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Institutions and the Impact of Investment on Growth

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Three major theories have emerged as explanatory factors underlying cross-country differences in income levels and growth rates. First, the neoclassical theory of economic growth, based on Solow (1956) and extended by Lucas (1988), Romer (1986, 1990), and others, focuses on the inputs of physical and human capital into the production process, and on technological advances, as the determinants of economic performance. Second, the geographic/locational theory (Sachs 2001, Gallup, Sachs and Mellinger 1998 and Diamond 1997) argues that a temperate climate and ease of access to markets are critically important for the achievement of high income levels and growth rates. In contrast, tropical climatic conditions both erode the energy level of workers and increase the risk of disabling and life-threatening diseases such as malaria. As a result, worker productivity and the general level of development are retarded in tropical areas. Third, the institutional approach stresses the importance of creating an institutional environment that is generally supportive of markets (e.g., protection of property rights, enforcement of contracts, and voluntary exchange at market-determined prices). The writings of Scully (1988, 1992), North (1990), Barro (1996), Landes (1998), Knack (1996, 2003), Hall and Jones (1999) and Acemoglu, Johnson and Robinson (2001) reflect the institutional perspective. These three explanations for growth are not logically inconsistent with each other, so all might play a role.

This paper focuses on the relationship between institutions and investment, and analyzes how institutional quality influences growth through its impact on both the level and productivity of investment. The premise that a solid institutional framework is necessary for investment is well-established. Investors will be reluctant to risk their capital when property rights are weak and poorly protected, and as a result, they fear that their returns may be appropriated by others. Moreover, institutions also lay the foundation for

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the operation of the capital market. Johnson, McMillan and Woodruff (2002) de Soto (2000) and others have emphasized the importance of financial institutions to investment.

Section I of this paper considers some of the difficulties involved in the measurement of institutional quality and its impact on growth. Section II analyzes the impact of institutions on investment and in turn on the growth rate of per capita GDP. It also shows that widely used estimation procedures tend to understate the importance of institutions as a source of growth because they generally neglect the impact of institutions on investment. Section III analyzes the impact of institutions on the productivity of investment. The final section illustrates that while improvements in institutions enhance growth, there is no tendency for rapid growth to enhance the quality of institutions. In fact, the evidence indicates that the relationship runs in the opposite direction – poor economic performance is more likely to result in constructive future reforms.

I. DIFFICULTIES ENCOUNTERED WHEN MEASURING THE IMPACT OF INSTITUTIONAL QUALITY

When looking at the three alternative growth theories discussed in the introduction, one factor that has hindered the institutional approach is the difficulty of measuring institutional quality. With the neoclassical approach to growth, output, Q, is a function of capital, K, and labor, L, so $Q = f(K, L)$. Both K and L are relatively easy to measure. Institutional quality, on the other hand, is not easily quantifiable and this makes it difficult to measure the degree to which institutions affect prosperity. Scully (1988, 1992) did early empirical work in the area using Gastil's (1978, 1987) measure of political rights and civil liberties, and showed the relationship between freedom and growth. But while the political freedoms measured by Gastil are correlated with economic freedoms, most analysis of the subject indicates that economic institutions rather than political institutions generate prosperity (Barro 1996, Gwartney, Lawson and Holcombe 1999).

Knack and Keefer (1995) use the Gastil political freedom index and measures compiled by two private firms on international investment risk as measures of the quality of economic institutions. The risk indicators come much closer than Gastil's index to measuring the types of institutional arrangements that economists believe should matter for economic performance, but they omit other institutional factors such as the structure of a nation's tax, regulatory, and trade policies that may also influence economic performance.

Many researchers have expressed concern that institutions are actually endogenous reflecting various historical or cultural influences. If so, then any

correlation between institutions and economic results could reflect these underlying influences and not the institutions themselves. Statistically, the use of instrumental variable techniques provide one method of dealing with the endogeneity problem. Acemoglu, Johnson and Robinson (2001) use mortality rates of colonial settlers as an instrument for institutional quality in colonized areas. They argue that where colonizers encountered relatively few health hazards, they erected solid institutions to protect property rights and establish rule of law, whereas in other areas they concentrated on extracting resources quickly, and left behind relatively poor institutions. Hall and Jones (1999) use the fraction of the population speaking English and Western European languages as an instrument for institutional quality, and like Acemoglu, Johnson, and Robinson find that better institutions as measured by their language proxy result in higher levels of per capita income.

While the instrumental variable approach has the advantage of minimizing the endogeneity problem, this approach provides policy makers with little guidance about how to change institutions in the present time period. The recent spirited exchange between Rodrik et al. (2002) and Sachs (2003) illustrates the controversies that can arise over precisely what is being represented by an instrumental variable approach. For the purposes of this paper, we assume institutions are an exogenous influence on the economy. We do however address the related problem of reverse causality in Section IV of this paper.

The measure of institutional quality employed here is the Economic Freedom of the World (EFW) index constructed by Gwartney and Lawson (2003)[1]. The EFW index is a comprehensive measure that incorporates 38 components which are designed to measure the degree to which a nation's institutions and policies support voluntary exchange, the protection of property rights, open markets, and minimal regulation of economic activity[2].

The structure of the EFW index is consistent with Olson's (2000) idea of market-augmenting government. In order to achieve a high EFW rating a country must do some things while refraining from doing others. The country's legal institutions must protect the property rights of owners and enforce contracts. Access must also be provided to money of sound value. But

1. The EFW index is an outgrowth of a series of conferences sponsored by the Fraser Institute of Vancouver, British Columbia during 1986–1994. The conferences were co-hosted by Milton and Rose Friedman and Michael Walker, Executive Director of the Fraser Institute. Douglass C. North, Gary Becker, and Peter Bauer were among the economists participating in the series. The EFW annual report is now published by a network of institutes in 59 different countries.
2. The raw data for each of the 38 components were transformed to a zero-to-ten scale and then used to derive ratings for five major areas: (1) size of government, (2) legal structure and security of property rights, (3) access to sound money, (4) exchange with foreigners and (5) regulation of economic activity. In turn, the area ratings were aggregated into an EFW summary index.

governments must also refrain from actions that interfere with voluntary exchange, limit entry into labor, capital, and product markets, and the substitution of taxes and political spending for market organization. Thus, lower EFW ratings result when government spending is large, state-owned enterprises and regulations are widespread, tariffs and quotas are high, and exchange rate, interest rate, and other forms of price controls are widely imposed.

Several attributes of the EFW index make it attractive as a measure of institutional quality. It is a comprehensive measure. It includes many factors that economists have historically argued would facilitate economic activity and enhance growth. Because it is an actual measure of institutional quality rather than a proxy, it directly provides some direction for policymakers. Perhaps most important, the data are available at five year intervals over a period of several decades. We will focus on the 1980–2000 period. This will make it possible to examine not only the impact of the level of institutional quality but also the effects of changes in that quality.

II. INSTITUTIONS, INVESTMENT, AND GROWTH

Many researchers have investigated the relationship between various indicators of institutional quality and economic growth[3]. However, the impact of institutions has generally been estimated within the framework of models that also included the investment rate as an independent variable (e.g., Easton and Walker 1997, Gwartney et al. 1999, Scully 2002). If institutional quality influences the rate of investment, particularly private investment, this methodology will systematically underestimate the growth-enhancing effects of superior institutions.

A few studies have examined the relationship between investment and institutional quality as measured by the EFW index. Dawson (1998) found that economic freedom impacts growth directly and indirectly through enhanced investment. Gwartney et al. (2004) found similar results. Cole (2003) reported that investment will exert a stronger positive impact on growth in countries with greater economic freedom. Dawson (2003) found that economic freedom Granger causes investment. In contrast to these studies, de Haan and Siermann (1998) and de Haan and Sturm (2000) argued that investment is not related to economic freedom.

In this section, we seek to contribute to this debate and will attempt to isolate the independent effects of economic freedom on growth, through its impact on both the level and productivity of investment.

3. See Berggren (2003) for an excellent review of articles that have used the EFW data in the analysis of cross-country differences in income levels, growth rates, and related topics.

1. Data Set

When analyzing the impact of institutional factors on investment, growth and other indicators of economic performance, it is important to consider a lengthy time period. There are several reasons why this is true. First, by looking at changes over a longer time period, short-term effects such as business cycles or shocks that disproportionately affect particular economies will be minimized. Second, changes in institutional quality are likely to have effects only with lags. It will take investors some time to adjust to any institutional changes that take place. Moreover, investors may fear that recent institutional improvements might be reversed, and as changes remain in place for a longer period of time, investors will be more likely to accept such changes as permanent. The two-decade time period utilized here allows an examination of the longer-run relationships between institutions and various indicators of economic performance.

There were 94 countries for which the data used in this study could be obtained. A list of these countries along with their average EFW rating (and ranking) during 1980–2000 is presented in the appendix[4]. The per capita GDP, growth and investment data are from the *World Bank Development Indicators* CD-ROM. A major difference between our work and that of others is that our measure of investment is split into its private and public components[5]. This matters because many government-dominated economies have high rates of public investment but low rates of private investment. The human capital data are from Baier, Dwyer and Tamura (2003). Both the years of schooling per worker and demographic factors likely to influence the experience of persons in the work force are incorporated into this measure. These data were unavailable for nine of the countries in our data set, and therefore, several of the equations presented below will have 85 rather than 94 observations.

Jeffery Sachs (2001) and his colleagues have often used a set of three variables to measure the importance of geographic/locational factors. These three

4. The EFW measure used here is the chain-linked summary index. This is important because changes in this index will be influenced only by changes in components during overlapping years. This procedure eliminates possible distortions arising from the unavailability of data for some components of the EFW index during various years.
5. The data for private investment as a share of GDP were not always available from the World Bank, *World Development Indicators*. When this was the case, information on the scope of state-owned enterprises as a share of the economy was used to estimate government investment and private investment as a share of total investment. In turn, the figure for private investment as a share of total investment was used along with total investment as a share of GDP to derive the private investment/GDP ratio when the private investment figure was not directly available from the World Bank. See Gwartney and Lawson (2003), pp. 24–25, for additional details and a list of sources used to determine the scope of state-owned enterprises as a share of the economy. The private investment/GDP data are available from the authors upon request.

variables are: (1) tropical location – percentage of a country's land area located in the tropics, (2) coastal population – the percentage of a nation's population living within 100 kilometers of an ocean coastline and (3) distance from major markets – the minimum air distance of a country from Rotterdam, New York, or Tokyo. These same three measures were employed in our analysis. Distance from major markets was never statistically significant in the work that follows, and therefore it does not appear in the empirical results presented below. This omission does not affect the quality of the results in any way.

2. *Findings: Institutions and Impact of Investment*

Table 1 presents results showing the effect of institutional quality, as measured by the EFW rating, on investment and GDP growth. The first regression examines the impact of institutions on private investment. The dependent variable is the average share of private investment as a percentage of GDP over the 1980–2000 time frame. The independent variables are the EFW rating in 1980, the change in the EFW rating during the 1980s, the EFW change during the 1990s, location in the tropics, and coastal population. All independent variables except tropical location are statistically significant at commonly accepted levels, and the model accounts for 52.5 percent of the cross country variation in the private investment/GDP ratio among the 94 countries.

The coefficients on the EFW variables show that institutions, as measured by EFW, have a large impact on private investment as a share of GDP. The EFW rating at the beginning of the 20-year period was included because better institutions at the beginning of the period may have a positive influence on subsequent investment. The coefficient indicates that a one-unit change in the initial EFW rating is associated with a 2.59 percentage point increase in private investment as a share of GDP. The average private investment/GDP ratio in this set of countries is 13.7, so an EFW rating one point higher would be associated with 18.9 percent more private investment[6]. From looking at the EFW ratings in the appendix, one can see that a one-unit difference in EFW would be the difference in institutional quality in a country like the United

6. The relationship between EFW and the average of total and private investment as a share of GDP during 1980–2000 is shown below for three intervals of EFW ratings over the two decades:

EFW 1980–2000	I/GDP 1980–2000	PI/GDP 1980–2000
> 7.0	23.1	18.0
5.0 to 7.0	22.1	14.1
< 5.0	19.7	9.6

Note that the private investment rate of countries with an average EFW rating of more than 7.0 is almost twice the figure for countries with an average EFW rating of less than 5.

Table 1

Economic Freedom, Investment and Growth, 1980–2000

(t-ratio in parentheses)	All Countries				LDCs			
	Dependent variable: Private investment/ GDP, 1980–2000	Dependent variable: Average annual growth rate of GDP per capita, 1980–2000			Dependent variable: Private investment/ GDP, 1980–2000	Dependent variable: Average annual growth rate of GDP per capita, 1980–2000		
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
GDP per capita, 1980 (in 1000s US$)		−0.10	−0.29	−0.29		−0.19	−0.37	−0.37
		(1.56)	(3.98)	(3.98)		(1.54)	(3.25)	(3.25)
EFW rating, 1980	2.59		1.00	1.52	2.89		0.94	1.55
	(6.41)		(3.50)	(6.02)	(4.85)		(2.84)	(5.32)
Change in EFW rating, 1980–1990	3.06		1.28	1.90	3.73		1.24	2.03
	(4.64)		(3.68)	(5.95)	(4.68)		(3.08)	(5.70)
Change in EFW rating, 1990–2000	1.15		0.58	0.82	1.46		0.61	0.91
	(2.19)		(2.27)	(3.25)	(2.42)		(2.08)	(3.24)
Tropical location	0.33		−1.50	−1.43	−0.02		−1.59	−1.60
	(0.42)		(3.92)	(3.74)	(0.02)		(3.67)	(3.68)
Coastal population	2.82		−0.11	0.46	2.81		0.29	0.89
	(2.78)		(0.23)	(1.03)	(2.07)		(0.47)	(1.48)
Private investment/GDP, 1980–2000		0.47*	0.20	0.20^		0.47**	0.21	0.21^^
		(6.67)	(4.30)	(4.30)		(6.58)	(3.87)	(3.87)
Public investment/GDP, 1980–2000		0.22	0.17	0.17		0.23	0.18	0.18
		(3.55)	(3.22)	(3.22)		(3.48)	(3.07)	(3.07)
Growth of human capital, 1980–1999		0.54	0.43	0.43		0.63	0.50	0.50
		(1.92)	(1.82)	(1.82)		(2.03)	(1.89)	(1.89)
Intercept	−3.96	−6.88	−7.48	−8.28	−5.62	−7.05	−7.48	−8.67
R^2 (adjusted)	52.5	38.2	58.5	58.5	49.9	43.5	60.9	60.9
Number of countries	94	85	85	85	74	66	66	66
Estimated Impact of Average EFW Rating		**1.22**				**1.36**		
Estimated Impact of change in EFW Rating (80–90)		**1.44**				**1.75**		
Estimated Impact of change in EFW Rating (90–00)		**0.54**				**0.69**		

*Fitted values from equation (1), **Fitted values from equation (5), ^Residual values from equation (1), ^^Residual values from equation (5).

Kingdom (7.43) compared to France (6.43), or in Greece (5.92) compared with Turkey (4.93). These examples show that a one-unit difference in EFW is not a huge difference. Nonetheless, such an improvement in institutions would have a sizeable impact on the amount of investment.

Similarly, the coefficient of 3.06 on the change in the EFW rating from 1980 to 1990 is substantial in magnitude, and implies that a one-unit increase in the EFW rating during the initial decade resulted in more than a three percentage point increase in private investment as a share of GDP during the two decades. This is consistent with the view that an improvement in institutional quality makes a country more attractive to investors. The coefficient on the EFW rating from 1990–2000 is smaller at 1.15 but still substantial in magnitude. Its smaller magnitude makes intuitive sense. The dependent variable measures private investment over a two-decade period from 1980 to 2000, and institutional changes late in the period will have a smaller effect, partly because changes in the 1990s cannot affect investment in the 1980s, and because of the possibility of lags in the relationship between institutional change and the rate of investment.

Of course, the higher levels of investment accompanying better institutions will enhance long-term economic growth. How can this impact be measured? One option would be to use a recursive model and insert the fitted values from equation (1) into a subsequent growth equation. Regression (2) illustrates this approach. The dependent variable in equation (2) is the average annual growth rate of real GDP per capita during 1980–2000, while the predicted values for private investment as a share of GDP from regression (1) are included as an independent variable along with initial (1980) per capita GDP, public investment as a share of GDP, and the annual growth rate of human capital (1980–1999). All of the independent variables have the expected sign and all are significant except for the 1980 per capita GDP, a control variable.

Regression (2), reflecting the simple neoclassical approach, looks at growth as a function of physical and human capital input growth. A one unit increase in "fitted" private investment as a share of GDP is associated with an increase of 0.47 percentage points in the annual GDP growth rate. But better institutions will lead to more investment. Regression (1) indicates that if a country had an initial EFW rating one unit higher, investment as a share of GDP would be 2.59 percentage points higher, and regression (2) indicates that each unit increase in the "fitted" investment/GDP ratio enhances the growth of per capita GDP by 0.47 of a percentage point. Thus, the estimated increase in long-term growth associated with a one-unit higher initial EFW rating is 1.22 percentage points (2.59 times 0.47). The average GDP growth rate of the 85 countries in regression (2) is 1.54 percent, so a one-unit difference in a country's EFW rating has a substantial impact on its GDP growth rate, simply because

better institutions, as measured by the EFW index, increase the quantity of private investment[7].

Similarly, a one-unit change in the EFW rating from 1980 to 1990 is associated with a 3.06 unit change in investment as a share of GDP. This implies a 1.44 (3.06 times 0.47) percentage point increase in the annual growth rate of real per capita GDP. Finally, this recursive method indicates that a one-unit change in the EFW rating from 1990 to 2000 would enhance the growth of per capita GDP by 0.54 (1.15 times 0.47) of a percentage point.

When one looks only at inputs into the production function, taking a neoclassical approach to economic growth, the influence of institutions on investment is completely ignored. As researchers began to realize that neglect of institutional factors was a serious omission, many responded by inserting various indicators of institutional quality into models along with measures of physical and human capital. Using the EFW index as the measure of institutional quality, regression (3) illustrates this approach. Rather than using the fitted values for investment as in equation (2), regression (3) incorporates the actual figures for private investment as a share of GDP along with the EFW, human capital, tropical, and locational variables and the initial per capita GDP control variable. With the exception of coastal population, all of the variables in equation (3) are significant and have the expected sign. The explanatory power of the model, 58.5 percent, is quite high. Holding institutional quality as measured by the EFW variables constant, the coefficient on private investment in regression (3) drops to 0.20, less than half its value in regression (2). The coefficient on the initial EFW rating is 1.00, showing that countries with a one-unit higher EFW rating over the 20-year period have an economic growth rate one percentage point higher. Similarly, a one-unit improvement in EFW during the 1980s is associated with a 1.28 percentage point increase in real per capita GDP growth, and the improvement in the 1990s is associated with a GDP growth rate 0.58 percentage points higher.

As substantial as these numbers are, the coefficients on the EFW variables in regression (3) understate the impact of EFW on GDP growth, because they are based on the assumption that private investment as a share of GDP is constant, but regression (1) shows that better institutions as measured by EFW lead to more investment. The coefficients on the EFW variables in regression (3) will not capture this indirect impact. They will register only the direct impact of EFW on GDP growth as the result of its effect on the efficiency of resource use.

While the recursive method of regression (2) provides one way to estimate the indirect impact of institutions through investment, regression (4) illustrates

7. In contrast with physical capital, the linkage between EFW (and change in EFW) and changes in human capital were unrelated. Thus, there is no evidence that institutions as measured by EFW exert an impact on growth through investment in human capital.

another alternative. Regression (4), substitutes the residuals from regression (1) for the Private Investment/GDP variable. The logic of doing this is that the residuals from regression (1) represent the variation across countries in private investment that is not correlated with EFW, so by using these residuals, the variation in private investment that is associated with cross-country differences in EFW will be captured in the EFW coefficients. Thus, the EFW coefficients in equation (4) will reflect both the direct effect of institutions via improvements in the efficiency of resource use and their indirect effect via the attraction of a higher level of investment. Comparing regression (4) with regression (3), the impact of the initial EFW rating rises from 1.00 to 1.52, approximately a 50 percent increase. The impact of the change in EFW from 1980 to 1990 increases from 1.28 to 1.90, and the impact of the change in EFW during 1990 to 2000 rises from 0.58 to 0.82. Respectively, these estimates are 48 percent and 41 percent higher than those of equation (3). They indicate that the indirect impact of institutions via private investment is sizeable and therefore structural models that fail to capture this indirect affect will substantially understate the growth-enhancing attributes of institutions.

Regressions (5) through (8) in *Table 1* reproduce the first four regressions using data from less-developed economies only[8]. The 20 countries designated in the World Bank's 1980 *World Development Report* as "high-income industrial nations" were excluded from the LDC data set. The results are similar to those of the first four equations. Clearly, the results presented here were not driven by differences between developed and less developed economies. Indeed, comparison of the estimates derived by the recursive method (equations 2 and 5) and those derived by the residual method (equations 4 and 8) indicate that the impact of institutions (and changes in institutional quality) on growth was slightly higher in LDCs than for the entire set of countries. The explanatory power of the growth equations was also a little higher for the LDCs than for the "all country" data set. These results show that improvements in institutional quality can provide at least as much benefit in terms of GDP growth for LDCs as for developed countries[9].

When the impact of institutions on growth is estimated by the recursive method (regressions 2 and 6) or by using the residuals from the investment

8. Seventy-four countries are used in regression (5) but limitations on the availability of human capital data reduced the data set to 66 countries for the other regressions.
9. Of course, the EFW index is composed of components with values ranging from zero to ten, so its scale is in that sense arbitrary. That is, it is an ordinal index, not a cardinal one. It would be hard to say that an increase from 4 to 5 reflects the same improvement in institutions as an increase from 6 to 7. However, countries at the bottom of the EFW scale have more room to improve simply by imitating the institutional structures of higher-ranked countries, and in that sense it may be easier for countries at the low end of the EFW scale to improve their institutional quality.

equations (regressions 4 and 8), the indirect impact of institutional quality acting through the attraction of additional investment will be registered. But this will not be the case when both investment and measures of institutional quality are included in the same equation as was done in regressions (3) and (7). Thus, when empirical studies attempt to isolate the impact of institutions on economic growth by including both investment and institutional measures in the same regression, they will systematically understate the impact of institutions because this methodology will fail to register the indirect impact of institutions via higher rates of investment.

Turning to the other variables in the model, the growth of human capital was significant at the 90 percent level and above in all equations, indicating that improvements in the education and experience of workers exerts an independent impact on growth. Public investment as a share of GDP was significant in all equations, but the size of the coefficient was consistently smaller than for private investment. The coastal location variable exerted a positive impact on private investment as a share of GDP, but it was insignificant in all of the growth equations. While tropical location failed to exert a significant effect on investment, it persistently exerted a substantial negative impact (99 percent level of confidence) on growth. Other things constant, the estimated reduction in the long-term annual growth of per capita GDP accompanying a tropical location was between 1.4 and 1.6 percentage points. These findings are consistent with those of Sachs and others who argue that a tropical location adversely affects economic performance. The initial per capita GDP, inserted primarily as a control variable, was persistently negative and generally significant. This implies that, holding institutional quality and the growth of inputs constant, low income countries tend to grow more rapidly than those with higher initial income levels.

III. INSTITUTIONS AND THE PRODUCTIVITY OF INVESTMENT

The empirical results in *Table 1* show that institutional quality has a positive effect on the quantity of private investment, and that increases in private investment tend to enhance long-term growth. The impact of institutions is larger than just the effect institutions have on the quantity of investment, however. EFW exerts a positive impact on GDP growth even when the level of investment is held constant as shown in regressions (3) and (7). *Table 2* examines this finding in more detail by looking at how institutional quality affects the *productivity* of investment.

The dependent variable in *Table 2* is the average annual growth rate of per capita GDP during 1980–2000. As in *Table 1*, the initial (1980) income level, tropical location, coastal location, public investment as a share of GDP, and

Table 2

Economic Freedom and the Productivity of Investment

(t-ratio in parentheses)	Dependent variable: Average annual growth rate of GDP per capita, 1980–2000			
	All Countries		LDCs	
Independent variables	(1)	(2)	(3)	(4)
GDP per capita, 1980 (in 1000s US$)	−0.20	−0.18	−0.32	−0.31
	(3.16)	(2.84)	(2.85)	(2.74)
Tropical location	−1.61	−1.55	−1.70	−1.62
	(4.15)	(3.95)	(3.83)	(3.66)
Coastal population	0.13	0.03	0.43	0.48
	(0.27)	(0.06)	(0.65)	(0.74)
Private investment/GDP, 1980–2000 (EFW>7)	0.33		0.35	
	(7.36)		(6.41)	
Private investment/GDP, 1980–2000 (5<EFW<7)	0.27		0.27	
	(6.13)		(5.57)	
Private investment/GDP, 1980–2000 (EFW<5)	0.19		0.21	
	(3.21)		(3.13)	
Private investment/GDP, 1980–2000 (Top Half of EFW)		0.30		0.31
		(7.12)		(6.52)
Private investment/GDP, 1980–2000 (Bottom Half of EFW)		0.24		0.26
		(4.70)		(4.51)
Public investment/GDP	0.17	0.13	0.17	0.15
	(3.09)	(2.43)	(2.85)	(2.54)
Growth of human capital, 1980–1999	0.43	0.33	0.51	0.42
	(1.72)	(1.33)	(1.81)	(1.51)
Intercept	−2.47	−2.25	−2.60	−2.64
R^2 (adjusted)	54.9	52.8	58.5	56.8
Number of countries	85	85	66	66

the growth of human capital are included as independent variables. They all perform in much the same manner as in *Table 1*. Holding these factors constant, private investment is interacted with EFW to examine the effect of EFW on the productivity of investment. In regression (1), the countries are divided into three groups: those with EFW rating above 7, those with EFW ratings between 5 and 7, and those with EFW ratings below 5. The three private investment variables multiply private investment as a share of GDP by 1 for countries within that group and zero otherwise, so that the impact of investment on GDP growth can be examined separately for countries with different levels of institutional quality.

For each set of countries, the coefficient on private investment is significant and positive, showing that more investment is associated with higher rates of GDP growth. However, note that the coefficient on the top group of countries (EFW>7) is larger than the coefficient on the middle group of countries (5<EFW>7), which in turn is larger than the coefficient on the bottom group

of countries (EFW < 5). A joint f-test shows that the coefficients differ from each other[10]. The coefficient on the countries with EFW > 7 indicates that a one percent increase in private investment as a share of GDP is associated with a 0.33 percentage point increase in the annual growth rate of per capita GDP, whereas the coefficient of 0.19 on the countries with EFW < 5 indicates that a one percent increase in private investment for this group is associated with only a 0.19 percentage point increase in the annual growth rate. Not only do countries with better institutions as indicated by their EFW ratings tend to invest more, the investment is more productive – a given amount of investment enhances the growth of per capita GDP by a larger amount in countries with better institutions. The coefficients in regression (1) indicate that the productivity of investment is more than 50 percent greater in the top group of countries compared to the bottom group.

Regression (2) undertakes this same experiment, this time dividing countries into two groups: the half with the highest EFW ratings and the half with the lowest. Again, the results show that a given amount of investment is more productive in countries with better institutions. Regressions (3) and (4) repeat the exercise for the LDCs only and show results that are very similar, so these results are not driven by the presence of high income countries in the data set.

Interestingly, the coefficients also indicate that private investment, even in countries with poor institutions is more productive than public investment. For example, regression (1) indicates that a one percentage point increase in public investment as a share of GDP enhances growth by 0.17 of a percentage point. This is about half the impact of private investment in countries with EFW ratings of more than 7.0 and even less than the 0.19 estimate for countries with EFW ratings of less than 5.0. In regression (2), the public investment coefficient was 0.13, compared to 0.30 for private investment in countries in the top half of the EFW ratings and 0.24 for those in the bottom half. The same pattern emerges when only LDCs were included in the analysis. The public investment coefficients are always less than those for private investment, suggesting that the productivity of the former lags behind that of the latter.

The results presented in *Tables 1* and *2* show that better institutions exert a positive impact on both the rate and productivity of investment. Increases in economic freedom, as measured by the EFW index, are associated with both more private investment as a share of GDP and larger increases in long-term growth per unit of that investment. Both of these factors contribute to the higher growth rates of economies that rank higher in the EFW index.

10. The significance levels were over 99 percent in the three-way split for both data sets, over 98 percent for the two-way split for all countries, and just over 90 percent for the two-way split for LDCs.

IV. DIRECTION OF CAUSATION

One advantage of using an actual measure of institutional quality rather than a proxy is that the types of questions examined in *Tables 1* and *2* can be addressed directly. However, a potential question arises about the direction of causation. It may be that higher growth leads to better institutions, or that causation runs both ways. The regressions in *Table 3* investigate this issue[11].

If there is a causal relationship between economic freedom and the long-run growth of an economy, increases in economic freedom should be followed by lengthy periods of more rapid growth. The first two equations of *Table 3* shed light on this issue. In these two equations, the dependent variable is the average annual growth rate of per capita GDP during the 1990s. Changes in EFW during both the 1980s and the 1990s are included as independent variables, along with the initial (1980) EFW rating. In addition to the EFW variables, regression (1) also includes the initial per capita GDP and the two geographic/locational variables. Regression (2) adds the private investment, public investment, and growth of human capital variables to the model.

Both the change in the EFW rating during the 1980s and the change during the 1990s are strongly positive and significant in both regressions (1) and (2). The positive relationship between the change in EFW during the 1980s and growth of per capita real GDP during the 1990s illustrates that increases in economic freedom enhance the future rate of long-term growth. Economic freedom and growth are not just positively linked: Increases in the former tend to precede the latter. This is consistent with the view that there is a causal relationship between improvements in economic freedom and more rapid rates of long-term growth.

Note also that the coefficient on the change in the 1980s is higher than the coefficient on the change in the 1990s. When one considers the relationship between these EFW variables and the dependent variable, it makes sense that the change in EFW in the 1980s would have a larger effect on GDP growth in the 1990s than would the change in EFW in the 1990s. Institutional changes may only affect economic activity with a lag, so changes in the prior decade would have a bigger effect on future growth than changes occurring during that decade. Furthermore, if a change in EFW occurred during the latter part of the

11. Dawson (2003) used Granger causality analysis to investigate the relationship between the EFW data and economic growth, including the possible impact through investment. The analysis presented here differs from that of Dawson in several important respects. First, the chain-link EFW data were unavailable when his research was undertaken. Second, his investment variable was total rather than private investment as a share of GDP. Finally, Dawson's analysis includes data from the 1970s. While this would appear to be and advantage, it should also be noted that the EFW data for that decade are based on less complete information and they are available for fewer countries.

Table 3

Which Comes First? Economic Freedom or Growth?

(t-ratio in parentheses)	Dependent variable: Average annual growth rate of GDP per capita, 1990–2000		Dependent variable: Change in EFW rating, 1990–2000	
Independent variables	(1)	(2)	(3)	(4)
GDP per capita, 1980 (in 1000s US$)	−0.31	−0.20	0.01	0.05
	(5.10)	(2.39)	(0.38)	(1.33)
EFW rating, 1980	1.35	0.77	−0.39	−0.49
	(5.02)	(2.43)	(4.22)	(4.21)
Tropical location	−1.72	−1.28	0.01	0.19
	(3.66)	(2.96)	(0.05)	(0.78)
Coastal population	1.06	0.55	0.11	0.13
	(1.87)	(1.02)	(0.45)	(0.48)
Change in EFW rating, 1980–1990	1.69	1.15		
	(4.33)	(2.88)		
Change in EFW rating, 1990–2000	1.20	0.87		
	(4.33)	(2.88)		
Average annual growth rate of GDP per capita, 1980–1990			−0.11	−0.10
			(2.81)	(1.79)
Average annual growth rate of GDP per capita, 1990–2000			0.12	0.09
			(2.67)	(1.62)
Private investment/GDP, 1990–2000		0.19		0.00
		(3.93)		(0.10)
Public investment/GDP, 1990–2000		0.19		−0.01
		(2.82)		(0.30)
Growth of human capital, 1990–1999		0.60		−0.07
		(2.53)		(0.52)
Intercept	−5.60	−7.05	2.75	3.23
R^2 (adjusted)	39.2	50.8	28.8	29.9
Number of countries	94	85	94	85

1990s, there would be only a short time-frame for it to exert an impact on the average growth rate for the entire decade.

The specifications for regressions (3) and (4) are parallel to those of (1) and (2) except that the change in EFW during the 1990s is the dependent variable and the growth rates during the 1980s and 1990s are inserted as independent variables instead of the changes in EFW. As was the case for equations (1) and (2), a positive association between annual growth of per capita GDP and change in EFW during the same decade is found.

If some of the observed association between institutional quality and growth is the result of reverse causality, there should be a positive relationship between the growth of GDP during the 1980s and improvements in EFW during the 1990s, but this is not the case. To the contrary, the coefficient on GDP growth in the 1980s is negative and significant in both regressions. This implies that

countries with lower GDP growth rates during the 1980s had larger institutional improvements in the 1990s.

These results are noteworthy for two reasons. First, they directly address the causality issue and show that while improvements in institutional quality lead to more growth in the future (regressions (1) and (2)), higher GDP growth rates do not enhance the future quality of institutions. Put another way, the evidence indicates that improvements in institutions enhance growth, but there is no evidence that stronger growth enhances institutional quality. Second, it indicates that poor economic performance often creates a fruitful environment for constructive institutional change. A crisis situation is more likely to result in institutional improvements than solid economic performance. This finding is highly consistent with Pitlik and Wirth (2003).

V. CONCLUSION

This article makes three important contributions to the growth literature. First, it illuminates the impact of institutions on investment. Countries with higher quality institutions, as measured by the EFW index, both achieve more growth per unit of investment and attract a higher level of private investment as a share of GDP. Holding initial income, the geographic/locational, and human capital variables constant, the estimated impact of a percentage point increase in private investment as a share of GDP on long-term growth was 74 percent greater in countries with EFW ratings of more than 7 than in those with ratings of less than 5. Similarly, private investment was, on average, 25 percent more productive in countries with EFW ratings above the median compared to those with ratings below the median. Holding other things constant, both a higher initial EFW rating and improvements in EFW ratings through time also exerted a positive impact on private investment as a share of GDP. Further, the estimated impact of private investment on growth exceeds that of government investment. This implies that research that lumps private and government investment into a single variable will understate the sensitivity of private investment to differences in institutional quality.

Second, models that incorporate both investment and various measures of institutional quality as independent variables will neglect the indirect impact of institutions via the investment rate and therefore they will systematically understate the growth-enhancing affects of institutions. Our estimates indicate that when both the direct and indirect affects are considered, a one unit change in EFW increases long-term growth by approximately 1.5 percentage points, compared to 1.0 when the indirect affect is neglected. Thus, the indirect impact of institutional quality via private investment is sizeable.

Third, our analysis indicates that while changes in institutional quality exert a positive impact on growth both during the current period and in the future, there is no tendency for growth to exert a positive impact on the future quality of institutions. In fact, the linkage runs in the opposite direction – poor economic performance is associated with larger future improvements in institutional quality. Thus, the positive relationship between economic freedom and long-term economic growth is clearly not the result of growth having a positive impact on freedom.

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APPENDIX: AVERAGE EFW RATING, 1980–2000

Rank	Country	Rating	Rank	Country	Rating	Rank	Country	Rating
1	Hong Kong	8.61	33	Italy	6.13	65	Dominican Rep.	5.15
2	Singapore	8.22	34	Bahamas	6.11	66	Bolivia	5.15
3	United States	7.98	35	Indonesia	6.08	67	Ecuador	5.14
4	Switzerland	7.98	36	South Korea	6.07	68	Colombia	5.11
5	Canada	7.53	37	Costa Rica	6.04	69	Pakistan	5.11
6	Netherlands	7.43	38	Greece	5.92	70	Argentina	5.09
7	United Kingdom	7.43	39	Jordan	5.90	71	Senegal	5.05
8	Germany	7.38	40	Philippines	5.90	72	Turkey	4.93
9	Luxembourg	7.34	41	Guatemala	5.85	73	Togo	4.91
10	Australia	7.28	42	Botswana	5.81	74	China	4.88
11	New Zealand	7.27	43	Uruguay	5.81	75	Israel	4.86
12	Belgium	7.15	44	Cyprus	5.74	76	Congo, Rep. Of	4.73
13	Ireland	7.15	45	South Africa	5.72	77	Peru	4.68
14	Taiwan	7.02	46	Honduras	5.69	78	Zimbabwe	4.60
15	Finland	7.01	47	Venezuela	5.69	79	Gabon	4.56
16	Malaysia	6.94	48	Malta	5.66	80	Madagascar	4.54
17	Bahrain	6.88	49	Trinidad & Tob.	5.57	81	Burundi	4.48
18	Denmark	6.87	50	Mexico	5.53	82	Malawi	4.47
19	Japan	6.85	51	Cameroon	5.49	83	Iran	4.46
20	Unit. Arab Em.	6.85	52	Barbados	5.48	84	Sierra Leone	4.43
21	Austria	6.77	53	Kenya	5.44	85	Zambia	4.37
22	Norway	6.71	54	Cote d'Ivoire	5.42	86	Tanzania	4.36
23	Sweden	6.62	55	Tunisia	5.41	87	Brazil	4.33
24	Chile	6.51	56	Hungary	5.39	88	Bangladesh	4.31
25	Thailand	6.47	57	Sri Lanka	5.38	89	Ghana	4.10
26	Spain	6.45	58	Egypt	5.38	90	Syria	3.99
27	France	6.43	59	El Salvador	5.36	91	Nigeria	3.89
28	Iceland	6.33	60	Jamaica	5.35	92	Nicaragua	3.88
29	Portugal	6.31	61	Niger	5.30	93	Uganda	3.86
30	Kuwait	6.28	62	India	5.27	94	Congo, Dem. R.	3.51
31	Panama	6.26	63	Mali	5.26			
32	Mauritius	6.19	64	Morocco	5.21			

SUMMARY

The literature on institutions and economic growth shows a close relationship between the quality of institutions and prosperity. This paper examines the impact of institutions on investment, and the resulting impact of investment on growth. The private investment rate of countries with better institutional quality is higher, and the productivity of any given level of investment is greater in countries with better institutions. Models that include various indicators of institutional quality along with inputs such as physical and human capital will generally underestimate the impact of institutional quality on growth because they do not account for the indirect impact of institutions on investment, as is done here. The paper also examines the direction of causality to show that higher institutional quality causes more investment, rather than the other way around. Further, future institutional improvements are more likely to occur against a background of poor economic performance than one of sustained growth.