INSTITUTIONS, INVESTMENT, AND GROWTH: NEW CROSS-COUNTRY AND PANEL DATA EVIDENCE

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This paper outlines the alternative channels through which institutions affect growth, and studies the empirical relationship between institutions, investment, and growth. The empirical results indicate that (i) free-market institutions have a positive effect on growth; (ii) economic freedom affects growth through both a direct effect on total factor productivity and an indirect effect on investment; (iii) political and civil liberties may stimulate investment; (iv) an important interaction exists between freedom and human capital investment; (v) Milton Friedman's conjectures on the relation between political and economic freedom are correct; (vi) promoting economic freedom is an effective policy toward facilitating growth and other types of freedom. (*JEL* O17, O40, P51)

I. INTRODUCTION

The past decade has witnessed a resurgence of research on the macroeconomic determinants of growth. Concurrently, many countries of the world have promoted freedom as a means of fostering long-run economic success. Freedom—whether political, civil, or economic freedom—makes up what economists refer to as the "institutions" of an economy, and the trend toward increased freedom is indicative of the belief that "good" institutions are an important determinant of, or precondition for, economic growth and development.

Neither the inquiry into the causes of the wealth of nations nor the notion that institutions affect economic performance is new among economists. In 1776, Adam Smith eloquently proclaimed that the path to economic prosperity begins with freedom from government intervention. More recently, Milton Friedman [1962, 1981] has written on economic freedom, political freedom, and the role of government in a free society, and Douglas North [1990] has described the link between institutions and economic performance. The debate over institutions and economic outcomes, however, has been one of considerable controversy regarding which institutional arrangements are most conducive to long-run growth.

The past decade's renewed interest in growth has produced a vast literature, including both theory and empirical evidence on various potential "engines" of growth.[1] The relationship between institutions and growth, however, has received relatively little attention from either a theoretical or empirical standpoint. This is somewhat surprising given the long-standing tradition of institutions and growth in economics and the recent trend toward freedom in the world. This paper formalizes, in the context of the neoclassical growth model, the alternative channels through which institutions affect long-run growth. The question is whether institutions affect aggregate economic activity indirectly, through an effect on investment, or directly, through an effect on total factor productivity, or both. The alternative models imply different empirical specifications which, when confronted with

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1. For a review of modern growth theory, see Mankiw [1995] and McCallum [1996]. For a review of the empirical growth literature, see Levine and Renelt [1992].

ABBREVIATIONS
MRW: Mankiw, Romer and Weil [1992]
GLB: Gwartney, Lawson and Block [1996]

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cross-country data, provide new insight on the relationship between institutions and growth. The paper also addresses the relative importance of different types of freedom on long-run economic outcomes by using previously existing indexes of political and civil freedom as well as a new measure of economic freedom.

The empirical analysis uses both cross-section and, for the first time in the study of institutions and growth, panel data. The evidence suggests that free-market institutions have a positive effect on economic growth across countries and over time. Economic freedom appears to affect growth through both a direct effect on productive efficiency and an indirect effect on investment. The relationship between political and civil liberties and growth is found to be more tenuous. To the extent that the evidence supports such a relationship, it appears to work only through an effect on investment. The evidence also suggests that growth is affected through a channel involving human capital investment and population growth, lending support for models where the choice between fertility and human capital accumulation is crucial in the development process. Additional analysis suggests that economic and, possibly, civil liberties play a role in explaining cross-country variation in educational attainment.

The availability of new cross-country data on economic freedom also provides an opportunity for the analysis of institutions and growth to be extended in an important direction.[2] Friedman [1962] has conjectured that there is an intimate connection between economic and political freedom. This paper presents, for the first time that this author is aware of, empirical evidence supporting Friedman's hypothesis. This result has important implications for the study of institutional change as well as the institutions-growth relationship.

The paper is organized as follows. Section II introduces the growth model and discusses the data and empirical methodology used in the paper. Section III presents the empirical results and compares them with the findings of previous empirical studies of the institutions-growth relationship. Section IV extends the analysis to study patterns of institutional change, and the final section concludes.

II. MODELLING AND ESTIMATING THE INSTITUTIONS-GROWTH RELATIONSHIP

The Model and Cross-Section Estimation

The basic theoretical framework used for the analysis of growth in this paper is an extension of Mankiw, Romer, and Weil's [1992] (MRW) human capital augmented version of the Solow [1956] model. This section provides only enough detail to introduce the estimating equations that will be used below.[3]

The model assumes a Cobb-Douglas production function which exhibits constant returns to scale but diminishing returns to each factor individually, viz.

$$(1) \qquad Y_t = K_t^{\alpha} H_t^{\beta} (A_t L_t)^{1-\alpha-\beta};$$

$$\alpha, \beta > 0, \ \alpha + \beta < 1$$

where Y is aggregate output, K is physical capital, H is human capital, L is raw labor, and A is the level of (labor-augmenting) technology. Labor and technology are assumed to grow at the exogenously given rates n and g, respectively. All capital depreciates at the constant rate δ and s_h, in physical and human capital, respectively. Thus, this paper does not address the determinants of investment from the standpoint of a maximizing model of individual behavior.

Following MRW, the model can be solved for the steady-state level of output, and the transitional dynamics can be described by a linear approximation of the economy's path toward the steady state. The speed of convergence is given by the parameter $\varphi = (n + g + \delta)(1 - \alpha - \beta)$. Given this setup, the following estimating equation can be derived:

$$(2) \qquad \ln y_T - \ln y_0 = \pi_0 + \pi_1 \ln y_0$$

$$+ \pi_2 \ln(n + g + \delta) + \pi_3 \ln s_k + \pi_4 \ln s_h.$$

2. Thanks to an anonymous referee for suggesting this extension.

3. The derivation of the estimating equations is similar to that in MRW, and is formally presented in an unpublished appendix available from the author upon request.

The lower case y is the *per worker* analog of the aggregate level Y in equation (1). The subscripts 0 and T refer to the initial and terminal dates of the period over which the transition is defined. The π_i are parameters to be estimated, and the restriction $\pi_3 + \pi_4 = -\pi_2$ is implied by the model. Equation (2) provides a framework for testing the implications of the neoclassical model in a pure cross-section setting; that is, where one observation for each country is used. Typically, Ordinary Least Squares (OLS) is used in the estimation of the cross-section model.

This paper offers two extensions of the neoclassical model which illustrate the potential effects of institutions on growth. In the first, institutions affect growth through an effect on investment. In the second, institutions affect total factor productivity. Throughout the following discussion, F_t denotes an index of institutional attributes or freedom (e.g., political, civil, or economic freedom) for which a higher value represents "better" institutions or more freedom.

Institutions and Investment. If institutions primarily affect investment, then institutions affect growth indirectly through what is often called "the investment channel." Intuitively, three arguments for a positive link between institutions and investment are offered by Besley [1995]. First, secure property rights may protect the fruits of investment from expropriation by the state or other individuals. Second, favorable institutions governing credit markets and the enforcement of contracts can eliminate barriers to the financial and contractual arrangements that are necessary to carry out investment. Third, institutions which facilitate economic transactions between individuals and firms enhance the gains from trade and, therefore, increase the potential return to investment.

Extending the neoclassical model to include the effect of institutions working through the investment channel is straightforward. Simply let the saving share s_k be written as a function of F such that $s_k' > 0$. Note that while s_k is assumed to be constant over time within an economy, what we have in mind here is that different economies with different institutions (and, thus, a different value of F) will have a different value of s_k. This extension does not alter the steady-state solution of the model or the resulting estimable equation (2), except that s_k is now a function of F. However, this seemingly innocuous theoretical modification has potentially important implications for the empirical analysis that follows. Two cases are noteworthy. First, if institutions are the primary factor driving cross-country differences in investment, it is redundant to include both investment and an institutional measure as regressors in a cross-country analysis based on equation (2). One should, however, observe a strong relationship between institutions and investment in this case, and the relationship between institutions and growth should strengthen, in a statistical sense, if investment is omitted as a conditioning variable. Second, if factors other than institutions also contribute to cross-country variation in investment or if the effect of institutions operates partially outside the investment channel, the inclusion of an institutions variable should attenuate the size and significance of the estimated coefficient on investment to the extent that the investment channel is operative. Elimination of investment as a conditioning variable would not be appropriate in this case, however, as important information would presumably be lost.

Most empirical growth studies which investigate the role of institutions include investment as well as some measure of institutions, a specification which may be incorrect if the investment channel is operative. The findings of these studies regarding the importance of institutions in the growth process are mixed and, as is typical in empirical growth analysis, quite sensitive to changes in specification. None of these studies, however, exploit this sensitivity to study the channels through which institutions affect growth. The empirical work of section III will examine this issue.

Institutions and Total Factor Productivity. An alternative channel through which institutions might affect growth is changes in the aggregate production function. In other words, cross-country differences in institutional arrangements may cause variation in productive efficiency across countries. This implies that countries with abundant resources may experience low standards of living because they lack the institutional "infrastructure" to sup-

port a system of efficient resource allocation. This is the situation the formerly communist countries of the Soviet bloc are currently struggling to change. In the neoclassical growth model, A serves as a catch-all term for any influences on factor productivity. While A is usually described as the level of technology, other factors such as institutions and any inputs not explicitly accounted for in the production function also affect A.

The notion that institutions affect total factor productivity can be explicitly incorporated in the model by specifying technology, A, to be a function of institutions, F. This specification implies that technology evolves exogenously, as is traditional in the neoclassical model, but also that differences in institutions have a "fixed effect" on the level of productivity across countries. Given a convenient functional form for the equation describing the evolution of A, the following equation can be derived to replace equation (2):

$$(3) \qquad \ln y_T - \ln y_0 = \pi_0 + \pi_1 \ln y_0 + \pi_2 \ln(n + g + \delta) + \pi_3 \ln s_k + \pi_4 \ln s_h + \pi_5 \ln F.$$

Note that the new empirical specification is identical to equation (2) except that the right-hand side now includes a measure of institutions as a regressor. Thus, if institutions influence growth primarily through an effect on total factor productivity, measures of both investment and institutions should be statistically significant.

Since the empirical specification in equation (3) is distinct from that implied by the investment channel, empirical evidence may provide insight into which formulation most accurately describes how institutions affect growth. In summary, if institutions operate predominantly through the investment channel, measures of freedom will have little or no explanatory power if the saving rate is already included as an explanatory variable in cross-country regressions. If institutions work primarily through a direct effect on factor productivity, however, including a measure of freedom in a growth regression can be expected to add explanatory power. If institutions work through both channels simultaneously, the inclusion of an institutions variable as a regressor should add explanatory power and reduce the estimated size and significance of investment's impact on growth.

Panel Data Estimation

This section explains how the institutions-growth relationship can be estimated in a panel data setting. Previous studies of institutions and growth assume that institutions change only slowly over time, in which case no valuable information would be gained from an analysis that includes a time dimension. There are at least three reasons, however, that motivate an investigation of the growth effects of time variation in institutions. First, the results of previous cross-section studies suggest that changes in freedom over time may be important in explaining differences in long-run growth. Second, the introduction of a time dimension provides a means of controlling for reverse causation by relating initial levels of freedom to subsequent growth rates over a shorter, more proximate sample period. This increases the chances that an observed correlation implies causation. Finally, a panel analysis is particularly timely given the recent changes in freedom in many countries of the world.

Unlike the single cross-section framework where countries are assumed to have the same aggregate production function, the use of panel data allows different countries to have different production functions (that is, different parameter values for each country). This distinction is particularly important in the study of institutions and growth, since differences in institutions across countries have long been thought to be a "fixed effect" in explaining cross-country variation in economic performance. Since panel data analysis controls for fixed effects, it is important to assess the role of institutions in this framework. Rewriting equation (3) in a more general form provides an equation more suitable for panel data estimation:

$$(4) \qquad z_{it} = \mu_i + \eta_t + \pi_1 \ln y^0_{it} + \pi' \mathbf{x}_{it} + \varepsilon_{it}$$

where $z_{it} = \ln y^T_{it} - \ln y^0_{it}$, $\mathbf{x}_{it} = [\ln(n_{it} + g + \delta), \ln s_{k,it}, \ln s_{h,it}, \ln F_{it}]'$, $\pi = [\pi_2, \pi_3, \pi_4, \pi_5]'$, and μ_i and η_t represent country- and time-specific

effects, respectively.[4,5] If $\ln F_{it}$ is omitted in the estimation of equation (4), its influence is considered to be a country-specific effect captured by μ_i. Estimation of equation (4) is carried out using the three-stage least squares (3SLS) procedure described in Hsiao [1986, 95–96].[6]

In the panel analysis, the sample period 1975–1990 is divided into three five-year subperiods, namely 1976–1980, 1981–1985, and 1986–1990. Thus, the period subscript, t, in equation (4) is defined over the values [1, 2, 3]. For example, when $t = 1$, $T = 1980$ and y_{i1}^0 refers to the level of income per worker in 1975. The choice of five-year subperiods is a compromise between the 15-year averages used in the single cross-section analysis and the use of annual data. Using annual observations is not appropriate since the objective is to study long-run growth rather than short-term fluctuations in economic activity. A five-year subperiod is probably the shortest term in which it can be reasonably expected that all business cycle fluctuations will be "averaged" out.[7] Arguably, changes in institutions may manifest themselves slowly in terms of influencing economic performance, in which case the analysis using five-year time intervals may not uncover the underlying institutions-growth relationship. This question, however, is ultimately an empirical issue.

III. EMPIRICAL EVIDENCE ON THE INSTITUTIONS-GROWTH RELATIONSHIP

Brief Review of the Literature

The institutions-growth relationship has been considered in several empirical studies of cross-country growth, but difficulty in measuring institutional characteristics has been a limiting factor in these analyses. Mauro [1995] uses measures of bureaucratic honesty to proxy the institutional environment and finds that corruption lowers investment and therefore economic growth. Keefer and Knack [1995] use measures of property rights, which are found to be positively related to investment and growth. Barro [1991] finds that a measure of political instability is significantly related to investment. Other studies rely on indexes covering a wider array of institutional attributes. In their seminal study of growth empirics, Kormendi and Meguire [1985] utilize data from Gastil (various years) to test for an effect of civil liberties on economic performance and investment. They present evidence that civil liberties have "a marginal effect on growth and a dramatic effect on investment" in their sample of 47 countries over the period 1950–1977 [157]. More recently, Levine and Renelt [1992] found civil liberties robust in explaining cross-country variation in investment. In another extensive study, Barro [1991] uses Gastil's breakdown of countries into socialist, mixed, and free enterprise economic systems to construct a dummy variable which is included in cross-country growth regressions. Using a sample of 98 countries over the period 1960–1985, the results suggest a marginally significant, negative effect of socialist systems and a zero-effect of mixed systems on growth, relative to that in free enterprise systems.

While the Kormendi and Meguire, Levine and Renelt, and Barro studies consider a wide range of possible determinants of long-run growth, Scully [1988] focuses exclusively on the role of institutions in economic development. The institutional data for this study also come from Gastil's indexes of political, civil, and economic liberties across countries. In a sample of 115 economies over the years 1960–1980, Scully documents strong evidence of a positive relationship between the level of freedom and economic growth; however, his analysis omits most of the conditioning variables used in more comprehensive studies of the determinants of growth. Scully's analysis did not address the channels through which institutions affect growth.

A considerable literature exists on the relationship between democracy and growth, including recent papers by Helliwell [1992] and

4. The notation for initial and end-of-period income is altered slightly in this subsection since these variables take on different values in each subperiod t in the panel analysis.

5. μ_i and η_t can be viewed as a decomposition of the constant term π_0 in equation (3). In the derivation of equation (3), π_0 is expressed as the sum of two terms, one containing A_0, which captures the effects of all unobserved factors on production in country i, and one which suggests the presence of effects specific to period t.

6. The application of this procedure to equation (4) is described in an unpublished appendix available from the author upon request.

7. The choice of five-year subperiods is also dictated by the sampling frequency with which the human capital and economic freedom data are available.

Barro [1996]. As with the results based on broader measures of institutions, the evidence on the democracy-growth relationship is mixed. Przeworski and Limongi [1993] provide a review of this literature as well as a discussion of the possibility that political regimes are themselves a function of the level of development. The reverse causation issue will be discussed further in the sections below.

Measuring Institutional Characteristics

The most difficult obstacle in the empirical analysis of institutions and growth is the measurement of institutional characteristics. A measure of an economy's institutions, broadly defined, is a description of a multi-dimensional feature of an economy, where each dimension is inherently difficult to quantify. Despite this problem, measures of institutions currently exist. The most well-known and widely used measures are the indexes of civil and political liberties developed by Gastil. These measures are based on information gathered in the *Comparative Survey of Freedom*, originally conducted in 1972 by Freedom House, the publisher of the survey results. Gastil's indexes rate each country on a scale from 1 to 7, with 1 representing the most freedom and 7 the least, based on a sample of qualitative criteria. For example, the political liberty index is based on indicators of the meaningfulness of individuals' participation in the political process, such as the right to vote and hold office and the role of elected representatives in the making of public policy. The civil liberty ranking is based on such criteria as freedom of speech and the press, freedom of assembly and association for political and business purposes, and freedom of travel within and outside of the country.

Wright [1982] extends the Freedom House report to include a rating of economic freedom; because of the limited time period covered, however, Wright's rating is not used in the analysis below. This paper utilizes data recently published by Gwartney, Lawson, and Block [1996] (GLB). The economic freedom index, as it is called, is the most extensive measure available in terms of its coverage of countries, time, and attributes of freedom, and makes possible for the first time a panel analysis of economic freedom and growth. The GLB measure is based on the concept of economic freedom developed by Rabushka [1991] which emphasizes personal choice, protection of private property, and freedom of exchange. The index is based on various component aspects of economic freedom which include, among other things, freedom from government regulation; the presence of government-operated enterprises; the size of public sector consumption, transfers, and subsidies; top marginal tax rates on income; the size of the international trade sector; the presence of export subsidies or import tariffs; and the protection of money as a store of value. These components are weighted to construct summary measures, or indexes, of economic freedom which allow the most complete analysis to date of the role of free-market institutions in promoting economic growth.

GLB define three different indexes, denoted *IE*, *IS1*, and *IS2*; these correspond to three different weighting schemes. In the "equal impact" index *IE*, each index component exerts an equal impact on the index. This is accomplished by simply assigning each component a weight equal to the inverse of its standard deviation. The more subjective "survey indexes" *IS1* and *IS2* use weights derived from two different surveys of the relative importance of the index components in determining a country's economic freedom. Since the construction based on equal impact of the attributes is independent of any knowledge of recent country performance, *IE* will be used in the empirical analysis below.[8] An appendix presents summary statistics and correlations for the Gastil and GLB indexes used below.

Cross-Country Results

Adding an error term to equation (3) results in the following regression equation for a given country:

$$(5) \qquad z = \pi_0 + \pi_1 \ln y_0 + \pi_2 \ln(n + g + \delta) + \pi_3 \ln s_k + \pi_4 \ln s_h + \pi_5 \ln F + \varepsilon$$

8. Using the 1975–1985 average for each country, the Spearman rank correlations between *IE* and *IS1* and *IS2* are 0.96 and 0.97, respectively. The correlations are significant at the 1% level for the 85-country sample used in the analysis below. Using *IS1* or *IS2* instead of *IE* does not qualitatively affect the results reported below.

where $z = \ln y_T - \ln y_0$ and ε is a disturbance term. In the cross-section analysis, the sample period is 1975 to 1990. Thus, z is the cumulative growth rate over the period 1975 to 1990 and y_0 is the level of real GDP per worker in 1975. Annual averages over the period 1975–1990 are used for the explanatory variables n, s_k, and s_h. Alternative measures are used for F, as described below.

The primary data source for the estimation of equation (5) is Summers and Heston [1991]. The dependent variable is computed from the series *RGDPW* in the Summers and Heston dataset. The investment to GDP ratio, series *I* in the dataset, is used to proxy for s_k. A proxy for $n + g + \delta$ is obtained by computing the growth rate of the labor force, implicit in the Summers and Heston dataset, and adding $g + \delta = 0.05$ (following the assumption used in MRW).[9] A proxy for s_h is the percentage of the working-age population enrolled in secondary school taken from Barro and Lee [1993]. The alternative institutional measures discussed above are used for F_t to assess the relative importance of political, civil, and economic institutions' influence on growth.

OLS is used in the estimation of equation (5), with the parameter restriction $\pi_3 + \pi_4 = -\pi_2$ imposed. π_0 is estimated as the regression intercept and all reported standard errors in the cross-country analysis are corrected for possible heteroskedasticity using White's [1980] correction. The analysis includes all countries for which complete data are available.

Table I presents the cross-country estimates of equation (5). Column 1 presents the estimate of the model when no institutions variables are included. The results support the predictions of the underlying model in several respects. First, all explanatory variables are statistically significant and have the expected sign. Second, the imposed restriction that the coefficients on $\ln s_k$, $\ln s_h$, and $\ln(n + g + \delta)$ sum to zero cannot be rejected at conventional significance levels. And finally, the implied values of α, β, and φ, which can be derived from the parameter estimates, are consistent with those reported for the broadest sample of countries in MRW.

Columns 2, 3, and 4 report estimates of the model when the *initial level* (F_0) and *change* (ΔF) in the Gastil and GLB freedom indexes are used for F. The results in columns 2 and 3 indicate that political and civil liberties are not significantly related to growth after conditioning on other factors that affect growth. This result is in direct contrast to those presented in Scully's study of institutions and growth where, as mentioned above, most of the conditioning variables were omitted. Thus, the results are apparently sensitive to the set of explanatory variables included in the empirical specification. That is, when factors such as initial income, physical and human capital investment, and labor force growth are controlled for, the apparent impact of institutions as measured by the Gastil indexes disappears. This, of course, implies that these measures of institutions are positively correlated with some or all of the control variables which themselves are significant in explaining cross-country growth, but the institutional measures provide no additional explanatory power.[10]

Column 4 reports the results using the *IE* measure of economic freedom. The results indicate that, on average, the initial level of economic freedom has a marginally significant, positive effect on subsequent growth even after controlling for the change in freedom over the period and accounting for other correlates of growth.[11] A significant increase in explanatory power is also noteworthy, as the adjusted R^2 increases from 0.29 to 0.47 upon inclusion of the economic freedom variables. To provide an indication of the economic significance of this result, the estimated coeffi-

9. As described in footnote 15 of Summers and Heston, the Proportion of the Population Under age 15 (*PPU15*) and the Labor Force Participation Rate (*LFPR*) are available implicitly. Given explicit data on the Total Population (*POP*), the Labor Force (*LF*) is defined as $LF = LFPR \times (1\text{-}PPU15) \times POP$.

10. This point was made by Barro [1996, 10] with respect to political institutions.

11. The change in freedom over the period is highly significant in the growth regression, but this correlation could result from reverse causation in the institutions-growth relationship. In this analysis, the initial level and change in the indexes are used rather than the average level over the sample period because an observed relationship between the latter and growth could result from reverse causation. Conditioning on the change in freedom over the period controls for the correlation due to reverse causation, so that finding the initial level of freedom to be significant indicates more credibly that institutions *cause* growth.

TABLE I
Cross-Country Growth Regressions, 1975–1990
Estimation by OLS; Parameter Restriction Imposed[a]

Variable[b]	Freedom Measure			
	None	Political	Civil	Economic
Intercept	0.53	0.78	0.79	0.36
	(0.400)	(0.506)	(0.489)	(0.364)
Initial Income	–0.23**	–0.25**	–0.25**	–0.20**
	(0.057)	(0.059)	(0.060)	(0.049)
Investment share	0.26**	0.26**	0.26**	0.21**
	(0.067)	(0.067)	(0.067)	(0.062)
Labor force growth	–0.39**	–0.38**	–0.38**	–0.29**
	(0.073)	(0.074)	(0.072)	(0.069)
Human capital	0.13**	0.12**	0.12**	0.08*
	(0.047)	(0.047)	(0.048)	(0.047)
Initial freedom	—	–0.05	–0.06	–0.14*
		(0.067)	(0.065)	(0.074)
Change in freedom	—	–0.02	–0.01	–0.14**
		(0.024)	(0.030)	(0.024)
Adjusted R^2	0.29	0.28	0.27	0.47
Restriction p-value	0.966	0.809	0.817	0.976
Implied α	0.420	0.409	0.414	0.427
Implied β	0.207	0.194	0.187	0.163
Implied φ	0.018	0.019	0.019	0.015
Number of observations	85	85	85	85

Notes:

[a]The dependent variable is growth in real GDP per worker, 1975–1990. Parentheses contain White [1980] corrected standard errors. * and ** denote statistical significance at the 10% and 5% level, respectively.

[b]All explanatory variables entered as natural logarithms except for those representing changes in freedom.

cients suggest an initial *IE* rating one standard deviation above the mean provides a 3.78 percentage point higher growth rate over the subsequent 15-year sample period, holding the level of freedom fixed over the period.[12]

12. Another noteworthy issue is the use of the freedom indexes directly as regressors even though the use of ordinal rankings as cardinal measures is somewhat problematic in regression analysis. In particular, it assumes a linear response on the part of the dependent variable to the regressor in question. An alternative is to construct dummy variables based on the indexes, but this is also unsatisfactory since the choice of definition of the dummies is largely arbitrary and the results often depend on this choice. In addition, a choice of dummies that reduces the number of categories in the data discards potentially useful information. Thus, the analysis uses the freedom indexes directly as regressors with the reminder that the foregoing caveat applies.

We now turn to what the evidence suggests about the proper modelling of institutions in the growth process. Section II outlined two alternative channels through which institutions affect growth, and discussed the empirical implications of both. Table I reports that investment and economic freedom are significant in the cross-country growth regressions, but political and civil liberties are not. The significance of both investment and economic freedom, along with the coincident increase in explanatory power, is consistent with the view that economic institutions affect growth through an effect on total factor productivity. Alternatively, the insignificance of political and civil liberties implies that their effect, if any, is through the investment channel. Fur-

TABLE II
Cross-Country Investment, 1975–1990
Estimation by OLS[a]

Variable[b]	Equation 1	2	3	4	5
Intercept	−1.92**	−0.86	−0.77	−1.53	−1.59*
	(0.663)	(1.015)	(0.985)	(0.987)	(0.944)
Initial income	0.44**	0.41**	0.41**	0.40**	0.41**
	(0.075)	(0.100)	(0.098)	(0.099)	(0.094)
Initial economic freedom	0.10**	—	—	0.10**	0.10**
	(0.046)			(0.046)	(0.048)
Change in economic freedom	0.22**	—	—	0.21**	0.21**
	(0.054)			(0.057)	(0.059)
Initial political freedom[c]	—	−0.07**	—	−0.03	—
		(0.036)		(0.036)	
Change in political freedom[c]	—	−0.08*	—	−0.05	—
		(0.044)		(0.044)	
Initial civil freedom[c]	—	—	−0.08**	—	−0.02
			(0.038)		(0.040)
Change in civil freedom[c]	—	—	−0.05	—	−0.02
			(0.061)		(0.055)
Adjusted R^2	0.48	0.41	0.40	0.48	0.47
Number of observations	85	85	85	85	85

Notes:

[a]The dependent variable is the natural logarithm of the 1990 value of the investment share in GDP. Parentheses contain White [1980] corrected standard errors. * and ** denote statistical significance at the 10% and 5% level, respectively.

[b]All explanatory variables entered as natural logarithms except for those representing changes in freedom.

[c]A *negative* coefficient on the political and civil liberties variables implies a *positive* effect on growth since the Gastil indexes define 1 to be "most free" and 7 to be "no freedom."

ther inspection of Table I also indicates that the addition of economic freedom as a regressor decreases the estimated size of investment's impact on growth (the estimated coefficient on investment decreases from 0.26 in column 1 to 0.21 in column 4) while the addition of political and civil liberties does not. Thus, investment and economic freedom appear to be somewhat correlated but not perfectly collinear in their explanation of growth across countries. This finding suggests that, while economic freedom affects growth through an effect on total factor productivity, the investment channel also appears to be at work. On the other hand, the apparent lack of correlation between investment and political and civil liberties suggests these freedoms may not affect growth, even through the investment channel.

Table II provides further evidence on the importance of the investment channel. The table reports the results of regressing the terminal value of the investment share in GDP (that is, the 1990 value of s_k) on an intercept, initial income, and the initial level and change in the freedom indexes. The terminal value of s_k is used as the dependent variable to reduce the impact of reverse causation on the results. Initial income, which is included to control for differences in investment across countries at different stages of development, is significant in all equations.[13] If the investment chan-

13. The positive coefficients reported on initial income are somewhat controversial (the neoclassical growth model predicts more investment among initially poor countries) but consistent with previously reported results; see, e.g., the results and accompanying discussion in Kormendi and Meguire [1985, 153].

nel is operative, the freedom measures should be statistically significant. Column 1 reports that the initial level of economic freedom has a significantly positive effect on investment even after conditioning on the change in freedom and other factors that affect investment. This evidence, together with that in Table I, is consistent with the hypothesis that economic institutions affect growth indirectly through the investment channel, but also through a direct effect on total factor productivity. As for political and civil liberties, there is evidence that they too affect growth through the investment channel, as reported in columns 2 and 3. However, political and civil liberties explain significantly less of the cross-country variation in investment than economic freedom; compare the adjusted R^2 of 0.48 in column 1 to the 0.41 and 0.40 in columns 2 and 3. In addition, when political or civil liberties are added to the model along with economic freedom, they become insignificant in explaining investment while economic freedom retains its explanatory power; see columns 4 and 5.

Further inspection of Table I indicates that a different type of investment channel may be at work. Compared to the estimates in column 1 of Table I, the estimated coefficients on labor force growth and human capital investment fall in both size and significance on the inclusion of the institutional variables in column 4. In fact, the decrease in these coefficients—25% for labor force growth and 38% for human capital—exceeds the decrease in the investment coefficient that results when economic freedom is added, and the estimate on human capital becomes insignificant at the 5% level. This evidence suggests that economic freedom may influence growth in part through an indirect effect on labor force growth and human capital investment. Previously, Mauro [1993] has reported that politically unstable economies invest less in education. The evidence here suggests this result may also apply to economies with unfavorable economic institutions; i.e., differences in economic freedom may largely explain cross-country differences in human capital investment, so that when both variables are included in the empirical model, the apparent contribution of human capital investment to growth is attenuated. This hypothesis is entirely reasonable if unfavorable economic institutions imply lower or more uncertain returns to investment in education.

Recent growth literature contains several models where an increasing rate of return to human capital investment leads to a switch from a Malthusian regime with high fertility to a perpetual growth regime with rising human capital.[14] In Tamura [1996], attaining a threshold level of human capital is the key in establishing the perpetual growth regime. The response of both population growth and human capital investment to the addition of economic freedom in Table I is consistent with the predictions of a unified model of fertility, human capital investment and growth. Of particular interest in this paper, of course, is the importance of the interaction between economic freedom and human capital investment in determining growth rates. The following story identifies such an interaction.[15] A little economic freedom, say allowing family-run enterprises like groceries, restaurants, repair shops, furniture making, etc., provides incentives to accumulate human capital through learning-by-doing. Given slow improvement in living standards, this applied human capital provides for rising rates of return to literacy and numeracy. This leads to a demand for additional economic freedom through access to formal education, which provides the foundation for further development. Continued economic growth further increases the return to human (and physical) capital investment, further increasing the demand for education and other economic freedoms. Finally, in terms of the Tamura [1996] model, the accumulation of human capital bursts the Malthusian trap and the regime switch becomes observable.

While the results in Table I are suggestive that such a story may be credible, the importance of the interaction between economic freedom and human capital investment in the development process is ultimately an empirical question. As such, we perform an analysis of human capital and freedom similar in spirit to that reported in Table II. Table III reports the results of regressing the terminal (1985) level of secondary school enrollment on an intercept, initial income, and the change in the

14. See, for example, Becker, Murphy, and Tamura [1990], Ehrlich and Lui [1991], and Tamura [1994; 1996].

15. Thanks to an anonymous referee for making this line of reasoning explicit.

TABLE III
Cross-Country Human Capital Investment, 1975–1990
Estimation by OLS[a]

Variable[b]	Equation 1	2	3	4	5
Intercept	−7.69** (0.652)	−7.81** (0.645)	−7.66** (0.668)	−7.71** (0.655)	−7.56** (0.678)
Initial income	0.85** 0.071)	0.87** (0.070)	0.85** (0.072)	0.85** (0.071)	0.83* (0.074)
Change in economic freedom	0.12** (0.039)	—	—	0.12** (0.039)	0.12** (0.038)
Change in political freedom[c]	—	−0.01 (0.035)	—	−0.01 (0.037)	—
Change in civil freedom[c]	—	—	−0.09* (0.053)	—	−0.09* (0.052)
Adjusted R^2	0.71	0.69	0.70	0.70	0.72
Number of observations	84	84	84	84	84

Notes:

[a]The dependent variable is the natural logarithm of the 1985 value of the secondary school enrollment rate. Parentheses contain White [1980] corrected standard errors. * and ** denote statistical significance at the 10% and 5% level, respectively.

[b]All explanatory variables entered as natural logarithms except for those representing changes in freedom.

[c]A *negative* coefficient on the political and civil liberties variables implies a *positive* effect on growth since the Gastil indexes define 1 to be "most free" and 7 to be "no freedom."

freedom indexes over the sample period.[16] The results in column 1 indicate that changes in economic freedom indeed have a statistically significant, positive effect on subsequent levels of secondary school enrollment. The evidence also suggests that civil liberties have a marginally significant, positive effect on enrollment rates, even when economic freedom is also included (see the results reported in columns 3 and 5).[17] Although this effect is not discernible in Table I, it is not surprising that individual freedom and educational attainment are related. Political freedom proves to be unimportant in explaining cross-country variation in educational attainment; see columns 2 and 4.

16. 1985 is the last year for which the Barro and Lee data on educational attainment are available. The initial levels of the freedom indexes were also included in these regressions but were found to be statistically insignificant and subsequently dropped from the analysis.

17. Note that the *negative* coefficient on civil liberties implies a *positive* effect on growth since the Gastil indexes define 1 to be "most free" and 7 to be "no freedom."

Panel Data Results

Estimation of the model using panel data is carried out using 3SLS as described in section II. The explanatory variables are defined as averages over the five-year subperiods with the exception of the human capital proxy, where each subperiod's initial value is used due to data availability. All data sources are the same as those in the cross-country analysis. Table IV presents the results of 3SLS panel estimation where the vector of predetermined variables **x** is used as instruments. The estimate of the model without an institutions variable appears in column 1. Initial income, the investment share, and labor force growth are all correctly signed and significant at the 5% level. Human capital is insignificant, but this finding is consistent with previous results on the effects of human capital when a time dimension is introduced into the analysis. Islam [1995, 1,153–54] reports that this finding is often attributed to (i) the discrepancy between the theoretical variable H and the actual variable used in statistical analyses and

TABLE IV
Cross-Country Growth, 1975–1990
3SLS Panel Estimation[a]

Variable[b]	Freedom Measure			
	None	Political	Civil	Economic
Initial income	–0.91**	–0.96**	–0.90**	–0.89**
	(0.204)	(0.200)	(0.212)	(0.169)
Investment share	0.23**	0.23**	0.23**	0.21**
	(0.059)	(0.044)	(0.058)	(0.046)
Labor force growth	–0.51**	–0.42**	–0.49**	–0.45**
	(0.067)	(0.059)	(0.067)	(0.057)
Human capital	–0.04	–0.01	–0.03	–0.01
	(0.083)	(0.051)	(0.078)	(0.055)
Initial freedom	—	–0.003	–0.03	0.15**
		(0.026)	(0.055)	(0.063)
Number of countries	79	79	79	79

Notes:

[a]Estimation of equation (4) in the text; see section II for details. Parentheses contain standard errors. * and ** denote statistical significance at the 10% and 5% level, respectively.

[b]All explanatory variables entered as natural logarithms.

(ii) the lack of a richer specification through which human capital can influence growth.[18]

Columns 2–4 of Table IV report the estimates of equation (4) when the initial levels of the Gastil and GLB freedom indexes are included.[19] The results on the impact of political and civil freedom reported in columns 2 and 3 are consistent with those reported in the cross-section analysis; both political and civil liberties are insignificant at conventional levels of significance. The measure of economic freedom, on the other hand, is again found to have a significantly positive effect on growth, as reported in column 4. The estimated size of the effect suggests that a one standard deviation increase from the mean in the initial level of the *IE* index increases cumulative growth in GDP per worker by 4.05 percentage points over a five-year sample period. This estimate is even larger in magnitude than that suggested by the pure cross-section results of section III. Thus, even after controlling for country-specific fixed effects and other variables which affect growth, economic institutions are a significant factor in explaining economic performance over time and across countries.

Concerning the operation of the investment channel, the addition of the economic freedom index in Table IV (comparing columns 1 and 4) causes approximately a 10% decrease in the estimated coefficient on investment. Similar to the results in the cross-section analysis, this evidence is consistent with the hypothesis that institutions affect growth at least partially through an effect on investment. The results of a panel analysis of investment and freedom analogous to the cross-country analysis of Table II are not reported, but confirm that economic freedom indeed affects growth partially through the investment channel, and suggest that political and civil liberties are not important in explaining cross-country variation in investment. Despite the insignificance of human capital in Table IV, a panel analysis similar to the cross-country analysis of Table III shows changes in economic freedom to be statistically significant in explaining variation

18. The parameter restrictions implied by the model can be imposed in the panel analysis, but these restrictions were rejected by the data and, thus, are not imposed in Table IV. This result is probably owing, in large part, to the insignificance of human capital.

19. The change in the freedom indexes are not included since the panel analysis inherently controls for reverse causation. See the discussion in section II.

TABLE V
Cross-Country Institutional Change, 1975–1990
OLS Estimation[a]

Variable[b]	Dependent variable: End-of-period level of freedom			
	Economic	**Economic**	**Political**	**Civil**
	0.69	0.98**	5.55**	–5.42**
	(0.462)	(0.449)	(0.032)	(0.321)
Initial income	0.10**	0.08**	–0.51**	–0.48**
	(0.047)	(0.045)	(0.040)	(0.040)
Income growth	0.41**	0.39**	—	—
	(0.105)	(0.106)		
Initial political freedom[c]	–0.10**	—	—	—
	(0.050)			
Initial civil freedom[c]	—	–0.17**	—	—
		(0.054)		
Change in economic freedom[c]	—	—	–0.14**	–0.15**
			(0.051)	(0.047)
Adjusted R^2	0.32	0.35	0.56	0.61
Number of observations	92	92	92	92

Notes:

[a]Dependent variable given in column headings, entered in natural logarithms. Parentheses contain White [1980] corrected standard errors. * and ** denote statistical significance at the 10% and 5% level, respectively.

[b]All explanatory variables entered as natural logarithms except for those representing changes in income and freedom.

[c]Negative coefficient estimates imply a *positive* effect on the dependent variable due to the reverse scale defined in the Gastil indexes of political and civil liberties.

in secondary school enrollment rates, but changes in political and civil liberties are not. These results are not reported, but again support the conclusions from the cross-country analysis.

IV. THE RELATION BETWEEN ECONOMIC AND POLITICAL FREEDOM

Friedman [1962] conjectures that economic and political freedom are fundamentally related and that economic freedom, provided through the technique of free markets, promotes the specialization and division of labor required for the efficient use of resources. This section investigates the relation between economic and political freedom using the newly available GLB data, and discusses the implications for the institutions-growth relationship.

Perhaps Friedman's most specific statement about the empirical relation between economic and political freedom came in a recent *Wall Street Journal* interview: "In general, the relation between economic freedom and political freedom is that initial growth in either tends to promote the other" [1997]. The relationship suggested in this statement can be tested empirically using methods similar to those employed in previous sections of the paper. We begin with a pure cross-country setting, where the end-of-period (1990) value of the economic freedom index is regressed on the initial (1975) level of the political or civil liberties index and the 1975–1990 change in the index. The analysis is also performed using the end-of-period level of political and civil liberties as the dependent variable and the measures of economic freedom on the right-hand-side. In all regressions, the initial level of GDP per worker and its growth over the sample period are included as possible control variables. All statistically insignificant variables have been dropped in the estimates reported below.

Table V reports the results. The significance of initial income and/or income growth

suggests that economic performance affects institutional change. This finding supports conjectures made by North [1990], among others. The data are also consistent with Friedman's conjecture: initial levels or changes in one type of freedom affect subsequent levels of the other. The results do not imply a direction of causation between the two types of freedom, but neither does Friedman's statement suggest which type of freedom *causes* changes in the other. Qualitatively similar results are found in a panel analysis which controls for time-specific (but not country-specific) effects, but these results are not reported.

It is interesting to note in Table V that the *initial level* of political and civil liberties is important in explaining subsequent levels of economic freedom, while *changes* in economic freedom are important in explaining subsequent levels of political or civil liberties. This finding suggests that changes in economic freedom may have a more immediate impact on political and civil liberties than political or civil changes have on economic freedom. By similar reasoning, the significance of GDP growth in the economic freedom equations but not the political or civil liberties equations suggests that economic performance has a more immediate effect on economic freedom than on political or civil liberty. In general, it appears that economic freedom has a more immediate effect on, and responds more readily to, changes in the institutional and economic environment than do other types of freedom. It is also noteworthy that changes in economic freedom explain considerably more of the variation in subsequent levels of political and civil liberties, judging by the regression R^2s, than initial political or civil liberties explain subsequent levels of economic freedom. Taken together, these results imply that promoting *economic* freedom is the most effective policy for improving living standards and fostering other types of freedom in countries around the world.

These results do not imply that political and civil liberties are not important in the analysis of institutions and growth. Although the evidence is mixed, the results of the analysis in section III suggest that political and civil liberties may affect growth by stimulating investment. However, Friedman has suggested that, as a society becomes wealthier, economic freedom may be reduced due to higher taxes and regulation. If economic performance declines over time as economic freedom is reduced, economic freedom will be significant in explaining growth rates. To the extent that this occurs as political and civil liberties are still expanding, however, these liberties will be insignificant in cross-country growth regressions.[20] Preliminary evidence supports this explanation, as the correlation coefficients between changes in economic freedom and changes in the liberty variables are insignificantly different from zero (see Table VII in the appendix for details). A negative correlation would be observed if economic freedom and political and civil liberties were expanding or contracting at the same time across countries, and a positive correlation would result if these freedoms were moving in opposite directions.[21] The zero correlation indicates no systematic relationship between changes in different types of freedom across countries during this time period.

V. CONCLUSION

This paper outlines two alternative channels through which institutions affect long-run economic performance in the context of the neoclassical growth model. In one channel, institutions affect growth indirectly by stimulating investment. In the other, institutions have a direct effect on total factor productivity. These two channels imply different empirical specifications and, thus, the opportunity to distinguish between alternative explanations of how institutions affect growth.

The empirical results indicate that economic freedom has a significantly positive impact on growth in a large sample of countries over the years 1975–1990, even after controlling for other often-cited correlates of growth. This finding is robust to the use of specifications which ensure that the observed relationship is not the result of reverse causation, and the findings are similar in both pure cross-sec-

20. Thanks, again, to an anonymous referee for pointing out this possibility.

21. Recall, once again, that a *negative* correlation implies changes in the *same* direction due to the inverted scale used in the Gastil indexes; i.e., 1 ≡ most freedom and 7 ≡ least freedom.

APPENDIX

TABLE VI
Cross-Country Summary Statistics for Institutional Measures[a]

Variable	Mean	Std. Deviation	Minimum	Maximum
Economic Freedom[b]				
Average, 1975–1990	4.47	1.29	1.78	7.48
Initial (1975) level	4.19	1.28	1.20	7.30
Change, 1975–1990	0.67	1.11	–4.50	3.30
Political Freedom[c]				
Average, 1975–1988	3.59	2.01	1.00	7.00
Initial (1975) level	3.93	2.22	1.00	7.00
Change, 1975–1988[d]	–0.71	1.46	–5.00	3.00
Civil Freedom[c]				
Average, 1975–1988	3.64	1.82	1.00	7.00
Initial (1975) level	3.67	1.87	1.00	7.00
Change, 1975–1988[d]	–0.25	1.18	–3.00	2.00

Notes:
[a]Statistics are computed over the 85-country sample used in section III of the text.
[b]Summary index *IE* taken from GLB, defined on the interval [1,10] where 10 ≡ "most free."
[c]Taken from Gastil, defined on the interval [1,7] were 7 ≡ "no freedom."
[d]Due to the reverse scale, a *negative* change implies *more* freedom.

tion and panel data analyses. The evidence suggests that economic freedom works through both a direct effect on total factor productivity and an indirect effect on investment. Political and civil liberties are not statistically significant in the growth regressions after controlling for other factors, but there is mixed evidence that these types of freedom may affect investment.

The evidence also suggests that economic freedom and civil liberties influence growth through an effect on human capital investment. This finding has important implications for growth models where human capital accumulation is an important part of the development process. Finally, new data on economic freedom allow the first-ever tests of Friedman's hypothesized relationship between political and economic freedom. The evidence supports Friedman's conjecture that a change in one type of freedom initiates change in the other, even after controlling for the effects of economic performance on institutional change. The dynamics of this relationship suggest promoting *economic* freedom as a policy for facilitating growth and other aspects of freedom in the world.

APPENDIX continued

TABLE VII
Cross-Country Correlation Matrix for Institutional Measures[a]

Freedom[b,c]	Average Economic	Initial Economic	Change in Economic	Average Political	Initial Political	Change in Political	Average Civil	Initial Civil	Change in Civil
Average Economic	1.0000								
Initial Economic	0.8382***	1.0000							
Change in Economic	0.2623**	–0.1449	1.0000						
Average Political	–0.3881***	–0.2688**	–0.3657***	1.0000					
Initial Political	–0.3389**	–0.2591**	–0.3439**	0.9006***	1.0000				
Change in Political	0.0577	0.1149	0.0595	–0.1581	–0.4776***	1.0000			
Average Civil	–0.3909***	–0.2408**	–0.3886***	0.9638***	0.8372***	–0.0684	1.0000		
Initial Civil	–0.4169***	–0.2725**	–0.4020***	0.9089***	0.8880***	–0.2924**	0.9149***	1.0000	
Change in Civil	0.0666	–0.0309	–0.0309	0.0181	–0.1258	0.4904***	0.0926	–0.2407**	1.0000

Notes:

[a]Table entries are Spearman rank correlations. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

[b]See notes to Table VI for sources and years included in the sample.

[c]A *negative* coefficient between political or civil freedom variables and economic freedom variables implies a *positive* correlation between the two types of freedom due to the inverse scale used in the Gastil indexes.

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