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World Democracy and World Development: A Macro-systemic Level Causal Analysis of Democracy and Economic Development, 1960-2018*

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The long-term progressions of political freedom and economic wealth have characterized the post-World War era. The scholarly debate on how democracy and economic development are related, although having continued over multiple decades, is still lively. Does a more democratic world lead to a wealthier world? Does a more affluent world ensure a freer world? Or are political development and economic development separate processes independent from each other? This present study aims to help establish the causality between political development and economic development at a macro systemic level. I identify the possible causal mechanisms for the democracy-development nexus and draw a testable hypothesis. Empirically, I set up a set of vector autoregression-based Granger causality tests. The test results do not support any causal relationship between world democracy and world development.

Keywords: Democracy, economic development, causality, Granger test

INTRODUCTION

Both democracy and market economy characterize this current, most globalized era. Democracy seems to be the most preferred form of political system across the world. Economic development, through free market and free trade, appears to be the most desirable achievement for any political regime across the globe. How are democracy and economic development related to each other? Does democracy cause development? Does development causes democracy? Do they cause each other? Or are they separate processes having developed coincidently? The democracy-development nexus has constituted one of the most prevalent topic in both political science and economics. Numerous studies have focused on one-way causal relationships, concerning either the effect of democracy on development or the effect of development on democracy. However, surprisingly scant research directly and comprehensively addresses the possible two-way causation between democracy and development, especially at the world systemic level. This study investigates whether or not democracy and economic development cause each other at the macro systemic level.

Can we expect that a more developed world brings about a more democratized world? Does a more democratic world induce a wealthier world? In fact, indicators for both world democracy and world economic development have shown to be steadily increasing in the post-World War era. According to the Polity project that measures democracy with a 21-point scale from -10 (full autocracy) to 10 (full democracy), the average democracy score for the whole world has ultimately increased from -0.31 in 1960 to 4.08 in 2018, despite some interrupted setbacks. According to World Bank data, the per capita average for world GDP has steadily ascended from about $3746 in 1960 to about $11075 in 2019 in constant 2010 US dollars. The plots later shown in Figure 1 demonstrate well these two upward trends in

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world democracy and world development.

This present study aims to provide theoretical rationales and statistical evidence for the causality between democracy and development at the global systemic level. After examining theoretical possibilities, I conduct a set of Granger causality tests by using vector autoregressive models. Through VAR models, I regress the annual per capita world GDP against the annual world democracy score and a set of its lagged values to test whether world democracy Granger causes world development. Conversely, I predict the annual world democracy score by the annual per capita GDP and a set of its lags to determine if world development Granger causes world democracy. To measure democracy and development, I utilize the relevant data collections by the Polity5 project and the World Bank. The time intersection of these datasets determines the temporal domain of this present study, 1960-2018. The results show that world democracy and world development do not Granger cause each other, suggesting that the developmental processes of world politics and world economy have been historically coincident but these two processes are separate, increasing trends, causally independent from each other.

The remainder of this paper first discusses previous research on the relationship between democracy and economic development to explore the theoretical and empirical possibilities about how democracy and economic development affect each other. Along with these discussions, I present specific hypotheses for empirical testing. What follow are the discussion for the measurement and method and the presentation of the statistical results. I conclude this paper with implications for the real world and future research.

DEMOCRACY-DEVELOPMENT CAUSALITY

This section addresses whether and how democracy and development are related to each other in terms of causality at the world systemic level. Can the increasing trend of global democracy be translated into world development through a causal process? Does the soaring increase of average world income give rise to political development as a causal effect? These two processes can be simultaneously at work as a two-way causal relationship. I start this section by presenting a testable hypothesis:

Hypothesis: World democracy and world development Granger cause each other.

In what follows, I discuss theoretical and empirical rationales for the presented hypothesis. In doing so, I identify mechanisms for each of the two-way causations building upon the literature on the relationship between democracy and economic development. Alternatively, the two variables may not be causally related to each other. So, I also identify counter arguments for the hypothesis.

The Effect of Development on Democracy

Lipset's (1959) study is seminal on the effect of economic development on democracy. He argues that economic development is the most important prerequisite for democracy. Steady advanced economies pave the road toward democracy, along with "industrialization, wealth, urbanization, and education" (p. 71). Economic development changes the social conditions of lower strata workers, lessening their commitment to old ideologies, making them less susceptive to extremist ideas, and instead exposing them to middle class values. It also enlarges the size and political roles of the middle class, which highly values individual rights and political freedom.

Since Lipset's (1959) seminal work, scholars have elaborated theoretical mechanisms for the effect of development on democracy. This literature, by and large, suggests three mechanisms. The first mechanism emphasizes the roles of economic development in facilitating industrialization and urbanization. Industrialization and urbanization allow people to have pluralized sociopolitical interests and values (Dahl 1971) and expanded social ties (Tilly 2000). These processes encourage citizens to feel the importance of political rights and civil liberties. The second mechanism focuses on the socioeconomic dynamics that economic development brings about in favor of democracy. Increased income with development promotes socioeconomic mobility while reducing inequality and distributional conflict (Boix 2003). Through these dynamics, citizens come to a realization that they can earn income and raise status without government help and rent seeking and thus they need extended political freedom (Bilson 1982). The third mechanism is that development results in rising educational levels, which makes people realize the importance of equality, independent thinking, individual autonomy, and free choice (Pennar et al., 1993; Inglehart and Welzel 2005). Newly emerging knowledge societies will stimulate citizens to agitate for their pair shot, political rights and civil liberties that can be procured only by democracy.

Supportive cross-national empirical evidence for the modernization thesis has been documented by many studies over the decades. Examples include Burkhart and Lewis-Beck (1994), Londregan and Poole (1996), Feng (1997), Boix and Stokes (2003), Epstein et al. (2006), Boix (2011), Moral-Benito and Bartolucci (2012), and Benhabib et al. (2013). Most recently, Treisman (2015) finds that the positive effect of economic development on the emergence of democracy does not occur spontaneously in a short time window but happens in the medium term, perhaps over 10 to 20 years. Increased income provides dictators with political legitimacy and resources to strengthen their hold on power. Development ultimately will bring about democracy, but only after an incumbent dictator with successful economic records leaves office for whatever reasons. Based on this finding, Treisman (2020) suggests a modified modernization theory that the democracy-generating effect of economic development is triggered by disruptive internal and external events like economic crises and military defeats.

The discussion of modernization theory in its original and modified forms suggests that economic development leads to democratization and its consolidation at the state level. If national incomes increase across many parts of the world, there will be more emerging democracies and consolidated democracies. This gives a system-level implication that higher levels of world development lead to higher levels of world democracy.

In addition to the extension of the state-level mechanisms, we can develop some mechanisms that work at the system level. World development affects the levels of democracy for individual countries for the following reasons. First, what has underpinned the rise of democracy and liberalism is the successful trajectory of the world economy. In the modern world system, liberal capitalism has been the engine for economic development with few exceptions (Bremer 1992). Booms legitimate the prevailing systems of global political economy. It is fortunate for liberal democracy that "more wealth for more people has been generated in societies calling themselves liberal, democratic, and capitalist" (Karabell 2017). However, history shows that when the world is in economic downturns, democracy has been seriously threatened by the rise of nationalism and fascism in many corners of the world.

Second, as suggested, the progression of the world economy has been made with the expansion of market economies and economic integration expedited by increasing globalization. These processes are characterized by the increasing roles of foreign direct investment (FDI), technological advances, international trade, and economic international institutions. World economic booms may not occur unless these workforces operate in favor of many economies across the world. In fact, studies provide evidence for their auspicious associations with economic development (Borensztein et al., 1998; Nelson and Nelson 2005; Mukherjee 2008; Busse and Koeniger 2015). Thus, a large scale expansion of the world economy is likely when these workforces work to their full capacity in a positive direction.

Specifically, international businesses demand the transparency and liability of political and economic institutions in potential investment countries (Crackett 2011). They also consider whether investment countries have enforceable systems of property rights and impartial courts (Keck and Sikkink 2014). In fact, Li and Reuveny's (2003) statistical analysis reveals that FDI inflows positively affects the levels of democracy in hosting countries. Technological advances have penetrated most of the closed societies in the world. Various telecommunications facilitate the infusion of democratic norms and principles into these societies. There has been the rise of technocrats in government and politics across the world. There have been the steady inflows of technocrats from advanced democracies to developing autocracies. The increased influence of technocrats helps make governments more accountable and transparent (Dalpino 2001). International trade and economic openness positively affect democracy. Lopez-Cordova and Meissner (2008) find that as countries, whether already democratic or still autocratic, increase trade with other countries, they become more democratic. The increasing expansion of international institutions has been responsible for the fast globalization of the world economy. Examples include from economic organizations like WTO, IMF, and World Bank, through regional integration projects like the EU, NAFTA, various PTAs and FTAs, to security organizations like NATO. Joining these international organizations and adhering to their rules require member countries to make more transparent and accountable governments (Dalpino 2001). Domestic pro-democracy activist groups will find opportunities as international organizations can provide some protection, information, and capacity building assistance (Kim 2013). In line with this reasoning, Pevehouse (2002) offers supportive evidence that membership in international organizations, although limited to regional ones, promotes democratic transitions. All in all, the discussion suggests that trend of globalization expedited by booms in the world economy increases the intensity and effectiveness of the pro-democratic international factors.

The Effect of Democracy on Economic Development

A 17th century political philosopher, James Harrington, pioneered the idea that democratic governing structures promote economic development when he published *The Commonwealth of Oceanea* in 1656. In the modern era, it is Mancur Olson's 1982 seminal work, *Rise and Decline of Nations,* that revived the idea that the institutional fabric of government is associated with economic development. Although Olson highlights the possibility that stable mature democracies are prone to economic stagnations, he upholds that stable democracies are fundamentally important for long-term economic growth.

Since Olson's (1982) seminal work, scholars have identified several theoretical mechanisms for the positive effect of democracy on economic development. These mechanisms can be categorized into four kinds. The first mechanism emphasizes the roles of democratic rules and checks-and-balances systems in ensuring long-term economic development. In reality, extraordinarily rapid growth tends to appear with developmental dictatorships in poor countries. But, such growth lasts no longer than the span of one or two dictators' rule. To this point, Olson (1993) argues that a well-established democracy is necessary for lasting economic development since it protects individual property rights and its independent judiciary facilitates fair contract enforcement. Lasting democracies seem to be equipped with all the essential requisites that are necessary for long-term and maximum economic development. On this, North (1990, 2005) explains why. He argues that the institutional structures of societies shape their economic trajectories. Political elites are generally predatory and thus need to be constrained by various institutional devices such as political competitions, separation of power, and checks and balances. The rules and systems of democracy hinder predatory leaders, protect property rights, and enforce contracts. Indeed, many political economists suggest that political freedom and economic freedom reinforce each other, improving property rights and facilitating market competition, which in turn stimulates economic development (Friedman 1962; Sirowy and Inkeles 1990; Barro 1997). According to Leblang's (1996) cross-national time-series analysis, property rights have a statistically meaningful impact in enhancing economic growth.

The second mechanisms can be drawn from the selectorate theory of Bueno de Mesquita et al. (2003). The size of the winning coalitions matters for governments to pursue national interests than parochial ones. For their political survival, leaders in democracies need to satisfy a broader range of constituents as compared to those in autocracies, and thus their policies tend to be oriented toward enhancing public goods. Public goods such as national security, property rights, civil liberties, the rule of law, public health, education, and other social services benefit almost everyone in the society and facilitate market exchange activities. These all contribute to making market-friendly environments conducive to steady economic growth.

The third mechanism highlights how democratic constraints and accountability produce growth-generating effects by reducing rent seeking but increasing financial power. Lake (1992) argues in a different context that democracies generate greater national wealth and military capability than do autocracies. Rent-seeking behaviors are greatly inhibited, and thus there are relatively few economic distortions made in democracies. Reduced economic distortions are important for what Schultz and Weingast (2003, 3) call "the democratic advantage" that produces large financial power. Leader-sanctioning mechanisms associated with liberal democratic institutions allow punishing ill-behaving leaders and rewarding well-behaving ones. Such mechanisms have democrats bearing higher levels of political accountability than autocrats. Thanks to these relatively high levels of constraints and accountability, democratic governments "enjoy superior access to credit and lower interest rates than" autocratic governments. Debtholders will find it easier to sanction democratic state leaders than autocratic state leaders, who have more discretion in the event of default. Additionally, democratic constraints and accountability minimize economic distortions. These all are consistent with long-term economic growth that helps win prolonged competitions with foreign rivals.

Numerous empirical studies have assessed the effect of democracy on development over the last three decades. In general, the findings have been mixed and inconclusive, differing across studies. Most recently, Colagrossi et al. (2020) conduct a meta-analysis using 188 papers and 2047 regression results covering 36 years of research. Their finding shows that democracy has a significant direct positive impact on economic growth. They also investigate

875 models from 111 studies to meta-analyze the effect of democracy on human capital. They find this indirect growth-generating effect of democracy significant and robust, although weaker than its direct effect.

The discussion leads us to expect at the macro level that a world full of democracies should be more affluent than a world full of autocracies. Increased democratic governance in individual states aggregates up to an increase in global democracy. The resulting increased income in individual states adds up to an increase in world income. We can draw some macro-level mechanisms that global democracy affects economic development in individual states. First, democracy pacifies contemporary interstate relations as democracies rarely fight with each other in the Cold War and post-Cold War systems (Park 2013). A more democratic world provides a more peaceful and international environment in favor of economic development at both of the state and global levels. Peace, security and political stability are necessary for trade and sustained economic growth (Gowa and Mansfield 1993; Aisen and Veiga 2013). The regions surrounded by democracies provide more stable, peaceful, and conducive milieus for diplomatic negotiations, interstate cooperation, economic integration, and economic growth than those surrounded by autocracies (Gleditsch 2002; Mitchell 2002; Mansfield et al. 2008). As discussed above, trade and integration are helpful for the sustained growth of the world economy. Bosker and Garretsen (2009) provide direct evidence that democratic neighborhood leads to a higher national GDP per capita as well as better domestic governance.

Second, democracy per se reduces the trade barriers across borders. Mansfield et al. (2000) argue that the required legislative ratification processes allow democracies to set a lower trade barrier with other democracies. They find that democracies are more likely to trade with each other than other types of countries. Also suggestive is Kleinberg and Fordham's (2010) finding that citizens in middle-income democracies carry less unfavorable attitudes toward the US than they do towards China, the two largest economies that account for a substantial share of world trade and investment. It seems that other things being equal, citizens in democracies seem to prefer democratic trading partners than autocratic trading partners. These all suggest that international trade is more prevalent with a more democratic world. As has been discussed, trade is a main engine for the expansion of global economy.

The third mechanism is that global democracy can contribute to national economy and global economy by promoting the flows of FDI across the world. Democratic countries, in general, are found to attract more FDI inflows (Jensen 2003; Busse and Hefeker 2007) although this may not apply to some of developing democracies with large natural resource dependence (Asiedu and Lien 2011) and low economic freedom (Mathur and Singh 2013). The FDI-attracting effect of democracy even benefits nondemocratic countries that are surrounded by democratic neighbors because democratic neighborhood helps hosting countries improve institutional quality, enlarge economic returns, and lower the chance of experiencing armed conflict (Pinar and Stengos 2020). FDI can assist hosting countries to grow their economies (Borensztein et al. 1998). Malikane and Chitambara (2017) find that FDI has a direct positive impact on economic growth. Further, they show that this growth-generating impact is larger for democratic hosting countries than their nondemocratic counterparts because democracies are better able to absorb technological spillovers from other developed democracies. Taken together, the discussion suggests that a larger proportion of democracies in the world facilitates global FDI flows and intensifies the grow-contributing effect of FDI by helping improve institutional quality across the borders.

Non-Causal Relationship

Although consensus seems to be leaning toward the positive association between democracy and development in the literature, it is fair to identify skeptical views. Over long decades, scholars have raised skepticism about the relationship between democracy and development. Earlier sceptics have questioned the development-democracy nexus (Moore 1966; O'Donnell 1973). More recent sceptics do not deny that development and democracy are correlated, but they question whether the relationship is causal. Przeworski and Limongi (1997) argue that economic growth does not cause the emergence of democracy. Rather, the relationship is exogenous, meaning that high income helps a democracy last longer. Although democratization is increasingly likely for poor dictatorships as their income rises, increased wealth also helps dictatorships stabilize their regimes. Przeworski and Limongi (1997, 177) note that "[t]he emergence of democracy is not a by-product of economic development…. [I]t can be initiated at any level of development." Luo and Przeworski (2019) assert that political development and economic development are historically coincident but causally separate processes. In the pre-Industrial Revolution era, all countries were under-industrialized and underdeveloped so there was relatively little variance of income among countries. But, at a certain historical period, a lead country suddenly industrialized and grew faster. More and more countries followed this path, and ultimately the lead country's growth rate and the followers' growth rate converged to a similar rate. Likewise, in earlier eras, all countries were autocracies but at a certain historical point, a lead country suddenly started to be democratized. And more and more countries followed this path over long time.

In a similar vein, Acemoglu et al. (2008) argue that the historical coincidence of development and democracy is not causal. Instead, some divergent confounding factors rooted in colonial era history such as the demise of feudalism, the age of industrialization, the mode of colonial institutions, religion, and the date of independence accounts for the correlation. These historical variables interlinked economic and political development at certain historical junctures. In fact, the two-way fixed effects regression that the authors adopt to account for country-specific heterogeneities and year-specific shocks to the system removes the statistical significance for the association between income and democracy for the 1960-2000 period. For the data of an extensive range, 1500-2000, their inclusion of the historical variables eliminates the statistical significance of the income-democracy nexus.

Baum and Lake (2003) examine the direct and indirect effect of democracy on economic growth. Using a cross-national dataset of 128 countries for 1967-1997, they find no statistically significant direct effect. Instead, they find that democracy affects growth only indirectly through public health and education. Murtin and Wacziarg (2014) use time-series cross-national data to test the effect of democracy on income. They find that the relationship between democracy and income is statistically insignificant for the whole sample period of 1870-2000 and other subsamples of 1900-2000 and 1930-2000. Doucouliagos and Ulubasoglu (2008) conduct a meta-analysis examination of 483 coefficient-estimates from 84 studies. They find no significant result for the direct impact of democracy on economic growth. At best, democracy affects economic growth only through indirect means by increasing human capital and economic freedom while lowering political instability.

Taken together, these null findings for the effect of democracy on development and that of development on democracy lead us to expect that there might be no causality between democracy and development. However, expecting no causality between them is contradictory to what have been discussed theoretically and empirically in the two previous subsections.

This present study, adopting a Granger causality approach, should help model the appropriate relationship between democracy and development in the literature.

The Causality between Democracy and Development

Some previous studies conduct Granger causality tests for the relationship between democracy and development. Heo and Tan (2001) find two-way Granger causality, one causation from growth to democracy and the other causation from democracy to growth. However, their spatial and temporal domains only cover 32 states and 33 years, from 1950-1982. Also, they run 32 separate Granger causality tests for 32 different states. Hence, their findings are inconclusive for the macro-level causality between world democracy and world development. For instance, the authors report the growth → democracy Granger causality for 11 countries, the democracy → growth Granger causality for 10 countries, two-way Granger causality for 3 countries, and no relationship for 8 countries. Additionally, they measure growth in terms of growth rate. However, what is usually theorized is how the levels, not growth rate, of wealth or development help increase the levels of democracy and vice versa.

Boix (2011), using a cross-national time series dataset of over 130 countries for the 1820-2000, runs a Granger causality test between the levels of income and political regime. His test shows that income Granger causes democracy but not vice versa. However, Boix's finding is for an average point estimate for the cross-national time-series panel rather than a macro-systemic level point estimate for world democracy and world development. In contrast to Boix, Acemoglu et al. (2019) report an exact opposite finding, that democracy causes growth.

As such, previous research remains inconclusive about the causality between democracy and economic development at the cross-national level, and no studies have examined it at the macro-systemic level. In the following sections, I set out to help clarify the debate by adding evidence from the macro-systemic level.

DATA AND METHODS

I measure the macro-systemic level democracy by taking the annual average of all countries' scores for democracy in a given year. For democracy scores, I use the polity score of the Polity5 Project. It captures countries' levels of democracy and autocracy on a 21-point scale ranging from -10 (fully autocratic) to 10 (fully democratic). I call this variable world democracy. As for the system-level measure of economic development, I use the information on the per capita national GDPs in 2010 US dollars from the World Bank national accounts data. I take the average of all countries' per capita GDPs in a given year to measure the annual macro-level of development as a whole in the world. I call this variable world development. While the Polity data cover well over 200 years, from 1800 to 2018, the World Bank data cover only the 1960-2018 period. There are several sources for the per capita GDP data that cover the pre-1960 years. However, these data sources are quite unreliable and only available for a small set of countries. This present study covers the joint section of the World Bank and Polity Project data, 1960-2018. The post-war period is the most commonly used sample period in the literature and the most hotly debated years about the causality between democracy and development (Przeworski and Limongi 1997; Gowa 1999; Acemoglu et al. 2008; Boix 2011; Treisman 2015; Colagrossi et al. 2020).

The vector auto regression (VAR) model that I set up for Granger causality tests has two equations, as follows:

$$World\ Democracy_t = \alpha_0 + \sum_{i=1}^{p+m} \alpha_i World\ Democracy_{t-i} + \sum_{i=1}^{p+m} \beta_i World\ Development_{t-i} + e_t \quad (1)$$

$$World\ Democracy_t = \beta_0 + \sum_{i=1}^{p+m} \gamma_i World\ Democracy_{t-i} + \sum_{i=1}^{p+m} \delta_i World\ Development_{t-i} + v_t \quad (2)$$

where e_t and v_t denotes stochastic errors at time $t = 0$, assumed to have no autocorrelation within each series and no cross correlation with each other. Usually, the time series processes of two variables are assumed to be stationary and integrated at $t = 0$, *I(0)*. I test these assumptions in the analysis section. *p* refers to the appropriate order of lags while *m* refers to the additional number of lags added to the VAR system for nonstationary data, as explained in more details in the next section. Once this VAR system of equations is set up, Granger causality is tested by assessing whether the past values of one variable (*t-1*…*t-p*) predict the present values of the other variables (*t*=0). Formally, one conducts an F test for the joint significance of the *p* lag coefficients of *X* on *Y* in one equation. If the null hypothesis that the *p* lag coefficients are jointly equal to 0 is rejected, one can conclude that X Granger causes Y. The same procedure in the reverse order is conducted for testing the Granger causality of Y on X.

ANALYSES AND RESULTS

In Table 1, I present the summary statistics for the yearly averages of country polity scores and country per capita GDP values, measuring world development and world democracy. For the 1960-2018 period, the average for world democracy is 0.7521966 out of the 21-point polity scale from -10 (fully autocratic) to 10 (fully democratic) and the average for world development is $7140.579 in the 2010 US constant dollars.

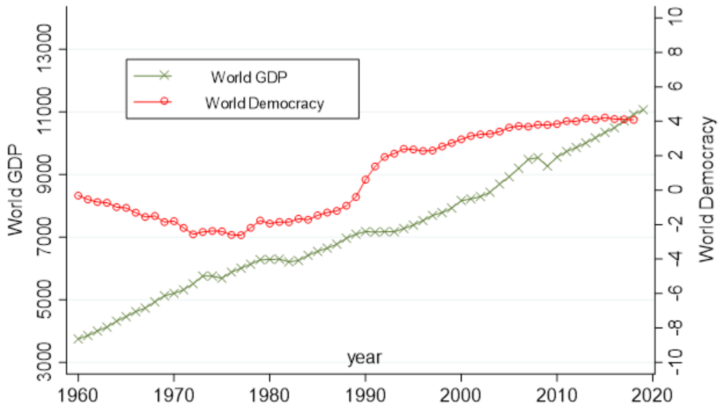
It is informative to see how world democracy and world development in their values have changed over the years. The annual trends of world democracy and world development are described in Figure 1. Following through the red line with hollow circles, we can trace the annual changes in the levels of world development. Chasing through the green line with Xs, we can observe the changes in the annual means for all countries' polity scores. There are clear and steady upward movements for both world democracy and world development. These two macro-level variables seem to trend together over time, suggesting not only that they may be nonstationary time-series processes but also that these series may be co-integrated. If these two conditions are the case, usual VAR models may lead to spurious regressions. Facing these possible difficulties, I follow the procedures suggested by Toda and Yamamoto (1995) to property conduct the VAR-based Granger causality testing.

The first step of a usual VAR analysis is to determine the length of lags, *p,* for both endogenous variables, world democracy and world development. I use the Akaike

Table 1. Summary Statistics for World Democracy and World Development, 1960-2018

Variables	Mean	Std. Dev.	Minimum	Maximum	N
World Democracy	.7521966	2.534036	-2.609929	4.218182	59
World Development	7140.579	1950.218	3746.056	10918.53	59

Figure 1. The Trends of World Democracy and World Development



information criterion (AIC) and values and Schwarz's Bayesian information criterion (SBIC). The results presented in Table 2 indicate that the optimal lag length are 2. Further, one needs to test if the VAR with the suggested length of lags is well specified without serial correlation in its residuals. Otherwise, the maximum lag length should be increased until no autocorrelation is present. I apply a VAR version of the Lagrange multiplier (LM) test and find that autocorrelation is not concerned with p=2.

Then, I perform the Augmented Dickey Fuller (ADF) tests to check whether our time-series data are stationary with the lag length of 2. Presented in Table 3, the ADF tests produce insignificant results for the null hypothesis of a unit root for both world democracy and world development. Therefore, both variables appear to be non-stationary in their levels with a unit root—random walk with a drift. In this case, according to Toda and Yamamoto

Table 2. Lag Length and Autocorrelation: Information Criteria and LM Test

	Statistics for the Lag Length		LM Test for Autocorrelation	
Lag Length	AIC	SBIC	chi2	p > chi2
0	20.9163	20.9893		
1	12.2104	12.4294	5.4089	0.24786
2	11.8224*	12.1874*	5.9128	0.20575
3	11.8315	12.3425	1.0642	0.89992
4	11.9186	12.5755	3.5498	0.47035
5			6.0390	0.19626
6			5.8833	0.20804
7			2.0721	0.72249
8			3.5343	0.47268
9			5.2695	0.26075
10			0.6517	0.95715

Table 3. The Augmented Dickey-Fuller Tests for Unit Root

	Level Series		Differenced Series	
	t-statistic	prob.	t-statistic	prob.
World Democracy	-2.385	0.3874	-2.931	0.0419
World Development	-0.804	0.9653	-5.584	0.0000

procedure, the next step with the two non-stationary time series is to examine the maximum order of integration, *m*, by differencing. The first order differencing ($t - t_{-1}$) makes both series stationary, as shown in the right half of Table 3. Therefore, the two variables, world democracy and world development, are found to be first-order integrated, *I*(1), and thus *m* = 1.

Once the maximum lag length *p* and the maximum order of integration *m* are determined, the next step of the Toda and Yamamoto procedure is to set up the VAR model with the time variables in their levels and p + m lags in each of the VAR equations. Then, the following step is to test for Granger causality using a standard Wald test against the coefficients of only the p lags excluding the coefficients of the m additional lags.

The results for the VAR estimation are reported in Table 4. Interpreting the individual autoregressive coefficients of the lagged terms is usually regarded as meaningless as each describes a fluctuation point of the whole dynamic system at a particular time point. An alternative is to sum the individual lagged coefficients of the exogenous factor in one equation of the VAR model to assess its overall impact on the endogenous factor. Summing up the individual autoregressive coefficients balances out their contrasting signs and magnitudes and gives an overall point estimate as utilized in distributed lagged models (Oneal et al. 2003; Park 2020). In the first VAR equation (Model 1), world democracy is regressed against the three lags of world development along with its own three lags. All of the coefficients for world development are statistically insignificant. Excluding the coefficient for the additional *m* (third order) lag, the coefficients for the *p* (first and second order) lags of world development are summed, ∑(L1/L2. Development) in the column of Model 1. The summed coefficient is positive but statistically insignificant. It appears that world development does not promote world democracy. In Model 2, the lagged impact of world democracy on world development is assessed. None of the lagged coefficients for world democracy has a statistically significant effect on world development. The summed coefficient for the first and second order lags of world democracy, ∑(L1/L2. Democracy), is actually negative, but statistically insignificant. The insignificant results for the VAR model suggest that a steady increasing movement of world democratization is not translated into making an increasingly wealthy world. Conversely, there is no evidence that an increasingly affluent world economy is effective in making the world more democratic over time.

Likewise, the test results for Granger causality reported in Table 5 do not lend support for the presence of causality between world democracy and world development in any direction. The Wald test statistic for the joint impact of the first and second order lags of world development on world democracy is not statistically significant at any conventional significance level. The same F test for the joint effect of the first and second order lags of world democracy on world development is not statistically significant either. Based on these results, we fail to reject the null hypothesis of Granger non-causality between world

Table 4. Vector Autoregression Estimation for World Democracy and World Development

Lagged Variables	Model 1 Y = Democracy	Model 2 Y = Development
Developmentt-1	0.0004 (0.0003)	1.1406*** (0.1384)
Developmentt-2	-0.0003 (0.0005)	-0.3849 (0.2033)
Developmentt-3	-0.00004 (0.0003)	0.2363 (0.1319)
∑(L1/L2. Development)	0.0001 (0.0003)	
Democracyt-1	1.3962*** (0.1398)	-84.1640 (61.4195)
Democracyt-2	-0.2074 (0.2456)	50.2687 (109.69)
Democracyt-3	-0.2376 (0.1441)	49.7701 (64.3485)
∑(L1/L2. Democracy)		-33.8953 (63.6505)
	N=56, R^2=0.9943	N=56, R^2=0.9978

*p<0.05, p**<0.01, p***<0.001

Table 5. Granger Causality Tests: World Democracy and World Development

Causality Direction	F (2, 49)	p < F	Decision
Development → Democracy	0.96	0.3899	No Granger causality
Democracy → Development	1.93	0.1561	No Granger causality

democracy and world development in both directions. Therefore, we conclude that world democracy does not Granger cause world development and that world development does not Granger cause world democracy.

Finally, I conduct a cointegration test using Johansen's (1991) tracing method. The null hypothesis of the trace statistic states that there are no more than r conintegrating relations among multiple time-series variables. The test result reported in Table 6 suggests that there is no evidence of a cointegration between world democracy and world development times series. This finding of no cointegration is expected as our VAR-based Granger causality tests find no evidence for the causality whether the causality running from world democracy to world economy or from world development to world democracy. If two (or more) nonstationary time-series variables are cointegrated, there must be Granger causality between them, at least in a one-way causal direction. However, the reverse is not true. Granger causality can exist between two time-series variables without cointegration. In case of a

Table 6. Cointegration Test (Johannsen's Trace Test)

Null Hyp.	Log-likelihood	Trace statistic	5% critical value
$r = 0$	-327.2896	15.4334	18.17
$r \leq 1$	-321.4933	3.8409	3.74
$r \leq 2$	-319.5729		

cointegrating relation between two nonstationary time-series processes, one may consider using a vector error correction model, which combines the data in levels and in differences, instead of a VAR in levels.

All in all, the Granger causal analysis conducted in this present study does not give any evidence for a causal relationship between world democracy and world development. With respect to hypothesis testing, the finding of no Granger causality is unsupportive of Hypothesis 1. Indeed, world development and world democracy appear to be separate processes, although they show a common increasing trend over time.

CONCLUDING REMARKS

The world has been steadily improving in terms of political freedom and economic wellbeing in the years after World War II. The proportion of democracies has increased over time, although interrupted by some setbacks and reverse waves, and now the majority of the world's countries are democracies, according to the Polity Project. The per capita world income has risen consecutively from 1960 to 2019, except for 5 separate intermittent years: 1976, 1982, 1991, 1993, and 2009, according the World Bank data in 2010 US constant dollars. Likewise, according to the poverty headcount ratio data of the World Bank, the percentage of the world population living below \$1.90 a day in terms of purchasing power parity in 2011 constant international dollars has dramatically decreased from 42.3% in 1981 to 10 % in 2015. Are these improvements in world politics and world economy related to each other? Does an improvement in one area lead to an improvement in the other area? Or are world democracy and world development separate independent processes, although they have been coincidentally progressing starting from a certain historical juncture?

This present study examines the causality between democracy and economic development at a macro-systemic level. I identify an overarching Granger-causality hypothesis, drawing from the three different lines of research in the literature. One strand of research suggests that economic development promotes political development. Development pluralizes and individualizes citizens' social consciousness, values and interests. Increased income changes the social conditions and enhances higher education. Indeed, the research regards economic development and wealth as a most important prerequisite in line with Lipset's (1959) modernization theory. Another strand of research concerns the possible positive impact that democracy has on economic development. Democracy leads to economic development by promoting economic freedom and protecting property rights. The institutional characteristics of democratic systems, such as the rule of law, checks and balances, political competitions, regular elections, political transparency, and the large size of winning coalitions, constrain leaders and governments from engaging in rent-seeking behavior and private goods-oriented policy. These all enable democracies to enjoy long-term economic growth. A third set of arguments hold that political development and economic development began to happen coincidently at a certain historical juncture in a certain place. At that juncture, countries embarked on divergent political-economic paths: some moved to freedom and prosperity while others remained poor and undemocratic. Although democracy and development tend to go hand in hand, they are not causally associated with each other.

In addition to these state-level mechanisms, I draw rationales for the causality between democracy and economic development at the macro-systemic level. I discuss how the expansion of world development leads to increased democratic governance for individual countries and the improvement of world democracy. I also delineate how the expansion of world democracy contributes to economic development for individual states and world economy.

I test the macro-systemic level causality between democracy and development, expecting that if one process leads to the other a more developed world in one aspect means a more developed world in the other respect. I employ the Toda-Yamamoto procedure to set a Vector Autoregression model for Granger causality tests because world development and world democracy are nonstationary time-series processes with a upward trend. The data for the 1960-2018 period do not lend support for a causal relationship between world democracy and world development. The Wald F-test statistics for the Granger causality tests are below the critical value of significance, and thus we fail to reject the null hypothesis of Granger non-causality between the two variables. We conclude that world democracy and world development do not Granger cause each other, as expected in Hypothesis 3.

An implication for future research can be drawn from this present research. Since there is no evidence for the causality between democracy and economic development, what really explains the apparent historical correlation between political development and economic development remains a puzzle. Have these two development processes just followed historically coincident paths as Luo and Przeworski (2019) argue? Or could it be that a third confounding factor has caused both democratization and capitalization as Acemoglu et al. (2008) argue? It would be fruitful to answer these questions by exploring possible candidate third factors.

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