Property Rights and the Wealth of Nations: A Cross-Country Study

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Many studies suggest that the key determinants of economic development are the accumulation of physical and human capital and technological improvements. Traditional neoclassical growth theory (e.g., Solow 1956) emphasizes physical capital accumulation whereas endogenous growth theory (e.g., Romer 1986) presumes that investment in human capital and technological progress are the main sources of economic growth. In augmented neoclassical models, Mankiw, Romer, and Weil (1992) have shown that physical and human capital are important determinants of growth.

Nevertheless, it still remains an open question whether these factors are the real sources of economic development. There is reason to believe that if physical or human capital enlargements or technological improvements are taking place, the real growth factors must already have been unbound.[1] Accordingly, physical and human capital and technology should be seen as *proximate* causes of growth.[2] The still open questions are: What speeds up capital accumulation and what conditions are necessary for technological improvements? What are the *ultimate* causes of economic growth?

The present study hypothesizes that the missing ingredient in the theory of economic growth is incentives, which strongly depend on

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[1]North and Thomas (1973: 2) argue that these "almost universally cited" determinants of growth (innovation, education, and capital accumulation) "are not the causes of growth; they *are* growth."

[2]This distinction between *proximate* and *ultimate* causes was emphasised by Maddison (1988).

private property rights. Indeed, property rights are at the heart of any economic activity—nobody will become economically active if he can be cheated out of the fruits of his efforts. In addition, meaningful prices and efficient use of resources require secure property rights.

Traditional growth theory makes no mention of incentives and private property rights; they are simply taken as given. In reality this is not the case. Obviously, many countries of the Third World lack secure and well-established private property rights and there are many graduations between secure and insecure property rights, so that in fact there are diverging incentives to work, invest, and innovate. Even developed countries show distinct variations with respect to property rights.

The aim of this study is to analyze the impact of private property rights in the framework of an investigation into the causes of economic growth in an international context. The analysis is based on a modified neoclassical growth model. It is assumed that private property rights have a strong impact on economic efficiency. In addition, it is hypothesized that there may be positive feedbacks from increased efficiency to further improvements of the property rights system. The reason is that gains in economic efficiency may improve the prospects for institutional reforms. It therefore seems reasonable to investigate whether the assumed influence of private property rights on prosperity is only in one direction (i.e., purely exogenous) or whether there is also a positive feedback from improved economic development to the establishment of more efficient private property rights (i.e., simultaneous determination). In addition, the impact of property rights on the traditional determinants of economic growth will be considered to see whether private property should be treated as an ultimate source of economic growth.

Thoughts on Private Property

At first glance, it appears that classical economists, especially the English, neglected the importance of private property rights as a prerequisite for economic development. Although classical writers were not indifferent to private property, they appear to have taken it for granted. The reason may be that the legal situation in England in the 18th and 19th centuries—when even the tenant enjoyed legal security—was completely different from that on the European continent.

Adam Smith said relatively little about the importance of private property for economic development in *The Wealth of Nations*

because he took it for granted.[3] Only at the end of his comprehensive work (Book V, Chapter III) did he state, "Commerce and manufactures can seldom flourish long in any state which does not enjoy a regular administration of justice, in which the people do not feel themselves secure in the possession of their property, in which the faith of contracts is not supported by law" (Smith [1776] 1976: 445). In his *Lectures on Jurisprudence,* given in Glasgow in 1762–63, Smith was much more explicit about the importance of property rights. He began his lectures with the following statement: "The first and chief design of every system of government is to give each one the secure and peaceable possession of his own property" (Smith 1978: 5).

Malthus ([1820] 1986: 249) regarded the security of private property as "among the most important causes which influence the wealth of nations." Yet, he concentrated on "the more proximate and immediate causes" of wealth: labor, capital, and land. Ricardo (1819: 175), in his study of the impact of taxes on property, stated: "For the general prosperity, there cannot be too much facility given to the conveyance and exchange of all kinds or property, as it is by such means that capital of every species is likely to find its way into the hands of those, who will best employ it increasing the productions of the country." Elsewhere, however, Ricardo rarely mentioned private property. Likewise, Mill ([1848] 1988), in his classic *Principles of Political Economy*, devoted only two chapters (in Book II, which was on distribution not production) to private property.

In France, Say devoted a whole chapter of his *Treatise on Political Economy* to "the right of property." According to Say ([1803] 1834: 132), the need for secure property rights is "so completely self-evident that demonstration is quite superfluous." Only if property is secure "can the sources of production, namely land, capital and industry, attain their utmost degree of fecundity" (p. 131). He also noted that if the "sovereign power" or government itself "practices robbery," property becomes a pure "mockery." Indeed, Say thought that, without the protection of property, "it is impossible to conceive any considerable development of the productive power of man, of land, and of capital; or even to conceive the existence of capital at all" (p. 135).

In the mid-1800s private property was viewed with growing suspicion. Engels and Marx ([1848] 1963: 59) wrote: "The Communists can summarize their theory in the single sentence: Abolition of private

[3]For an overview of the thought of the classical writers on private property see Bethell (1998, especially chaps. 7–8).

property." For Marx, property was more an effect of the stage through which history was passing than a cause of economic development (Bethell 1998: 114). Engels and Marx ([1848] 1963: 66–67) were not very explicit about the form property would take in the classless future, but they took it for granted that the immediate successor of bourgeois private property would be state ownership, centrally controlled.

After World War I, the Soviet Union embarked on central planning and attempted to promote economic development without well-defined private property rights. That experiment turned out to be very costly in terms of life, personal liberty, and economic prosperity. Nevertheless, many development experts believed in planning and neglected the role of property rights (Bauer 1972). The Great Depression contributed to the notion that plans could outperform markets and that "capitalism was defective" (Friedman and Friedman 1980: 94). Roosevelt's New Deal lent further support to this general assessment, as did World War II. As the Friedmans note, "At the end of the war it looked as if central economic planning was the wave of the future" (p. 95). In Europe the Marshall Plan further encouraged the belief in government spending, and in the Third World central planning was increasingly used as a tool to promote development. Keynesian policies to manage the economy were adopted widely and are still in use today.

In Keynesian theory, private property and the incentives it engenders are completely missing. It seems to be "a theory about economic activity that depends for its fulfillment upon … economic activity itself" (Bethell 1998: 30). In the 1960s, however, some economists began to examine property rights in more detail, and economic theory began to rediscover its real foundations. This revival was closely linked with the work of Alchian (1965), Coase (1960), and Demsetz (1967). Within a few decades a wide body of research from different scholars has emerged demonstrating the importance of property rights.

Property rights affect transaction costs, incentives, and economic performance, and economic conditions, in turn, can influence the structure of property rights (Pejovich 2001). Private property rights offer individuals unique incentives to consider short- and long-term costs and benefits. Secure private property rights allow owners to pursue their personal goals and, if successful, to enjoy the fruits of their labor. Thus, private property rights provide a much stronger incentive to create wealth and to preserve the value of assets than does state ownership.

When property rights are safeguarded, individuals will be able to

plan their lives within known legal rules that minimize the use of force. "The aim of the rules of law," wrote Hayek (1973: 108), "is merely to prevent, as much as possible, by drawing boundaries, the actions of different individuals from interfering with each other." Only boundary drawing—that is, the enforcement of private property rights—has made it possible to assign meaningful values (prices) to different inputs and thus allow efficient trades to take place.

In addition, if *transferable* (i.e., exchangeable) property rights exist, there is the possibility that one party can resolve a conflict by buying out the property rights of another (Coase Theorem). Where the interests of parties are in conflict, one option is for one party to buy the opposing interests. For example, in the case of land, the purchaser may either retain the adjacent property or resell it with a caveat on its use.

The main hypothesis that can be drawn from this section is that *secure* and *transferable* property rights are the key to economic efficiency and wealth. Legal definitions of rights and responsibilities based on firmly understood private property rights are the major instrument for economic progress while at the same time ensure the sustainability of production.

Empirical Evidence

Several economic historians have presented evidence that the rise of the Western world was based on gradual but fundamental changes in property rights (e.g., North and Thomas 1973, North 1981, and Rosenberg and Birdzell 1986). North and Thomas demonstrated that strong population pressure and accompanying changes in relative prices—above all in wage-rental ratios—since the 16th century induced strong incentives for restructuring institutions and property rights, and that the two most innovative countries, Holland and England, achieved much higher standards of living than European countries that were slow to embrace reforms that gave greater security to private property. In this context, Rosenberg and Birdzell (1986: 120) emphasized the substitution of taxation for confiscation as a major step toward allowing individuals to discover new ways of creating and accumulating wealth.

Econometric evidence on the relationship between private property rights and economic development is relatively small, especially if compared with the copious body of empirical literature on the more traditional determinants of economic growth. Very few studies provide a formal empirical analysis of the direct relationship between property rights and economic development. Researchers have

resorted to relatively easy available proxies to capture the quality of private property rights. Barro (1991) used measures of political stability such as coups, revolutions, and political assassinations; Kormendi and McGuire (1985), Grier and Tullock (1989), and Scully (1988) used measures of political freedom and civil liberties taken from Gastil (1983, 1986) and other sources.

Subsequent empirical research provided more direct tests on the quality of property rights. Torstensen (1994) employed two proxies of private property rights from Scully and Slottje (1991). The first was intended to record the degree to which property is state owned. The other attempted to capture whether individuals are safe from arbitrary seizure of their property. His empirical results indicate that the degree of state ownership does not seem to affect growth rates whereas arbitrary seizure significantly affects growth in a negative way.

Knack and Kiefer (1995) introduced new data sets to measure the quality of property rights—namely, indicators compiled by private international investment risk services such as International Country Risk Guide (ICRG) and Business Environment Risk Intelligence (BERI). This approach appears to have been a marked improvement in the data base. The empirical tests—with and without included rates of factor accumulation—revealed a significant positive relationship between the quality of property rights and economic growth. In addition, property rights also appear to have a positive impact on physical capital accumulation. As a result, there is empirical evidence that institutions that protect private property rights are conducive to economic growth and investment.

Nevertheless, important questions have been left unanswered. The first one refers to causality. There is still the possibility that higher growth rates or higher levels of economic development lead to improved property rights. Without additional econometrics it is difficult if not impossible to assess whether the estimated relationship is really causal.[4] Another problem is that of simultaneity. Previous studies on property rights only investigated one likely path of causality, namely from property rights to economic growth. As has been argued above, there is reason to suggest that improvements in private property rights promote economic growth and that this makes the introduction

[4]Hall and Jones (1999) revealed that — after controlling for endogeneity — differences in social infrastructure still account for much of the variation in long-run economic performance around the world. Acemoglu, Johnson, and Robinson (2001) tried to solve the problem of causality by introducing additional sources of exogenous variation in institutions (i.e., potential settler mortality rates and European settlements).

of additional improvements in the quality of property rights more likely, which again will promote economic performance. Thus, according to these additional feedback effects, the positive overall impact of property rights on economic development may be higher than previously estimated. A third problem is related to factor accumulation. Previous studies only investigated the impact of property rights on physical capital formation. But there are good reasons to assume that property rights also have a significant impact on human capital formation and on population growth. Improved property rights make investments in human capital more profitable. And they reduce the need to rely on family and kinship ties and on a large number of family members as is the case when private property rights are insecure or absent. The purpose of this study is to extend the existing empirical analyses—and avoid the deficiencies mentioned above—through the use of instrumental variables analysis and two-stage least squares estimates.

The Model

This study focuses on levels of economic development rather than rates of economic growth. The reason is that international differences in growth rates may, in part, be transitory whereas levels of gross domestic product (GDP) better capture the wealth of nations.[5] The empirical tests refer to the 1975–95 period and will include all countries of the world for which reliable data, especially on property rights, are available.

The theoretical basis is given by the neoclassical approach to economic growth. The starting point is the Solow neoclassical growth model as specified by Mankiw et al. (1992)—namely, a human capital augmented approach. This model is characterized by a neoclassical production function with decreasing returns to all forms of capital. From this general assumption it follows that countries reach different *steady state* levels of per capita income. According to the model these levels depend on the accumulation of physical and human capital and the growth rate of the labor force. This also means that the rate of growth of per capita income during the transition period is also dependent on these determinants (but not in the final steady state).

The specification of the neoclassical growth model follows Mankiw et al. (1992: 416–18). The production function is given by

$$(1) \quad Y(t) = K(t)^{\alpha} H(t)^{\beta} (A(t)L(t))^{1-\alpha-\beta}.$$

[5]Hall and Jones (1999: 85) argue that an analysis of economic growth in terms of income levels is preferable because levels capture the differences in long-run economic performance that are most relevant to welfare as measured by the consumption of goods and services.

The notation is standard: Y is output, K physical capital, H human capital, L labor, and A the level of technology. L and A are assumed to grow at rates n and g, respectively. The number of effective units of labor, $A(t)L(t)$, then grows at $n+g$. It is also assumed that the same production function applies to physical capital, human capital, and consumption—that is, one unit of consumption can costlessly be transformed into either one unit of physical capital or one unit of human capital. In addition, physical and human capital depreciate at the same rate δ. Finally, it is assumed that α and β, the factor shares of physical and human capital, respectively, sum up to less than unity. This implies that there are decreasing returns to all kinds of capital.

After some reformulations and substitution into the production function as well as taking logs, the following equation for the level of income per capita in the steady state emerges:

$$(2)\quad n\left[\frac{Y(t)}{L(t)}\right] = A(0) + gt - \frac{\alpha+\beta}{1-\alpha-\beta}\ln(n+g+\delta) + \frac{\alpha}{1-\alpha-\beta}\ln(s_k) + \frac{\beta}{1-\alpha-\beta}\ln(s_h).$$

The equation shows how income per capita depends on the growth rate of the labor force and on the accumulation of physical and human capital. The coefficients of the factors of production are functions of the factor shares.

According to Mankiw et al. (1992: 410–11) the term $A(0)$ reflects not only technology but also resource endowments, climate, institutions, and so on and may thus differ between countries. They assume that

$$(3)\quad \ln A\,(0) = a + \varepsilon,$$

where a is a constant and ε is a country-specific shock. In their estimation equation these factors are neglected and are—if present—reflected in the constant term and in the error term.

In the present study the impact of property rights on economic development is of primary interest. To estimate this effect, a property rights variable explicitly enters the estimation equation as an additional variable similar to A(0). The coefficient of this variable will indicate changes in economic efficiency due to changes in the quality of property rights.

Estimation

The estimation procedure is as follows. First, the equation for gross domestic per capita income as specified by Mankiw et al. (1992)—

that is, without property rights—is estimated. This equation serves as a reference point. Next, the equation is reestimated taking explicitly into account the differences in private property rights. Changes in the estimated coefficients as well as in the coefficient of determination are then assumed to be due to the presence of a property rights variable.

The international data sample covers the 20 years between 1975 and 1995. The main data source is Penn World Tables (Heston and Summers 2000). These data are from real national accounts statistics and include among other things real income, investment, and the working age population for almost all countries of the world. The data are annual and cover the period 1960–92. The data for 1992–95 are extrapolated according to IMF statistics. Variable n is measured as the average rate of change of the working age population. Savings (s) are proxied by the average shares of real investment (including government investment) in real GDP. $Y(t)/L(t)$ is "productivity," that is, real GDP per capita of the working age population in 1995. The data source for human capital accumulation (h) is Barro and Lee (2001). This variable is measured as the average number of years of secondary schooling of the working age population in 1985. As in Mankiw et al. (1992: 413–14), it is assumed that the rate of technical progress (g) is 2 percent and the rate of depreciation of physical capital (δ) is 3 percent. Thus $g + \delta$ is 5 percent per year.

The international data set on property rights is from Gwartney and Lawson (2000) and is based on various reports from ICRG and BERI. The index is intended to capture the security of property rights and the enforcement of contracts. It has three components: (1) the legal security of private ownership rights (i.e., the risk of confiscation) with a weight of 34.5 percent;[6] (2) the viability of contracts (i.e., the risk of contract repudiation by the government) with a weight of 33.9 percent; and (3) the rule of law (i.e., the legal institutions supportive of this principle, including access to a nondiscriminatory judiciary) with a weight of 31.7 percent. The index ranges from 0 to 10. A rating close to 10 indicates that property rights are well established and that the quality of the supportive legal system is high.

Some illustrative descriptive statistics of the variables used are depicted in Table 1. GDP per capita in 1995 ranged from $369 in Niger to $18,855 in the United States. The average share of investment in GDP was 17.44 percent. The average growth rate of the working age population varied from 0.16 percent in Denmark to 4 percent in

[6]The weights have been adopted from Gwartney and Lawson (2000).

TABLE 1
DESCRIPTIVE STATISTICS OF THE VARIABLES USED, 1975–95

Variable[a]	Mean	Maximum	Minimum	Std. Deviation
RGDP	6,063.00	18,855.00	369.00	5,536.00
INV	17.44	35.12	1.28	7.59
POP	1.87	4.00	0.16	1.07
HUM	1.50	4.77	0.05	1.00
PROP	5.43	10.00	0.72	2.59
BLACK	107.89	3,106.30	0.00	363.15

[a]Statistics based on common sample (N = 84); RGDP, real gross domestic product per person of working age population in 1995 (purchasing power parities); INV, average share of investment in gross domestic product in 1976–95; POP, growth rate of working age population in 1975–95; HUM, human capital proxied by average years of secondary schooling of working age population in 1985; PROP, property rights index in 1985; BLACK, black market premium/discount of the exchange rate in 1985 (average of 1980–88).
SOURCES: Barro and Lee (2001), Cowitt (various years), Gwartney and Lawson (2000), Heston and Summers (2000), International Monetary Fund (various years), Republic of China (2000), author's calculations.

Kenya. Human capital, proxied by the average number of years of secondary schooling of the working age population, was 1.5 years on average. The index of the quality of property rights had a mean of 5.43. Luxembourg, the Netherlands, Switzerland, and the United States ranked highest (10) whereas the index of property rights in Bolivia ranked lowest (0.72).

A two-step procedure is applied to estimate equation (2). The first set of regressions consists of several unrestricted estimations—that is, restrictions to estimate factor shares are not imposed. The results of the first set of regressions are presented in Table 2. The first regression ignores international differences in the quality of property rights and serves as a benchmark. In the next regression, the property rights index is included as an additional exogenous variable. Significance or insignificance of the coefficients as well as changes in the coefficients of determination can give a first indication of the importance of property rights. If the coefficient of the property rights variable turns out to be statistically significant, additional empirical tests will be applied to detect possible problems of causality and to correct for them, if necessary. In a second set of regressions (shown in Table 3), restrictions on all previous equations are imposed to get estimates of the underlying factor shares.

TABLE 2

REGRESSION TO EXPLAIN LEVELS OF GROSS DOMESTIC PRODUCT IN 1995 (84 COUNTRIES, 1975–95)

Equation[a]	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) TSLS
Endogenous Variable[b]	RGDP	RGDP	PROP	RGDP	RGDP
Exogenous Variables[c]					
C	10.615 (9.65**)	9.260 (8.52**)	2.594 (2.82**)	8.019 (6.15**)	6.233 (5.68**)
INV	0.649 (5.01**)	0.529 (4.25**)	0.204 (1.89†)	0.419 (3.01**)	0.354 (2.78*)
POP	−2.219 (−4.35**)	−1.681 (−3.39**)	−0.783 (−1.80†)	−1.188 (−2.08*)	−0.437 (−1.92†)
HUM	0.484 (4.85**)	0.492 (5.30**)	−0.020 (−0.25)	0.500 (5.44**)	0.511 (5.03**)
PROP	—	0.420 (3.67**)	—	0.804 (3.15**)	1.155 (2.91**)
BLACK	—	—	−0.070 (−4.37**)	—	—
RES	—	—	—	−0.479 (−1.68†)	—
Adjusted R^2	0.75	0.78	0.38	0.79	0.75
S.E. Regression	0.56	0.52	0.46	0.52	0.56
F-Test	81.82**	74.41**	14.00**	61.49**	64.18**

[a]Estimation using a cross-section of 84 countries; t-test statistics in parentheses; †significant at 90 percent, *at 95 percent, and **at 99 percent; OLS, ordinary least squares; TSLS, two-stage least squares.

[b]RGDP, real gross domestic product per person of working age population in 1995 (purchasing power parties); PROP, property rights index (Fraser Institute) in 1985; all variables in logs.

[c]INV, average share of investment in gross domestic product in 1976–95; POP, growth rate of working age population in 1975–95 plus 5 percent (on account of technological progress and capital depreciation); HUM, human capital proxied by average years of secondary schooling of working age population in 1985; PROP, property rights index in 1985; BLACK, black market premium/discount of the exchange rate in 1985 (average of 1980–88); all variables in logs; RES, residual.

SOURCES: Same as in Table 1.

TABLE 3

Restricted Regressions to Explain Levels of Gross Domestic Product in 1995
(84 Countries, 1975–95)

Equation[a]	(1) OLS	(2) OLS	(3) OLS	(4) TSLS
Endogenous Variable[b]	RGDP	RGDP	RGDP	RGDP
Exogenous Variables[c]				
C	8.536 (36.72**)	7.939 (31.08**)	7.028 (20.41**)	7.028 (15.46**)
INV-POP	0.780 (6.49**)	0.603 (5.13**)	0.332 (2.52*)	0.332 (1.91†)
HUM-POP	0.534 (6.58**)	0.510 (6.87**)	0.474 (6.79**)	0.474 (5.14**)
PROP	—	0.451 (4.19**)	1.139 (5.34**)	1.139 (4.05**)
RES	—	—	–0.884 (–3.66**)	—
Adjusted R^2	0.75	0.79	0.82	0.68
S.E. Regression	0.55	0.50	0.47	0.61
F-Test	122.96**	104.54**	93.87**	70.84**
Implied α	0.24	0.22	0.18	0.18
Implied β	0.30	0.27	0.26	0.26

[a]Estimation using a cross-section of 84 countries; t-test statistics in parentheses; †significant at 90 percent, *at 95 percent, and **at 99 percent; OLS, ordinary least squares; TSLS, two-stage least squares.

[b]RGDP, real gross domestic product per person of working age population in 1995 (purchasing power parties); PROP, property rights index (Fraser Institute) in 1985; all variables in logs.

[c]INV, average share of investment in gross domestic product in 1976–95; POP, growth rate of working age population in 1975–95 plus 5 percent (on account of technological progress and capital depreciation); HUM, human capital proxied by average years of secondary schooling of working age population in 1985; PROP, property rights index in 1985; all variables in logs; RES, residual; α, factor share of physical capital; β, factor share of human capital.

Sources: Same as in Table 1.

In the first equation in Table 2 (column 1), all determinants show the expected signs and are statistically significant at the 99 percent level. The regression predicts that countries converge to different *steady state* levels of GDP. These levels are positively related to physical capital accumulation and negatively related to population growth. Consequently, if the growth rate of the working age population is high, physical capital has to be spread more thinly per worker and the achievable level of GDP is lower. As in the case of physical capital, human capital formation is also positively related to GDP. The investigated determinants "explain" about three quarters of the variation of per capita GDP in 1995. The estimation thus confirms the results of Mankiw et al. (1992: 420) for a different sample period.

If the quality of property rights is included as an additional variable (column 2), the coefficients of some of these determinants change. Controlling for property rights, the positive impact of physical capital accumulation is reduced and the negative impact of the growth rate of the labor force is also lower. The coefficient of the human capital variable nearly stays the same. The coefficient of the property rights variable turns out to be positive as expected and to be statistically significant at the 99 percent level. Thus, the steady state level of per capita GDP that countries can achieve also strongly depends on secure and well-defined property rights. Gains in economic efficiency and wealth appear to be much stronger if the security of property is high so that economic incentives can fully operate.

Are Property Rights Exogenous?

Nevertheless, the impact of property rights on economic development may be ambiguous. As was argued above, causality can in fact run from economic development to property rights (reverse causation) or additional feedback effects may be at work (simultaneity). To account for these possibilities it seems reasonable to carry out some additional econometric tests. An appropriate tool is the Hausman (1978) specification test.

The first step in this test is to run an auxiliary regression in which the property rights index is regressed on the above hypothesized exogenous variables (the constant, physical and human capital accumulation and the growth rate of working age population) and an instrumental variable—in this case, the black market premium or discount on the exchange rate in 1985.[7] The residuals of this

[7]The use of the average black market rates, taken from Cowitt (various years), as an instrumental variable appears to work well: At the 99 percent significance level, this variable

additional regression in Table 2 (column 3) are reflected in a variable called RES.

The next step is to reestimate equation (2) including the residuals (RES). The results are presented in column 4. Under the null hypothesis that property rights are exogenous, the variable RES should not be significant. As can be seen RES is statistically significant at the 90 percent level. Thus the null hypothesis has to be rejected. Per capita GDP and the quality of property rights seem to be simultaneously determined. This simultaneity causes ordinary least squares—as in column 2—to be biased and inconsistent (Pindyck and Rubinfeld 1998: 353).

The equation in column 4 already contains the simultaneity-corrected coefficients for the exogenous variables. However, their standard errors are not correct. To also obtain correct standard errors and t-statistics, a two-stage least squares regression can be run (column 5).[8] In this final equation physical capital is significant at the 95 percent level, while human capital and property rights are still significant at the 99 percent level. The growth rate of the working population is statistically significant at the 90 percent level. Compared with the original ordinary least square estimates (column 2), the coefficient of physical capital accumulation is considerably reduced. The coefficient of human capital is about the same. The coefficient of property rights turns out to be more than twice as high as in the original ordinary least squares regression. Thus, correcting for the simultaneity bias reveals that the impact of property rights on the wealth of nations turns out to be much higher.

Imposing Restrictions

To complete the analysis and to get estimates of the factor shares of this modified neoclassical growth model, one may follow Mankiw et al. (1992: 420) and reestimate all equations with parameter restrictions imposed. The estimates are presented in Table 3. The benchmark regression—without property rights as an exogenous variable—in column 1 reveals factor shares of $\alpha = 0.24$ and $\beta = 0.30$. The magnitude of α is somewhat lower than in Mankiw et al. (0.31) whereas β is slightly higher (0.28). Inclusion of property rights (column 2) into the growth model yields slightly lower values (0.22 and 0.27, respectively). The correction for the simultaneity bias leads to a

is significantly correlated with the Fraser Institute's property rights index (Gwartney and Lawson 2000) but not with the errors of the regression in column 2.

[8]The regressors in columns 4 and 5 are identical (excluding RES).

further decline to 0.18 and 0.26, respectively (columns 3 and 4). Thus, the inclusion of property rights as a determinant of economic development reduces the relative importance of physical and human capital as factors of production whereas the regression coefficients of the property rights variable remain about the same.

Taken as a whole, the above results clearly indicate that property rights and the rule of law promote economic efficiency and that positive feedback effects appear to play an important role. Countries that improve the quality of their property rights can therefore reach higher levels of per capita income in the steady state.

Factor Accumulation

Do property rights also have an impact on physical and human capital accumulation and on population growth? As argued above, there should be strong causal links between the quality of property rights and the rule of law on the one hand and the accumulation of physical and human capital and population growth on the other. With respect to physical capital accumulation, the impact seems to be obvious. Physical capital is "shy" and therefore hides if the risk of confiscation is high due to a lack of private property rights. International capital inflows to an insecure country will also be small and perhaps negligible, whereas capital flight out of such a country may be considerable. There are also reasons to suggest that personal savings will be held in forms that can easily be hidden (e.g., cash, gold, and jewelry). But capital held in these forms is also "dead capital" (DeSoto 2000: 6). It does not bear interest and it cannot be used as collateral for obtaining a mortgage. In addition, if insecure private property rights mean there is little access to formal business—as is the case in many developing countries (DeSoto 1989)—a large part of business activities can only be done informally. In such countries investment in machinery and equipment will be smaller compared with countries that protect property rights. Moreover, investment will take other forms, such as light and flexible machinery and equipment that can easily be removed and hidden from the authorities.

Human capital accumulation will also suffer from insecure private property rights. If access to formal business is seriously restricted, the returns to education will be lower as will be the demand for formal education. Education will then eventually take place in family-run enterprises and be in the form of learning-by-doing. Lack of formal housing due to inadequate access to private property will further strengthen such tendencies. The reason is that in areas of illegal housing the supply of formal education—above all, higher education—is often totally missing.

In addition, insecure property rights and a weak rule of law are incentives to raise children, which will foster population growth (Norton 2002). The reason is that, in an insecure environment, traditional family ties become more important because they are seen as a substitute for legally enforced property rights. Family-run enterprises as well as family- or clan-related business lines will thus form a large part of the formal and informal economy.

Thus, there are unambiguous causal links between the quality of property rights and the accumulation of physical and human capital and population growth. Such links are also suggested by the empirical results in Table 2. The inclusion of property rights as an exogenous variable in the regressions made the coefficients of physical capital accumulation and population growth decline and lose statistical strength. But the relationship was not strong enough to lead to insignificant coefficients—that is, multicollinearity was not a serious problem.

Another indication of the strength of the relationship between property rights and the other exogenous variables of the growth equation is given by the correlations in Table 4. As can be seen all coefficients exhibit the expected sign and are statistically significant at the 99 percent level. Additional regression analyses confirm these findings (Table 5). In these equations the investment share, the growth rate of the working age population and human capital accumulation are the endogenous variables. In each equation the only exogenous

TABLE 4

CORRELATION MATRIX OF THE VARIABLES USED, 1975–95

Variable[a]	RGDP	INV	POP	HUM	PROP
INV	0.68**	—	—	—	—
POP	–0.70**	–0.54**	—	—	—
HUM	0.84**	0.59**	–0.65**	—	—
PROP	0.81**	0.58**	–0.55**	0.59**	—
BLACK	–0.22*	–0.11	0.16	–0.18	–0.29**

[a]Statistics based on common sample N = (84); **significant at 99 percent; *significant at 95 percent. RGDP, real gross domestic product per person of working age in 1995 (purchasing power parities); INV, average share of investment in gross domestic product in 1976–95; POP, growth rate of working age population in 1975–95; HUM, human capital proxied by average years of secondary schooling of working age population in 1985; PROP, property rights index (Fraser Institute) in 1985; BLACK, black market premium/discount of the exchange rate in 1985 (average of 1980–88).

SOURCES: Same as Table 1.

TABLE 5

REGRESSIONS TO EXPLAIN FACTOR ACCUMULATION
(84 COUNTRIES, 1975–95)

Equation[a]	(1) OLS	(2) OLS	(3) OLS
Endogenous Variable[b]	INV	POP	HUM
Exogenous Variables[c]			
C	2.068 (12.51**)	1.419 (6.06*)	–0.682 (–2.68*)
PROP	0.426 (4.27**)	–0.683 (–4.83**)	0.518 (3.36**)
Adjusted R^2	0.17	0.21	0.11
S.E. Regression	0.53	0.76	0.82
F-Test	18.19**	23.28**	11.32**

[a]Estimation using a cross-section of 84 countries; t-test statistics in parentheses; *significant at 95 percent and **at 99 percent.
[b]INV, average share of investment in gross domestic product in 1976–95; POP, growth rate of working age population in 1975–95; HUM, human capital proxied by average years of secondary schooling of working age population in 1985; all variables in logs.
[c]PROP, property rights index in 1985 in logs.
SOURCES: Same as in Table 1.

variable is property rights, which in all cases exhibits the expected sign and is statistically significant at the 99 percent level. The coefficient of determination varies between 0.11 and 0.17. This is quite remarkable since in all equations the quality of property rights is the only regressor and the number of total observations is quite high. Since all variables are in logs the coefficients represent elasticities. Thus, it is easy to assess the underlying magnitudes of the relationships: A 10 percent improvement in the index of property rights would lead to an increase in the average investment share of about 4.3 percent. Whereas the magnitudes involved with long-term population growth and human capital accumulation are –6.8 percent and 5.2 percent, respectively.

Reduced Form

The estimates in Tables 2 and 3 reveal that the quality of private property rights exerts a statistically significant impact on the level of economic development. In addition, empirical evidence in Table 5 indicates that the quality of property rights has an influence on the accumulation of the factors of production—that is, additional channels with respect to investment in physical and human capital as well as with respect to population growth are also important. It is therefore reasonable to assume a model of economic growth that focuses on the direct relationship between the quality of property rights—as the only exogenous variable—and economic development. In such a model the equations of Tables 2, 3, and 5 can be interpreted to be only the structural equations of the model whereas the equation of the direct relationship between property rights and the level of economic development can be viewed as the "reduced form."

Estimating this reduced form yields:

$$\begin{array}{llcll} (4) & \ln \text{RGDP95} & = & 6.506 & + \quad 1.107 \quad \ln \text{PROP} \\ & & & (23.92^{**}) & (6.77^{**}) \end{array}$$

$\text{adj}R^2 = 0.35$; S.E. = 0.88
N = 84; F = 45.90**

The regression shows a highly significant relationship at the 99 percent level. The coefficient has a value of 1.107 with a standard error of 0.163. The magnitude of the parameter of the property rights variable is nearly the same as the one obtained in Tables 3 and 5 after correcting for the simultaneity bias. The regression's coefficient of determination ($\text{adj}R^2 = 0.35$) is remarkably high, given the large number of observations (N = 84) and the fact that there is only one exogenous variable. The estimated coefficient indicates that a

doubling of the index of property rights—as could be done relatively easily in the case of a poor developing country (e.g., from 2 to 4)—would more than double the level of per capita gross domestic product in the *steady state*.

In addition, it should be noted that this magnitude seems to be on the low side. Given the above empirical results when correcting the simultaneity problems within the neoclassical model, there is reason to believe that such simultaneity problems may also be present with respect to the reduced form estimation. Due to feedback effects the overall impact could be even stronger. But to arrive at satisfying simultaneity-corrected estimates is difficult, mainly because of the low degrees of freedom and problems of underidentification. Further research with respect to additional exogenous sources of variation in private property rights is needed to solve these problems.

Conclusion

The central hypothesis of this study is that secure private property rights and the rule of law are important determinants of economic growth. This hypothesis was tested using an international cross-section of countries for the 1975–95 period. Empirical tests using a modified human capital augmented neoclassical growth model revealed that property rights had a significant positive impact on economic efficiency and the wealth of nations over the 20-year period. Compared with the more traditional determinants of economic growth—such as physical and human capital accumulation and the growth rate of the working-age population—the impact of property rights is quite remarkable.

As was demonstrated, rising income levels lead to further improvements in the quality of property rights, which implies that property rights and economic development are determined simultaneously. Hausman specification tests significantly support this relationship. The overall impact of property rights on economic development is considerable: A doubling of the property rights index more than doubles per capita income.

In addition it was shown that more secure property rights significantly raise the accumulation of physical and human capital, whereas the growth rate of the working-age population is significantly decreased. Thus, the economic effects of property rights on factor endowments are as expected.

Given this additional area of influence, it seems reasonable to classify property rights among the *ultimate* sources of economic growth. In contrast, the more traditional determinants (physical and human

capital accumulation as well as population growth) should be classified as proximate sources. Obviously, in such a model, the relationship between property rights and economic growth is of central importance and represents the reduced form of the model—whereas the other equations estimated in this study could be thought of as structural equations. Estimating the direct relationship between property rights and end-of-period per capita incomes yields a highly significant regressor and again indicates that *a doubling in the index of property rights more than doubles living standards*. This study therefore lends strong support to Mancur Olson's (1996) view that there are "big bills left on the sidewalk" and the gains from secure property rights and a transparent legal framework could amount to trillions of dollars.

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