ON THE AMBIGUOUS ECONOMIC FREEDOM-INEQUALITY RELATIONSHIP

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Abstract

Previous research on the relationship between economic freedom and income inequality has produced mixed results. We provide a short survey of this literature, identifying potential causes for this empirical heterogeneity. Next, we replicate the results from two significant studies using six alternative measures of income inequality for an updated dataset of up to 112 countries over the period 1970-2010. Notably, we use the latest release of the Standardized World Income Inequality Dataset, which allows us to account for the uncertainty of the estimated Gini coefficients. We find that the results of previous studies are sensitive to the choice of country sample, time period and/or inequality measure used. We conclude with suggestions for future research in the area.

JEL Codes: C82, D30, D63, P16

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1. Introduction

Economic freedom is associated with market-oriented institutions and policies, which are believed to incentivize private investment and lead to an efficient allocation of resources (Dawson 1998, Gwartney et al. 2006), economic growth (Dawson 2003; De Haan et al. 2006; Hall and Lawson 2014) and, ultimately, long-run economic development (Faria and Montesinos 2009). While there is an emerging consensus that the institutions and policies associated with economic freedom are positively associated with economic performance, some believe that higher levels of economic freedom also comes at the expense of greater inequality (Okun 1975).

The small but growing literature that has examined the relationship between economic freedom and inequality across countries has found mixed results.[2] These studies have employed a variety of econometric methodologies, used heterogeneous measures of both inequality and economic freedom, and examined different country samples and periods. These ambiguous findings leave policymakers, development agencies and other reformers with little empirical guidance on the potential distributional effects of enacting institutional or policy reforms that either enhance or reduce economic freedom.

This paper makes three main contributions to this literature. First, we provide an extensive discussion of previous studies and identify possible reasons for the empirical heterogeneity. Second, using the Fraser Institute's Economic Freedom of the World index (EFW), we replicate the results from two of the relevant studies using six different measures of income inequality and an updated dataset of up to 112 countries over the period 1970-2010. To the best of our knowledge, this is the first study examining economic freedom and inequality to utilize the Standardized World Income Inequality Dataset version 5.0 measures, which account for the uncertainty of the estimated Gini coefficients. Our analysis reveals that previous results are sensitive to the country sample, time period, and/or the measure of inequality. Third, this is the first paper to analyze the relationship between economic freedom and inequality using the Heritage Foundation's Index of Economic Freedom, an alternative to the EFW index.

The remainder of the paper is organized as follows. The existing literature is described next, followed by a discussion of the data and theoretical considerations in section 3. Section 4 presents results from sensitivity tests of the linear and non-linear

[2] Section 2 provides a detailed review of this literature, which includes papers by Apergis and Cooray (2015), Berggren (1999), Scully (2002) Carter (2006), Clark and Lawson (2008), Bergh and Nilsson (2010), Sturm and De Haan (2015) and Bennett and Cebula (2015).

models of Bergh and Nilsson (2010) and Carter (2006). Section 5 provides results from a dynamic panel system GMM analysis. Section 6 offers concluding remarks.

2. A Discussion of the Literature

Only a handful of studies have explicitly examined the relationship between economic freedom and inequality across countries and the results have been mixed. Berggren (1999) used cross-sectional Gini coefficients from the Deininger and Squire (1996) database and the first rendition of the EFW index, which was comprised of four areas, to examine the relationship over the period 1975-1985 for 66 countries. He found that the level and 10-year change in economic freedom are associated with more and less income inequality in 1985, respectively. Berggren's results have been criticized for several reasons. First, Scully (2002) pointed out that Berggren utilized non-comparable Gini coefficients in his study, biasing the results.[3] Second, Carter (2006) argued that Berggren's model is algebraically equivalent to a distributed lag model, which drastically changes the interpretation of the estimates to suggest that short-run and long-run effects of economic freedom on inequality are negative and positive, respectively.

Scully (2002) used Gini coefficients from the Deininger and Squire (1996) database and a customized economic freedom index derived from nine variables from the EFW dataset to examine the relationship between economic freedom, economic growth and inequality over the period 1975-1990 for a sample of 26 mostly developed countries. Scully included a set of dummy variables to control for the potential systemic biases of the various Gini coefficient concepts.[4] He pooled data and employed a two-stage least squares model in which inequality was specified as a function of economic freedom and growth. Growth was assumed to be endogenous and instrumented for with the growth of physical capital and government spending. Scully's results suggested that economic freedom exerts negative direct and total effects on inequality, but the indirect effect through growth is positive. Scully's identification strategy is problematic, however, as it requires that the two instruments be uncorrelated with economic freedom. The economic freedom index constructed by Scully includes variables that are likely to be correlated with the growth of government spending such as government enterprises, taxation and

[3] The Deininger and Squire (1996) database contains inequality measures representing different income and household concepts. These conceptual differences are believed to produce systemic differences and considerable effort has been exerted to construct more comparable inequality datasets in recent years (e.g. Atkinson and Brandolini 2001; Deininger and Squire 1996; Solt 2014).

[4] This approach common in the literature, but has also been subject to criticism (Atkinson and Brandolini 2001; Pyatt 2003).

transfers and subsidies. Additionally, economic theory suggests that institutions consistent with economic freedom incentivize investment, and several studies have found a positive empirical relationship between the two variables (Dawson 1998; Gwartney et al. 2006).

Clark and Lawson (2008) likewise model inequality as a function of both economic freedom and predicted economic growth.[5] They used Gini coefficients from the World Bank World Development Indicators database spanning the period 1990-2000, and average four-area EFW index over the period 1980-2002.[6] For a sample of 66 countries, Clark and Lawson found a negative relationship between EFW and inequality using cross-sectional OLS estimation. Documentation on the World Bank Gini coefficients is very limited such that the quality and comparability of the inequality measures is highly suspect. As such, their results should be interpreted very cautiously. Additionally, Clark and Lawson (2008: 27) employed a "type of 2SLS model" that excluded EFW from the first-stage growth regression in an effort to try to estimate the total effect of EFW on inequality in the second-stage. Traditionally, 2SLS models include all exogenous variables in the first-stage regression and the total effect can be estimated by adding the direct and indirect effects (see e.g., Scully 2002).

Carter (2006) argued that inequality is a non-linear function of economic freedom, and specifically that the relationship is negative at low levels of economic freedom but positive at higher levels. Using Gini measures from the World Institute for Development Economics Research WIID2a database and the five-area EFW index, Carter examined this hypothesis for an unbalanced panel of 39 high and middle income countries over the period 1980-2000 using fixed effects estimation.[7] The specification included linear and square EFW terms, with the former negative and the latter positive, suggesting the existence of a U-shaped inequality-freedom relationship in which the estimated partial effect changes from negative to positive at an EFW level of 4.03 (on a scale from 0-10).[8] This result is fairly sensitive, however, to the country sample, time period and measure of inequality used, as indicated by the replicability results discussed in section 4.

[5] Growth is predicted by a regression of actual growth on initial GDP and a set of geographic and investment variables.
[6] The EFW index used by Clark and Lawson (2008) excludes regulation due to scarcity of data.
[7] Carter (2006) also includes Gini coefficients derived from different income concepts and like Scully (2002), controls for a set of concept indicator variables.
[8] Bennett and Vedder (2013) used U.S. state-level data to estimate a quadratic inequality-economic freedom model and found the relationship to exhibit an inverted U-shape, opposite Carter's findings; however, results from the two studies are not directly comparable due to differences in the samples and composition of the economic freedom indices. Differences between country and subnational economic freedom measures are discussed in more detail below. See footnote 13. In a forthcoming paper, Apergis and Cooray (2015) also find evidence of an inverted U-shaped economic freedom-inequality curve for a panel of 138 countries using cointegration techniques.

Bergh and Nilsson (2010) used the Standardized World Income Inequality Database (SWIID) version 2.0 net income Gini measures and the five-area EFW index to examine the relationship between EFW and income inequality using a fixed effects model for a panel of 78 mostly middle and high income countries over the period 1970-2005.[9] They found a positive relationship between the level of EFW and income inequality, noting that this result may be driven by the over-representation of developed countries in their sample.[10] As the replicability results in section 4 show, this result is also highly sensitive to the country sample, time period and measure of inequality used.

Sturm and De Haan (2015) suggested that the results of previous studies might be biased because aggregate economic freedom indices often include income redistribution via the government sector and inflation.[11] They tested their hypothesis using gross income (before taxes and transfers) Gini coefficients from the SWIID version 4.0 dataset and an EFW index that excluded the government size and sound money areas for a sample of 108 countries over the period 1971-2010. They found that economic freedom exerts no effect on inequality using a fixed effects estimator.[12] Bennett and Cebula (2015) used the long-run average SWIID version 4.0 net income Gini coefficient over the period 1990-2010 and regress it on the average EFW over the period 1985-2005 and a set of covariates. Using OLS estimation, they found that EFW is positively associated with inequality, but is not statistically significant. Because the results of Sturm and De Haan and Bennett and Cebula were not robust, they are not considered further.

Apergis and Cooray (2015) utilize cointegration methods to examine the relationship between EFW and the SWIID version 4 Gini coefficients over the period 1970-2010, finding a long-run negative relationship between EFW and inequality. Additionally, they utilize a panel smooth transition regression approach to examine a potential non-linear

[9] SWIID version not indicated in Bergh and Nilsson (2010), but confirmed in email correspondence with Therese Nilsson on June 23, 2015.

[10] Bergh and Nilsson (2010) also find a positive and marginally significant relationship between EFW and gross income Gini coefficients. In addition, they obtain null results when employing a dynamic model to examine the effect of long-run changes in EFW on changes in inequality, as well as when utilizing GMM estimation.

[11] The argument that government redistribution via the government sector and inflation does not impact market incomes assumes that redistribution is not distortionary and takes place without economic cost. Redistributionary policies often distort investment, labor-leisure and allocation decisions such that it is highly plausible that market incomes, and hence gross income inequality, would differ in the absence of such redistribution, although admittedly, it is not possible to measure incomes in such a counterfactual world. Regarding the use of his dataset, Solt (2014: 21) adds that "Market-income inequality, although accurately described as measuring the distribution of income before taxes and transfers are taken into account, cannot be considered 'pre-government': a wide range of non-redistributive government policies, from public education and job-training programs to capital-accounts regulations, also shape the income distribution. In addition to such market-conditioning policies, market-income inequality also includes the feedback effects of redistributive policies on household's decisions regarding savings, employment, and retirement."

[12] Sturm and De Hann (2015) also found that the effect of economic freedom on income redistribution, as measured by the difference between net and gross income inequality, is conditional on fractionalization.

EFW-inequality relationship, finding that EFW is positively (negatively) associated with inequality below (above) an EFW threshold of around 5.4 (on a 0-10 scale).

The studies described above have utilized different measures of both inequality and economic freedom. They have also employed various econometric specifications, country samples, and time periods to empirically examine the effect of economic freedom on inequality. Appendix Table A1 provides a summary of these studies.

Several studies have also examined the relationship between subnational economic freedom and inequality in North America. Like the cross-country studies, the subnational analyses have made use of different econometric approaches and inequality data, although they have all utilized the Frasier Institute's Economic Freedom of North America (EFNA) index as the measure of economic freedom. The results have been more consistent than those of the cross-country studies, generally pointing towards a negative relationship between state-level economic freedom and inequality (Apergis et al. 2013; Ashby and Sobel 2008; Bennett and Vedder 2013; Webster 2013; Wiseman 2016), although Bennett (2016), who pools data for the U.S. states and Canadian provinces, found a positive relationship between EFNA and inequality. Although they do not examine the overall impact of economic freedom on inequality, Compton et al. (2014) found that increases in EFNA exert a positive and significant impact on the growth rates of mean household income for the top four quintiles, and a positive but insignificant impact on the bottom income quintile. Wiseman (2016), however, finds that increases in economic freedom are associated with larger income growth rates for the bottom 90 percent of income earners relative to the top 10 percent. [13]

3. Data & Theoretical Considerations

3.1 Economic Freedom

The main variable of interest in this study is economic freedom, which is a complex concept applicable to a variety of economic and legal institutions and policies that govern the rules of economic interaction of a society. We use the chain-linked Economic

[13] The EFNA index only accounts for heterogeneity among the U.S. states in three areas: government expenditures, government revenues, and labor market policies (Stansel and McMahon 2013). National institutions measured by the EFW index such as the regulatory environment, monetary policy, international trade policy, and legal institutions are relatively homogenous across subnational regions. These macro-level institutions may nonetheless influence the distribution of income such that results pertaining to the relationship between subnational economic freedom and inequality are not directly comparable to those resulting from the study of county-level economic freedom and inequality because the margins by which institutions and policies are operating at the subnational and national level differ.

Freedom of the World (EFW) index as the primary measure of economic freedom (Gwartney et al. 2013).[14] The EFW index measures the extent to which a nation's institutions and policies are consistent with personal choice, voluntary exchange, freedom to enter and compete in markets, and protection of persons and their property from the aggression of others. It is comprised of five main areas (size of government, legal institutions and property rights, sound money, freedom to trade internationally, and economic regulations), with each area derived from numerous component variables and placed on a 0-10 scale that is increasing in freedom. The index's authors suggest that it measures how closely a nation's institutions and policies compare with the idealized structure of a perfectly competitive market system (Gwartney et al. 2013, p. 2).

As noted by Acemoglu et al. (2015, p. 1885): "[A]ny market system is embedded in a larger political system. The impact of the political system on distribution depends on the laws, institutions, and policies enacted by that system." The degree to which a country's institutions and policies are consistent with economic freedom and how they impact economic distribution are therefore a reflection of "the distribution of power in society and how political institutions and mobilized interests aggregate preferences (Ibid)." These factors therefore influence the creation and reform of institutions and policies, which in turn have an impact on distribution through various channels. Acemoglu et al. (2015, p. 1943) examine the various channels through which democracy may influence income inequality, concluding that: "Democracy may be bringing new opportunities and economic change, which may increase inequality, while simultaneously lowering barriers to entry and investing in public goods, which may reduce inequality, and the net result could be either an increase or decrease in inequality."

Although democracy describes a political system that is imperfectly correlated with and represents a different concept than economic freedom, the results of Acemoglu et al. (2015) provide some insight on how we might expect the various institutions and policies comprising economic freedom to influence the distribution of income. The work of Marreo and Rodriguez (2013), who suggest that income inequality is a composite

[14] The Heritage Foundation provides an alternative economic freedom measure, the Index of Economic Freedom (IEF). The EFW measure is used in this study for several reasons. First, the EFW data are available for a large number of countries as far back as 1970, while the IEF data are only available since 1996. Second, one of the objectives of this study is to replicate the results of existing literature and all of the cross-country studies on economic freedom and inequality have utilized the EFW data. Third, the majority of the empirical economic freedom literature uses the EFW and not the IEF data. Hall and Lawson (2014), for instance, document that hundreds of scholarly articles have been published in academic journals that cite the EFW data. Analogous system GMM results using the Heritage data are presented, however, in Appendix Table A3.

measure of inequality of opportunity (IO) and inequality of effort (IE), also informs how the various components of economic freedom potentially influence income inequality. IO refers to inequality stemming from circumstantial factors beyond the control of individual responsibility such as race, sex and socioeconomic background, whereas IE refers to inequality attributable to responsible individual choices such as number of hours to work or career field. While it is beyond the scope of this paper to examine how every component of economic freedom potentially impacts income inequality, we build on the excellent discussion by Bergh and Nilsson (2010) in considering the five major areas of the EFW index within this framework.

First is the size of government area. Higher EFW scores reflect more limited government. As Bergh and Nilsson (2010) discuss, countries with larger welfare states are expected to have less inequality because income is redistributed through tax-and-transfer policies to potentially reduce income disparities attributable to IO,[15] but large government does not necessarily imply a large welfare state. In addition to transfers and subsidies and progressivity of the income tax, the size of government area of the EFW index also consists of components measuring government consumption and the extent of state-owned enterprises and government investment. The greater the extent to which government is involved in allocating a society's resources; the greater is the incentive for unproductive entrepreneurship such as rent-seeking and cronyism (Holcombe 2013), which may stifle economic mobility, increasing IO (Stiglitz, 2012, Bennett and Cebula, 2015). Governments also subsidize education and other types of human capital investments, which may act to create more widespread economic opportunity, reducing IO.[16]

Area 2 of the EFW index provides a measure of a country's legal system and it consists of components such as property rights protections, evenhanded contract enforcement, impartial legal system, and police reliability. While many of the variables used in constructing area 2 are based on surveys of business leaders and may therefore be biased towards legal protections of business interests, the variables included in the index reflect the degree to which a country's institutional arrangements are consistent with competitive markets void of partiality towards particular firms, industries or groups

[15] Assuming that income is progressively redistributed and welfare programs are designed to not discourage work effort from transfer recipients. If the latter condition does not hold, then the net effect on an individual's income could be neutral. Although the transfer would still reduce income inequality, it would do so by further increasing IO if the transfer recipient reduced his/her labor hours.

[16] As discussed by Bennett and Vedder (2015), the relationship between educational attainment and income inequality is theoretically ambiguous and empirical evidence is mixed.

of people. Impartial legal institutions that favor some firms, industries or groups create barriers to entry, uncertainty and an uneven playing field, acting to increase IO for those not benefitting from impartial legal rules. This also reduces incentives for individuals to start a business or invest in human capital to gain skills necessary for entry into higher paying occupations, potentially acting to also reduce the IE. Economic historians Engerman and Sokoloff (2002) suggest that substantial multi-generational income disparities have persisted in societies in which a wealthy elite minority has managed to influence rules, laws and other policies to protect its members' economic interests and limit economic opportunities available to the masses. The Engerman and Sokoloff hypothesis receives some empirical support in studies by Acemoglu et al. (2015) and Bennett and Nikolaev (2016). Bergh and Nilsson (2010) discuss additional reasons to expect a negative relationship between impartial legal institutions and inequality.

Area 3 provides a measure of sound money. Countries with stable monetary growth and low and variable inflation are more economically free. As Bergh and Nilsson (2010) note, high and variable inflation are expected to be more detrimental to low-income than high-income earners because the latter are better positioned to protect their assets. Bagus (2014) suggests that the wealthy may also be in a better position to leverage their assets to take advantage of arbitrage opportunities attributable to a lag between increases in the money supply and general price increases. Because those with greater incomes and wealth are better positioned to protect and/or leverage their assets, unsound monetary practices are expected to increase inequality, although very low inflationary environments may not maximize employment in the short-run, potentially disproportionately harming the bottom of the income distribution (Akerlof et al. 1996).

Area 4 provides a measure of freedom to trade internationally. Standard Heckscher-Olin (H-O) trade theory suggests that trade liberalization will be relatively more (less) beneficial to unskilled workers in less (more) developed countries. H-O theory suggests that trade barriers in less developed countries limit economic opportunities for unskilled workers, resulting in greater IO and reducing the potential gains from exerting effort. Trade liberalization is predicted to result in greater equality. Meanwhile, H-O theory predicts that trade liberalization in developed nations will reduce economic opportunities for unskilled workers, resulting in greater inequality. As such, the effect of trade freedom on inequality depends in theory on a country's level of economic development, although as Bergh and Nilsson (2010) describe, more sophisticated trade models do not offer such a clear prediction and empirical evidence is mixed.

Area 5 measures regulation of credit, labor and business. Less regulation is associated with more economic freedom. While some regulations protect consumers and workers from unscrupulous business practices and may promote more widespread economic opportunities, other regulations serve as entry barriers that protect the economic interests of certain firms or industries by limiting competition. Regulations could therefore either impact inequality negatively or positively. Hopkin and Blyth (2012) argue that low and high levels of regulation are associated with greater inequality, but intermediate levels of regulation are associated with more equality. Bergh and Nilsson (2010) discuss additional theoretical considerations regarding the effect of regulation on inequality, but ultimately conclude that the impact of regulatory freedom on inequality is theoretically ambiguous, potentially reflecting that economic regulations are potentially prone to the same sort of elite capture of legal institutions described above.

As discussed above, the various institutional and policy components of economic freedom are expected to exert a differential and sometimes ambiguous impact on inequality, and as such the relationship between the two variables is theoretically ambiguous. Indeed, using a parsimonious two-agent theoretical model, Berggren (1999) shows that other than income redistribution through a static tax-and-transfer system, which reduces both economic freedom and inequality, the relationship between economic freedom and inequality is ambiguous due to the expected differential effect that various components of economic freedom exert on the distribution of income.[17] Given these considerations, it is unsurprising that empirical evidence has been so mixed.

Another possibility is that the relationship between economic freedom and inequality is non-linear, potentially exhibiting a Kuznets-like curve. Bennett and Vedder (2013, p.49-50) describe this possibility:

> *Kuznets (1955) famously theorized that as economies grow inequality rises until a certain level of income is reached and inequality begins to fall, suggesting that the benefits of growth initially accrue to the upper end of the income distribution before trickling down to the lower part of the distribution. Assuming that the Kuznets relationship holds, one might expect that the same inverted U-shape relationship exists between economic freedom and income inequality, since the former has been*

[17] The theoretical result that redistribution reduces inequality is not completely generalizable either. Berggren's framework hinges on income being redistributed from the rich to the poor at no economic cost, assumptions which may not hold in practice. "Director's law," for instance, suggests that the median voter will choose to redistribute resources to the middle class and not the poor (Stigler 1970). Additionally, the rent-seeking literature suggests that well-organized interest groups have an incentive to lobby for subsidies that result in regressive redistribution. Tax-and-transfer policies can also potentially distort labor market decisions on both the supply and demand sides, altering individual incomes.

> *empirically shown to be a positive determinant of economic growth… Thus it is plausible that starting from low levels of economic freedom, enhancements would induce growth and provide new economic opportunities that initially benefit the upper part of the income distribution more so than the lower part since investments would likely originate from those with the physical and human capital necessary to launch an enterprise or engage in trade. This would result in an increase in income inequality. As economic freedom continues to expand, growth continues, providing new economic opportunities to those previously lacking the capital to take advantage of emerging economic opportunities. Eventually, greater economic freedom should result in greater benefits accruing to the lower part of the distribution relative to the upper part, resulting in an increase in equality.*

Using U.S. state level panel data, Bennett and Vedder (2013) find evidence of an inverted U-shaped economic freedom-inequality curve. Apergis and Cooray (2015) find a similar relationship across countries using time series methods, but Carter (2006) finds evidence of a U-shaped economic freedom-inequality curve. As shown in section 4, however, Carter's results are very sensitive to the country sample, time period, and/or inequality measure, somewhat discrediting this finding.

3.2 Inequality Measures

Measuring inequality is a methodologically challenging task. Differences in income definitions and the unit of measurement have led to concern over the quality and comparability of inequality data across countries and over time (Atkinson and Brandolini 2001; Deininger and Squire 1996; Pyatt 1993; Székely and Hilgert 1999). Researchers have recognized these concerns and considerable effort has been exerted in recent years to compile inequality databases consisting of measures that are comparable across countries and time.

Unfortunately the choice of inequality measures often involves a quality versus quantity trade-off. For instance, the Luxembourg Income Study (LIS) and Socio-Economic Database for Latin America and the Caribbean (SEDLAC) databases provide high quality, comparable inequality measures based on representative income surveys, but these measures are limited in their country and time coverage and are not comparable to one another. Meanwhile, the Standardized World Income Inequality Database (SWIID) and Estimated Household Income Inequality (EHII) dataset both provide comparable inequality measures for a large number of countries across time, but the measures are predicted rather than based on actual random and representative income data, compromising quality in favor of quantity.

The latest release of SWIID, version 5.0, takes into account the uncertainty of the predicted inequality measures. For the complete series of Gini coefficients, 100 separate imputations are provided. This allows for the use of multiply imputed estimation techniques that automate the Monte Carlo simulation process and average the results (Solt, 2014). The SWIID 5.0 net and market Gini coefficient measures are used in the current study.[18]

While the SWIID 5.0 measures are the main inequality data used, four additional inequality datasets are utilized, allowing for a test of the sensitivity of an econometric specification to the choice of inequality measure. The six alternative Gini coefficient measures are described in Table 1.[19]

Because inequality data are often not available annually, an assignment metric is utilized in an effort to match the inequality measures to the quinquennial EFW data. Inequality observations from each dataset are assigned to the closest year ending in zero or five. The average of the observations assigned to a given quinquennial period for a given country, when more than one is available, is used as the measure for that period. This is performed for each of the 100 imputations of both the net and market Gini coefficients from SWIID 5.0,[20] as well as for each of the other four inequality measures.

3.3 Independent Variables

Researchers studying economic freedom and inequality have included a number of control variables that also potentially impact inequality such as GDP, educational attainment, age composition of the population, composition of the workforce, the degree of urbanization, the fertilization rate, investment price distortion, and foreign direct investment. Because the objective of the analysis in section 4 is to replicate and explore the robustness of previous results, to the extent possible, the variables that have been used in the econometric models considered are included in these results. As with the inequality measures, the average five-year value is assigned to each quinquennial period. The main control variables applicable to each of the previous studies are indicated in the last column of Appendix Table A1. A description of all of the variables used in this study and summary statistics are provided in Appendix Table A2.

[18] The R^2 values reported in section 4 for estimates based on the SWIID version 5 data are computed using Rubin's (1987) combination rule and utilize Fisher's z transformation over the imputed data.

[19] Gini coefficients take a value ranging from zero (resources equally distributed over population) to one (one person or household possess all resources). It is a relative inequality measure and there is no direct mapping between the underlying income distribution and the Gini coefficient.

[20] SWIID author Frederick Solt confirmed in an email on June 4, 2015 that this was the appropriate way to compute longer term averages of the data series for multiply imputed estimation.

TABLE 1: ALTERNATIVE INEQUALITY MEASURES

Inequality Measure	Description	Period	Country Coverage	Source
SWIIDN5	Net household income Gini coefficient. Predicted using a missing-data algorithm that incorporates Gini coefficients from the Luxemburg Income Study, World Income Inequality Database, Socio-Economic Database for Latin America and the Caribbean, OECD Distribution Database, Eurostat, World Bank PovcalNet dataset, UN Economic Commission for Latin America and the Caribbean, University of Texas Inequality Project, World Top Incomes Database, national statistical offices and other sources. 100 imputations provided.	1960-2013	174	Solt (2014)
SWIIDG5	Gross household income Gini coefficient. Predicted using a missing-data algorithm. See SWIIDN for data sources. 100 imputations provided.	1960-2013	174	Solt (2014)
EHII	Gross household income Gini coefficient. Predicted from econometric relationship between manufacturing pay inequality, Gini coefficients from the World Income Inequality Database, and other independent variables.	1963-2008	149	Galbraith and Kum (2005)
NETGINI	Net household income Gini coefficient. Actual measures taken from a number of sources, including United Nations University Worldwide Institute for Development Economics Research (UNU-WIDER) World Income Inequality Database version 2.0c (WIID2C) and Milanovic's All the Gini's (ATG) database.	1970-2010	68	Custom dataset. See Appendix B for details
GROSSGINI	Gross household income Gini coefficient. See NETGINI for data sources.	1970-2010	71	Custom dataset. See Appendix B for details
CONGINI	Consumption Gini coefficient. See NETGINI for data sources.	1970-2010	79	Custom dataset. See Appendix B for details

4. Replicability of Previous Findings

This section explores the replicability and sensitivity of the baseline linear and non-linear fixed effects estimates of Bergh and Nilsson (2010) and Carter (2006), respectively.[21]

Column 1 in Table 2 reproduces the baseline estimate from Bergh and Nilsson (2010, p. 496, Table 2, column 1), which was derived using the SWIID version 2.0 net Gini data for a sample of 78 countries over the period 1970-2005. The 0.949 coefficient for EFW is positive and statistically significant at the 5 percent level. Using the same sample of countries and time period, column 2 instead uses the SWIID 5.0 net income Gini (SWIIDN5) data as the dependent variable. The coefficient on EFW remains positive but drops to 0.265 and is not statistically significant. Columns 3 and 4 lift the country sample and period restrictions, respectively, and the EFW coefficient estimates drop to 0.231 and 0.061, neither of which is significant statistically.

Data for the independent variables used to estimate column 1-4 were taken from Bergh and Nilsson (2010). The remaining columns utilize the same set of covariates but utilize more recent data obtained from the original sources, expanding the country sample. SWIIDN5 and SWIIDG5 are the dependent variables in columns 5 and 6, respectively, but EFW is not statistically significant in either. The remaining four columns employ the EHII, NETGINI, GROSSGINI and CONGINI measures as the dependent variable. EFW has a positive coefficient in columns 7-9 and a negative sign in column 10, but is only statistically significant at conventionally accepted levels in column 8, which uses the NETGINI measure as the dependent variable.

The results from Table 2 suggest that Bergh and Nilsson's (2010) finding of a strong, positive and statistically significant effect of economic freedom on income inequality is sensitive to the measure of inequality, sample period, and/or country sample used. While insightful, the country samples and number of observations available differ across the various measures of inequality, hindering the comparability of the estimates. Table 3 provides additional insight into the sensitivity of these results by restricting the samples to country-year observations available for multiple measures of inequality.

[21] Sensitivity of the results from the cross-sectional models used by Berggren (1999) and Clark and Lawson (2008), as well as the results from the 2SLS model used by Scully, are not considered here, primarily because of methodological issues with the models they utilize, as described in section 3, but also because of space limitations. In results not reported, we find that the Berggren cross-sectional and Scully 2SLS models are also quite sensitive to the time period, inequality measure, and sample of countries examined. Sturm and De Haan (2015) and Bennett and Cebula (2015) both found a null result, so the sensitivity of their models are not considered here either. The study by Apergis and Cooray (2015) was released after the current study was completed and it includes a number of sensitivity tests.

Rows 1 and 2 in Table 3 restrict the sample to observations with data available for both the SWIIDN5 and NETGINI measures. For this sample of 60 countries, EFW exhibits a positive and statistically significant relationship with both measures of net income inequality exhibit. The point estimates are similar, suggesting that a unit increase in EFW is associated with a 1.245 to 1.493 increase in net income inequality. This is unsurprising given that many of the inequality measures included in the NETGINI dataset are used by Solt (2009) as the baseline in his missing data algorithm.

Rows 3-5 in Table 3 restrict the sample to observations with data available for the SWIIDG5, EHII, and GROSSGINI datasets. For this sample of 48 countries, EFW has a positive but statistically insignificant association with gross income inequality. The point estimates range from 0.200 to 0.352. Finally, rows 6-9 in Table 3 restrict the sample to observations with data available for the SWIIDN5, SWIIDG5, EHII and CONGINI inequality measures. For this sample of 53 countries, EFW and inequality are positively related, but the estimates are not statistically significant, with the exception of row 8 which utilizes the EHII inequality measure and is significant at the 10 percent level. Interestingly, the 1.298 coefficient is noticeable smaller than the coefficient in row 4, which also uses the EHII data for a sample of 48 countries and is statically insignificant.

Table 4 performs a similar sensitivity analysis of the non-linear fixed effects baseline model employed by Carter (2006, p. 170, Table 3). Row 1 reproduces the coefficient and standard error estimates for EFW and its square, as well as indicates the level at which the effect of EFW changes from negative to positive (EFW^*), the p-value of the joint significance of the two EFW terms and information about the sample. Recall from section 3 that Carter's estimates were derived for a sample of 39 countries over the period 1980-2000, controlling for the set of covariates listed in Appendix Table A2.[22]

Rows 2-4 in Table 4 restrict the country and period sample to that used by Carter (2006), but use the SWIIDN5, SWIIDG5 and EHII inequality measures as the dependent variable, respectively.[23] The coefficient estimates for the linear and squared EFW terms are both statistically significant at 5 percent or better, as well as jointly significant, in row 2 and form an inverted U-shaped curve. The estimated turning point is $EFW^*=4.79$, so the results for this regression are similar to Carter's original results. The EFW terms have the correct sign in row 3, but only the squared term is statistically significant and

[22] Covariates include the following and their square: real GDP per capita, political rights, civil liberties, share of population living in urban area, average years of schooling of adult population, shares of population under age 15 and above age 65, shares of labor force employed in the industrial and service sectors.

[23] The other inequality datasets employed in this analysis do not have observations for some of the countries used by Carter (2006).

they are jointly insignificant. In row 4, the EFW terms actually form a U-shaped curve, opposite the findings of Carter, but neither is statistically significant, although they are jointly significant at the 10 percent level.

Rows 5-7 in Table 4 remove the time period restriction to allow for a larger total sample size. Again, the results using SWIIDN5 are consistent with an inverted U-shaped EFW-inequality curve. None of the EFW terms are statistically significant when SWIIDG5 and EHII are used, although they are jointly significant in row 7 and again form a U-shaped curve. Rows 8-10 lift the country sample restriction but retain the time period restriction. The results are very similar for each of the three inequality measures – those using SWIIDN5 are consistent with an inverted U-shaped EFW-inequality curve, but those using the other two measures are not. The EFW terms are jointly significant in rows 8 and 10.

Rows 11-16 in Table 4 do not restrict either the country or time period, and each uses a different inequality measure as the dependent variable. The estimates form an inverted U-shaped EFW-inequality curve in the regressions using the SWIIDN5, SWIIDG5 and CONGINI measures, but a U-shaped curve in those using the EHII, NETGINI and GROSSGINI measures. The EFW terms are jointly significant at 10 percent or better in each regression, but are both statistically significant only in rows 13 and 16, which use the EHII and CONGINI inequality measures. The estimates in row 16 suggest that the effect of EFW on consumption inequality changes from negative to positive at EFW* = 5.98, which is slightly above the mean EFW level for this sample of countries. The estimates in row 13 suggest that the effect of EFW on gross income inequality changes from positive to negative at EFW*=7.15, which is approximately the lower bound of 75th percentile for this sample. The EFW* estimates are 3.86 and 3.37 in rows 11 and 12, and greater than 10 in rows 14 and 15. Only 16 observations in this sample have an EFW score below 4 and 10 is the upper bound of EFW. These estimates effectively suggest that EFW is positively associated with inequality.

The remaining estimates in Table 4 restrict the samples to country-year observations available for multiple measures of inequality to increase the comparability of results. Rows 17 and 18 restrict the sample to observations with data available for both the SWIIDN5 and NETGINI measures. For this sample of 59 countries, both EFW terms are positive in row 17, and although they form an inverted U-shaped curve in row 18, the estimated EFW*=9.557 is out of sample, effectively suggesting that EFW is positively associated with net income inequality in both regressions.

TABLE 2: SENSITIVITY TESTS FOR LINEAR FIXED EFFECTS MODEL

Gini Coefficient is dependent variable	(1) SWIIDNBN	(2) SWIIDN5	(3) SWIIDN5	(4) SWIIDN5	(5) SWIIDN5	(6) SWIIDG5	(7) EHII	(8) NETGINI	(9) GROSSGINI	(10) CONGINI
EFW	0.949**	0.265	0.231	0.061	0.283	0.381	0.444	1.572***	0.246	-0.470
	(0.384)	(0.539)	(0.533)	(0.484)	(0.417)	(0.495)	(0.409)	(0.470)	(0.392)	(0.651)
LRGDPL	3.304**	2.403	2.395	3.583	3.173*	2.794	-2.554**	2.761	0.555	7.305***
	(1.570)	(1.999)	(1.986)	(2.273)	(1.905)	(1.896)	(1.263)	(2.251)	(2.629)	(2.361)
HUMCAP	0.373**	0.189	0.183	0.030	0.026	0.237*	-0.038	-0.024	-0.237	0.035
	(0.162)	(0.161)	(0.160)	(0.124)	(0.116)	(0.138)	(0.091)	(0.128)	(0.209)	(0.238)
DEP2LABOR	4.219	6.762	6.171	8.624**	8.498**	15.865***	9.537***	8.097	-4.574	8.577
	(3.490)	(4.134)	(4.104)	(4.172)	(3.944)	(4.786)	(3.138)	(7.068)	(4.863)	(6.439)
Observations	479	459	480	536	668	668	614	260	190	230
Countries	78	78	88	77	112	112	106	60	61	67
Period	1	1	1	2	2	2	2	2	2	2
R^2	0.122	0.117	0.109	0.11	0.119	0.176	0.275	0.290	0.330	0.104
F	5.681						11.03	5.421	6.002	.
p	0.00						0.00	0.00	0.00	.
F(mi)		2.181	1.895	2.488	2.554	2.822				
p(mi)		0.025	0.051	0.009	0.005	0.002				

Robust standard errors in parentheses. Data for independent variables in columns 1-3 from Bergh and Nilsson (2010). Data for remaining specifications taken from source – see Appendix Table A2. F(mi) and p(mi) represent the F-statistic and p-value of joint significance for multiply imputed regression estimates in columns 2-6. The R^2 values reported in columns 2-6 are computed using Rubin's (1987) combination rule and utilize Fisher's z transformation over the imputed data. Periods 1 and 2 denote 1970-2005 and 1970-2010, respectively. Constant term and fixed time effects omitted for space. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 3: RESTRICTED SAMPLE SENSITIVITY TESTS FOR LINEAR FIXED EFFECTS MODEL

	Dep. Variable	EFW Coeff	EFW Std. Error	Obs.	Countries	R^2
(1)	SWIIDN5	1.245***	(0.418)	259	60	0.394
(2)	NETGINI	1.493***	(0.459)	259	60	0.298
(3)	SWIIDG5	0.216	(0.607)	117	48	0.306
(4)	EHII	0.200	(0.481)	117	48	0.155
(5)	GROSSGINI	0.352	(0.550)	117	48	0.202
(6)	SWIIDN5	0.692	(0.521)	147	53	0.392
(7)	SWIIDG5	0.981	(0.646)	147	53	0.403
(8)	EHII	1.298*	(0.667)	147	53	0.313
(9)	CONGINI	0.202	(0.730)	147	53	0.162

Robust standard errors in parentheses. Each row represents a different regression. Rows 1 and 2 restricted to sample for which SWIIDN5 and NETGINI measures available. Rows 3-5 restricted to sample for which SWIIDG5, EHII and GROSSGINI measures available. Rows 6-9 restricted to sample for which SWIIDN5. SWIIDg5, EHII and CONGINI measures available. The R^2 values reported for regressions using SWIIDN5 and SWIIDG5 are computed using Rubin's (1987) combination rule and utilize Fisher's z transformation over the imputed data. Results for constant term, fixed time effects, and covariates omitted for space. See Table 2 for a list of control variables. *** p<0.01, ** p<0.05, * p<0.1.

Rows 19-21 in Table 4 restrict the sample to observations with data available for the SWIIDG5, EHII, and GROSSGINI datasets. For this sample of 41 countries, the EFW terms are not jointly significant statistically in any of the three regressions. Rows 22-25 restrict the sample to observations with data available for the SWIIDN5, SWIIDG5, EHII and CONGINI inequality measures. For this sample of 43 countries, the EFW terms are only jointly significant statistically in rows 24 and 25, which use the EHII and CONGINI measures. The estimates in these two specifications are similar to those obtained for the unrestricted samples in rows 13 and 16.

Overall, the results presented here suggest that the positive and significant effect of EFW found by Bergh and Nilsson (2010) generally becomes insignificant statistically when the country sample, time period, or measure of inequality is altered. Similarly, the inverted U-shaped EFW-inequality curve found by Carter (2006) is sensitive to the country sample, time period, or measure of inequality used, and the curve is sometimes inverted when an alternative inequality measure is used.

5. Additional Results: Dynamic Panel System GMM

The analysis in section 4 attempts to replicate the findings of two popular studies on the relationship between economic freedom and inequality. The analysis suggests that the findings of Carter (2006) and Bergh and Nilsson (2010) are quite sensitive to the choice of inequality measure and sample. Both employ a fixed effects model, which may generate biased estimates if economic freedom is endogenous. Apergis et al. (2013) finds

evidence of bidirectional causality between economic freedom and inequality in a study of the 50 U.S. states and Murphy (2015) argues that high levels of inequality may cause voters to prefer policies that lower inequality by reducing economic freedom. There is thus reason to believe that economic freedom may be endogenous. In the spirit of Acemoglu et al. (2015), who study democracy and inequality, and Marrero and Rodriguez (2013), who study economic growth and inequality, Table 5 reports the results of the dyanmic panel system GMM estimator of Blundell and Bond (1998) to control for the potential endogeneity of economic freedom.[24]

The dependent variable in Table 5 is the Gini coefficient, with each column utilizing one of the six alternative Gini measures introducted in section 3.[25] The independent variables include a lag of the dependent variable and lagged EFW, both of which are treated as endogenous, and a vector of lagged control variables.[26] Because the dataset is an unbalanced panel, the forward orthogonal deviations-transformation described by Arellano and Bover (1995) is used to preserve the sample size. EFW enters negatively in the regressions using SWIIDN5 and SWIIDG5, but neither is statiscally significant at conventional accepted levels. EFW is positive in the remaining regressions, but is only significant in column 4, which is estimated using the NETGINI measure.

As discussed in section 3, one potential reason for the sensitivity of empirical findings on the relationship between economic freedom and inequality is that the former is a complex concept comprised of a wide variety of institutons and policies. Accordingly, Table 6 reports results from decomposition of the EFW index to individually estimate the impact of its five major areas on the six alternative inequality measures using the system GMM estimator. Each row corresponds to a different regression, omitting the results for the control variables for space.

[24] It is acknowledged that some p-values from the Hansen specification test in the results reported below are close to 1.0, suggesting potential over-identification. See Roodman (2009) for a discussion of over-identification in the context of System GMM. It is also acknowledged that the p-value of the ar(2) test in some estimates is less than 0.1, suggestive that instruments lagged t-2 are invalid and an additional lag should be introduced with t-3 lagged instruments used. Because the results are generally null, there are a limited number of time periods, and the objective of this analysis is to estimate comparable coefficients for each of the various coefficients, additional results addressing these issues are not reported.

[25] The analysis for this paper executed in Stata. To the best of our knowledge, there is not a known method to apply system GMM analysis using MI data. For the regressions utilizing the SWIID version 5 inequality measures, we use the average of the 100 imputations for each observation.

[26] The control variables include: log of real GDP per capita (LRGDPL), the shares of labor employed in the industrial (INDUSTRY) and service (SERVICE) sectors, the price of investment goods relative to the U.S. (PDISTORT), the fertility rate (FERTILITY), the average years of secondary education of males (EDUCF) and females (EDUCF), the dependent to labor force ratio (DEP2LABOR), and the share of population residing in an urban area (URBAN). See appendix Table A1 for more information.

TABLE 4: SENSITIVITY TESTS FOR NON-LINEAR FIXED EFFECTS MODEL

	Dep.	EFW		EFW^2							
	Variable	Coeff	Std. Error	Coeff	Std. Error	EFW*	p(EFW*)	N	Countries	Period	R^2
(1)	WIID2a	-2.892**	(1.107)	0.359***	(0.093)	4.03	-	104	39	1980-2000	-
(2)	SWIIDN5	-4.284**	(1.666)	0.448***	(0.138)	4.79	0.002	169	39	1980-2000	0.410
(3)	SWIIDG5	-3.581	(2.558)	0.386*	(0.224)	4.63	0.132	169	39	1980-2000	0.362
(4)	EHII	1.440	(1.481)	-0.058	(0.127)	12.52	0.069	169	39	1980-2000	0.696
(5)	SWIIDN5	-3.678*	(1.919)	0.424***	(0.152)	4.33	0.000	245	39	1970-2010	0.468
(6)	SWIIDG5	-2.934	(3.146)	0.378	(0.280)	3.88	0.108	245	39	1970-2010	0.353
(7)	EHII	2.369	(1.539)	-0.116	(0.130)	10.20	0.009	203	39	1970-2010	0.587
(8)	SWIIDN5	-2.758*	(1.441)	0.316**	(0.124)	4.36	0.005	315	98	1980-2000	0.359
(9)	SWIIDG5	-1.766	(2.295)	0.218	(0.205)	4.06	0.210	315	98	1980-2000	0.363
(10)	EHII	2.675*	(1.379)	-0.201	(0.125)	6.65	0.059	309	91	1980-2000	0.546
(11)	SWIIDN5	-2.138	(1.466)	0.277**	(0.119)	3.86	0.000	487	107	1970-2010	0.386
(12)	SWIIDG5	-1.514	(2.114)	0.225	(0.187)	3.37	0.034	487	107	1970-2010	0.371
(13)	EHII	3.024**	(1.159)	-0.212**	(0.104)	7.15	0.005	390	92	1970-2010	0.500
(14)	NETGINI	2.258	(1.934)	-0.112	(0.157)	10.08	0.097	235	59	1970-2010	0.450
(15)	GROSSGINI	3.502	(3.269)	-0.152	(0.277)	11.51	0.024	160	52	1970-2010	0.295
(16)	CONGINI	-6.621*	(3.487)	0.553*	(0.324)	5.98	0.073	174	60	1970-2010	0.391
(17)	SWIIDN5	0.028	(2.006)	0.118	(0.148)	-0.118	0.001	234	59	1970-2010	0.622
(18)	NETGINI	2.885	(2.150)	-0.151	(0.169)	9.557	0.087	234	59	1970-2010	0.453
(19)	SWIIDG5	1.256	(4.547)	-0.036	(0.378)	17.28	0.382	100	41	1970-2010	0.465
(20)	EHII	1.946	(2.296)	-0.203	(0.199)	4.783	0.359	100	41	1970-2010	0.632
(21)	GROSSGINI	7.358	(4.963)	-0.545	(0.425)	6.753	0.218	100	41	1970-2010	0.446
(22)	SWIIDN5	-1.687	(2.438)	0.231	(0.215)	3.650	0.227	117	43	1970-2010	0.570
(23)	SWIIDG5	0.590	(3.925)	-0.002	(0.343)	120	0.764	117	43	1970-2010	0.574
(24)	EHII	4.065*	(2.134)	-0.289	(0.209)	7.033	0.013	117	43	1970-2010	0.519
(25)	CONGINI	-9.290**	(4.143)	0.859**	(0.364)	5.404	0.067	117	43	1970-2010	0.437

Robust standard errors in parentheses. Each row represents a different regression. Row 1 represents the baseline estimate from Carter (2006: 170, Table 3). Rows 2-7 restrict the country sample to those included in Carter's analysis. Rows 2-4 restrict time period to that examined by Carter, while rows 5-7 do not restrict the time period. Rows 8-10 restrict the time period but not the country sample. Rows 11-16 do not impose any country or period restrictions. Rows 17-18 are restricted to the sample with observations available for both SWIIDN5 and NETGINI. Rows 19-21 are restricted to the sample with observations available for SWIIDG5, EHII and GROSSGINI. Rows 22-25 are restricted to the sample with observations available for SWIIDN5, SWIIDG5, EHII and CONGINI. Constant term and covariates omitted for space. $EFW^* = -\beta_1/2\beta_2$ is derived from first order condition. p(EFW) is the p-value of the joint significance of EFW and EFW^2. See Appendix Table A2 for a list of control variables, but note that Gini concept dummies are not included here because all of the Gini measures are comparable. The R^2 values reported for regressions using SWIIDN5 and SWIIDG5 are computed using Rubin's (1987) combination rule and utilize Fisher's z transformation over the imputed data. No R^2 value is reported in row 1 because Carter reported the between R^2 instead of the within. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 5: DYNAMIC PANEL SYSTEM GMM ESTIMATES

	(1) SWIIDN5	(2) SWIIDG5	(3) EHII	(4) NETGINI	(5) GROSSGINI	(6) CONGINI
L.GINI	0.871***	0.849***	0.448***	0.707***	0.894***	0.844***
	(0.048)	(0.062)	(0.106)	(0.081)	(0.079)	(0.094)
L.EFW	-0.116	-0.371	0.089	1.131***	0.547	1.010
	(0.254)	(0.345)	(0.292)	(0.430)	(0.441)	(0.751)
L.LRGDPL	-0.731	0.184	3.720***	-2.220***	-2.798**	0.298
	(0.450)	(0.480)	(0.884)	(0.711)	(1.170)	(1.053)
L.INDUSTRY	-0.013	-0.018	-0.257***	-0.076	0.178	0.089
	(0.029)	(0.037)	(0.054)	(0.059)	(0.121)	(0.099)
L.SERVICE	0.023	0.011	0.004	-0.051	0.080	-0.017
	(0.028)	(0.029)	(0.040)	(0.048)	(0.057)	(0.038)
L.PDISTORT	-0.831	-0.381	-0.353	-5.142***	-3.073	1.713
	(0.734)	(0.642)	(1.507)	(1.737)	(2.629)	(1.490)
L.FERTILITY	0.247	-0.462	-3.017***	0.435	1.160	-0.195
	(0.410)	(0.436)	(0.989)	(0.999)	(1.330)	(1.378)
L.EDUCF	0.629*	0.417	2.773*	0.383	3.084	0.664
	(0.339)	(0.403)	(1.644)	(0.501)	(2.333)	(0.768)
L.EDUCM	-0.552	-0.029	-2.993*	0.180	-3.600*	-0.940
	(0.355)	(0.465)	(1.619)	(0.480)	(2.061)	(0.974)
L.DEP2LABOR	-3.669	2.618	21.278***	10.475	-12.487	4.603
	(3.293)	(3.770)	(7.424)	(7.124)	(8.740)	(12.034)
L.URBAN	-0.002	-0.005	-0.010	0.067*	-0.026	-0.022
	(0.012)	(0.013)	(0.051)	(0.040)	(0.034)	(0.036)
N	370	370	212	161	108	101
Countries	91	91	72	47	40	37
Wald chi2	8346	1325	671.5	1254	2274	2253
#Instruments	77	77	64	77	73	64
p(Sargan)	0.001	0.474	0.032	0.002	0.617	0.058
p(Hansen)	0.519	0.222	0.265	0.997	1.000	1.000
p(ar1)	0.000	0.003	0.040	0.033	0.047	0.057
p(ar2)	0.069	0.125	0.010	0.618	0.820	0.864

Blundell and Bond dynamic panel system GMM estimates. Lagged dependent variable and EFW treated as endogenous. Forward orthogonal deviations-transformation is used to preserve sample size because the panel dataset has gaps. Robust standard errors in parentheses. Constant term and fixed time effects omitted for space. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 6: DYNAMIC PANEL SYSTEM GMM ESTIMATES, BY ECONOMIC FREEDOM AREA

	Dependent Variable	EF Area	Coeff.	Std. Dev.	N	Countries	No. Instruments	p(Sargan)	p(Hansen)	p(ar1)	p(ar2)
(1)	SWIIDN5	EF1	0.022	(0.253)	371	91	77	0.005	0.432	0.001	0.077
(2)	SWIIDG5	EF1	-0.139	(0.179)	371	91	77	0.063	0.272	0.006	0.113
(3)	EHII	EF1	-0.248	(0.177)	291	79	77	0.007	0.454	0.004	0.184
(4)	NETGINI	EF1	-0.003	(0.316)	162	47	77	0.007	0.999	0.040	0.356
(5)	GROSSGINI	EF1	0.682*	(0.377)	108	40	73	0.156	0.999	0.103	0.511
(6)	CONGINI	EF1	-0.355	(0.301)	100	37	64	0.313	0.999	0.025	0.518
(7)	SWIIDN5	EF2	0.132	(0.153)	368	91	77	0.027	0.313	0.000	0.055
(8)	SWIIDG5	EF2	0.334*	(0.202)	368	91	77	0.246	0.536	0.002	0.168
(9)	EHII	EF2	-0.204	(0.169)	287	79	77	0.075	0.404	0.003	0.123
(10)	NETGINI	EF2	0.014	(0.419)	160	47	77	0.002	0.995	0.012	0.632
(11)	GROSSGINI	EF2	0.225	(0.355)	107	39	73	0.747	1.000	0.041	0.829
(12)	CONGINI	EF2	-0.178	(0.347)	101	37	64	0.082	1.000	0.040	0.607
(13)	SWIIDN5	EF3	-0.141	(0.099)	373	91	77	0.001	0.507	0.000	0.038
(14)	SWIIDG5	EF3	-0.258**	(0.109)	373	91	77	0.872	0.517	0.006	0.099
(15)	EHII	EF3	-0.029	(0.078)	292	79	77	0.001	0.225	0.007	0.111
(16)	NETGINI	EF3	0.335	(0.223)	163	47	77	0.001	0.999	0.084	0.702
(17)	GROSSGINI	EF3	-0.065	(0.167)	108	40	73	0.670	0.993	0.086	0.750
(18)	CONGINI	EF3	0.430	(0.309)	101	37	64	0.210	1.000	0.062	0.890
(19)	SWIIDN5	EF4	-0.143	(0.138)	370	90	77	0.001	0.520	0.000	0.078
(20)	SWIIDG5	EF4	-0.051	(0.162)	370	90	77	0.054	0.705	0.001	0.163
(21)	EHII	EF4	-0.200**	(0.100)	287	78	77	0.623	0.132	0.003	0.085
(22)	NETGINI	EF4	-0.654*	(0.362)	162	47	77	0.052	0.976	0.119	0.586
(23)	GROSSGINI	EF4	0.106	(0.333)	107	39	73	0.135	1.000	0.033	0.755

Table continued on next page

TABLE 6, CONTINUED FROM PREVIOUS PAGE

	Dependent Variable	EF Area	Coeff.	Std. Dev.	N	Countries	No. Instruments	p(Sargan)	p(Hansen)	p(ar1)	p(ar2)
(24)	CONGINI	EF4	0.426	(0.307)	101	37	64	0.071	0.997	0.047	0.802
(25)	SWIIDN5	EF5	-0.621**	(0.247)	370	91	77	0.001	0.424	0.000	0.146
(26)	SWIIDG5	EF5	-0.677***	(0.257)	370	91	77	0.249	0.361	0.013	0.128
(27)	EHII	EF5	-0.340	(0.231)	286	78	77	0.010	0.249	0.011	0.150
(28)	NETGINI	EF5	0.473	(0.489)	162	47	77	0.001	0.999	0.056	0.285
(29)	GROSSGINI	EF5	-0.307	(0.464)	108	40	73	0.098	1.000	0.035	0.674
(30)	CONGINI	EF5	0.543	(0.450)	101	37	64	0.023	0.999	0.087	0.725

Each row corresponds to a different regression. All specifications include the same set of covariates as the results reported in Table 5 – omitted for space. Blundell and Bond dynamic panel system GMM estimates. Lagged dependent variable and lagged economic freedom variables treated as endogenous. Forward orthogonal deviations-transformation is used to preserve sample size because the panel dataset has gaps. Robust standard errors in parentheses. Constant term and fixed time effects omitted for space. *** p<0.01, ** p<0.05, * p<0.1.

Rows 1-6 report the results for the government size area (EF1). EF1 is positive and statistically significant in row 5, which uses the GROSSGINI measure, but is statistically insignificant in the remaining regressions. Rows 7-12 report the results for the legal system and property rights area (EF2). EF2 is positive and statistically significant in row 8, but insignificant in the remaining specifications. Rows 13-18 report results for the sound money area (EF3). EF3 enters negatively in all but row 16, but is only statistically significant in row 14. Rows 19-24 report results for the trade freedom area (EF4). EF4 enters negatively and is statistically significant in rows 21 and 22, but is insignficant in the remaining regressions. Finally, rows 25-30 report results for the regulatory freedom area (EF5). EF5 enters negatively in four of the six regressions, but is only statistically significant in rows 25 and 26.

The results in Tables 5 and 6 confirm the sensitivity of the relationship between economic freedom and inequality. Not only is the composite index sensitive to various measures of inequality and samples, but the individual areas are as well. The results are similalry ambiguous when using the Heritage Foundation's Index of Economic Freedom data as an alternative to the Fraser Institute's EFW data. Appendix Table A3 reports the results for the composite IEF measure as well as its 10 individual components using the dynamic panel system GMM estimator.[27]

6. Conclusion and Discussion

The relationship between economic freedom and income inequality is theoretically ambiguous and previous cross-county studies have reached mixed conclusions. This paper contributes to this line of research in three important ways. First, we provide an extensive discussion of previous research on the topic in an effort to understand the inconsistency of the results. Second, using the Economic Freedom of the World (EFW) index, we replicate the results from two of the relevant studies by using six different measures of income inequality and an updated dataset for up to 112 countries over the period 1970-2010. To the best of our knowledge, this is the first study in this literature that we are aware of to utilize Standardized World Income Inequality Dataset (SWIID) version 5.0, which includes 100 imputations of each inequality measure to account for the uncertainty of its predicted measures. Our analysis suggests that the use of different econometric models and measures of inequality have contributed to the mixed results. We also show that previous results are sensitive to the sample used, suggesting that the results differ across econometric models as well as within them.

[27] Because the Heritage data are only available since 1995, there are many fewer periods in the dataset. To preserve sample size, contemporaneous values of the independent variables are used, whereas Tables 5 and 6 use lagged values of the independent variables.

The third contribution of this study is that it is the first to examine the relationship between economic freedom and inequality using the Heritage Foundation's Index of Economic Freedom and its various components. The results are similarly sensitive to the measure of inequality and/or sample. Overall, our study suggests that empirical efforts to find consistent evidence for the relationship between economic freedom and income inequality have thus far been unfruitful. We suggest three possible explanations and offer directions for future research.

First, reduced form regressions are likely to provide only a limited and ambiguous picture of the economic freedom and inequality relationship. Economic freedom is a measure of economic and legal institutions that determine the relative rewards from productive activities (e.g., investment in human and physical capital) and non-productive activities (e.g., lobbying for subsidies or competition-hindering regulations). In this sense, economic freedom is likely to influence inequality indirectly through channels such as education, globalization, innovation, and rent-seeking. Using reduced form models that control for some (or all) of these variables does not allow an adequate assessment of the net (direct and indirect) effect of economic freedom on inequality. Moreover, the indirect effect of economic freedom on income inequality through some of these channels may work in the opposite direction. A fruitful avenue for future research, then, will be the estimation of simultaneous equation models that will distinguish between these different effects.

Second, economic freedom is a complex composite indicator that measures multiple dimensions of a country's economic and legal institutions. The analysis in section 5 decomposed the EFW index to examine the potential heterogeneous impact of its five major areas on inequality, but these results should be viewed as a preliminary effort to understand how the various components of economic freedom affect inequality. Additional research focused on examining the various channels and mechanisms through which components of economic freedom influence the distribution of income could help discover potential trade-offs, enabling better policy guidelines.

Finally, while we attempt to minimize the potential endogeneity of economic freedom by lagging it relative to inequality and employing the system GMM estimator in section 5, we are careful not to make claims of causation. It has been suggested that the direction of causality may run from inequality to economic freedom (Murphy 2015; Apergis et al. 2013). In a seminal work, Arthur Okun (1975) argued that economic inequality serves an important efficiency role by providing incentives that channel productive energies into experimentation and innovation. Higher rewards generate productivity that enhances societal prosperity, but the newly created wealth is inevitably distributed unevenly across the different income classes, with more talented

and motivated individuals doing better. More importantly, however, some of the winners of the economic race might use their newly acquired wealth to obtain a head start in the economic race through unproductive activities such as rent-seeking, which can reduce economic freedom and create even greater inequalities by reducing opportunities for economic mobility. Bennett and Nikolaev (2016) provide some evidence along these lines, but additional research that investigates this more dynamic view is welcomed.

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Appendix A: Additional Tables

TABLE A1: SUMMARY OF CROSS-COUNTRY ECONOMIC FREEDOM & INEQUALITY STUDIES

Study	Main Specification	Inequality Measure	Economic Freedom Measure	Period Examined	Sample	Main Findings	Control Variables
Apergis and Cooray (2015)	Linear & non-linear panel cointegration $y_{it} = \alpha_{0,i} + \delta_i t + \alpha_{1,i} EFW_{i,t} + X'_{i,t}\gamma + u_{i,t}$ $y_{it} = \beta_{0,i} + \mu_i t + \beta_{1,i} EFW_{i,t} + \beta_{1,i} EFW_{i,t}^2 + X'_{i,t}\xi + v_{i,t}$	SWIID 4.0 (Solt, 2009) Net and gross income Gini coefficients	5 area EFW index 1. size of government 2. legal structure 3. sound money 4. international trade 5. regulation	1970-2010	138 countries, but exact number used in estimates not reported	$\overline{\alpha_1}, \overline{\beta_2} < 0$ $\overline{\beta_1} > 0$	1. LRGDPL 2. Unemployment rate 3. HUMCAP 4. Manufacturing employment share 5. DEP2Lab 6. Female labor force share 7. Population density
Bennett and Cebula (2016)	OLS cross-sectional $y_i = \beta_o + \beta_1 EF_i + X'_i\gamma + u_i$	SWIID 4.0 (Solt 2009) Net income Gini coefficient. Average, 1990-2010.	5 area EFW index 1. size of government 2. legal structure 3. sound money 4. international trade 5. regulation Average 1985-2005.	1985-2010	96 countries.	$\overline{\beta_1} = 0$	1. LRGDPL 2. Ethnolinguistic Fractionalization 3. AYS15 4. DEP2LAB 5. INDUSTRY 6. SERVICE 7. Share of population living in tropics
Berggren (1999)	OLS cross-sectional $y_i = \beta_0 + \beta_1 EF_i + \alpha_2 \Delta EF_i + X'_i\gamma + u_i$	Deininger & Squire (1996) database. Net and gross income and consumption Gini coefficients.	4 area EFW index: 1. money and inflation; 2. government operations and regulations; 3. takings and discriminatory taxation; 4. restraints on international exchange.	1975-1985	66 countries. List of countries not provided.	$\overline{\beta_1} > 0$ $\widehat{\beta_2} < 0$	1. RGDPL 2. Adult illiteracy rate
Bergh and Nilsson (2010)	Linear fixed effects panel $y_{i,t} = \beta_0 + \beta_1 EF_{i,t} + X'_{i,t}\gamma + \delta_i + u_{i,t}$	SWIID 2.0 (Solt 2009) Net income Gini coefficient.	5 area EFW index 1. size of government 2. legal structure 3. sound money 4. international trade 5. regulation	1970-2005	78 countries Mostly high and middle income nations.	$\overline{\beta_1} > 0$	1. LRGDPL 2. HUMCAP 3. DEP2LAB 4. Fixed time effects

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TABLE A1: CONTINUED FROM PREVIOUS PAGE

Study	Main Specification	Inequality Measure	Economic Freedom Measure	Period Examined	Sample	Main Findings	Control Variables
Carter (2006)	Non-linear fixed effects panel $y_{i,t} = \beta_0 + \beta_1 EF_{i,t} + \beta_2 EF_{i,t}^2 + X'_{i,t}\gamma + \delta_i + u_{i,t}$	World Institute for Development Economics Research (2005) WIID2a database. Net and gross income and consumption Gini coefficients.	5 area EFW index: 1. size of government 2. legal structure 3. sound money 4. international trade 5. regulation	1980-2000	39 countries. Mostly high income and a few middle income nations.	$\widehat{\beta_1} < 0$ $\widehat{\beta_2} > 0$ $EFW^* = 4.03$	1. RGDPL 2. POLRIGHTS 3. CIVLIB 4. AYS25 5. UNDER15 6. OVER65 7. URBAN 8. INDUSTRY 9. SERVICE 10. Square of each of above variables 11. Gini concept dummies
Clark and Lawson (2008)	OLS cross-sectional $y_i = \beta_0 + \beta_1 EF_i + X'_i\gamma + u_i$	World Bank World Development Indicators Gini Coefficient dataset. Inequality measures reflect a range of years between 1990 and 2000	4 area EFW index: 1. size of government, w/o marginal tax rate 2. legal structure 3. sound money 4. international trade	1980-2002	66 countries List of countries not provided.	$\widehat{\beta_1} < 0$	1. Top marginal tax rate 2. Economic growth, predicted by tropics, coastal location, initial GDP, investment share of GDP, human capital investment
Scully (2002)	Pooled 2SLS $y_i = \beta_0 + \beta_1 EF_i + \beta_2 Growth_i + X'_i\gamma + e_i$ $Growth_i = \alpha_0 + \alpha_1 EF_i + \alpha_2 \dot{K}_t + \alpha_3 \dot{G}_t + u_i$	Deininger & Squire (1996) database. Net and gross income and consumption Gini coefficients.	9 variable custom EFW index: 1. government enterprise index 2. government taxation index 3. black market exchange premium index 4. trade share GDP 5. transfers/ subsidies share GDP 6. inflation variability 7. foreign currency ownership dummy 8. foreign bank account ownership dummy 9. capital transactions w/ foreigners index	1975-1990	26 countries Mostly developed nations. Multiple observations for each country. Data pooled.	$\widehat{\beta_1} < 0$ $\widehat{\beta_2} > 0$ $\widehat{\alpha_1} > 0$ $\lvert\widehat{\beta_1}\rvert > (\widehat{\beta_2} + \widehat{\alpha_1})$	1. Economic growth, predicted by EF, growth of physical capital and government spending 2. Gini concept dummies

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TABLE A1: CONTINUED FROM PREVIOUS PAGE

Study	Main Specification	Inequality Measure	Economic Freedom Measure	Period Examined	Sample	Main Findings	Control Variables
Sturm and De Haan (2015)	Linear fixed effects panel $y_{i,t} = \beta_0 + \beta_1 EF_{i,t} + X'_{i,t}\gamma + \delta_i + u_{i,t}$	SWIID 4.0 (Solt 2009) Market income (before taxes & transfers) Gini coefficient.	3 area custom EFW index: 1. legal structure 2. international trade 3. regulation	1971-2010	108 countries	$\widehat{\beta_1} = 0$	1. LRGDPL 2. Economic globalization 3. FDI 4. Share of adult population w/ secondary education 5. Agricultural workforce share 6. Fixed time effects

TABLE A2: DESCRIPTIVE STATISTICS

Variable	Description	Mean	Std. Dev	Min	Max	N	Source
EFW	Economic freedom of the world index. Measure the degree to which a country's institutions and policies are consistent with personal choice, voluntary exchange, open markets, and protection of persons and their property from aggressors. Comprised of 42 variables derived from publically available sources such as the World Bank, International Monetary Fund, and the Global Competitiveness Report. Each variable transformed to a 0-10 scale increasing in freedom and assigned to 1 of 5 major areas: size of government; legal system and property rights; sound money; freedom to trade internationally; and regulation of credit, labor and business. Each area score equals the average of its components and the composite EFW index represents the average of the five areas.	6.05	1.34	1.78	9.14	932	Gwartney, Lawson and Hall (2013)
LRGPDL	Log of real GDP per capita.	8.43	1.33	5.19	11.82	1,172	Heston, Summers and Aten (2012)
HUMCAP	Share of population above age 25 that has completed a tertiary education.	5.55	5.59	0.00	31.95	1,125	Barro and Lee (2013)
AYS25	Average years of schooling for the population above age 25.	6.02	3.18	0.03	13.27	1,199	Barro and Lee (2013)
FDI	Foreign direct investment as a share of GDP.	18.38	47.71	0.00	978.73	990	KOF, as used by Sturm and De Haan (2015).
UNDER15	Share of the population under age 15.	33.39	10.62	12.14	49.97	1,274	World Bank*
OVER65	Share of the population over age 65.	6.90	4.58	0.33	23.67	1,274	World Bank*
DEP2LABOR	Ratio of dependent population to potential labor force, defined as ratio of the sum of UNDER15 and OVER65 to the share of the population between ages 15-64.	0.69	0.20	0.17	1.13	1,274	World Bank*
URBAN	Share of the population living in an urban area.	51.02	24.15	2.38	100.00	1,265	World Bank*
INDUSTRY	Share of the labor force employed in the industrial sector.	23.82	8.60	2.10	56.25	642	World Bank*
SERVICE	Share of the labor force employed in the service sector.	53.56	16.81	5.59	87.20	642	World Bank*
CIVLIB	Civil liberties index. Transformed from 1-7 scale decreasing in freedom to a 0-10 scale that is increasing in freedom.	5.55	3.08	0.00	10.00	1,188	Freedom House
POLRIGHTS	Political rights index. Transformed from 1-7 scale decreasing in freedom to a 0-10 scale that is increasing in freedom.	5.53	3.60	0.00	10.00	1,188	Freedom House
PDISTORT	Market distortions, measured as price of investment goods relative to the U.S.	999.51	37,390	0.01	140,000	1,402	Heston, Summers and Aten (2012)
FERTILITY	Fertility rate - umber of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age-specific fertility rates.	3.95	2.04	0.86	9.16	1,518	World Bank
EDUCM	Average years of secondary education for males.	2.12	1.48	0	7.25	1,260	Barro and Lee (2013)
EDUCF	Average years of secondary education for females.	1.74	1.48	0	6.89	1,260	Barro and Lee (2013)

*Data for Taiwan from Taiwan Statistical Book 2012

TABLE A3: DYNAMIC PANEL SYSTEM GMM ESTIMATES, BY HERITAGE FOUNDATION ECONOMIC FREEDOM AREA

	Dependent Variable	EF Area	Coeff.	Std. Dev.	N	Countries	No. Instruments	p(Sargan)	p(Hansen)	p(ar1)	p(ar2)
(1)	SWIIDN5	IEF	-0.025	(0.773)	344	108	0.000	0.008	0.085	0.137	-0.025
(2)	SWIIDG5	IEF	0.386	(0.971)	344	108	0.003	0.002	0.033	0.393	0.386
(3)	EHII	IEF	-1.801***	(0.629)	229	90	0.001	0.380	0.056	0.686	-1.801***
(4)	NETGINI	IEF	-0.739	(0.591)	139	48	0.043	0.189	0.068	0.850	-0.739
(5)	GROSSGINI	IEF	1.166**	(0.564)	100	41	0.075	0.210	0.086	0.333	1.166**
(6)	CONGINI	IEF	-1.218	(1.430)	125	49	0.002	0.632	0.311	0.926	-1.218
(7)	SWIIDN5	IEF1	0.202	(0.426)	344	108	0.000	0.006	0.092	0.153	0.202
(8)	SWIIDG5	IEF1	0.850*	(0.498)	344	108	0.012	0.006	0.030	0.380	0.850*
(9)	EHII	IEF1	-0.972***	(0.374)	229	90	0.002	0.264	0.096	0.138	-0.972***
(10)	NETGINI	IEF1	-1.189*	(0.655)	139	48	0.056	0.231	0.071	0.664	-1.189*
(11)	GROSSGINI	IEF1	0.303	(0.422)	100	41	0.063	0.265	0.078	0.365	0.303
(12)	CONGINI	IEF1	0.409	(0.803)	125	49	0.001	0.583	0.489	0.338	0.409
(13)	SWIIDN5	IEF2	-0.514	(0.512)	344	108	0.000	0.074	0.275	0.180	-0.514
(14)	SWIIDG5	IEF2	0.096	(0.562)	344	108	0.005	0.079	0.041	0.370	0.096
(15)	EHII	IEF2	-0.848***	(0.244)	229	90	0.029	0.094	0.006	0.257	-0.848***
(16)	NETGINI	IEF2	-0.551*	(0.301)	139	48	0.174	0.138	0.036	0.835	-0.551*
(17)	GROSSGINI	IEF2	-0.104	(0.471)	100	41	0.237	0.220	0.209	0.291	-0.104
(18)	CONGINI	IEF2	0.343	(0.609)	125	49	0.004	0.494	0.348	0.364	0.343
(19)	SWIIDN5	IEF3	0.596	(0.526)	344	108	0.000	0.024	0.040	0.199	0.596
(20)	SWIIDG5	IEF3	1.232	(0.783)	344	108	0.006	0.011	0.019	0.711	1.232
(21)	EHII	IEF3	-0.232	(0.523)	229	90	0.000	0.024	0.011	0.340	-0.232
(22)	NETGINI	IEF3	0.226	(0.488)	139	48	0.037	0.236	0.110	0.959	0.226
(23)	GROSSGINI	IEF3	0.960	(0.769)	100	41	0.066	0.451	0.180	0.429	0.960
(24)	CONGINI	IEF3	1.218	(1.144)	125	49	0.007	0.450	0.329	0.308	1.218
(25)	SWIIDN5	IEF4	0.196	(0.263)	344	108	0.000	0.053	0.120	0.135	0.196

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TABLE A3, CONTINUED FROM PREVIOUS PAGE

	Dependent Variable	EF Area	Coeff.	Std. Dev.	N	Countries	No. Instruments	p(Sargan)	p(Hansen)	p(ar1)	p(ar2)
(26)	SWIIDG5	IEF4	-0.247	(0.261)	344	108	0.000	0.003	0.053	0.423	-0.247
(27)	EHII	IEF4	-0.354*	(0.209)	229	90	0.000	0.069	0.040	0.287	-0.354*
(28)	NETGINI	IEF4	0.544*	(0.319)	139	48	0.131	0.115	0.101	0.872	0.544*
(29)	GROSSGINI	IEF4	0.302	(0.599)	100	41	0.121	0.449	0.119	0.333	0.302
(30)	CONGINI	IEF4	-0.267	(0.533)	125	49	0.001	0.246	0.217	0.824	-0.267
(31)	SWIIDN5	IEF5	-0.030	(0.373)	344	108	0.000	0.030	0.128	0.144	-0.030
(32)	SWIIDG5	IEF5	0.293	(0.380)	344	108	0.004	0.015	0.045	0.382	0.293
(33)	EHII	IEF5	0.187	(0.319)	229	90	0.016	0.129	0.018	0.185	0.187
(34)	NETGINI	IEF5	0.110	(0.388)	139	48	0.182	0.201	0.071	0.893	0.110
(35)	GROSSGINI	IEF5	0.067	(0.489)	100	41	0.195	0.525	0.126	0.280	0.067
(36)	CONGINI	IEF5	0.656	(0.676)	125	49	0.011	0.204	0.258	0.440	0.656
(37)	SWIIDN5	IEF6	0.417	(0.459)	177	100	0.000	0.000	.	.	0.417
(38)	SWIIDG5	IEF6	0.172	(0.496)	177	100	0.009	0.007	.	.	0.172
(39)	EHII	IEF6	-0.867	(1.131)	85	67	0.114	0.037	.	.	-0.867
(40)	NETGINI	IEF6	-0.456	(0.744)	72	43	0.075	0.081	.	.	-0.456
(41)	GROSSGINI	IEF6	0.953*	(0.555)	39	21	0.000	0.010	.	.	0.953*
(42)	CONGINI	IEF6	1.004	(1.982)	70	47	0.016	0.024	.	.	1.004
(43)	SWIIDN5	IEF7	-0.733***	(0.233)	344	108	0.000	0.073	0.039	0.161	-0.733***
(44)	SWIIDG5	IEF7	-0.597**	(0.235)	344	108	0.023	0.050	0.013	0.462	-0.597**
(45)	EHII	IEF7	-0.265*	(0.149)	229	90	0.001	0.059	0.027	0.259	-0.265*
(46)	NETGINI	IEF7	0.075	(0.277)	139	48	0.085	0.203	0.080	0.920	0.075
(47)	GROSSGINI	IEF7	-0.496	(0.507)	100	41	0.274	0.636	0.192	0.366	-0.496
(48)	CONGINI	IEF7	-1.567**	(0.689)	125	49	0.000	0.114	0.395	0.852	-1.567**
(49)	SWIIDN5	IEF8	0.017	(0.404)	344	108	0.000	0.053	0.052	0.151	0.017
(50)	SWIIDG5	IEF8	-0.061	(0.342)	344	108	0.007	0.039	0.028	0.370	-0.061
(51)	EHII	IEF8	-0.923**	(0.446)	229	90	0.001	0.108	0.093	0.859	-0.923**

Table continued on next page

TABLE A3, CONTINUED FROM PREVIOUS PAGE

	Dependent Variable	EF Area	Coeff.	Std. Dev.	N	Countries	No. Instruments	p(Sargan)	p(Hansen)	p(ar1)	p(ar2)
(52)	NETGINI	IEF8	0.774	(0.633)	139	48	0.009	0.189	0.037	0.546	0.774
(53)	GROSSGINI	IEF8	0.837	(0.702)	100	41	0.066	0.738	0.147	0.369	0.837
(54)	CONGINI	IEF8	-0.132	(0.898)	125	49	0.011	0.349	0.354	0.401	-0.132
(55)	SWIIDN5	IEF9	-0.153	(0.304)	344	108	0.000	0.050	0.215	0.121	-0.153
(56)	SWIIDG5	IEF9	0.199	(0.256)	344	108	0.003	0.077	0.037	0.401	0.199
(57)	EHII	IEF9	0.140	(0.193)	229	90	0.000	0.046	0.009	0.178	0.140
(58)	NETGINI	IEF9	-0.521*	(0.266)	139	48	0.012	0.322	0.075	0.862	-0.521*
(59)	GROSSGINI	IEF9	0.913***	(0.212)	100	41	0.026	0.388	0.048	0.307	0.913***
(60)	CONGINI	IEF9	-0.502	(0.474)	125	49	0.025	0.648	0.317	0.324	-0.502
(61)	SWIIDN5	IEF10	-0.195	(0.275)	344	108	0.000	0.028	0.112	0.141	-0.195
(62)	SWIIDG5	IEF10	0.110	(0.281)	344	108	0.006	0.007	0.033	0.370	0.110
(63)	EHII	IEF10	0.106	(0.252)	229	90	0.001	0.051	0.019	0.212	0.106
(64)	NETGINI	IEF10	-0.417	(0.266)	139	48	0.037	0.205	0.044	0.990	-0.417
(65)	GROSSGINI	IEF10	0.635*	(0.362)	100	41	0.236	0.563	0.147	0.245	0.635*
(66)	CONGINI	IEF10	-0.641	(0.519)	125	49	0.009	0.576	0.136	0.848	-0.641

Each row corresponds to a different regression. All specifications include the same set of covariates as the results reported in Table 5 – omitted for space. Blundell and Bond dynamic panel system GMM estimates. Lagged dependent variable and contemporaneous economic freedom variables treated as endogenous. IEF is composite Heritage Foundation economic freedom index. IEF1 is property rights freedom, IEF2 is freedom from corruption, IEF3 is fiscal freedom, IEF4 is government spending, IEF5 is business freedom, IEF6 is labor freedom, IEF7 is monetary freedom, IEF8 is trade freedom, IEF9 is investment freedom, and IEF10 is financial freedom. See Forward orthogonal deviations-transformation is used to preserve sample size because the panel dataset has gaps. Robust standard errors in parentheses. Constant term and fixed time effects omitted for space. *** p<0.01, ** p<0.05, * p<0.1.

Appendix B: Custom Inequality Dataset

As indicated in Table 1, three of the measures of inequality used in the current analysis are drawn from a custom inequality database developed using Gini measures over the period 1967-2012 from Milanovic's All the Ginis (ATG) database[28] and the UNU-WIDER World Income Inequality Database version 2.0c (WIID2C). The construction of the custom database that contains the NETGINI, GROSSGINI and CONGINI measures is described in this appendix.

The ATG database consists of 3,401 country-year Gini coefficients that were retrieved from eight sources: Luxembourg Income Study (LIS); Socio-Economic Database for Latin America and the Caribbean (SEDLAC); Survey of Income and Living Conditions (SILC); World Bank's Easter Europe and Central Asia (ECA); World Income Distribution (WYD); World Bank's POVCAL; World Institute for Development Economics Research's World Income Inequality Database version 1 (WIID1) and individual data sets (INDIE). Most of the Gini coefficients contained in the ATG database were derived from nationally-representative household survey micro datasets, a characteristic desirable by many inequality scholars. ATG also provides information on the welfare concept and recipient unit for each Gini measure. It indicates whether a Gini is based on income or consumption, whether the concept is gross or net, and whether the measure represents total household welfare or is adjusted to per capita household welfare. This is valuable information because it allows for the creation of a custom dataset containing Gini coefficients that are highly comparable across countries and time, reducing the likelihood of erroneous empirical results attributable to incomparable data, as described in section 3.1.

With the exception of the WIID1 measures, all of the Gini measures included in the ATG database were screened to develop a database consisting of measures of per capita net income inequality (NETGINI), per capita gross income inequality (GROSSGINI), and per capita consumption inequality (CONGINI). The WIID1 dataset only includes observations prior to 1999. A more recent version, WIID2C, includes observations through 2006. Because the WIID2C database contains a greater number of Gini observations than the WIID1 database, the WIID1 measures from ATG are not included in the construction of the custom database, while the WIID2C measures are included. The 5,313 WIID2C observations were also carefully screened. Only measures with a quality rating of 1 or 2 that cover the entire population and are based on a

[28] ATG data available at <http://data.worldbank.org/data-catalog/all-the-ginis>.

household per-capita welfare measure were included. Observations whose source is indicated as LIS, SEDLAC, or Milanovic were excluded to avoid possible duplication. Gini observations were classified as consumption if the income definition is given as consumption, consumption / expenditure or expenditure. Gini measures were classified as net and gross income if the income definition is given as disposable and gross income, respectively.

An initial screening of the ATG and WIID2C data yielded 2,413 Gini observations, some of which are available from multiple sources for the same country-year. For each of the three Gini concepts (NETGINI, GROSSGINI, CONGINI), the following procedures were followed in assembling the custom measures observed at five-year intervals. First, if a Gini observation was only available from a single source for a given country-year observation, that source is used. Table A.1 indicates the number of observations for each Gini concept by the original source, as well as the total. Second, if Gini observations are available for more than one source for a given country-year observation, then the source providing the greatest number of observations for a given country is selected. Next, each country-year observation is assigned to the nearest quinquennial year ending in five or zero. Lastly, the average of all of a country's Gini observations assigned to a given quinquennial period (if more than one) spanning 1970-2010 is used as the measure for that period.

TABLE B1: GINI OBSERVATIONS BY SOURCE

	NETGINI	GROSSGINI	CONGINI
LIS	153	0	0
SEDLAC	0	292	0
SILC	85	0	0
ECA	77	0	76
WYD	45	96	156
POVCAL	0	0	377
INDIE	115	0	22
WIDER2C	169	48	31
TOTAL	644	436	662