noise process. In equation (6), the true values of $\mathbf{A}_{k+1}, \mathbf{A}_{k+2}, \dots, \mathbf{A}_{k+d}$ are assumed to be zeros.

Let $\boldsymbol{\Phi} = (\mathbf{A}_1, \dots, \mathbf{A}_k)_{n \times nk}$ and $\phi = vec(\boldsymbol{\Phi})$ be a vector that contains the true parameters, and $\mathbf{R}$ be an $m \times n^2 k$ matrix with $rank(\mathbf{R}) = m$ and $\mathbf{0}$ is $m-$dimensional zero vector. Then, the nonexistence of Granger causality in the null hypothesis is written as follows:

$$H_0: \mathbf{R}\phi = \mathbf{0} \tag{7}$$

The modified Wald statistic (W) of null hypothesis in equation (6) is

$$W = \left(\mathbf{R}\hat{\phi}\right)' \left[\mathbf{R}\{\hat{\Sigma}_\varepsilon \otimes (\mathbf{S}'\boldsymbol{Q}\mathbf{S})^{-1}\}\mathbf{R}'\right]^{-1} \mathbf{R}\hat{\phi} \tag{8}$$

where $\mathbf{s}_t = (\mathbf{x}'_{t-1}, \dots, \mathbf{x}'_{t-k})'_{nk \times 1}$, $\mathbf{S} = (\mathbf{s}_1, \dots, \mathbf{s}_T)'_{T \times nk}$, $\hat{\Sigma}_\varepsilon = \frac{1}{T}\hat{\boldsymbol{\varepsilon}}'\hat{\boldsymbol{\varepsilon}}$, $\boldsymbol{\varepsilon} = (\boldsymbol{\varepsilon}_1, \dots, \boldsymbol{\varepsilon}_T)'_{T \times n}$, $\boldsymbol{Q} = \boldsymbol{I}_T - \mathbf{Z}(\mathbf{Z}'\mathbf{Z})^{-1}\mathbf{Z}'$, $\mathbf{Z} = (\mathbf{z}_1, \dots, \mathbf{z}_T)'_{T \times nd}$, $\mathbf{z}_t = (\mathbf{x}'_{t-k-1}, \dots, \mathbf{x}'_{t-k-d})'_{nd \times 1}$ and $\otimes$ is the Kronecker product. Also, $\hat{\phi}$ is ordinary least square estimator of ϕ in level VAR system. Under the null hypothesis (7), the W statistic has the standard χ^2_m asymptotic null distribution, where m is the number of restrictions.

The algorithm of the RE procedure proposed is followed: The W statistic given equation (8) is calculated for each subsample regression over $[f_1, f_2]$with a sample size fraction of $f_w = f_2 - f_1 \geq f_0$ and denoted by $W_{f_1}^{f_2}$. Then, the supremum of the $W_{f_1}^{f_2}$ statistic sequence is given by

$$SW_f(f_0) = \sup_{f_2 = f, f_1 \in [0, f_2 - f_0]} W_{f_1}^{f_2} \tag{9}$$

Let f_e and f_f denote the starting and ending episodes in the causal relationship. The dating rules based on the RE algorithm are defined by

$$\hat{f}_e = \inf_{f \in [f_0, 1]} \{f: SW_f(f_0) > scv\} \qquad \hat{f}_f = \inf_{f \in [\hat{f}_e, 1]} \{f: SW_f(f_0) < scv\}$$

where scv is the corresponding critical value of the SW_f. The estimated first observations, namely $\hat{f}_e$ and $\hat{f}_f$ are obtained where the calculated test statistics are higher or lower than the critical values for the starting and ending points in the causal relation. Similarly, these periods can be obtained for multiple switches. The TV approach has been widely used in wide range of areas including energy economics (Emirmahmutoglu et al., 2021; Raggad, 2021; among others) financial economics (Lu et al., 2022; Tsuru et al., 2021; among others), tourism economics (Aslanturk et al., 2011; Wu et al., 2016; among others), etc.

5. Empirical Results

This section starts with determining the order of integration of the variables used in this study. Table 1 provides the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) unit root tests results. A linear time trend is added in the test regression to apply both tests. The Akaike information criterion (AIC), is used for determining the optimal lag length for the ADF test. Additionally, in the PP test, the Andrews bandwidth method is used for the automatic bandwidth selection and the quadratic spectral kernelis employed for spectral estimation. As displayed in Table 1, the data series are nonstationary at level. Therefore, all data series are $I(1)$.

Table 1. The ADF and PP unit root test results

ADF	Y_REAL	FINANCE (M2/GDP)	FINANCE (CREDIT/GDP)	TRADE	CAPITAL
Level	-3.319	-2.487	-2.6743	-2.284	-2.890
First Difference	-6.451***	-6.263***	-5.2545***	-8.600***	-5.997***
PP					
Level	-3.154	-2.262	-2.1558	-2.141	-2.708
First Difference	-13.641***	-8.364***	-9.5465***	-10.869***	-12.783***
***denotes the statistically significance level at the 1 %.					

Equation 5 is used to figure out the time-varying causality between financial development-economic growth using TRADE and CAPITA as control variables[3]. Figure 1 illustrates the response of Y_REAL to FINANCE, whereas the response of FINANCE to Y_REAL is illustrated in Figure 2[4]. To be clear, the left panels of each figure utilize M2/GDP, whereas the right panels use CREDIT/GDP for the financial development indicator. The left panel of Figure 1 displays that the algorithm identifies a single episode with longer duration. A development in the financial system decreases economic growth over the period 2015-2021. Meanwhile, as displayed in the right panel of Figure 1, the negative effect of financial development on economic growth prevails over the period 2015-2019 ignoring the short-lasted relationships in the early 1990s. Our finding is in line with the studies by Jung (2017); Chiou-Wei et al. (2010); Yang et al. (2008).

The left panel of Figure 2, on the other hand, illustrates that the recursive evolving algorithm locates one episode from 1993 to 1996 as well as another episode identified over 2009-2012 period[5]. Notice that the global financial crisis interrupted the validity of the GDP-led finance hypothesis from mid-2007 to late 2008. During both periods, the response of FINANCE to Y_REAL is positive. Interestingly, when CREDIT/GDP is used for the financial development, there is no causality detected from Y_REAL to FINANCE, ignoring the short-lasted relationship in the late 1990s.

3 The relationships between the capital stock and economic growth and trade openness and economic growth are well established in the economic growth literature. See Narayan and Narayan (2013) for the further discussion.

4 The lag order is determined by the AIC for the entire sample period, and maximum lag length is 4. The optimal lag order obtained by the AIC is fixed for all subsamples. Additionally, the critical values are obtained by 1000 bootstrap repetitions and controlled over 4 quarters.

5 We do not pay special attention to the specific quarters when the respond becomes on and off within the identified period.

Figure 1: TV Granger causality tests from FINANCE to Y_REAL

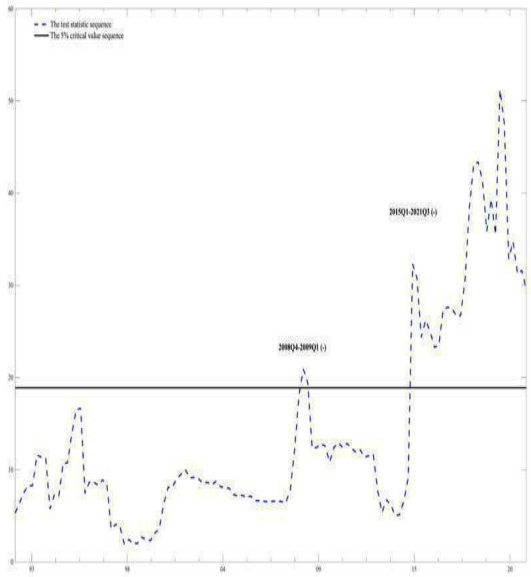
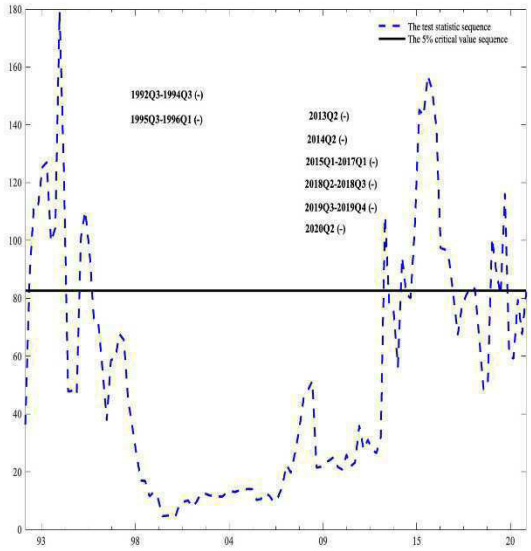
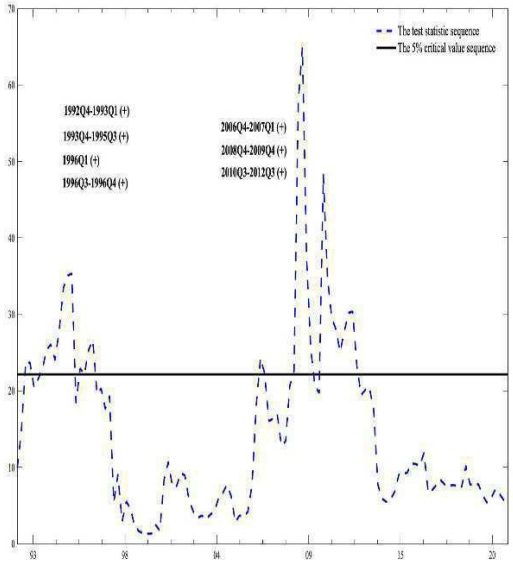
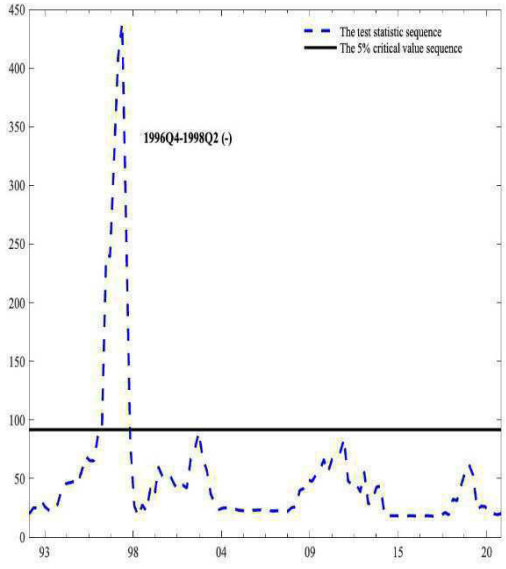
FINANCE (M2/GDP)	FINANCE (CREDIT/GDP)
	

Figure 2. TV Granger causality tests from Y_REAL to FINANCE

FINANCE (M2/GDP)	FINANCE (CREDIT/GDP)
	

6. Concluding Remarks

Our research reexamines the causality relationship between financial development and economic growth in the South Korean economy over the period from 1983Q1-2021Q3. Unlike the existing literature, our study acknowledges and incorporates the heterogeneous TV nature of the financial development-economic growth nexus over the study sample. In addition, our study not only detects the causality episodes, but it also determines the direction of the effect of the causality episodes. To this end, our study confirms the positive impact of economic growth on financial development at an earlier period when the ratio of broad monetary aggregate, M2 to GDP is proxied for the financial development. Interestingly, the negative impact of financial development on growth has been continuously present since 2015 regardless of the financial proxies used in this study. Thus, our findings provide the following several important conclusions.

First, since the South Korean economy experienced three decades of state-led economic growth with an average yearly economic growth of 8% through 1996 (Kim, 2000), it is not surprising that the economic growth promotes financial development in South Korea at earlier periods. However, the positive effect of economic growth on financial development vanished after 2012.

Second, the financial development has had a negative effect on South Korean's economic growth, validating the demand-following hypothesis starting mid-2015. The reserve negative causality corresponds well with the maturity periods of the financial market liberalization government policies. During the period from 2015 -2020, the South Korean economy experienced sluggish economic growth. This economic slowdown can be explained by two factors: a) the Korean government's excessive efforts transformed the Korean financial market into more open and globally integrated market; b) the Bank of Korea's persistent effort to lower interest rates over the last decade to increase the aggregate demand. So, both efforts probably lead to an "too much finance" phenomenon. Therefore, our study confirms the danger of rapid and excessive financial development on the real economy of South Korea (De la Torre and Ize 2011, Arcand et al. 2015).

Overall, the causality relationship between financial development and economic growth varies and is sensitive to the sample period. Therefore, future research must incorporate these features for the development and implementation of the appropriate policies. Also, the Korean policymakers should not overlook the detrimental effect of excessive financial development on economic growth and avoid misallocation of the financial resources.

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