TITLE: ECONOMIC FREEDOM AND ECONOMIC GROWTH: selection, specification and genuine effects

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ABSTRACT:

Meta-analytic techniques are applied to the available literature on the impact of economic freedom on economic growth. An overall positive direct association between economic freedom and economic growth, and a positive indirect effect on economic growth through stimulation of physical investment is established. However, it is also shown in the paper that the literature is affected by specification bias, particularly with respect to controls for capital stock and the use of panel data. This literature is tainted also with selection and publication bias. The existence of publication bias makes it difficult to isolate the genuine effect of economic freedom on economic growth.

ECONOMIC FREEDOM AND ECONOMIC GROWTH:
selection, specification and genuine effects[1]

1. Introduction

One of the foremost areas of research in the past decade has been the impact of institutions on economic performance. For example, a relatively large number of authors have explored the links between democracy and economic growth and political stability and growth (see, Przeworski and Limongi 1993 and Alesina and Perotti 1994 for reviews). A smaller group of researchers has investigated the links between economic freedom and growth. Economists agree that economic freedom, along with political freedom and civil liberties, is one of the pillars of a country's institutional structure, and following from this, institutions are amongst the more prominent factors in cross-country differences in living standards. For example, Easterly and Levine (1997) note that conventional factors, such as physical and human capital and labor supply do not completely explain growth in Africa, and they place more emphasis on institutional explanations. However, researchers are yet to understand completely the exact links from institutions to growth and welfare, and the channels through which they function. For instance, it is found that the relationship between economic freedom and growth is not robust, and components of economic freedom have distinct links to growth.[2] Therefore, we need a solid comprehension on these issues, so that valuable and relevant policies can be suggested to decision-makers. In the wake of the challenges of East European and African development, a solid approach to institutions is more than necessary.

There has been no comprehensive review and assessment of the economic freedom-growth literature.[3] Accordingly, this paper has four objectives. First, the paper offers an extensive review of all the empirical studies exploring the impact of economic freedom on economic growth. This is important, as reviews are essential for research synthesis, they facilitate inference from the available stock of knowledge, and they serve as a guide to future research. Second, the paper offers the first quantitative review of this literature. As such, the paper

[1] The authors are grateful to Randy Silvers and Tom Stanley for their valuable input to the development of this paper.

[2] See De Haan and Siermann (1998), De Haan and Sturm (2000), Sturm and De Haan (2001), and Carlsson and Lundstrom (2002).

[3] The Editorial Introduction of De Haan (2003) to the special issue of *European Journal of Political Economy* on Economic Freedom has a critical review of 12 studies on economic freedom and growth. Additionally, Hanke and Walters (1997) survey the measures of economic freedom that were available until 1997.

attempts to identify the direction and the strength of the association between economic freedom and economic growth using the results from the available published literature. A single study can never resolve theoretical debates, nor on its own can it offer conclusive empirical evidence on research questions. Hence, it is necessary to draw inferences from the available pool of studies. Third, meta-regression analysis is employed to trace the impact of data and specification differences on the estimated relationship between economic freedom and growth. Fourth, the paper explores the existence of publication bias in this literature. Publication bias is an important area of research in economics. Previous investigations of the existence of publication bias have almost unanimously found that it is a major problem (see, for example, Card and Krueger 1995 and Gerber *et al.* 2001). Publication bias results in selection bias in the available information set, and hence, distorts conclusions that can be drawn from the available literature.

The paper is set out as follows. Section 2 provides a qualitative review of the economic freedom literature, including the measurement and specification issues. Section 3 discusses the data used in our study. Section 4 presents the meta-analysis results. The core of the paper is section 5, exploring the sensitivity of published findings to specification and data differences and investigates the existence of publication bias in this literature. Section 6 concludes the paper.

2. Economic Freedom and Economic Growth

Economists have for a long time been interested in issues such as property rights, economic freedom and free markets. The empirical literature on economic freedom and growth, on the other hand, is relatively young. There had been only a few studies until the late 1990s, after which there has been an explosion of interest on the issue. For example, 24 empirical studies have been published on this topic since 2000. Essentially, it was the measure of Gwartney *et al.* (1996) that triggered interest in empirical explorations of the relationship. The conceptual arguments presented by Gwartney *et al*. and subsequent authors are based on individualistic incentives to engage in productive activities, such as safety and security in investment or property rights.[4] Nearly all of the published studies report a positive relationship between economic freedom and economic growth.

[4] In contrast, Wright (1982) takes a pluralistic view and argues that economic freedom is based on collective freedom of economic decision-making. There is, however, a pre-conceived 'political freedom' to this reasoning. Additionally, Gwartney *et al.* (1996), and thereby the literature, seem to agree on methodological individualism, which goes back to Rabushka (1991), and to authors such as Milton Friedman, John Locke and Adam Smith.

While the construction of measures is an extremely valuable effort in its own right, the theoretical arm of the literature remained relatively silent, and the "debate" overall has lacked a formal and rigorous theoretical setup. This situation arose because the empirical measures became available relatively earlier than the theoretical analyses. This is in sharp contrast to the debate on political freedom and growth whose foundations were built in the 1960s. In this case, a solid theoretical literature developed before agreement was reached on measures, involving various aspects on the pros and cons of different political regimes on economic growth. The debate was also rich due to concurrent development experiences in the post-war period, such as in East Asia, Latin America, and the development of the cross-country growth literature *per se*. However, in the case of economic freedom, essentially it was the way in which Gwartney *et al*. (1996) constructed their measures that constituted the theoretical basis for the empirical studies. To put it in a slightly different way, it has been the conceptual basis upon which measures are constructed that is driving the theoretical aspects of the economic freedom empirical studies.

2.1 The Links between Economic Freedom and Growth

Broadly speaking, liberal thought and the capitalist ideals envisioned by Adam Smith, John Locke, and relatively more recently by Milton Friedman are the underpinnings of the economic freedom concept. The Heritage Foundation's report (2003) describes economic freedom as: "the absence of government coercion or constraint on the production, distribution, or consumption of goods and services beyond the extent necessary for citizens to protect and maintain liberty itself". More specifically, freedom of personal choice, freedom of exchange, freedom to compete, and protection of persons and private property are regarded as the central elements to this notion (Gwartney and Lawson 2003a). Accordingly, economic freedom measures capture these aspects in their construction. For instance, in the latest report of the Fraser Institute (2003), the index of economic freedom is subdivided into five major categories: (1) size of government: expenditure, taxes and enterprises; (2) legal structure and security of property rights; (3) access to sound money; (4) freedom to exchange with foreigners; and (5) regulation, credit, and business.

It is acknowledged widely that governments can play a paramount role in facilitating economic freedom for their citizens by establishing the institutions and policies that facilitate freedom, and by refraining from freedom-retarding, distortionary activities. A legal structure that enforces contracts in an even-handed manner and protects private property from violence, coercion, fraud and involuntary confiscations is a necessary infrastructural arrangement. However, economic freedom requires that, apart from what social interest

necessitates, governments should not interfere with personal choice and voluntary and competitive exchange. It requires an emphasis and reliance on factor and product markets, rather than political processes to allocate resources.

North (1990) discusses the link between institutions and economic performance at length. Essentially, poor institutions and policies result in lack of confidence as to the enforceability of contracts, protection of rightfully-acquired private property, rule of law and independent judiciary. Similarly, high tax rates limit individuals' access to the fruits of their labor. High and volatile inflation rates distort prices, erode the value of the monetary assets, alter the fundamental terms of long-term contracts, and make it very difficult for individuals and businesses to plan sensibly for the future. Also, restrictions to free trade and controls on capital flows deny the gains from exchange, and result in deadweight costs on the society. All of these reduce the returns from productive economic activities, which will in turn hinder the incentives for investment. Additionally, high amounts of government consumption or state-owned production may diminish the scope for productive individual activities. Finally, regulation of credit, labor and product markets, conscription, and heavy bureaucracy are overriding factors that inhibit growth.

2.2 Measurement Issues

Since this literature is noticeably measure-driven, it has provided more details on the measures, than on modeling the growth process. There have been four sets of measures of economic freedom: i) the Fraser Institute, ii) the Heritage Foundation, iii) the Freedom House, and iv) that of Scully and Slottje (1991). The first two measures have been produced on a continuous basis. These measures attempt to quantify: "a continuum of unwritten taboos, customs and traditions at one end and constitutions and laws governing economics and politics at the other" (Aron, 2000, p. 103).

The Measures

For the most part, researchers use the Fraser Institute - Gwartney *et al.* (1996, 2000 and 2003a)[5] – measure in growth studies, as it is the most comprehensive one in terms of time span. The latest report (2003) presents data for the period 1970-2001, which is in 5-year intervals up to 2000. The data are available for 123 countries for the years 1995, 2000 and 2001.[6] The measure of the Heritage

[5] The efforts to build a measure by the Fraser Institute started in 1980s. Over time, the Institute provided measures by several affiliates, the culmination of which was achieved by the Gwartney *et al.* (1996) report.

[6] According to Gwartney and Lawson (2003b), the Fraser measure can be viewed in other ways. It depicts the continuum between dominant state and minimal state, between left and right

Foundation is qualitatively similar to the Fraser Institute measures, but its construction commenced in 1995, covering 161 countries. It is published yearly, and a break is given to grading if a country experiences war, violence, or any other sort of severe instability. It originally included more institutional measures than Gwartney *et al.* (1996), however, the subsequent indices of the Fraser Institute have, too, added these aspects.[7] The Fraser Institute measures span from 0 to 10, with 10 being the highest score, and represent the most economically free countries. The Heritage scale runs from 1 to 5, with 1 the highest score. The Fraser Institute measure (2003) uses 38 variables presented in five major categories,[8] while the Heritage Foundation (2003) measure uses 50 variables presented in 10 classifications.[9] It is reported that the rank correlations of these measures are quite high (De Haan and Sturm, 2000).

Freedom House has a series of indicators, built intermittently by its affiliates (among whom R. Gastil is the most renowned) from 1982 to 1996. The first attempt was made by Wright (1982). This measure was advanced upon in later reports of the institution, and the latest measure was constructed by Messick (1996). The summary scale spans from 0 to 16 covering 82 countries, with the highest score represents the freest countries.[10] This indicator takes a legal approach to economic freedom and places more emphasis on political and civil liberties, compared to the Fraser and Heritage measures, which emphasize discretionary activities such as monetary policy and the size of government sector.

The Scully and Slottje (1991) measure is one of the early measures, and is an attempt to build on the early measures of Freedom House. It is available only

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(Berliner, 1999), as well as being a quality measure of a country's institutional and policy environment.

[7] For instance, Gwartney and Lawson (2003a) use survey data for 18 variables on legal structure and regulatory areas, obtained from the International Country Risk Guide (ICRG) and the Global Competitiveness Report.

[8] The original Gwartney *et al.* (1996) measure comprised of 17 variables in four major categories.

[9] The five major categories of the Fraser Institute have been provided in the text. The classifications of the Heritage Foundation measures are: i) trade policy; ii) fiscal burden of government; iii) government intervention in the economy; iv) monetary policy; v) capital flows and foreign investment; vi) banking and finance; vii) wages and prices; viii) property rights; ix) regulation; and x) black market activity. However, at an appropriate disaggregation of the categories, the attributes of the Fraser Institute and the Heritage Foundation measures mostly overlap.

[10] It contains eight attributes, which are classified in four sub-indices: i) the right to private property; ii) freedom of association; iii) freedom of internal and external travel; and iv) freedom of information. Rabushka's (1991) approach was to use also the following attributes: taxation, public spending, economic regulation of business and labour, money and trade. The measures of Fraser Institute are highly influenced by his notions.

for the year 1980, and has 15 different attributes, covering 144 countries.[11] The authors present various liberty indicators, and their ranges differ across measures.

There is also a property rights index put forward by Knack and Keefer (1995) that captures country risk evaluations, such as enforceability of contracts and risk of expropriation. These data were originally provided by the ICRG and BERI institutions. However, the availability of the more general economic freedom measures above facilitated the information on these aspects to be captured.[12]

Issues

The foremost measurement issue has been the procedure used to aggregate the attributes of economic freedom. The majority of researchers have agreed on Principal Components Analysis (for a counter argument, see Heckelman and Stroup 2000). Scully and Slottje (1991) were the first to apply Principles Components Analysis to aggregate their 15 attributes, in addition to a hedonic approach which uses regression analysis to establish the weights for each attribute in the aggregation process. Some indices are obtained by assigning weights to different categories based on expert opinions (as in some Gwartney *et al*. measures), or with respect to the standard deviation of the category index, or assign equal weights to each category.[13] Various correlations are reported among these components ranging from very low to very high. Consequently, Gwartney and Lawson (2003b) imply that researchers can decide on the weights with respect to particular problems they face. However, it should be noted that most attributes of the economic freedom are mutually inclusive (as documented by Carlsson and Lundstrom 2002 through analysis of multicollinearity), and they are likely to reinforce each other. Therefore, it is inevitable that

[11] Their attributes are: i) freedom of foreign currency regime; ii) freedom from military draft; iii) freedom of property; iv) freedom of movement; v) freedom of information; vi) Gastil's civil rights index; vii) Gastil-Wright classification of type of economic system; viii) freedom of print media; ix) freedom of the broadcast media; x) freedom of internal travel; xi) freedom of external travel; xii) freedom of peaceful assembly; xiii) freedom of work permits; xiv) freedom from search without a warrant; and xv) freedom from arbitrary seizure of property.

[12] Additionaly, Gould and Gruben (1996), use patent protection data as a proxy for "intellectual" property rights and Scully (1998) uses efficiency-related variables of Summers-Heston (1984) and Gastil to approximate institutions (and in particular, economic freedom). These are more or less the aspects that more generic economic freedom measures aim to capture.

[13] The Heritage Foundation favors equal-weighting of the categories.

aggregating them together by taking simple averages would tend to overstate the true extent of economic freedom.[14]

Furthermore, it is not prudent to grant a hundred-percent objectivity to these measures. Apart from some attributes that rely on certain statistics such as inflation volatility or the mean tariff rate, many are based on individual expert opinions. Moreover, the accuracy of the statistics may in some cases be questionable owing to the political ideology of the governments that release them. Certainly this is better than nothing. However, no economic freedom-growth study has taken into account the inherent measurement error associated with the construction of economic freedom indices in the estimation process, such as the one that could be done with instrumental variables estimation.[15]

The extent to which components of economic freedom are related to growth varies. While Ayal and Karras (1998) find that 6 of the 13 attributes are positive and significantly related to growth, 7 attributes are insignificantly related to it. Carlsson and Lundström (2002) find that even certain attributes have a negative relationship with growth.[16] One could have expected these results, as the issue is related to the attributes of economic freedom being mutually inclusive. Even some disaggregate components of economic freedom, such as government consumption and monetary policy are aggregate concepts on their own right and include aspects other than institutions. A study should consider holding the other aspects constant when working with these disaggregate measures (for which Heckelman and Stroup 2000 is a good example).

Another measurement issue is that there are some outcome variables such as the share of government spending in GDP or inflation rate in the economic freedom indices. De Haan and Sturm (2000) question the suitability of these. In an outcome variable, various sorts of economic, social, cultural and political variables are embedded, and one needs to sort out the relevance of these to economic freedom. For instance, both the Fraser Institute and the Heritage Foundation reports indicate that Latin American countries do well in terms of

[14] We indeed find that aggregate measures result in higher partial correlations in our meta-regression analysis results, reported below.

[15] Hanson (2003) approaches the issue from another direction. He drills the measures' meanings based on their attributes, and suggests that for example the Freedom House measure can be suitably named as a 'Liberal values index' or 'Modern values index' . Also, according Hanson, the Fraser and Heritage indices are more like `economic policy' measures, rather than `economic freedom' ones. He considers using instrumental variable estimation, but finds no suitable instrument for economic freedom.

[16] Ayal and Karras add 13 economic freedom attributes one-by-one to a basic Solow specification, whereas Carlsson and Lundstrom add 7 broader categories simultaneously to the regression, and analyze for multicollinearity. Carlsson and Lundstrom also test the sensitivity of analysis by EBA and Sala-i Martin's methods.

the size of government in the economy, but this has not translated into higher protection of property rights.[17]

2.3 Specification Problems

Several specification problems can be identified in this literature. Following Temple (2000), De Haan (2003) notes two main problems: i) model selection, and ii) parameter heterogeneity and outliers. Regarding the former, there are some 50 variables that researchers have related to growth (Levine and Renelt 1992), and economic theory does not provide a definitive answer as to which to use. Although certain types of analyses such as Extreme Bounds Analyis (see Leamer 1983 and Levine and Renelt (1992)) or Sala-i Martin's (1997) suggestions on EBA are available, as Sturm and De Haan (2001) note, most empirical studies lack sensitivity analyses. For example, our data set for meta-analysis (discussed below) shows that nearly half of the economic freedom studies do not use a physical capital variable in their specifications, and only 35% include both human and physical capital, whereas it was documented firmly by Mankiw *et al.* (1992) that physical and human capital are relevant in growth functions.[18] Failing to control for human and physical capital is likely to lead to specification bias. Also, some researchers, even if they use human capital in their regressions, drop this variable due to insignificance of the estimated coefficients. In the presence of an institutional variable in the growth specification, the insignificance of human capital is implicative. One should bear in mind that in a regression context, the coefficient of an explanatory variable indicates the impact of that variable on the dependent variable, *holding other variables constant*. In the human capital case, the whole explanatory power of human capital may be stripped out by the institutional variables, if it is the institutions that lie behind the human capital accumulation within a country. In this sense, working with structural equations in, say, an augmented-Solow framework promises to be a worthwhile .

A further problem is that researchers typically impose the same production function onto all economies, whether developing or developed.[19] The nature of the production process is likely to be different between these economies. For example, Islam (1995) reveals significant "fixed effects" across countries and notes that taking this into account changes Mankiw *et al.'s* (1992) findings. If

[17] The response of Gwartney and Lawson (2003b) to this argument is that, as they conceive it, any kind of government spending supplants individual decision making with collective decision making, eroding economic freedom. This view is controversial.

[18] Interestingly, our meta-regression analysis results show that the use of physical capital in the specifications provides a lower partial correlation for the relationship between economic freedom and growth.

[19] A notable exception is Dawson (1998).

data were generated by different regimes, applying the same model to data would lead to a variety of misspecifications.

More or less, there is no temporal mismatch problem in this literature between the time spans for which the growth and freedom measures are used (unlike early stages of democracy-growth literature). For example, if the economic freedom measure is available for 1975-1995, then researchers look at the growth rates of the 1975-1995 period. However, there may be a possible mismatch between the natures of the measures of interest. The majority of the researchers regress growth *rates* on the *levels* of freedom. De Haan and Sturm (2000) argue that this may lead to imprecision. These authors found that the *change* in economic freedom, rather than its *level*, was *robustly* related to economic growth.[20] Pitlik (2002) also documents that volatility of freedom matters. More importantly, Gwartney *et al.* (1999) prefer to focus on the effects of *changes* in economic freedom on economic growth, and they find strong supporting evidence. They even suggest that a lagged effect in the change of economic freedom should be allowed for, because it takes time for governments to earn credibility.

Another issue is that no channel between freedom and growth, other than investment, has been explicitly explored. This goes back to the focus of the direct impact of freedom on growth (as in an augmented Solow specification). However, factor accumulation is equivalently important as factor productivity, especially for developing countries that lack solid infrastructure for production. The impact of an economically free environment on the production process can be better understood and quantified by explicitly specifying the channels in a system framework.

Estimation Issues

Typically Ordinary Least Squares (OLS) estimation methodology is used by studies. So far all endonegeity tests between the *rate* of economic growth and *level* of economic freedom have been rejected. No reverse causality has been detected through Hausman (1978) or Maddala (1982) tests. However, Dawson (2003) provides evidence that at least some components (money and prices and use of markets) of economic freedom are jointly determined with growth. This endogeneity is more pronounced for the relationship between growth of economic freedom and growth of real GDP.

[20] This is similar to the Minier (1998) result on political freedom (democracy) and growth. Additionally, Minier finds that decreases in democracy matter more to growth than increases in democracy.

3. Data Used in the Meta-Analysis

In order to review and explore the freedom-growth literature in more detail, we use meta-analysis and meta-regression analysis. Meta-analytic techniques have gained wide appeal and use in the medical, biological and behavioral sciences, and are rapidly been adopted in economics (see Stanley 2001). The principal aim of these techniques is to dissect a literature using statistical procedures and econometric techniques that help to quantify key relationships. This enables valid inferences to be drawn, rather than relying on subjective interpretations that necessarily follow from traditional qualitative literature reviews.

A quantitative review of a literature commences with the collection of data derived from primary studies. A comprehensive computer search of several databases was conducted, including Econlit and Proquest. From the available studies that have investigated empirically the links between economic freedom and economic growth, we identified 48 studies that provided the necessary estimates of the impact of economic freedom on economic growth. This is the whole population of studies that is currently available.[21] These studies all used regression analysis and reported coefficients, standard errors or t-statistics. We use these statistics for the subsequent empirical analysis. Several studies did not report the necessary information, and hence, were excluded from the analysis. Excluded also were studies that explored the impact of economic freedom on economic development (such as Esposto and Zaleski 1999) or income inequality (Grubel 1998). These are incompatible with the growth studies.[22] In addition to the studies that have explored the impact of economic freedom on growth, we identified also those studies that have explored the impact of economic freedom on investment.

From the 48 studies we derive three different datasets. First, we can derive one estimate from each study. That is, each study is assumed to be statistically independent. A study can be regarded as statistically independent in this context if it uses the same dataset as a previous study but involves different authors, or if the same authors use different datasets. This criterion means that the studies by Ali and Crain (2001) and (2002) are averaged so that only one estimate is derived. The same applies to Knack and Keefer (1995) and Keefer

[21] This literature is moving so fast that we have no doubt that a new meta-analysis with a wider set of studies will be necessary in the future. It would be interesting to compare the results of a subsequent meta-analysis with the ones presented in this paper, especially the publication bias findings.

[22] We also do not include studies that look at some particular aspects of economic freedom with a different focus, such as black market premium or size of government spending.

and Knack (1997) and to De Haan and Sturm (2000) and Sturm and De Haan (2001), leaving 45 studies.

Some studies report several estimates of the impact of economic freedom. For example, Wu and Davis (1999) report separate estimates for the OECD, developing countries, and all countries combined. This becomes our second dataset of 62 observations (denoted as the medium dataset). The third dataset (denoted as the full dataset) involves 111 observations, which includes estimates using disaggregate measures of economic freedom reported in papers that use disaggregate measures (such as Ayal and Karras 1998, Carlson and Lundstrom 2002, Heckleman 2000 and Heckleman and Stroup 2000). The use of these different datasets enables sensitivity analysis of the meta-analysis. However, as shown below, except for the analysis of publication bias, it makes little difference which dataset is used.

Table 1 lists the one study one estimate dataset (based on 45 studies), together with the author's name, the publication date, the sample size, the average t-statistic[23] and the average partial correlation between economic freedom and economic growth.[24] Unfortunately, only a handful of studies report the elasticity of economic freedom on growth, and most do not offer information from which this elasticity could be calculated. Hence, the partial correlation is our preferred measure of the impact of economic freedom, as it shows the association between economic freedom and economic growth, after controlling for other determinants of economic growth. The partial correlation was calculated for the preferred estimates reported in each study. In many cases, only a single estimate is provided, or the authors offer their own assessment of what is the preferred estimate. Additionally, Table 1 lists the number of citations. This is an indicator of the influence and importance the profession has attached to each study. The citation counts were derived from the Social Science Citation Index. Nearly 60% of the studies have received no citations, at least in part because many of the studies are relatively new.

TABLE 1 ABOUT HERE

[23] That is, an average t-statisic from studies that reported more than one usable t-statistic. Not all reported estimates are used, as many of the estimated regressions are reported purely for the sake of sensitivity.

[24] Average in this context is the average relating to estimates reported in the primary study. Hence, the 111 estimates from the large dataset noted in the text are averaged so that each study contributes only one partial correlation. The partial correlations were calculated from the reported t-statistics, see Greene (2000). The full dataset is available from the authors.

4. Meta-Analysis of Economic Freedom

Meta-analysis is used to provide a quantitative synthesis of the empirical findings from the available literature (Hunter and Schmidt, 1990; Stanley 2001). The approach adopted in this paper is to apply meta-analysis techniques to the economic freedom-growth literature in order to identify and quantify patterns, to draw inferences from the available studies and to detect possible regularities in the association between economic freedom and economic growth.

Direct Growth Effects

Table 2 presents the unweighted average, weighted average and 95% confidence intervals of partial correlations for the three different datasets and for two different groups of studies. The unweighted mean is simply the average of partial correlations reported in the literature. However, since studies vary with respect to sample size, it is customary in meta-analysis to calculate a weighted average, with the weights being the study's sample size (see Doucouliagos and Laroche 2003).[25] Column 2 presents the results for all studies, while column 3 presents the results for what we consider to be the best practice group of studies. The best practice group of studies consists of 16 studies that use a production function framework, controlling for the effects of *both* physical and human capital on economic growth.

As can be seen from table 2, the weighted and unweighted average partial correlations are moderately positive in all cases. Importantly the 95% confidence intervals do not contain zero, and hence, we can conclude that the average partial correlations are statistically significantly different to zero. The confidence intervals were constructed using bootstrapping methods. Bootstrapping was undertaken using 1000 iterations (with replacement) from which the distribution of economic freedom-growth partial correlations was generated. The percentile method was used to construct bootstrap confidence intervals (see Efron and Tibshirani 1993). That is, the lower and upper 2.5 percent of the values of the generated distribution were used to construct the 95 percent confidence intervals. The bootstrap confidence intervals so created are appropriate in that they are centred on the observed data.

The other notable feature in table 2 is that in all cases the best practice group of studies (those including physical and human capital) generates lower weighted average partial correlations. It appears that studies that do not use a production

[25] Doucouliagos and Laroche (2003) recommend using also citations counts as weights. When this was done for our dataset, it made little difference to the conclusion of a statistically significant and positive effect between economic freedom and economic growth.

function framework generate larger estimates of the impact of economic freedom. This result is supported more rigorously in the meta-regression analysis reported in section 5.

TABLE 2 ABOUT HERE

Investment Effects

An important area of research in the economic growth literature is the investigation of channels through which institutional arrangements influence growth. For example, researchers have explored the direct impact of democracy on growth, as well as the indirect effects through channels such as human capital formation, investment, political stability, and income inequality. Economic freedom can have a direct impact on economic growth, and it may also have an indirect effect through, for example, its impact on human and physical capital investment and political stability. Unfortunately, there have been few investigations of channels within the economic freedom literature. The most widely explored channel has been the impact of economic freedom on investment.

Table 3 lists the nine studies that have explored the links between economic freedom and investment, as well as meta-analysis descriptive statistics. The evidence is clear. Economic freedom has a positive impact on investment. Investment is one of the few variables which have been associated with a clear positive impact on economic growth (see, for example, Levine and Renelt 1992). Hence, it is possible to infer that economic freedom works through investment to stimulate economic growth.

TABLE 3 ABOUT HERE

The sample size weighted average partial correlation between economic freedom and economic growth for the one study one estimate group is +0.29, with a 95% confidence interval of +0.21 to +0.41. The sample size weighted average partial correlation between economic freedom and investment is +0.21, with a 95% confidence interval of +0.11 to +0.29. This suggests that the impact of economic freedom on investment is likely to be smaller than the direct impact of economic freedom on economic growth. Hence, it is likely that economic freedom has an impact on economic growth over and above its indirect positive impact through investments. These associations are illustrated in figure 1.

FIGURE 1 ABOUT HERE

5. Exploring Specification and Publication Bias

Before concluding that Table 2 identifies and quantifies the magnitude of a genuine effect of freedom on growth, it is important to determine whether the literature has been influenced by specification bias and whether it has been contaminated by publication bias. Conceptually, the association between genuine and observed partial correlations can be expressed as:

$$r_o = f(r_g, r_s, r_p, u) \quad (1)$$

where r_g denotes the true or genuine partial correlation between economic freedom and economic growth, r_o is the observed partial correlation, r_s is systematic specification differences, r_p is the impact of publication bias and u denotes random specification differences. The genuine partial correlation is not observed and must be inferred from the available literature. The r_o is the estimated r_g based on the population of published studies (adjusting for differences in sample size across studies). However, it is well known that specification differences can affect reported study outcomes. Fortunately, meta-regression analysis can be used to identify the impact of specification differences on the reported economic freedom effects on growth. That is, we can in theory estimate r_s and hence identify r_g.

A further problem arises if there is publication bias in a literature. Publication bias arises when the selection of studies for publication is made on the basis of the statistical significance of results, and/or on whether the results satisfy preconceived theoretical expectations. Publication bias leads to a truncated pool of published studies, with the consequent suppression of some of the available empirical findings on a literature. In the context of economic freedom, publication bias can take the form of researchers finding it difficult to publish manuscripts in which economic freedom is shown to have a negative impact on economic growth. More likely, publication bias, if it exists, takes the form of authors finding it difficult to publish results where economic freedom has a positive but statistically insignificant result. For example, in reviewing manuscripts, referees may argue that economic freedom should have a positive and statistically significant impact on economic growth (a preconceived expectation) and authors are encouraged to find this by changing the sample size, changing the empirical methodology, using a different estimation technique, etc.

Hence, before we can accept the results presented in Tables 2 and 3 as genuine effects of economic freedom, it is important to test the following Null hypothesis:

$$H_0: r_s = r_p = 0 \quad (2)$$

We test this hypothesis in the joint form expressed in equation 2, as well as the individual Null hypotheses embedded within.

5.1 Specification bias

The impact of specification differences can be investigated by estimating a meta-regression model (known as an MRA) of the following form:

$$r_{oi} = \alpha + \beta_1 N_i + \gamma_1 X_{i1} + \ldots + \gamma_k X_{ik} + \delta_1 K_{i1} + \ldots + \delta_n K_{in} + u_i \quad (3)$$

where

r_{oi} is the observed partial correlation derived from the ith study,

α is the constant,

N_i is the sample size associated with the ith study,

Xs are dummy variables representing characteristics associated with the ith study,

Ks are the mean values of any quantifiable variables, such as the adjusted R-squared and the average value of the measure of economic freedom, and

u_i is the disturbance term, with usual Gaussian error properties (see Stanley and Jarrell 1998).

The number of observations (actually studies) available for the MRA is relatively small (45 in the case of the one study one estimate dataset). This limits the extent to which meta-regression moderator variables can be explored. Hence, we restrict the analysis to the following variables:

- FRASER: a dummy variable equal to 1 if the Fraser Institute measure of economic freedom was used and 0 otherwise.
- AGGREGATE: a dummy variable if an aggregate measure of economic freedom was used and 0 if a disaggregate measure was used.
- DEMOCRACY: a dummy variable equal to 1 if a study included political freedom as a control variable and 0 otherwise.
- HKPK: a dummy variable equal to 1 if a study included human and physical capital as control variables and 0 otherwise.
- CAPITAL: a dummy variable equal to 1 if a study included physical capital as control variables and 0 otherwise.
- SIZE: the sample size of a study.
- YEAR: the publication date of the study.

- CAUSALITY: a dummy variable taking a value of 1 if the analysis was based on Granger Causality testing, 0 otherwise.[26]
- PANEL: a dummy variable taking a value of 1 if the study used panel data and 0 if cross-sectional data was used.
- KYKLOS: a dummy variable taking a value of 1 if the study was published in *Kyklos*, 0 otherwise.
- CATO: a dummy variable taking a value of 1 if the study was published in *Cato Journal*, 0 otherwise.
- PUBLIC: a dummy variable taking a value of 1 if the study was published in *Public Choice*, 0 otherwise.

The FRASER variable is included to explore whether the measure of economic freedom affects the reported economic freedom effects. The impact of aggregation is captured by the AGGREGATE variable. DEMOCRACY, HKPK and CAPITAL explore the impact of different control variables. SIZE is included to detect any differences in reported results between small and large sample studies. YEAR captures any fad effects. CAUSALITY explores any differences between a Granger Causality specification and a growth regression. PANEL captures any differences in the type of data used, while KYKLOS, CATO and PUBLIC capture any differences in the publication outlet. Together, these variables capture differences in specification, functional form, data and publication outlet. In addition, when the larger datasets are used, we included dummy variables for different authors, but do not report these. Close inspection of the published studies shows that these are the key differences in the studies. Hence, a MRA of these variables should offer useful information on whether $|r_s| > 0$.

The adjusted R-squared was not reported by many studies, so it could not be included. Likewise, most studies do not report the average value of the economic freedom measure. We considered also several other variables but the MRA results with these variables included are not presented here. For example, dummy variables for the ICRG measure of property rights and the Scully and Scotje measure of economic freedom were included, but these were never statistically significant.

The MRA estimates are presented in Table 4, for the three different datasets. Columns 2, 4 and 6 present the general MRA with all potential explanatory

[26] Dawson (2003) notes correctly that the way that regression models are specified produces information on the correlation between economic freedom and growth, not causation. Further, Dawson analyses the issue with Granger-causality tests. Although this is the strongest test on causality, Dawson acknowledges that it implies *Granger-causation*, rather than the true sense of the word "causation".

variables included, while columns 3, 5 and 7 present the specific MRAs, after sequentially eliminating any variables which were not statistically significant at the 10% level.

A properly specified growth regression should control for the impact of capital (Barro 1991). Regardless of the dataset used, controlling for capital in the growth equation produces a smaller partial correlation between economic freedom and economic growth (as shown by the negative coefficient on the PK variable). Omitting the impact of capital in a growth equation leads to a misspecification of the growth equation with real consequences for the estimated impact of economic freedom. The only other variable that is consistently significant is the use of panel data. This literature uses either cross-sectional data (capturing the long-run effects) or panel data (capturing the transitory effects). The use of panel data leads to lower estimates of the impact of economic freedom. This implies that transitory effects are lower than long-run effects. When the extended dataset is used (using both aggregate and disaggregate measures of economic freedom) we can test more fully for the impact of aggregation. It is clear that aggregation matters. Studies that use an aggregate measure of economic freedom produce larger economic freedom-growth effects.

TABLE 4 ABOUT HERE

5.2 Publication Bias

Several explorations on publication bias have been conducted in economics.[27] These have almost universally detected the existence of publication bias. For example, Card and Krueger (1995) found evidence of publication bias in minimum wage studies, Ashenfelter *et al.* (1999) found this for estimates of returns to education and Gorg and Strobl (2001) established publication bias in the productivity effects of multinationals. The one exception has been Doucouliagos and Laroche (2003). The evidence to date appears to suggest that publication bias is a universal problem.

Economists have had a longstanding interest on property rights, free markets and economic freedom. To many economists, economic freedom is sacrosanct. We expect that most economists, and hence, most reviewers and journal editors will take it as an *a priori* given that economic freedom has a positive effect on growth. Hence, it is possible that this literature will be affected by publication bias. For example, researchers who find a negative effect on growth may not

[27] These explorations have appeared in leading journals such as the *American Economic Review* and the *Economic Journal*. Hence, publication bias is receiving the attention it deserves within the profession.

submit these results to journals, on the basis that they believe the results to be incorrect.[28] Indeed, some authors allude to this occurring. For example, in one of their regressions Adkins *et al.* (2002, p.102) found that the coefficient on economic freedom had "an implausible negative sign". The effect of publication bias, if it exists, will be to truncate the information that is publicly available, and hence, to potentially distort inferences.

A close inspection of Table 1 reveals two salient features. First, there is only one negative partial correlation reported in this literature, although some of the disaggregate measures do report negative associations. Second, only 7 of the 45 studies report a statistically insignificant positive effect. In order to explore whether this distribution is an outcome of publication bias, we can use certain tests that rely on basic and straightforward statistical premises.

5.2.1 Funnel Plot

A popular graphical test for detecting the presence of publication bias is the funnel plot. The plot derives its name from the funnel like pattern expected when there is no publication bias in a literature. The funnel plot compares the effect size against some measure, such as sample size (see Sutton *et al.* 2000). The logic behind funnel plots is that those studies with a smaller sample size should have larger sampling error. Hence, the freedom-growth relationship in smaller studies should have a larger spread around the mean effect, which itself could be positive, negative or zero. In figures 2, 3 and 4, the partial correlations are measured on the vertical axis and the sample size on the horizontal over the three datasets. As can be seen from these figures, a funnel does *not* appear, indicating the potential for publication bias in this literature.[29] Note however that figure 4 has more of a funnel than figures 2 and 3. By way of comparison, consider figure 5, which plots the partial correlations of the union-productivity effects reported in Doucouliagos and Laroche (2003)[30]. A clear funnel plot is apparent in this dataset indicating the absence of publication bias.

FIGURE 2 ABOUT HERE

FIGURE 3 ABOUT HERE

FIGURE 4 ABOUT HERE

[28] They may, of course, be correct in this assumption. However, the whole point of empirical investigations is to prove/disprove assertions.

[29] Using only the estimates from the best practice group of studies does not change the asymmetry in the funnel plots.

[30] We thank these authors for making their data available to us.

FIGURE 5 ABOUT HERE

5.2.2. Statistical Analysis

Publication bias can be explored more rigorously through the meta-regression analysis. If there is a real effect between economic freedom and economic growth, then there should be a positive relationship between the natural logarithm of the absolute value of the t-statistic and the natural logarithm of the degrees of freedom in the regression:

$$\ln|t_i| = a_0 + a_1 \ln df_i + e_i \quad (4)$$

where t_i and df_i denote the t-statistic and degrees of freedom from study *i*, respectively. The logic behind this test is simple. As sample size rises the precision of the estimate rises also, and hence, t-statistics also rise. Stanley *et al.* (2004) show that the slope coefficient in equation (4) offers information on the existence of genuine empirical effects, publication bias, or both. If $a_1 > 0$, there is a genuine association between economic freedom and economic growth. If $a_1 < 0$, the literature is contaminated by selection effects, or publication bias. If $0 < a_1 < 0.5$, then there is a genuine association between economic freedom and economic growth, as well as publication bias in the literature. Equation 4 is known as meta-significance testing (known as MST, see Stanley 2001).

Researchers in other fields, particularly medicine, have also been interested in publication bias. In response, Egger *et al.* (1997) developed an econometric test of the funnel plot, known as the Funnel Assymetric Test (or FAT). This involves running one of the following two regressions:

$$e_i = ß_0 + ß_1 SE_i + e_i \quad (5a)$$

$$t_i = ß_1 + ß_0 1/SE_i + v_i \quad (5b)$$

where e is the reported effect (such as a regression coefficient) and SE_i is a study's standard error. It is known from statistical theory that smaller samples will tend to have larger standard errors. If publication bias is absent from a literature, then there should be no association between a study's reported effect and its standard error. However, if there is publication bias, smaller studies will search for larger effects in order to compensate for their larger standard errors, which can be done by modifying specifications. Since the explanatory variable in 5a is the standard error, heteroscedasticity is likely to be a problem. It is

possible to correct equation 5a for heteroscedasticity by dividing it by the standard error. This produces equation 5b. If publication bias is present, the constant in equation 5b ($ß_1$) will be statistically significant.

The MST (meta-significance) and FAT (meta-publication) results are presented in Table 5. The FAT results show that the constant is statistically significant, indicating that there is publication bias in this literature. The MST results show that the slope coefficients are not statistically significant, suggesting that there is no genuine association between economic freedom and economic growth. This may appear to be an odd result given that the majority of the studies found a statistically significant coefficient on economic freedom. However, it is consistent with the hypothesis of a literature contaminated by publication bias. In the presence of severe publication bias, the slope coefficient in a MST will not be statistically significant.

The MST is a conservative test. Although the results do not indicate that there is no genuine positive economic freedom effect, it is more prudent to conclude that the size of the publication bias is so strong that it disguises the underlying genuine effect. This is indeed reinforced by the statistically insignificant slope coefficient in the FAT results.

TABLE 5 ABOUT HERE

5.3. Specification and Publication Biases Together

Specification and publication bias can be combined to provide a test for equation 2, as there is good reason to believe that both may be present. This involves incorporating MRA with MST models, and hence the estimation of a general MST model, that controls for specification differences, data differences, modelling differences, as well as publication bias and the existence of genuine empirical effects:

$$\text{(MSTMRA)} \qquad \ln|t_i| = a_0 + a_1 \ln df_i + a_2 Z_i + e_i \qquad (6)$$

Similarly, MRA can be combined with FAT:

$$\text{(FATMRA)} \qquad t_i = ß_0 + ß_1 1/SE_i + ß_2 Z_i + u_i \qquad (7)$$

where Z is a vector of variables used in the MRA. Table 6 combines the MST with the MRA, capturing both publication bias, as well as specification bias. The second column reports the results with all variables included, while the results with only those variables with a t-statistic of greater than 1 are presented in columns 3, 4 and 5, for the three different datasets. The MSTMRA results in

general support those of the MST. Publication bias is evident in this literature. Note, however, that when the medium and full datasets are used, the coefficient on $\ln df_i$ is positive and statistically significant, but only at the 10% level. That is, once specification differences are controlled, such as the use of capital, panel data and other study characteristics, the coefficient on the degrees of freedom variable becomes statistically significant. The coefficient on $a_1 = 0.30 < 0.50$, indicating that there is both a genuine effect, as well as publication bias.

Since the dependent variable is the *absolute* value of the t-statistic, this test indicates that there is an effect between economic freedom and growth, but not the direction of the effect. However, the overwhelming majority of the studies found a positive effect. Hence, we can conclude that there is a positive effect between economic freedom and economic growth.

Unfortunately, it is not possible to identify from this literature the size of the impact of economic freedom on growth. Egger *et al.* (1997) argue that the slope coefficient in equation 5b will offer an estimate of the genuine economic freedom effect, free of publication bias. In Table 5 the slope coefficient is negative but is not statistically significant. For the sake of brevity, the results for equation 7 are not reproduced here but confirm the results of estimating equation 5b – publication bias is confirmed. The coefficient on the constant is statistically significant confirming the presence of publication bias, while the slope coefficient is positive but statistically insignificant (coefficient = 0.06, t=0.98). Publication bias is so strong in this literature that it disguises the true effect of economic freedom on economic growth. Sturm, Leertouwer and de Haan (2002) have shown that the economic freedom-growth association is not robust, using three different measures applied to one sample. Our meta-analysis confirms this conclusion even when all the studies (numerous samples) are explored. There are major issues with respect to the measurement of economic freedom, making it difficult to capture the true effect of economic freedom. However, the meta-analysis provides strong evidence of publication selection.

TABLE 6 ABOUT HERE

5.4. Testing the MRA predictions

The MRA and MSTMRA results (Tables 4 and 6, respectively) regarding the importance of capital investment in growth equations and the use of cross-section vs. panel data are interesting on their own right. In order to test this conclusion, we estimated a standard Solow growth model with and without physical capital investment, and with and without political freedom. The data set consists of 82 countries for which we were able to match political freedom,

economic freedom, and the other growth related variables.[31] The data spans the period 1970-1999 and is structured into 5-year intervals. We measure growth as the logarithmic change in real output per worker from the first year of the interval to the last. Other variables are the averages of the 5-year intervals and were obtained from the World Development Indicators CD-ROM (2002), except for the human capital and economic freedom data, which are available for the initial years of the intervals (1970, 1975, etc.). Human capital is measured as the proportion of the population which has completed secondary education (see Barro and Lee 2000). Labor force data was derived from the International Labor Organisation. The series for economic freedom is that of the Fraser Institute (Gwartney *et al.* 2003a). Political freedom is measured as the average of the Gastil political and civil liberties data (the Freedom House series). The sample size is 380 observations.

Ignoring issues of endogeneity and causality (which are not the focus of this paper), we use OLS to estimate the Solow growth model, as extended by Mankiw *et al.* (1992). OLS in this context is useful for comparability with results from other papers. The results are presented in Table 7. In all cases, the coefficient on economic freedom is positive and statistically significant. Note however, that the exclusion of physical investment in a growth equation increases significantly the magnitude of the economic freedom coefficient. In Model 1, the coefficient is 73% lower than in Model 2, and in Model 3 it is 84% lower. The partial correlations between economic freedom and economic growth are reported also in Table 7, and these are higher when investment is excluded.

The last two rows of Table 7 list the coefficients on the economic freedom variable when cross-sectional data is used. The cross-sectional data was constructed by taking the average value for all the variables over the 1970-1999 period. The sample size is thus 82 observations. Once again, it is clear that the inclusion of physical capital reduces the coefficient on economic freedom. In this simple framework, economic freedom has a positive but statistically insignificant effect on growth (see Models 1 and 3).[32] Note that for this data set and rather simple growth framework, the use of cross-sectional data does lead to slightly higher coefficients on the economic freedom variable and higher partial correlations between growth and economic freedom. Moreover, compare Model 2 using cross-sectional data to Model 1 using panel data. The partial correlations between economic freedom and growth are 0.27 and 0.12,

[31] The sample does *not* include transitional economies, very small economies and oil producing countries. The data are available from the authors.

[32] Recall, however, that economic freedom has a positive impact on investment and hence a positive indirect effect on growth is still possible (see Table 3).

respectively. As predicted by MRA, studies that use cross-sectional data and exclude investment from the growth regression will report significantly higher freedom-growth effects.

6. Conclusions

The identification of the factors that drive economic growth is crucially important for economic development and social welfare. This requires empirical analysis by many researchers, and requires also that inferences be drawn from the available evidence. Economic freedom is an important aspect of economic performance and has received considerable attention from researchers. To date, no systematic review of this literature has been conducted. This paper provides such a review and in the process highlights the strengths and weakness of this literature. There is solid evidence that the economic freedom literature (like all other empirical literatures) is affected by specification and measurement differences. The meta-regression analysis was confirmed by our own growth equations that show the impact of not including physical investment when investigating the impact of economic freedom on economic growth.

An additional concern is that this literature is so affected by publication bias, that it is not clear what the size of the genuine effect of economic freedom on economic growth is. The evidence is certainly indicative of a positive impact on economic growth. However, until more studies are conducted, and until unpublished investigations are made public, it is difficult to infer how large the positive impact of economic freedom on economic growth is. It is not enough however to have more studies. They need to be carefully prepared studies. The meta-regression analysis presented above shows clearly that specification issues matter. In particular, additional studies are needed which adopt a proper production function framework and which consider the channels through which economic freedom may impact on economic growth. The use of simultaneous equations model that captures both the direct and indirect effects of economic freedom on growth promises to be a fruitful strategy.

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Table 1: Individual Study Estimates of the Impact of Economic Freedom on Economic Growth

Author	Year	Sample Size	t-statistic	Partial Correlation	Citations
Abrams & Lewis	1995	87	4.80	0.49	5
Ali & Crain	2001 & 2002	92	1.98	0.21*	0
Adkins *et al.*	2002	292	1.05	0.06	0
Ayal & Karras	1998	58	2.05	0.27*	2
Bengoa & Robles	2003	108	2.29	0.22*	0
Carlson & Lundstom	2002	74	5.22	0.53*	1
Chong & Calder?n	2000	550	na	0.13	0
Comeau	2003	82	2.49	0.29*	0
Dawson	1998	237	1.97	0.13*	14
Dawson	2003	262	na	0.07*	0
De Haan & Siermann	1998	114	2.86	0.26*	7
De Vanssay & Spindler	1994	100	7.06	0.59*	6
Easton & Walker	1997	57	3.54	0.44*	9
Farr *et al.*	1998	144	1.91	0.19*	0
Feld & Voigt	2003	35	na	0.91*	0
Fidrumc	2003	275	2.12	0.13*	0
Goldsmith	1995	59	3.04	0.38*	9
Goldsmith	1997	70	3.30	0.37*	0
Gould & Gruben	1996	79	1.77	0.21*	0
Gounder	2002	29	2.09	0.39*	0
Gwartney *et al.*	1999	82	1.85	0.22*	4
Hanke & Walters	1997	91	7.12	0.60*	0
Hanson	2003	108	8.74	0.65*	0
Heckelman	2000	188	na	0.15*	0
Heckelman & Stroup	2000	49	6.28	0.68*	3
Islam	1996	94	2.45	0.25*	0
Johnson & Lenartowicz	1998	38	6.01	0.71*	4
Karabegovic *et al.*	2003	420	18.41	0.67*	0
Knack & Keefer & Keefer & Knack	1995 & 1997	97	3.27	0.33*	0
Leblang	1996	147	2.55	0.28	12
Leschke	2000	80	5.39	0.53*	0
Nelson & Singh	1998	167	2.25	0.17*	10
Norton	2003	94	4.26	0.42*	0

Park & Ginarte	1997	60	2.43	0.32*	10
Pitlik	2002	73	2.75	0.34*	1
Ram	2000	62	0.88	0.12	0
Scully	1988	115	3.01	0.27*	5
Scully	2002	86	1.87	0.20*	0
Spindler	1991	140	1.03	0.09	0
Sturm & De Haan & De Haan and Sturm	2001 & 2000	80	0.99	0.11	0
Sturm, Leertouwer & de Haan	2002	49	-0.08	-0.012	1
Torstensson	1994	67	2.55	0.32*	18
De Vanssay & Spindler	1996	109	1.89	0.18*	0
Weede & Kampf	2002	63	1.42	0.19	1
Wu & Davis	1999	49	2.57	0.13*	0

* statistically significant at least at the 10% level.

n.a. not reported in the study.

Table 2: Meta-analysis, Partial Correlations of Economic Freedom and Economic Growth

Measure	All Economic Freedom Studies	Best Practice Economic Freedom Studies
Unweighted Average Partial Correlation	+0.37 (+0.29 to +0.47) (n=45)	+0.24 (+0.18 to +0.33) (n=16)
Sample Size Weighted Average Partial Correlation	+0.29 (+0.21 to +0.40) (n=45)	+0.27 (+0.20 to +0.34) (n=16)
Unweighted Average Partial Correlation	+0.39 (+0.32 to +0.47) (n=62)	+0.26 (+0.20 to +0.35) (n=20)
Sample Size Weighted Average Partial Correlation	+0.32 (+0.25 to +0.41) (n=62)	+0.29 (+0.22 to +0.37) (n=20)
Unweighted Average Partial Correlation	+0.28 (+0.23 to +0.33) (n=111)	+0.25 (+0.19 to +0.33) (n=22)
Sample Size Weighted Average Partial Correlation	+0.25 (+0.20 to +0.31) (n=111)	+0.28 (+0.22 to +0.35) (n=22)

Table 3: Impact of Economic Freedom on Investment

Author	Year	Sample Size	Partial Correlation
Ali & Crain	2001 & 2002	93	+0.19*
Bengoa & Sanchez-Robles	2003	108	+0.31*
Comeau	2003	82	+0.08
Dawson	2003	258	+0.15*
De Haan & Siermann	1998	78	+0.17
De Hann & Sturm	2000	80	+0.19
Fidrmuc	2003	275	+0.34*
Knack & Keefer	1995	69	+0.22*
Park & Ginarte	1997	60	-0.18
Descriptive Statistics			
Unweighted Average	+0.17	Weighted Average	+0.21
95% Bootstrap Confidence Interval	+0.07 to +0.25		+0.11 to +0.29

* statistically significant at least at the 10% level.

Table 4: Meta-Regression Analysis, Economic Freedom and Economic Growth

Variable	Y = r (MRA)	Y = r (MRA)	Y = r[a] (MRA)	Y = r[a] (MRA)	Y = r[a] (MRA)	Y = r[a] (MRA)
Constant	-20.55 (-0.97)	0.49 (7.23)***	-20.51 (-1.13)	0.53 (11.69)***	-19.19 (-1.18)	0.33 (4.83)***
AGGREGATE	-0.05 (-0.46)	-	-0.05 (-0.54)	-	0.20 (2.42)**	0.23 (3.97)***
HKPK	-0.07 (-0.88)	-	0.02 (0.26)	-	-0.02 (-0.36)	-
CATO	0.25* (1.96)	0.09 (1.96)*	0.14 (1.40)	-	0.07 (0.82)	-
PK	-0.13 (-1.27)	-0.22 (-3.07)***	-0.22 (-2.74)***	-0.25 (-5.02)***	-0.15 (-2.29)**	-0.21 (-4.00)***
DEMOCRACY	-0.11 (-1.67)	-	-0.08 (-1.49)	-	-0.08 (-1.54)	-
FRASER	-0.09 (-1.00)	-	-0.05 (-0.74)	-	-0.08 (-1.34)	-
KYKLOS	-0.08 (-0.72)	-	-0.08 (-0.87)	-	-0.27 (-2.90)***	-0.18 (-2.76)***
PANEL	-0.16 (-1.89)*	-0.20 (-2.29)**	-0.17 (-2.07)**	-0.27 (-4.21)***	-0.09 (-1.13)	-0.13 (-2.17)**
PUBLIC	-0.02 (-0.16)	-	0.06 (0.72)		-0.03 (-0.41)	-
SIZE/100	-0.03 (-0.81)	-	-0.03 (-1.03)	-	-0.06 (-2.15)**	-0.06 (-1.91)*
YEAR	10.59 (1.00)	-	10.57 (1.17)	-	9.81 (1.20)	-
CAUSALITY	-0.23* (-1.77)	-0.16 (-2.02)*	-0.18 (-1.67)	-	-0.13 (-1.29)	-
N	45	45	62	62	111	111
Adj R-squared	0.21	0.26	0.35	0.36	0.30	0.32
F-statistic	1.97*	5.11***	3.76***	18.08***	4.11****	9.56***

, **, * denotes statistical significance at the 10%, 5% and 1% levels, respectively. t-statistics in brackets using White's heteroscedasticity consistent standard errors.*

Y: Dependent variable, r = partial correlation.

[a] Author dummies included but not reported.

Table 5: Meta-Significance Testing and Meta-Publication Bias Analysis, Economic Freedom and Economic Growth

Variable	$Y= \ln\|t_i\|$ (MST)	$Y= \ln\|t_i\|$ (MST)	$Y= \ln\|t_i\|$ (MST)[a]	Y = t (FAT)	Y = t (FAT)	Y = t (FAT) [a]
Constant	-0.06 (-0.07)	0.19 (0.23)	-0.09 (-0.11)	3.47*** (7.06)	3.75*** (8.96)	2.66*** (8.58)
$lndf_i$	0.23 (1.04)	0.19 (1.02)	0.24 (1.34)	-	-	-
1/SE	-	-	-	-0.02 (-0.51)	-0.02 (-0.60)	-0.01 (-0.17)
N	42	59	98	41	58	97
F-statistic	1.07	1.03	6.85***	0.25	0.36	0.03

, **, * denotes statistical significance at the 10%, 5% and 1% levels, respectively. t-statistics in brackets. Y: Dependent variable, t=t-statistic. [a] author dummies included in regression.*

Table 6: Meta-Significance Meta-Regression Analysis, Economic Freedom and Economic Growth

Variable	Y= ln|t| (MSTMRA)	Y= ln|t| (MSTMRA)	Y= ln|t| (MSTMRA)	Y= ln|t| (MSTMRA)[a]
Constant	-48.16 (-0.67)	0.99 (1.02)	0.27 (0.35)	0.11 (0.17)
lndf$_i$	0.06 (0.28)	0.11 (0.47)	0.31 (1.68)*	0.30 (1.80)*
AGGREGATE	0.13 (0.52)	-	-	0.22 (1.15)
CATO	1.09 (2.68)**	0.86 (3.11)**	0.44 (1.50)	0.30 (1.43)
PK	-0.45 (-1.59)	-0.51 (-2.08)**	-0.78 (-3.76)***	-0.81 (-5.96)***
DEMOCRACY	-0.33 (-1.28)	-	-0.27 (-1.36)	-0.23 (-1.48)
FRASER	-0.53 (-1.81)*	-0.39 (-1.71)*	-	-
KYKLOS	-0.78 (-1.07)	-	-	-
PANEL	-0.08 (-0.22)	-	-0.43 (-1.30)	-0.42 (-1.46)
PUBLIC CHOICE	-0.06 (-0.14)	-	-	-
YEAR	24.79 (0.68)	-	-	-
CAUSALITY	-1.29 (-3.97)***	-1.37 (-12.50)***	-0.84 (-1.89)*	-0.79 (-1.96)*
N	42	42	59	98
Adj R-squared	0.06	0.12	0.21	0.32
F-statistic	1.25	2.08*	3.56***	6.63***

, **, * denotes statistical significance at the 10%, 5% and 1% levels, respectively. t-statistics in brackets using White's heteroscedasticity consistent standard errors.. Y: Dependent variable, t=t-statistic.*

[a] author dummies included in regression.

Table 7: Sensitivity of Solow Growth Model to Physical Capital

Variable	Model 1	Model 2	Model 3	Model 4
Panel Data				
Constant	-0.80 (-5.75)***	-0.13 (-1.04)	-0.76 (-4.98)***	-0.17 (-1.16)
ln(Physical Capital)	0.19 (8.16)***	-	0.19 (8.16)***	-
ln(Human Capital)	0.01 (1.24)	0.02 (2.69)***	0.01 (1.08)	0.03 (2.74)***
ln(n + g + d)	-0.15 (-3.10)***	-0.06 (-1.25)	-0.14 (-2.93)***	-0.07 (-1.33)
ln(Initial GDP)	-0.03 (-3.67)***	-0.02 (-2.72)***	-0.03 (-3.65)***	-0.02 (-2.32)**
Economic Freedom	0.0155 (2.26)**	0.0269 (3.72)***	0.0148 (2.13)**	0.0273 (3.75)***
Political Freedom	-	-	-0.003 (-0.69)	0.003 (0.54)
Partial Correlation	0.12	0.19	0.11	0.19
Output Elasticity				
Cross-Sectional Data (1970-99)				
Economic Freedom	0.0131 (1.24)	0.0285 (2.45)**	0.0150 (1.38)	0.031 (2.64)**
Partial Correlation	0.14	0.27	0.16	0.29
Output Elasticity				

, **, * denotes statistical significance at the 10%, 5% and 1% levels, respectively.* ln denotes the natural logarithm. n = population growth, and g + d is the exogenous growth in technology and capital depreciation (capped to 0.05 together as is standard in the literature).

Figure 1: Economic Freedom and Growth, Direct and Indirect Channels

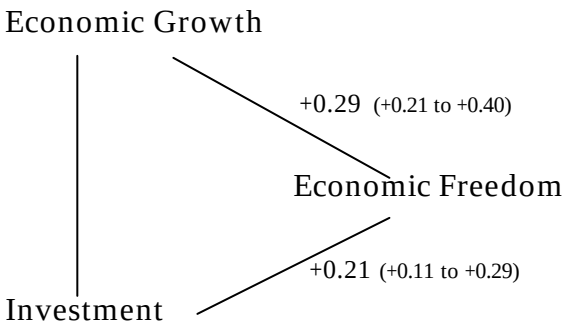

Figure 2: Funnel Plot of Economic Freedom and Economic Growth Studies: One Study, One Estimate Dataset

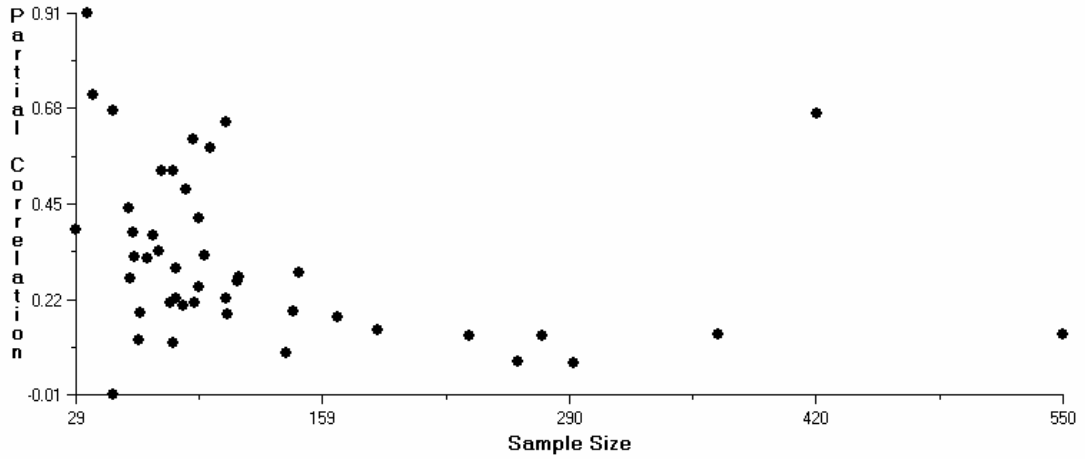

Figure 3: Funnel Plot of Economic Freedom and Economic Growth Studies (Medium Dataset)

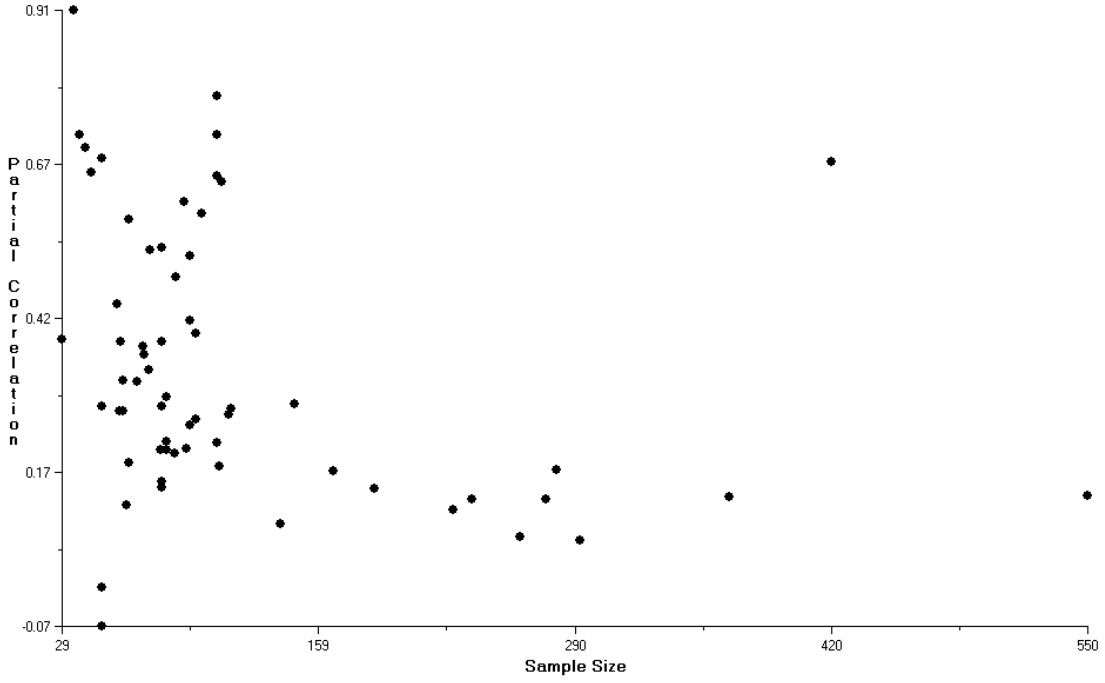

Figure 4: Funnel Plot of Economic Freedom and Economic Growth Studies (Full Dataset)

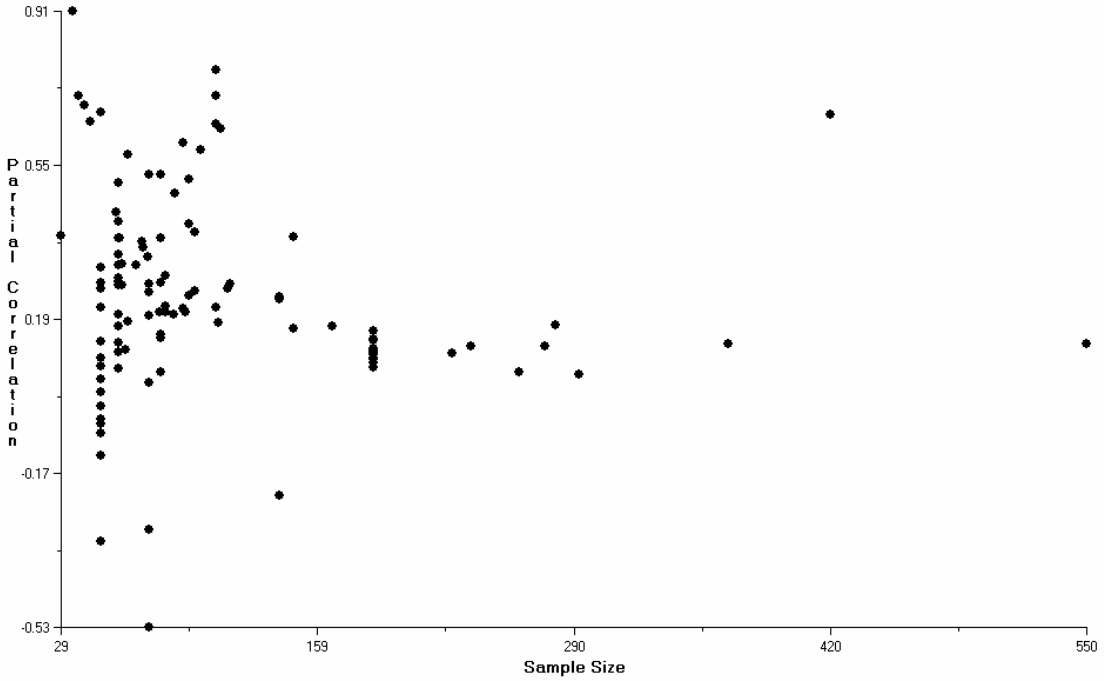

Figure 5, A Symmetrical Funnel Plot, No Publication Bias

(data taken from Doucouliagos and Laroche 2003)