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Causality in the freedom–growth relationship

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Abstract

This paper addresses the issue of causality in the relationship between various types of institutions—namely, political and economic freedom—and long-run economic growth. It is shown that existing empirical studies of these relationships provide evidence of correlation, but not causation. Granger causality tests of freedom vs. growth, and freedom vs. investment are conducted using aggregate measures of freedom as well as underlying components of freedom when available. The results suggest which aspects of freedom are most important in fostering growth in a causal sense. The paper closes with a causal analysis of changes in the different types of freedom themselves.

JEL classification: D78; O17; O40; P51
Keywords: Institutions; Economic freedom; Growth; Granger causality

1. Introduction

A number of empirical studies have consistently shown a positive relationship between various measures of economic freedom and economic growth rates across countries. See, for example, recent papers by Dawson (1998), Ayal and Karras (1998), Gwartney et al. (1999), De Haan and Sturm (2000), and Carlsson and Lundström (2002). This empirical evidence confirms what economists have long suspected. Indeed, economic thinking as far back as Adam Smith suggests an important role for institutions in determining economic outcomes. Other types of institutions, such as political and civil liberties, have been investigated as well, but the results have been somewhat more mixed. Papers in this area include Kormendi and Meguire (1985), Barro (1991), and Barro (1996), among others.

While this body of evidence certainly adds to our understanding of the importance of institutions in the growth process, one question which remains unsettled in the institutions–

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growth literature is the question of causation. In other words, the studies mentioned above suggest a partial correlation between various measures of economic freedom and growth. That is, in cross-country growth regressions, economic freedom is significant even after accounting for other variables related to growth. But is this correlation present because freedom causes growth, because growth causes more freedom, or because the two are jointly determined by some third factor? For example, if freedom is a normal good, economic development, which raises living standards in a country, may induce a higher level of freedom to be granted by the government. In this case, causation runs from growth to freedom, but cross-country growth regressions of the type found in the existing literature will only detect the correlation that exists between the two measures, saying nothing about the direction of causation.

Similarly, many studies of the determinants of growth investigate the role of investment in the growth process. That is, do institutions affect growth via an indirect effect on investment (which in turn promotes growth), or by a direct effect on total factor productivity itself? Dawson (1998), for example, provides regression evidence that both channels are at work. But again, is this correlation an indication that institutions cause investment, or the other way around? Again, the existing literature cannot settle this issue.

This paper addresses the causality issue in the institutions–growth relationship. The organization is as follows. Section 2 briefly reviews the existing empirical literature on the institutions–growth relationship and shows that the causality issue cannot be adequately addressed in these studies. Section 3 uses the Granger causality methodology to assess the causal relationship between economic freedom and its subcomponents on the one hand and the long-run economic outcomes of investment and growth on the other. Section 4 extends the Granger analysis to the relationship between various types of institutions themselves. The final section concludes.

2. Making the case for causality testing

2.1. Brief review of the institutions–growth literature

The introduction of a broad measure of economic freedom by Gwartney et al. (1996) enabled studies of the relationship between this concept of freedom and economic outcomes. Importantly, the Gwartney, Lawson, and Block (henceforth, GLB) summary measure of freedom provides data back to 1975 for a large number of countries, making studies of growth over a relatively long period of time possible. Another useful feature of the GLB freedom measure is its aggregation from several underlying components, allowing researchers to focus on the individual aspects that make up the broader concept of freedom.[1]

[1] The seven components which make up the latest version of the GLB freedom index are (1) size of government, (2) structure of the economy and use of markets, (3) monetary policy and price stability, (4) freedom to use alternative currencies, (5) legal structure and property rights, (6) freedom to trade with foreigners, and (7) freedom of exchange in capital and financial markets.

Early studies of the economic freedom–growth relationship focused solely on the summary index of freedom. Dawson (1998) and Gwartney et al. (1999), for example, provide cross-country and panel data evidence in support of the view that economic freedom is associated with more growth. The next logical step in studying the freedom–growth relationship was to test the various components of freedom, and studies by Ayal and Karras (1998) and Carlsson and Lundström (2002) carry out this analysis. Briefly, these studies find that some areas of freedom are related to growth while others are not.[2] Finally, an issue which emerged in the larger empirical growth literature, following the work of Levine and Renelt (1992), is the sensitivity of the results of cross-country growth regressions to changes in sample (which countries are included in the analysis) and specification (which explanatory variables are included in the model). De Haan and Sturm (2000) provide a sensitivity analysis of the freedom–growth relationship, and find that *changes* in the GLB freedom index are robustly related to growth while the *level* is not.

2.2. Correlation vs. causation

The standard empirical specification for estimating the effects of institutions on growth is an extension of the standard Solow (1956) growth model, as presented in Barro (1991) and Mankiw et al. (1992). Dawson (1998) provides a discussion of the extension to include institutions. While the theory is quite precise in terms of modeling the economic determinants of growth, it is much less instructive in modeling the role of institutions. For example, in testing the relationship between economic freedom and growth, it is not clear whether the initial level of freedom or change(s) in freedom, or both, should be included in the empirical specification. As a result, existing studies rely on various ad hoc specifications in their empirical analysis. We now turn to a discussion of what these various specifications can, and cannot, say regarding the relationship between institutions and growth.

The specification used by Gwartney et al. (1999) most clearly illustrates the main point of this section. They estimate equations of the following form:

$$\Delta y_{80-95} = \ldots + \alpha \mathrm{EF}_{75} + \beta \Delta \mathrm{EF}_{75-80} + \gamma \Delta \mathrm{EF}_{80-85} + \delta \Delta \mathrm{EF}_{85-90} + \varepsilon \Delta \mathrm{EF}_{90-95} \tag{1}$$

where y is the natural logarithm of real GDP per capita, EF is an index of economic freedom, and Δ denotes change. Note that this equation can be rewritten as:

$$\Delta y_{80-95} = \ldots + (\alpha - \beta)\mathrm{EF}_{75} + (\beta - \gamma)\mathrm{EF}_{80} + (\gamma - \delta)\mathrm{EF}_{85} + (\delta - \varepsilon)\mathrm{EF}_{90} + \varepsilon \mathrm{EF}_{95} \tag{2}$$

This specification tests whether values within a certain period of time of a particular variable affect another variable during part of that time period. To be more exact, economic freedom in 1975, 1980, 1985, 1990, and 1995 is regressed on the growth rate

[2] We will discuss these findings in more detail in the analysis of the next section.

over the period 1980–1995. Such a specification may be useful for establishing correlation between two variables, but it is unclear how any conclusions regarding causality can be drawn from such a regression. For example, due to the oil crises of the mid- and late-1970s, growth may have been particularly low during the late 1970s and early 1980s. If governments subsequently restrict economic freedom, this effect may show up in β or γ but not in any of the other coefficients. Alternatively, countries with a high level of freedom in the late 1970s may have been in a better position to cope with the second oil price shock. Again, this would probably show up in β. Thus, we cannot use γ or β or any of the other 'intermediate' coefficients to investigate causality issues.[3] The only coefficients which might suggest a causal relationship are α, or $(\alpha - \beta)$, as they show how the initial or a leading level of economic freedom affects subsequent growth.

The same argument applies to the specifications used by other authors as well. Dawson (1998), for example, estimates:

$$\Delta y_{75-00} = \ldots + \alpha \mathrm{EF}_{75} + \beta \Delta \mathrm{EF}_{75-00} \tag{3}$$

which can be written as:

$$\Delta y_{75-00} = \ldots + (\alpha - \beta)\mathrm{EF}_{75} + \beta \mathrm{EF}_{00} \tag{4}$$

Although there are fewer intermediate coefficients to contend with, the distinction between correlation and causation remains difficult to establish by applying this specification in a systematic way. That is, only with a case by case analysis of the timing of different events could the researcher make an argument regarding causality using such a specification. Similar arguments apply to the specifications used by Ayal and Karras (1998) and Carlsson and Lundström (2002). They use the *average* level of economic freedom over a particular period to explain growth over the same period. These averages, of course, are based on the same intermediate values of freedom as the specifications discussed above, which again makes it difficult to separate correlation and causation. The use of averages, in fact, arguably makes it more difficult to draw conclusions regarding causation, since all the intermediate effects are summarized into a single explanatory variable. Thus, it becomes impossible to attend to the timing of different events and their effect on growth.

2.3. The Granger causality methodology

The foregoing discussion makes clear that little can be said regarding causality when intermediate values of a particular variable (economic freedom) are regressed on another variable (growth) during the intervening period. Studies based on this methodology clearly establish correlation between freedom and growth, but not causation.

[3] I am grateful to an anonymous referee for suggesting this line of reasoning.

Indeed, a common problem in economics is determining whether changes in one variable *cause* changes in another. Clearly, the studies discussed above suggest a relationship between economic freedom and growth, but does freedom cause growth, does growth cause freedom, or are the two endogenously determined? One approach to answering this type of question is the test for causality introduced by Granger (1969) and Sims (1972). The basic idea of 'Granger' causality is to test whether lagged values of a particular variable significantly affect the contemporaneous value of another variable. More specifically, if X causes Y, then X should precede Y such that when Y is regressed on past values of Y, the addition of past values of X should contribute significantly to the explanatory power of the regression. Furthermore, Y should not help to predict X.

To test these implications, we proceed by estimating the following equation:

$$Y_t = \alpha_o + \sum_{i=1}^{q} \alpha_i Y_{t-i} + \sum_{i=1}^{q} \beta_i X_{t-i} + \varepsilon_i \tag{5}$$

and testing whether the group of coefficients $\beta_1, \beta_2, \ldots, \beta_q$ are significantly different from 0. If they are, then we can reject the hypothesis that "X does not cause Y". Then, we can test the hypothesis "Y does not cause X" by running the same regression as above, but switching X and Y and testing whether lagged values of Y are significantly different from 0. To conclude that X causes Y, we must reject the hypothesis "X does not cause Y" and not reject the hypothesis "Y does not cause X". If both hypotheses are rejected, we conclude that X and Y are both endogenously determined. Note that the lag length q in these regressions is arbitrary. In the analysis below, different values of q are tested to assess the sensitivity of the results to the choice of q. Also, it is possible that some third variable (or set of variables) Z might in fact be causing Y, but might also be contemporaneously correlated with X. One way to deal with this possibility is to include Z in the regressions. It is particularly important to consider such 'conditioning' variables in our tests of freedom and growth given the documented sensitivity of cross-country growth regressions to different specifications.[4]

We should note at the outset that the concept of 'Granger causality' is not equivalent to the notion of causation in the traditional sense of the word. Indeed, no econometric test can prove causation. Granger causality may best be thought of as a test of 'firstness' rather than causation, so that if X Granger causes Y then we have evidence that X precedes Y. However, evidence in favor of Granger causality is certainly supportive of the notion that X causes Y in the traditional sense. In the discussion that follows, the use of the word 'cause' is understood to imply 'Granger' causality rather than some stronger sense of the word.[5]

Two previous studies have looked at the causal relationship between economic freedom and variables of economic interest. Farr et al. (1998) use the Granger

[4] Again, we refer the reader to Levine and Renelt (1992) and De Haan and Sturm (2000) for a discussion of this sensitivity.

[5] For a critical examination of Granger–Sims causality tests, see Jacobi et al. (1979) and Feige and Pearce (1979). Also, for a more general and recent discussion of causality, see Granger (1988) and Zellner (1988).

methodology to test the relationship between economic freedom and living standards, as measured by the *level* of GDP, across countries. Their findings suggest the two are jointly related. A problem with using GDP *levels* is that regressions cannot distinguish economies that are growing from those that are not. Unfortunately, Farr et al. do not look at the relationship between freedom and *growth rates*, nor do they test the individual components of freedom. Heckelman (2000) investigates the causal relationship between freedom and growth, including the individual attributes of freedom, using a measure of economic freedom developed by the Heritage Foundation.[6] His results suggest the average level of freedom as well as many of the underlying components of freedom precedes growth. Due to the short time span of the Heritage data, however, the analysis focuses only on the *short-run* relationship between freedom and growth. Neither of these studies considers the possibility that other (conditioning) variables may be important in the freedom–growth relationship. In the remaining sections, we apply the Granger methodology to test the relationship between various measures of institutions, including political and civil liberties as well as economic freedom and its underlying components, and the economic outcomes of growth and investment over the long run.

3. Causality in the economic freedom–growth relationship

3.1. Data and empirics

This section reports the results of Granger causality tests of economic growth rates vs. the Gwartney and Lawson (2001) economic freedom ratings and the seven underlying areas of freedom. Regression equations are estimated over data from 1970 to 2000 for all countries and time periods for which data are available. The tests are run using lag lengths of $q=1$, 2, and 3, which should be sufficient since the data are measured in 5-year increments (e.g., $q=3$ is equivalent to a 15-year lag).[7] Economic growth is defined as the (5-year) growth rate of real GDP per capita. Some specifications include measures of initial income and the investment–GDP ratio for each 5-year period as conditioning variables.[8] All data are taken from the World Bank's *World Development Indicators* database. In the interest of conserving space and not overwhelming the reader with statistical results, we only report summary results of the causality tests in the tables that follow. Detailed results are available from the author upon request.

[6] For information on this measure of economic freedom, see Johnson et al. (1998).

[7] The use of data reported at 5-year intervals is necessitated by the Gwartney and Lawson freedom index, which is reported at 5-year intervals, but is also desirable as it prevents the results from being influenced by business cycle (short-run) fluctuations that would be present in annual data.

[8] The choice of initial income and the investment share in GDP as conditioning variables follows from Levine and Renelt (1992) who found these variables to be robust in their sensitivity analysis of cross-country growth regressions.

Table 1
Granger causality tests of economic freedom vs. growth, 1970–2000

Freedom measure	Null hypothesis			
	$EF \nrightarrow \Delta y$	$EF \nrightarrow \Delta y \mid y_0, I$	$\Delta EF \nrightarrow \Delta y$	$\Delta EF \nrightarrow \Delta y \mid y_0, I$
Summary index	→	H_1: →	↔	↔
Size of government	←	H_4: ←	←	←
Use of markets	→	H_2: →	↔	↔
Money/prices	↔	↔	↔	↔
Alternative Currencies	→	←	→	←
Property rights	→	H_3: →		
International trade				
International finance	→	↔	←	←

Null hypothesis	Detailed results for selected specifications					
	Freedom measure	Direction of causation	N	q	Adj. R^2	Long-run effect
H_1: $EF \nrightarrow \Delta y \mid y_0, I$	summary index	→	262	3	0.319	0.0070 (0.2847)
H_2: $EF \nrightarrow \Delta y \mid y_0, I$	use of markets	→	198	3	0.239	0.0032 (0.2779)
H_3: $EF \nrightarrow \Delta y \mid y_0, I$	property rights	→	220	3	0.256	0.0079 (0.1260)
H_4: $EF \nrightarrow \Delta y \mid y_0, I$	size of Government	←	291	3	0.267	0.0052 (0.4691)

Freedom measures (EF) are taken from Gwartney and Lawson's (2001) index of economic freedom and the seven underlying areas of freedom used to construct the Index; see footnote 1 for details. y denotes the natural logarithm of real per capita GDP, I denotes the investment–GDP ratio, and Δ denotes 'change'. Arrows indicate the implied direction of causation from Granger causality tests; see the text for details. Long-run effect is measured as the sum of the estimated coefficients on lagged independent variables; numbers in parentheses are p-values for an F-test of the null hypothesis that the long-run effect is 0.

The top panel of Table 1 presents the conclusions from Granger causality tests of the freedom–growth relationship. The row 1, column 1 cell of the table presents test results for the null hypothesis "EF does not cause growth" (henceforth, denoted $EF \nrightarrow \Delta y$). Note that testing this hypothesis requires estimating the equation

$$\Delta y_t = \alpha_o + \sum_{i=1}^{q} \alpha_i \Delta y_{t-i} + \sum_{i=1}^{q} \beta_i EF_{t-i} + \varepsilon_t \tag{6}$$

for $q = 1, 2$ and 3, and testing the joint significance of the β_i.[9] Then, the reciprocal regression

$$EF_t = \gamma_o + \sum_{i=1}^{q} \gamma_i EF_{t-i} + \sum_{i=1}^{q} \delta_i \Delta y_{t-i} + \zeta_t \tag{7}$$

must be estimated for $q = 1, 2$, and 3, and the corresponding test for the significance of the δ_i performed. A finding that the β_i are significantly different from 0 *and* the δ_i are not

[9] With lagged dependent variables in the Granger causality regressions, the standard F-test for the joint significance of the β_i is only valid asymptotically. Thus, we use an asymptotically equivalent χ^2 test as described by Hamilton (1994, p. 305). A variety of alternative approaches have been suggested to deal with this and other econometric issues related to Granger causality tests—including the use of panel data. However, Monte Carlo simulations in a survey by Geweke et al. (1983) suggest that estimation of the standard Granger regression along with the aforementioned χ^2 test may well be the best approach.

significantly different from 0 is interpreted as a rejection of the null hypothesis EF $\nrightarrow \Delta y$. In other words, we have evidence that "EF causes growth" (denoted EF $\rightarrow \Delta y$), which is indicated in the row 1, column 1 cell of the table by the symbol ' $\rightarrow$ '. Thus, each entry in the table is based on the results from two regression equations, each estimated for $q = 1, 2$, and 3 (six equations estimated altogether), and the corresponding tests for significance of the relevant coefficients.

The following conventions are used in interpreting the results of the causality tests and constructing the table: (1) a 10% confidence level is used in carrying out significance tests of the β_i and δ_i coefficients; and (2) cases where a rejection of the null hypothesis occurs for only one of the three lag lengths ($q = 1, 2, 3$) are ignored, as such cases indicate substantial sensitivity to the chosen specification. In other words, a report of ' $\rightarrow$ ' in the table requires rejecting the hypothesis EF $\nrightarrow \Delta y$ at the 10% level in at least two of the three lag lengths considered *and* not rejecting the hypothesis $\Delta y \nrightarrow$ EF at the 10% level in at least two of the lag lengths. Failing to reject the hypothesis EF $\nrightarrow \Delta y$ and rejecting $\Delta y \nrightarrow$ EF indicate that causality runs in the opposite direction, and is reported as ' $\leftarrow$ ' in the table. If both hypotheses are rejected, the conclusion is that EF and Δy are jointly determined by some third factor; this result is indicated by '$\leftrightarrow$' in the table. No entry in the table indicates that neither hypothesis is rejected, and is interpreted as no evidence of Granger causality in either direction.

The top panel of the table is organized as follows. Row 1 uses Gwartney and Lawson's (2001) summary index of economic freedom. Rows 2 through 8 use the seven underlying components of the index individually as the measure of freedom. Columns 1 and 2 of the table use the *level* of freedom, with conditioning variables for initial income (y_0) and the investment–GDP ratio (I) included in the second column. The last two columns use the *change* in freedom, with conditioning variables I and y_0 included in column 4. The bottom panel of the table provides additional details on selected specifications of interest in our discussion of the results. We now turn to a discussion of the results themselves.

3.2. Evidence on the freedom–growth relationship

The first two columns in the top panel of Table 1 report on the *level* of economic freedom. The results are consistent for a number of the measures in both the bivariate (column 1) and multivariate (column 2) tests for causality. First, the evidence confirms that the overall level of economic freedom, as measured by Gwartney and Lawson's index of economic freedom, Granger causes growth. This finding strengthens the results in the literature showing freedom to be *correlated* with growth by suggesting that freedom actually *causes* growth. Secondly, levels of several of the underlying components of freedom are found to be causally related to growth, but the direction of causation varies across components. Components measuring 'use of markets' and 'property rights' are found to *cause* growth, while 'size of government' is found to be *caused by* growth. Carlsson and Lundström (2002) found these areas of freedom to be *correlated* with growth, but their analysis could not discern the direction of causation. These results suggest policies promoting use of markets and property rights are more likely to foster growth than other aspects of freedom. Alternatively, larger government is itself a result of growth.

The data provide no evidence of Granger causality in either direction between growth and the area of freedom related to 'international trade'. This result contradicts other results in the literature, such as those in Carlsson and Lundström (2002) and Ayal and Karras (1998), in that their findings of correlation do not translate into causation. Freedom related to 'money and price stability' is found to be endogenously determined with growth. Finally, results for areas of freedom related to 'use of alternative currencies' and 'international finance' are sensitive to the specifications considered in columns 1 and 2, thus, making it difficult to assess the direction of causation.

We now turn to the results reported in columns 3 and 4 of Table 1, which relate *changes* in economic freedom to growth rates across countries. Column 3 reports on bivariate Granger causality tests, and column 4 includes initial income and investment ratios as conditioning variables. Results for the overall index of economic freedom (reported in row 1) suggest an endogenous relationship between changes in freedom and growth. This finding builds on results elsewhere in the literature, in particular, the results of De Haan and Sturm (2000) who find that changes in freedom are robustly related to growth. Our results indicate, however, that this relationship is complex and not unilateral.

When *changes* in the underlying areas of freedom are related to growth, none are found to cause growth. The results suggest that causation runs from growth to freedom relating to 'size of government' and 'international finance', rather than the other way around. For size of government, this finding is consistent with those reported in columns 1 and 2 using the level of this area of freedom. In relating 'money and price stability' as an area of freedom to growth, the results consistently suggest that the two are endogenous, that is, they are jointly determined by some other factor. This result, too, is consistent with that in columns 1 and 2. 'Use of markets' also is found to be jointly determined with growth, in contrast to the previous results using the level of this area of freedom. No causal relationship is found for 'property rights' and 'international trade' when changes in these areas of freedom are related to growth. The results for 'use of alternative currencies' are not robust across specifications.

In the foregoing discussion, we restricted attention to the issue of causation in the freedom–growth relationship. That is, in the Granger causality tests, we only looked at which coefficients were significant and reported the implied direction of causation. However, it is also possible to test whether the sum of all relevant coefficients, which can be interpreted as the *long-run effect*, is positive or negative (or insignificant).[10] And, such tests provide information on the relative sizes of these long-run effects (if they are indeed significant). The bottom panel of Table 1 reports the long-run effects, along with some additional details, for selected specifications from our previous analysis. The cells in the top panel of the table with an H_i label are the specifications for which additional details are provided in the bottom panel. For the purpose of discussing long-run effects, we restrict attention to specifications with the longest possible lag length (i.e., $q = 3$) and

[10] More specifically, in the Granger causality test of X vs. Y, we regress Y on past values of Y, past values of X, and perhaps a conditioning variable Z. Subsequently, the reciprocal regression is run by switching the variables X and Y in the original regression. If it is found that X causes Y (denoted $X \rightarrow Y$), then the *long-run effect* of X on Y is measured as the sum of the coefficients on the lagged values of X in the first regression.

specifications which include conditioning variables, as these would be the most extensive models estimated.

In row 1 of the bottom panel of Table 1, details on the result $EF \rightarrow \Delta y \mid y_0, I$ are provided. The estimated long-run effect of the overall freedom index on growth, after accounting for other factors related to growth, is found to be positive but insignificantly different from 0. In other words, even though the temporal behavior of freedom and growth suggests a causal relationship between the two (with causation running from freedom to growth, as reported in the top panel of the table), the accumulated effect over time is found to be insignificant. Similar results are reported in rows 2 and 3 for the two underlying areas of freedom—use of markets and property rights—which were found to cause growth in the analysis above. In the last row of the table, we look at the result from above, which suggests that growth causes freedom as measured by size of government. Once again, the estimated long-run effect is insignificantly different from 0.

The preceding discussion of long-run effects certainly begs the question of how these results can be reconciled with previous results in the literature which suggest these institutions are important in the growth process. Note that our discussion of long-run effects concentrates only on specifications that use the *level* of freedom. De Haan and Sturm (2000) found the level of freedom to be fragile in explaining cross-country growth, but found the *change* in freedom to be robust. Our results indeed confirm these findings, in that changes in freedom are found to be causally related to growth. However, the causal relationship between freedom and growth is found to be complex, with the two often being jointly determined. Our analysis of long-run effects did not look at the relation between changes in freedom and growth, as estimating such effects would be difficult and misleading given the complexity of the implied relationship. Taken together, the results of Table 1 provide a richer understanding of the economic freedom–growth relationship. While freedom and many of its underlying components have been found to be *correlated* with growth in the literature, our evidence regarding *causality* is in fact quite varied, with some areas of freedom causing growth, other areas of freedom a result of growth, and still other areas of freedom jointly determined with growth. The results also indicate that it is important to distinguish between the *level* of freedom and *changes* in freedom, and that the size of long-run effects may warrant further study.

We note in closing this part of the analysis that failing to find freedom *causing* growth for many of the measures of freedom considered here should not be a disappointment to proponents of freedom. Indeed, the role of freedom, in general, and reliance on free markets and property rights, in particular, has been emphasized by the foregoing results. This analysis provides more precise guidance to policymakers in terms of the specific areas of freedom, which promote growth, and provides understanding to researchers interested in the nature and causes of economic freedom itself. Ultimately, it is the *concept* of freedom and its relation to economic outcomes that is of interest, while our empirical evidence, and often our perceptions, are constrained by the available *measures* of freedom. It is important not to allow our emphasis on the particular variables used to measure freedom by, say, the Gwartney and Lawson index, to suggest too important a role for these specific components of freedom. While the selection of the underlying component variables used in measuring freedom is clearly driven by the desire to capture various aspects of the concept of freedom, the choice of specific components may be limited by issues as mundane as data availability.

In the end, the evidence presented here is certainly consistent with the notion that economic freedom plays an important role in the growth process.

3.3. Evidence on the freedom–investment relationship

We now turn our attention to the causal relationship between economic freedom and investment across countries. The analysis is similar to that above, except that our focus is on the investment–GDP ratio as an economic outcome. The top panel of Table 2 presents the results. The first two columns relate the *level*s of freedom to investment. The multivariate Granger causality tests in column 2 use exports of goods and services as a percentage of GDP (Ex) as a conditioning variable. This follows from results in Levine and Renelt (1992) that show this variable to be robust in estimating cross-country investment equations. In row 1, the overall level of economic freedom, as measured by the Gwartney and Lawson index of economic freedom, is found to *cause* investment in both the bivariate (column 1) and multivariate (column 2) causality tests. Among the individual areas of freedom, results in rows 2 through 8 suggest that only freedom in the areas of 'size of government', 'international trade', and 'international finance' are robustly related to investment. Causation runs from freedom in the area of

Table 2
Granger causality tests of economic freedom vs. investment, 1970–2000

Freedom measure	Null hypothesis			
	$EF \nrightarrow I$	$EF \nrightarrow I \mid Ex$	$\Delta EF \nrightarrow I$	$\Delta EF \nrightarrow I \mid Ex$
Summary index	→	H_5: →	→	H_7: →
Size of government	←	←	→	←
Use of markets				
Money/prices			←	←
Alternative currencies				
Property rights	←			
International trade	←	←		
International finance	→	H_6: →	→	H_8: →

Null hypothesis	Detailed results for selected specifications					
	Freedom measure	Direction of causation	N	q	Adj. R^2	Long-run effect
H_5: $EF \nrightarrow I \mid Ex$	summary index	→	307	3	0.605	−0.0042 (0.6357)
H_6: $EF \nrightarrow I \mid Ex$	international finance	→	279	3	0.594	−0.0004 (0.9386)
H_7: $\Delta EF \nrightarrow I \mid Ex$	summary index	→	258	3	0.626	0.0848 (0.0004)
H_8: $\Delta EF I \mid Ex$	international finance	→	224	3	0.622	0.0551 (0.0089)

Freedom measures (EF) are taken from Gwartney and Lawson's (2001) index of economic freedom and the seven underlying areas of freedom used to construct the Index; see footnote 1 for details. *I* denotes the investment–GDP ratio, Ex is exports as a percentage of GDP, and Δ denotes 'change'. Arrows indicate the implied direction of causation from Granger causality tests; see the text for details. Long-run effect is measured as the sum of the estimated coefficients on lagged independent variables; numbers in parentheses are *p*-values for an *F*-test of the null hypothesis that the long-run effect is 0.

'international finance' to growth, but areas of freedom related to 'size of government' and 'international trade' appear to be a result of investment. No robust evidence regarding the direction of causation is provided for the other areas of freedom. Thus, it appears that policies encouraging international capital flows may be most important in terms of promoting investment.

Results relating *changes* in freedom to investment are presented in columns 3 and 4 of the top panel of Table 2. Results in row 1 confirm the importance of the overall level of freedom in promoting investment. That is, the evidence suggests that changes in the broad measure of economic freedom cause investment. Results concerning the importance of freedom in 'international finance' also hold up here, with robust results suggesting that changes in this area of freedom cause investment. Freedom in terms of 'size of government' and 'money and prices' appears to be a result of investment, rather than a cause of it. No evidence of a causal relationship is found for areas relating to 'use of markets', 'use of alternative currencies', 'property rights', and 'international trade'.

In the bottom panel of Table 2, we provide additional details on specifications which suggest causation running from some measure of freedom to investment. In the first row of the bottom panel, the level of the overall freedom index is found to have a statistically insignificant long-run effect on investment. Similar results are found for the level of freedom in the area of international finance. As for *changes* in these measures of freedom, however, the results are different. Changes in the summary index of freedom are found to have a significantly positive effect on investment. That is, more freedom causes more investment. In terms of magnitude, the results suggest that a 1-unit increase in the freedom index causes an 8.5-percentage-point increase in the investment–GDP ratio over a 15-year period. Results for the long-run effect of changes in the 'international finance' aspect of freedom are similarly positive and statistically significant, except that the size of the long-run effect is smaller. A 1-unit increase in this subcomponent of the freedom index causes a 5.5-percentage-point increase in the investment–GDP ratio over a 15-year period.

In comparing the results for investment in Table 2 to those for growth in Table 1, the importance of the overall level of freedom is confirmed, with causation running from freedom to each of these economic outcomes. In addition, *changes* in freedom cause investment, and the estimated long-term effects are positive and significant. It does appear, however, that fewer of the individual areas of freedom are causally related to investment than was the case for growth. In sum, the results confirm an important role for freedom and several of its underlying components in determining the long-run outcomes of investment and growth across countries.

Before closing this section, we note that empirical studies of growth have also considered the role of political freedom and other aspects of individual freedom.[11] It is interesting, therefore, to use the Granger methodology to assess causality in the relationship between political and individual freedoms and growth and investment. The results of this analysis are not reported, but the evidence suggests political and civil freedom affect growth directly, as opposed to working through the investment channel. Additional details are available from the author upon request.

[11] See, for example, the studies cited in the opening paragraph of the paper.

4. Causality and institutional change

As economists become more interested in the role of institutions in the growth process, the interaction between various types of institutions themselves becomes a topic of interest. In particular, do changes in one type of institution lead to changes in another? Economists generally rely on theory to help predict causal relationships among variables. But, in the case of institutions, no theory currently exists to provide sufficient explanations of the possible connections, if any, between political, civil, and economic institutions. Economists have, however, acknowledged the possibility of relationships between various types of institutions.

Friedman (1982, pp. 9–12) conjectures that economic and political freedom are fundamentally related. Friedman initially states that "[h]istory suggests only that capitalism is a necessary condition for political freedom" and "[c]learly it is not a sufficient condition". He goes on to explain, however, that "[i]n the early nineteenth century, Bentham and the Philosophical Radicals were inclined to regard political freedom as a means to economic freedom", concluding that the "relation between political and economic freedom is complex and by no means unilateral". In the end, then, it is difficult to discern any direction of causation from his discussion, and perhaps this is intentional. Nevertheless, the discussion raises an interesting question regarding causation, which can be addressed using the Granger methodology.

In Dawson (1998), I used standard regression analysis to investigate the relationship among measures of political, civil, and economic freedom across countries. The evidence supports Friedman's conjectures that the various types of freedom are related, but regression analysis cannot identify the direction of causation in the relationship. In this section, we use the Granger methodology to investigate the causal connection between political, civil, and economic freedom. In addition to using the summary economic freedom rating developed by Gwartney and Lawson (2001), we also employ the seven areas of freedom underlying their index to determine if specific aspects of economic freedom are causally linked to other institutions. The measure of political and civil liberties comes from Gastil's indexes of political and civil liberties. Since these indexes are very highly correlated, we use the sum of the two indexes as a broad measure of political and other aspects of individual freedom in our analysis. Although Gastil's indexes are available annually since 1972, we continue the use of 5-year periods to maintain comparability with the previous results and eliminate potential business cycle effects. The beginning level of the Gastil political measure is used for each 5-year period.

The results of the bivariate and multivariate Granger causality tests of political/civil institutions vs. economic freedom are reported in the top panel of Table 3. Multivariate tests include lagged growth rates and investment–GDP ratios as conditioning variables. Conditioning on these variables seems appropriate given the evidence presented above suggesting causal relationships between economic freedom, growth, and investment. Following the setup in previous tables, the first two columns relate *levels* of economic freedom to *levels* of political/civil freedom. Results in these two columns suggest that levels of economic freedom, both the broad measure and the underlying component measures, are caused by levels of political/civil freedom, with the exception of the international trade and finance areas of economic freedom, where the evidence suggests an

Table 3
Granger causality tests of economic freedom vs. political/civil freedom, 1970–2000

Economic freedom measure	Null hypothesis			
	EF ↛ PF	EF ↛ PF | $\Delta y,I$	ΔEF ↛ PF	ΔEF ↛ PF | $\Delta y,I$
Summary index	↔	H_{12}: ←	→	
Size of government	←	H_{13}: ←	←	↔
Use of markets	←	H_{14}: ←		
Money/prices	←	H_{15}: ←	←	←
Alternative currencies	←	H_{16}: ←	↔	←
Property rights	←	H_{17}: ←		
International trade	↔	↔		
International finance	↔	↔	→	

Null hypothesis	Detailed results for selected specifications					
	Freedom measure	Direction of causation	N	q	Adj. R^2	Long-run effect
H_{12}: EF ↛ PF | $\Delta y,I$	summary index	←	248	3	0.787	−0.0517 (0.0009)
H_{13}: EF ↛ PF | $\Delta y,I$	size of government	←	278	3	0.802	0.0737 (<0.0001)
H_{14}: EF ↛ PF | $\Delta y,I$	use of markets	←	187	3	0.699	−0.0390 (0.0797)
H_{15}: EF ↛ PF | $\Delta y,I$	money/prices	←	278	3	0.672	−0.0748 (0.0038)
H_{16}: EF ↛ PF | $\Delta y,I$	alternative currencies	←	280	3	0.576	−0.1651 (<0.0001)
H_{17}: EF ↛ PF | $\Delta y,I$	property rights	←	212	3	0.487	−0.1303 (0.0090)

Freedom measures (EF) are taken from Gwartney and Lawson's (2001) index of economic freedom and the seven underlying areas of freedom used to construct the Index; see footnote 1 for details. Political/civil freedom (PF) is the sum of Gastil's indexes of political and civil liberties. y denotes the natural logarithm of real GDP per capita, I is the investment–GDP ratio, and Δ denotes 'change'. Arrows indicate the implied direction of causation from Granger causality tests; see text for details. Long-run effect is measured as the sum of estimated coefficients on lagged independent variables; numbers in parentheses are p-values for an F-test of the null hypothesis that the long-run effect is 0. Note the caveat mentioned in footnote 12.

endogenous relationship with political freedom. This result is consistent with the findings of De Haan and Sturm (2003) who find that increases in economic freedom are caused by the level of political freedom in a sample of developing countries. When *changes* in economic freedom are related to levels of political/civil freedom, the results reported in columns 3 and 4 suggest less evidence of a causal relationship between the various types of freedom.

The bottom panel of Table 3 provides estimates of the long-term effect of the level of political/civil freedom on the level of economic freedom for cases where the former is found to cause the later. All reported estimates of the long-run effects are statistically significant and indicate that more political/civil freedom causes more economic freedom across all measures except 'size of government', where more political/civil freedom is associated with larger government (less economic freedom).[12] A 1-unit increase in political/civil liberties, as measured on the Gastil index, is estimated to cause a 0.05

[12] A *negative* sign reported on the long-run effect in Table 3 implies a *positive* effect of political/civil freedom on economic freedom since Gastil's indexes are set up so that a *smaller* value indicates *more* freedom.

increase in the summary index of economic freedom. Among the underlying areas of economic freedom, political/civil liberties are estimated to have the largest impact on freedom in the area of 'use of alternative currencies' and the smallest impact on 'use of markets'.

Taken together, these results suggest that various types of institutions evolve together, with causation running primarily from political and individual liberties to economic freedom. This finding supports the views of Friedman and others who have hypothesized that various aspects of the institutional framework are intimately related. Once again, our results show more than a mere correlation among the various aspects of freedom, they provide new details on the process by which institutional change occurs.

5. Conclusion

This paper shows that existing studies of the empirical relationship between economic freedom and growth are unable to address the issue of causality. That is, existing studies establish *correlation* between various measures of freedom and growth, but not *causation*. We then use Granger causality tests to address the issue of causality in the relationship between various measures of institutions and growth across countries. The results suggest that the overall *level* of economic freedom appears to cause growth, while *changes* in freedom are jointly determined with growth. Among the underlying areas of economic freedom, *levels* of freedom relating to use of markets and property rights appear to be driving the causal relationship between economic freedom and growth. These results emphasize the importance of economic freedom, in general, and the role of free markets and property rights, in particular, in fostering long-run economic prosperity.

Our results also show both *levels* and *changes* in freedom, as measured by the size of government, to be *a result of* growth, rather that a cause of it. *Changes* in areas of freedom related to international finance also appear to be a *result* of growth. Finally, the evidence largely supports the conclusion that freedom as related to money and price stability, in both *levels* and *changes*, is jointly determined with growth.

When the Granger analysis is extended to the relationship between economic freedom and investment, we find evidence that both the level and changes in the broad measure of freedom cause investment. Among the individual areas of freedom, there is less evidence of a causal relationship with investment, with the exception of freedom in the area of international finance, which appears to cause investment. Estimates of the long-run effects of economic freedom indicate that improvements in freedom overall, and aspects of freedom relating to international finance in particular, may be most effective in increasing investment, rather than growth directly. This result emphasizes the importance of the investment channel in economic freedom's role in affecting growth. Alternatively, when a measure of political and civil liberties is employed in the analysis, it is found that these types of freedom are particularly important in affecting growth directly, as opposed to investment.

The paper closes with a causal analysis of the different types of freedom themselves. We find that the level of economic freedom overall, and most of its underlying components, are preceded (Granger-caused) by the level of political and individual

liberties. For all cases where causation runs in this direction, estimates of the long-run effects of political freedom on economic freedom are significantly different from 0. This result supports the view that various aspects of freedom are related, and provides a richer understanding of the process of institutional change by establishing the direction of causation.

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