Globalization, Institutions, and Income Convergence

Kaitlyn Harger[*]**, Andrew T. Young**[#]**, and Joshua Hall**[†]
[*]*Florida Gulf Coast University – USA,* [#]*Texas Tech University – USA,* [†]*West Virginia University – USA*

Abstract: The income convergence literature suggests that poor countries or regions can catch up to rich ones conditional on sharing certain characteristics with rich countries or regions. Good institutions such as strong property rights and rule of law are key among those characteristics. Globalization provides opportunities for agents in poor economies to learn about and experiment with institutional innovations across regions. We estimate the relationship between globalization and cross-country income convergence using a panel of up to 184 countries covering 1970 to 2009. We employ the KOF index of globalization and control for measures of political and economic institutional quality. A standard deviation increase in the KOF index is associated with a country closing the gap between its income per capita level and that of the richest country by an additional 13.6% annually.

1. Introduction

According to the World Bank, an estimated 1.29 billion people lived on less than $1.25 a day in 2008. That is a marked improvement over the 1.94 billion who lived in extreme poverty in 1981. Given population growth, this represents a difference between 22% of people in the developing world in 2008 versus a staggering 52% in 1981 (Chen and Ravallion, 2012). While the extent of poverty alleviation is impressive, the absolute number of people who are extremely poor remains very large.

The stark contrast between per capita incomes in the developed versus the developing world has spawned a large empirical literature on income convergence.[1] This literature asks whether poor economies (countries or regions) tend to catch up to richer ones. The consensus answer is yes – *conditional on poor economies having long-run growth paths similar to*

those of rich ones. Early cross-country studies of conditional convergence suggest that the gap between a country's current income and its long-run path closes at a rate of about 2% a year – what Barro (2012) has referred to as the "iron law of convergence".[2] Given a 2% rate of conditional convergence, the gap between current income and an economy's long-run growth path will be halved in about 35 years, or about one generation.

Alternatively, the absolute rate of convergence is the rate at which poor economies approach actual rich economy income levels. In a cross-country context, absolute convergence occurs when the variance of per capita incomes decreases. Quah (1993) and Friedman (1992) argue that absolute convergence is a more meaningful concept because it directly addresses whether or not the cross-country distribution

---

[1] The seminal papers are Barro and Sala-i-Martin (1992) and Mankiw et al. (1992). Sala-i-Martin (1996) provides a review of the early literature. Papers focused on convergence from a regional perspective include Carlino and Mills (1996), López-Bazo et al. (1999), and Rey and Mountouri (1999).

[2] Later studies using panel data and controlling for country fixed effects report considerably higher convergence rates – between 4% and 10% per year (e.g., Islam, 1995; Caselli et al., 1996). However, Barro (2012) argues that the inclusion of country fixed effects biases convergence rate estimates upwards.

of incomes is becoming more equitable. The absolute rate of convergence will depend not only on the conditional convergence rate but also the distance between poor economy long-run growth paths and those of rich economies.[3]

But how can poor economies emulate the long-run growth paths of rich ones? In this paper we explore the role that globalization may play in allowing them to do just that. We explore the relationship between globalization and cross-country (absolute) income convergence. By *globalization* we refer to the creation of international networks that facilitate flows of individuals and information. We argue that these networks can promote income convergence by increasing the rate at which an economy puts the current stock of knowledge to use in production. This can occur through at least two channels. First, globalization can directly increase the rate at which usable knowledge from rich economies flows to agents in poor ones. Second, through its effect on institutional quality globalization can indirectly increase the rate at which such knowledge is actually put into use in production by agents in poor economies.

A well-known result from the Solow (1956) model is that long-run growth is ultimately constrained by the world production frontier. The long-run growth paths of rich economies follow this production frontier relatively closely. The frontier expands over time as additions are made to the stock of knowledge that is usable in production. These additions mostly come from rich economies, but the usable knowledge is nonrival. For poor countries the problem of development becomes largely one of how to *gain access to* and *effectively utilize* knowledge that already exists (Parente and Prescott, 2000). The problem of development for poor countries is one of how to converge toward the world production frontier.

Hayek (1960) argues that the processes through which knowledge is transmitted and accumulated are largely decentralized. Globalization can provide agents in poor economies "the maximum of opportunity [...] to learn of facts that we ourselves are yet unaware of and to make use of this knowledge in

their actions" (Hayek, 1960, p. 30). Networks facilitating access to usable knowledge and individuals embodying that knowledge in the form of human capital can work to increase the rate at which a poor economy's long-run growth path approaches the world production frontier.

In addition to increasing a poor economy's access to usable knowledge, globalization may promote institutional change that increases the extent to which agents actually utilize that knowledge in production. Whether or not existing and available knowledge is effectively put to use will depend largely on an economy's institutions. When property rights are well defined and enforced under the rule of law, we expect that individuals will internalize the costs and reap the benefits of their actions. As such, they will have incentives to make use of existing knowledge when doing so is wealth enhancing. Alternatively, when institutional quality is poor, wealth-creating opportunities will not be pursued because individuals do not have incentives to do so.

Rich economies tend to have institutions that are more conducive to the effective utilization of existing knowledge than do poor economies. The empirical link between institutional quality and income levels and growth rates is well established (e.g., Knack and Keefer, 1995; Barro, 1996; Hall and Jones, 1999; Acemoglu et al., 2001, 2002; Rodrick et al., 2004; Acemoglu and Johnson, 2005; Hall et al., 2010; Cebula et al,. 2012; Cebula and Clark, 2014; Young and Sheehan, 2014; Foley and Clark, 2016).[4] Unfortunately, economists and policymakers have little understanding of how to transplant "good" institutions such as property rights and the rule of law. Efforts to do so are likely to be unsuccessful unless other complementary institutions are already in place (Sobel and Coyne, 2011). These complementary institutions may be largely informal. Cultural traits such as a willingness to trust strangers and a belief in self-determination may be necessary for more formal institutional reforms to "stick" (Williamson, 2009).[5] Transplanting culture traits is exceedingly difficult, not to mention ethically questionable.

---

[3] Conditional convergence is driven by investment rates and the extent of diminishing returns (Barro and Sala-i-Martin, 1992; Mankiw et al., 1992). Conditional on having identical long-run growth paths and investment rates, the poorer of two economies will have a higher marginal product of capital and, thus, a higher growth rate. See Young et al. (2008) for a more detailed discussion of conditional versus absolute convergence in cross-economy samples.

[4] Knack (1997) goes so far as to argue that where income convergence is absent, a lack of good institutions is to blame.

[5] Based on a cross-country sample and data from the World Values Surveys and European Values Surveys, Williamson (2009) finds that formal institutions are only positively related to growth if they are grounded in strong informal institutions. Her results are consistent with the "regression theorem" of Boettke et al. (2008): the likelihood of an institutional change succeeding is a function of that institution's relationship to individuals in the previous time period. In Boettke et al.'s terminology, informal institutions provide the *mētis* that (formal) institutional changes may or may not "stick" to.

Globalization provides opportunities for agents in poor economies to learn about and experiment with institutional innovations. If better institutions are associated with better use of available knowledge in production, then globalization can promote income convergence through its effects on institutional quality. Empirical studies suggest that cross-country institutional spillovers occur across geographic neighbors (Seldayo, 2010; Groot, 2011). In particular, economies adopt neighbors' institutions that are associated with good economic outcomes (Simmons and Elkins, 2004).[6] Globalization can increase the effective number of "neighbors" from which agents in an economy can consider institutional innovations. Al-Marhubi (2005), Bhattacharyya (2012), Bergh et al. (2014), and Sheehan and Young (2015) all report that measures of economic and/or social globalization are positively related to measures of institutional quality.[7]

Globalization may promote innovations to informal as well as formal institutional quality. Hayek (1960, p. 27) argues the results of decentralized knowledge transmission will consist "in a large measure of forms of conduct which [an individual] habitually follows without knowing why [and] uses because they are available to him as a product of cumulative growth without ever having been designed by one mind." Increased globalization can expose agents in poor economies to an expanded menu of "forms of conduct" (norms, cultural traits). From this menu agents can piecemeal adopt forms that they judge to be both desirable and also compatible with institutional frameworks already in place.

We estimate the relationship between globalization and cross-country income convergence using a panel of up to 184 countries covering 1970 to 2009. We employ the KOF globalization index described in Dreher (2006). In addition to the overall KOF index, we also consider the separate economic, political, and social globalization sub-indices. We report a statistically significant, positive relationship between globalization and the income convergence rate. Social globalization appears to be particularly important. The KOF social globalization index measures an economy's openness to individuals, information, and cultural beliefs from other countries.

Globalization can affect convergence both directly

by promoting greater access to usable knowledge and also indirectly by affecting institutional quality and the utilization of available knowledge. Our empirical model is based on that of Xu and Li (2008). Based on a panel of 104 countries covering 1970 to 2003 they report that measures of economic and political institutional quality are positively related to income convergence. We estimate the effect of globalization on income convergence while controlling for measures of both political and economic institutional quality. We also consider interacting the measures of globalization and institutional quality. In doing so we attempt to separate the effects of the different variables and also acknowledge that those effects are likely conditional on one another.

In exploring the relationship between globalization and income convergence, our work complements empirical studies linking globalization to economic growth. Dollar (1992), Sachs et al. (1995), and Edwards (1998) all report that trade openness is associated with higher growth rates. Other researchers have reported that the KOF index, which provides a broader measure of globalization, is positively associated with growth (e.g., Dreher, 2006; Dreher et al., 2008b; Bergh and Karlsson, 2010; Villaverade and Maza, 2011). Rather than focus of income growth generally, our work focuses specifically on how globalization relates to the rate at which an economy closes the gap between its income and that of the leader economy.

We proceed as follows. The second section outlines our approach to estimating the income convergence rate as a function of, among other determinants, the extent of globalization. The data that we employ is described in the third section. Results of our analysis are reported and discussed in section four. We then provide a concluding discussion in the fifth and final section.

2. Empirical model

Our analysis follows Xu and Li (2008) in modeling changes in the relative incomes of countries across time. Xu and Li's (2008) model provides a framework for estimating what they refer to as the *horizontal convergence rate*. The horizontal convergence rate is the

---

[6] Bosker and Garretsen (2009) report that economic growth in a country is positively linked to the institutional quality of its neighbors.

[7] Bergh et al. (2014) report that poor countries with an abundance of natural resources are an exception to this general relationship. Levchenko (2013) provides a model where increases in trade

openness increase a country's comparative advantages in particular markets but also decreases the rents to be captured in those particular markets by special interests. Whether trade openness will lead to higher or lower institutional quality depends on the equilibrium outcome of a political game.

rate at which the gap narrows between a given country's income per capita and that of the richest country. A higher rate of horizontal convergence, all else equal, corresponds to a faster absolute convergence in the cross-country distribution of income.

Xu and Li (2008) define the (horizontal) convergence ratio as the ratio of country i's income per capita to that of the richest in the same time period. We will denote this ratio in a given time period by S_{it} and then assume that,

$$S_{it} = \frac{1}{1+e^{-f(\beta Z_{it})}} \qquad (1)$$

where the convergence rate, $f(\beta Z_{it})$, is a function of a vector of variables, Z_{it}, and a vector of parameters, β. With (1) we are assuming that the income gaps change at rate $-f$ over time. That rate is a function of various determinants, Z_{it}, of which we are particularly interested in globalization.

By dividing S_{it} by 1 minus itself, (1) can be transformed into a variable that we will call L_{it}:

$$L_{it} = \frac{S_{it}}{1-S_{it}} = e^{f(\beta Z_{it})} \qquad (2)$$

By focusing on the transformed variable L_{it} we isolate the exponential of the horizontal convergence rate. By taking then taking the natural log of (2) we isolate the horizontal convergence rate itself: $\ln(L_{it}) = f(\beta Z_{it})$. If we assume that f is approximately linear and append an error term, then we are left with the following regression model:

$$\ln(L_{it}) = \beta_0 + \sum_{j=1}^{N} \beta_j Z_{it,j} + \mu_{it} \qquad (3)$$

Equation (3) specifies the convergence rate as a linear function of Z_{it}. In our estimations of this regression model Z_{it} includes a measure(s) of globalization as the control variable(s) of primary interest.

We estimate (3) by OLS. In all estimations we also include period fixed effects. For all estimations we report heteroscedasticity-autocorrelation-consistent (HAC) standard errors.

3. Data

For the construction of S_{it} (a country's relative real per capita GDP level in period t) we draw annual data from the World Bank's *World Development Indicators* (WDIs) from 1970 through 2009. GDP per capita (*GDP_PC*) is reported in constant 2000 US$. We then take five-year averages (1970-1974, 1975-1979, 1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004, and

2005-2009). The panel is unbalanced with up to 184 countries.

In principle, the highest average income country for each period constitutes the denominator of S_{it}. However, the highest average income country in our sample is always Monaco, and typically Liechtenstein is second in line. These countries are notable outliers in the sample: for 2005-2009 Monaco's average per capita GDP is $95,885 while Liechtenstein's is $80,388 (the average U.S. GDP per capita for 2005-2009 is $37,905). They are also microstates, each with populations less than 40,000 people.

Furthermore, Monaco has a largely tourism-based economy, suggesting that a considerable portion of its GDP is composed of natural resource rents. The underlying growth theory which forms the foundation for our empirical analysis is based on a *value-added* production frontier. The world production frontier consists of usable knowledge, where the *usable* implicitly refers to the utilization of labor and capital (broadly conceived) to produce goods and services. The lead country is, in principle, the one operating on or closest to this frontier. To the extent that a country's GDP is composed of rents, it does not represent value-added. Monaco's GDP, then, is likely to not be indicative of how close its economy is operating to the world production frontier. (Similar concerns could be raised regarding oil-rich countries such as the United Arab Emirates and Kuwait that have per capita income greater than many OECD countries.)

For the above reasons, we are hesitant to use Monaco as a benchmark. We instead take the highest average income OECD country as the benchmark for each period. This makes the benchmark country the U.S. for 1970-1975 ($19,358) and 1975-1979 ($21,496), Switzerland for 1980-1984 ($29,271) and 1985-1989 ($31,761), and Japan for 1990-1994 ($35,206). For the remaining four periods Luxembourg is the benchmark ($39,264-$52,076). However, despite what we believe are good reasons for taking this approach, others may not be convinced by our reasoning. Therefore we check the robustness of our results to two alternative benchmarks. First, we produce results using the richest country in each time period (Monaco) as the benchmark. Second, we produce results using the U.S. as the benchmark for each time period.

We utilize the KOF index as a measure of globalization (Dreher, 2006; Dreher et al., 2008b). Dreher (2006, p. 1092) describes globalization as "the process of creating networks of connections among actors at

multi-continental distances, mediated through a variety of flows including people, information and ideas." The KOF index measures the networks and flows of ideas, people, capital, information, and goods across country borders. This index of globalization has been used widely in empirical studies and has been positively linked to several types of "good" economic outcomes. These outcomes include economic growth (Dreher, 2006), life expectancies (Bergh and Nilsson, 2010a), and people's subjective evaluations of their own well-being (Hessami, 2011).[8] KOF scores 207 countries on the economic, social, and political dimensions of globalization. The overall globalization index (*GLOB*) is a weighted-average of these 3 sub-indices. All of the KOF data are annual, and the overall globalization index (as well as each of sub-indices: economic, social, and political) is on a scale of 0 to 100, with 100 indicated the most globalized. We take 5-year averages corresponding to the same periods as our GDP data (1970-1974, ..., 2000-2004, and 2005-2009).

The economic globalization sub-index (*E_GLOB*) is designed to incorporate two components: *economic flows* and *restrictions to trade and capital*. Data on trade, foreign direct investment, and portfolio investment are used to score economic flows; the sub-index is increasing in these flows. Measures of hidden import barriers, mean tariff rates, and taxes on international trade are used along with an index of capital controls to score trade and capital restrictions. The sub-index is decreasing in these restrictions.

Flows of information, ideas, images, and people across international borders are the basis for the social globalization sub-index (*S_GLOB*). This sub-index involves three components. The first is *personal contacts,* the direct interaction among people across international borders using measures such as telecom traffic, tourism, and international letter volume. *Information flows* is the second component and is based on measures of Internet and television usage as well as subscriptions to international newspapers. The third component is *cultural proximity*, the extent to which cultural beliefs move across borders. This component is based on measures such as the number of books imported and exported and the number of

McDonald's restaurants and IKEA stores in a country. The social globalization sub-index is increasing in each of these three components.

Political globalization (*P_GLOB*) is the most straightforward of the KOF globalization sub-indices. It is based on the number of embassies and high commissions within a country, the number of international organizations of which the country is a member, and the number of UN peace missions in which the country has participated. The political globalization sub-index is increasing in all of these measures.

We include additional control variables from the WDIs. These control variables include gross capital formation (*K*); gross rates of primary school, secondary school, and tertiary school enrollment (*PRIM_EDU*, *SEC_EDU*, and *TER_EDU*, respectively); life expectancy (*LIFE_EXP*); and the rate of population growth (*POP*). Gross capital formation, the primary driver of conditional convergence in neoclassical growth theory, is measured by investment as a percent of GDP. School enrollments are percentages of countries' populations enrolled at each level and control for investments in human capital. Life expectancy is included as a measure of the health of the labor force. The population growth rate is another standard control variable from neoclassical growth theory. Our dependent variable is also constructed from WDI data. GDP per capita is stated in constant 2000 U.S. dollars.

To control for political and economic institutions, three measures are used. Economic institutions are measured using the Economic Freedom of the World (EFW) Index from the Fraser Institute (Gwartney, Lawson, and Hall, 2011). The EFW score is increasing in the extent of economic freedom in a country, with a maximum score of 10. Political institutions are controlled for using two measures, a measure of political freedom from Freedom House and a measure of democracy from the Polity IV index. Freedom House creates a political freedom score based on an individual's ability to participate in the political process within their country, with lower scores indicating more freedom (Freedom House, 2012). Democracy is measured using the Polity IV Project's democracy variable, which accounts for three

---

[8] While the KOF social globalization index, specifically, has been positively linked to income inequality, particularly in developing economies (Bergh and Nilsson, 2010b), it has been negatively linked to gender inequality (Potrafke and Ursprung, 2012). Increased globalization has also been hypothesized to fiscally constraint governments by subjecting them to increased budgetary

pressures from without. Dreher et al. (2008A) report evidence based on the KOF index that fails to confirm this so-called *disciplining hypothesis*. Samimi et al. (2012) report a negative relationship between the KOF index and inflation; alternatively, the authors fail to find an independent link between a more conventional measure of trade openness and inflation.

elements of democracy: the presence of institutions that allow citizens to express preferences about policies and leaders, whether or not there are formal constraints on the executive, and the availability of civil liberties to all citizens (Polity IV, 2013). Larger values of the Polity IV score indicate more democracy within the country.

Combining these data we arrive at an unbalanced panel that includes up to 184 countries and covers 5-year periods from 1970 to 2009. Table 1 reports descriptions, sources, and summary statistics for all of the variables included in our analysis.

Table 1. Descriptions, sources, and summary statistics for variables.

Variable	Description	Source	Min.	Max.	Mean	St. Dev.
GDP_PC	GDP per capita (constant 2000 US$)	World Bank WDI	85.21	95,885	7,050	11,173
S	Ratio of GDP to Highest Income OECD Country GDP	Xu and Li, WDI	0.002	1.000	0.509	0.445
S_{US}	Ratio of GDP to U.S. GDP	Xu and Li, WDI	0.002	1.000	0.523	0.445
S_{MONACO}	Ratio of GDP to Highest Income Country GDP	Xu and Li, WDI	0.001	1.000	0.454	0.457
L	Logistic Transformation of S equal to $S/(1-S)$		0.002	179.1	0.705	5.51
L_{US}	Logistic Transform. of S_{US} equal to $S_{US}/(1-S_{US})$		0.002	2486	3.240	73.6
L_{RICH}	Logistic Transformation of $S_{RICH}/(1-S_{RICH})$		0.001	15.621	0.166	0.639
$LN(L)$	Natural Log of Logistic Transformation of S		-6.335	5.188	-2.574	1.92
$LN(L_{US})$	Natural Log of Logistic Transformation of S_{US}		-6.538	7.818	-2.467	1.95
$LN(L_{MONACO})$	Natural Log of Logistic Transformation of S_{RICH}		-6.890	2.749	-3.357	1.75
$GLOB$	Overall Globalization Index	KOF	13.809	92.375	44.948	17.5
E_GLOB	Economic Globalization Index	KOF	9.575	97.921	49.470	19.1
S_GLOB	Social Globalization Index	KOF	6.130	92.456	40.452	20.8
P_GLOB	Political Globalization Index	KOF	1.000	97.698	46.070	26.5
$DEMOC$	Polity IV Democracy Score	Polity IV Project	0.000	10.000	4.088	4.09
$ECON\_FREE$	Economic Freedom of the World Score	Fraser Institute	1.782	9.141	5.944	1.35
POL_FREE	Freedom House Political Freedom Score	Freedom House	1.000	7.000	3.848	2.03
K	Gross Capital Formation (% of GDP)	World Bank WDI	3.575	86.79	23.121	8.19
$PRIM\_EDU$	Primary School Enrollment Rate (Gross)	World Bank WDI	11.518	216.72	96.080	24.6
SEC_EDU	Secondary School Enrollment Rate (Gross)	World Bank WDI	0.140	164.6	59.092	34.0
TER_EDU	Tertiary School Enrollment Rate (Gross)	World Bank WDI	0.000	100.1	17.997	19.0
$LIFE\_EXP$	Life Expectancy at Birth	World Bank WDI	28.871	82.56	64.296	10.9
POP	Population Growth Rate	World Bank WDI	-4.645	16.245	1.799	1.64

4. Results

Results from regressions of the specification shown in equation (3) are presented in Table 2. All estimations reported in Table 2 include period fixed effects. Column 1 reports results from our baseline specification, including a positive and statistically significant (1% level) estimated relationship between *GLOB* and the rate of horizontal convergence. Column 2 reports on an expansion of the baseline

specification that includes the standard controls associated with neoclassical growth theory and institutional quality.[9] The estimated relationship between globalization and the horizontal convergence rate is positive and significant (1% level) in all cases. However, the coefficient point estimate does decrease when the controls are added. Including both neoclassical and institutional controls results in a point

---

[9] For the column 1 the Hausman test statistic is 139.51. The null hypothesis is easily rejected, suggesting that the random effects estimator is inconsistent and that the fixed effects estimator is to be preferred. For specification 2 the number of cross-sections included is not large enough to carry out random effects estimation.

estimate of 0.036, implying that an increase in *GLOB* of 19 points (about 1 standard deviation) is associated with an increase in the convergence rate of about 68 percentage points, all else equal. This is a large effect. A difference of 19 points is comparable to the 2005 globalization index differential between the U.S. (about 76) and countries such as Trinidad and Tobago

and the Philippines (each about 54). The estimate implies that if those latter countries were to become as globalized as the U.S., then, all else equal, they would close the gap between their income and the richest country by an additional 68% over a 5-year period (or about 13.6% annually).[10]

Table 2. Regressions of the income convergence rate on globalization indices and other controls, 1970-2009.

	(1)	(2)	(3) (L_{US})	(4) (L_{MONACO})	(5)
GLOB	0.093***	0.036***	0.048***	0.033***	0.038***
	(0.002)	(0.007)	(0.007)	(0.004)	(0.008)
K		-0.012*	-0.016**	-0.014***	-0.009
		(0.007)	(0.007)	(0.005)	(0.007)
PRIM_EDU		-0.003	-0.004	-0.001	-0.001
		(0.002)	(0.002)	(0.002)	(0.002)
SEC_EDU		0.015***	0.017***	0.013***	0.014***
		(0.003)	(0.003)	(0.002)	(0.003)
TER_EDU		0.002	-0.005	0.001	0.006*
		(0.003)	(0.004)	(0.003)	(0.003)
LIFE_EXP		0.060***	0.059***	0.062***	0.055***
		(0.009)	(0.009)	(0.008)	(0.009)
POP		0.054	0.079	0.068*	0.055
		(0.045)	(0.049)	(0.040)	(0.044)
ECON_FREE		0.225***	0.120**	0.160***	0.212***
		(0.053)	(0.054)	(0.038)	(0.054)
POL_FREE		-0.111***	-0.123***	-0.066***	
		(0.027)	(0.032)	(0.022)	
DEMOC					0.024**
					(0.012)
Countries	183	99	99	99	93
Observations	1,199	566	550	574	536
F-stat. (redundant effects)	338.17***	233.43***	205.69***	359.47***	248.11***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Adj. R²	0.652	0.848	0.820	0.877	0.853

Notes: *, **, and *** denote, respectively, significance at the 10, 5, and 1 percent levels. HAC standard errors are in parentheses.

Dependent variable is ln(L_{it}), where $L_{it} = \frac{S_{it}}{1-S_{it}}$. Constants are included in regressions though not reported above.

All estimations include fixed period effects. The null for the redundant fixed effects test is that the fixed effects are jointly insignificant.
"L_{US}" ("L_{MONACO}") indicates that relative per capita GDP was calculated using U.S. (Monaco's) GDP per capita as the benchmark.
Panel is unbalanced and based on 5-year periods (1970-74, 1975-79, 1980-84, 1985-89, 1990-94, 1995-99, 2000-2004, and 2005-2009).

---

[10] For each of these estimations, the F-statistic associated with a test of joint insignificance of the period effects rejects the null at the 1% significance level. This suggests that there is relevant unobserved time variation in convergence rates that is not captured by our

other control variables. In the appendix (Table A1) we report regressions analogous to those of Table 2 including both country and period fixed effects. The globalization estimates are qualitatively similar and statistically significant.

Focusing on column 2, our preferred specification, most of the other control variables enter with the expected signs and are statistically significant (10% level or better). In particular, life expectancy and institutional quality are positively associated with horizontal convergence rates.[11] Of the educational measures, only secondary enrollment enters significantly, but the estimated effect is positive.

Columns 3 through 5 report various robustness checks. Column 3 reports results based on using the U.S. as the benchmark per capita income level in each period (in place of the richest OECD country). Column 4 reports results based similarly on using the richest country in the given time period (always Monaco) as the benchmark. The positive and significant relationship between globalization and the horizontal convergence rate is robust to this change in the benchmark. Quantitatively, when the U.S. is the benchmark income level the coefficient estimate on *GLOB* increases from 0.036 (column 2) to 0.048 (column 3). However, using the richest country benchmark the coefficient estimate is comparable to that of column 2 (0.033). As demonstrated above, this is a sizable effect for any of these point estimates. Lastly, column 5 reports results that are analogous to those reported in column 2 save for the fact that the Polity IV measure of democracy (*DEMOC*) replaces Freedom House's political freedom score (*POL_FREE*). Employing this alternative measure of the political institutional quality does not change the results meaningfully.

As described above in the introduction, Knack (1997) has argued that where income convergence is absent, poor institutions are to blame. While we control for measures of economic and political institutional quality, it is possible that globalization facilitates formal institutional change and that the omission from out estimations of an interaction between globalization and institutional quality is biasing our results. In particular, we could be attributing importance to globalization when the institutional changes that it leads to are actually the proximate determinants of income convergence. This would be a result consistent with the empirical studies documenting cross-country institutional spillovers (e.g., Seldadyo et al., 2010; de Groot, 2011; Simmons and Elkins, 2004).

To address this concern, in Table 3 we report results from three estimations that include interactions of globalization with one or more measures of institutional quality. Otherwise the estimations are analogous to those reported in column 2 of Table 2. The column 1 estimation includes an interaction of the globalization index with the economic freedom score. The interaction does not enter significantly. The column 2 estimation includes an interaction of globalization with the Freedom House political freedom score. This interaction enters negatively and significantly, though only at the 10% level. Recall that a higher Freedom House score implies *less* political freedom, so the estimates imply that globalization has a larger effect in environments of greater political freedom. In Figure 1 we plot the estimated marginal effect of a change in *GLOB* conditional on the value of *POL_FREE*, along with 95% confidence intervals.[12] The marginal effect of globalization is positive and statistically significant at the 5% level or better at all values of *POL_FREE*. Importantly, the marginal effect point estimates all lie in the fairly narrow range of 0.020 to 0.038. While there is evidence that the relationship between globalization and income convergence is conditional on the quality of political institutions, the relationship is positive, statistically significant, and quantitatively meaningful at *all* values of *POL_FREE*. Finally, column 3 of Table 3 includes results from an estimation where both interaction terms of included. In that case, neither interaction enters significantly.

Table 4 reports the results of estimations that consider countries' economic, social, and political globalization scores separately (*E_GLOB, S_GLOB,* and *P_GLOB*, respectively). The estimations reported in columns 1 through 4 include the Freedom House measure of political institutions as a control; the estimations reported in columns 5 through 8 include the Polity democracy index. All estimations include investment, education, and population growth rate controls; they also control for political and economic institutional quality as well as period fixed effects.

When only economic globalization is included (columns 1 and 5), it enters positively and significantly (5% level in column 1 and 10% level in column 5). The coefficient point estimates are both considerably smaller than that associated with the overall

---

[11] Recall that the *POL_FREE* measure is one where *lower* values correspond to *more* political freedoms, so a negative coefficient reveals a positive effect of political freedom.

[12] Brambor et al. (2006) provide an overview of how to properly interpret conditional marginal effects in models with interaction terms. Denoting β_{GLOB} and $\beta_{PGLOB; POL\_FREE}$ as the coefficients on

GLOB and its interaction with *POL_FREE*, respectively, the point estimate of the conditional marginal effect is ($\beta_{GLOB} + \beta_{GLOB; POL\_FREE} \times POL\_FREE$) and the conditional standard error is [Var(β_{GLOB}) + Var($\beta_{GLOB; POL\_FREE}$)$\times POL\_FREE^2$ + 2$\times$Cov($\beta_{GLOB}, \beta_{GLOB; POL\_FREE}$)$\times POL\_FREE$]$^{1/2}$.

globalization index in column 2 of Table 2. The sample standard deviations on *GLOB* and *E_GLOB* are similar (17.5 versus 19.1), so the difference in co-efficient estimates is meaningful. The coefficient estimates for political globalization (columns 3 and 7) are also small. The sample standard deviation of *P_GLOB* is larger than that of the other two sub-indices (26.5) but its effect is still roughly similar to that of economic globalization. Alternatively the estimated effects of social globalization (columns 2 and 6) are comparable to those reported for the overall globalization index. These estimated effects are both

statistically significant at the 1% level. Finally, columns 4 and 8 present results with the inclusion of all three globalization sub-indices together. In column 4, both the social measure of globalization and the political measure of globalization remain significant at the 5% level or better. In column 8, when the Polity IV index is the measure of political institutional quality, both social and political globalization enter significantly at the 1% level and economic globalization enters slightly significantly at the 10% level. However, *E_GLOB* enters *negatively* in this case, and we note that the point estimate is also negative in column 4.[13]

Table 3: Regressions of the income convergence rate on globalization indices and other controls, 1970-2009; including interactions between globalization and measures of institutional quality.

	(1)	(2)	(3)
GLOB	0.021*	0.041***	0.036**
	(0.013)	(0.009)	(0.018)
K	-0.011	-0.011	-0.011
	(0.007)	(0.007)	(0.007)
PRIM_EDU	-0.002	-0.002	-0.002
	(0.002)	(0.002)	(0.002)
SEC_EDU	0.015***	0.015***	0.015***
	(0.003)	(0.003)	(0.003)
TER_EDU	0.000	-0.000	-0.000
	(0.004)	(0.004)	(0.004)
LIFE_EXP	0.062***	0.065***	0.065***
	(0.009)	(0.009)	(0.009)
POP	0.047	0.062	0.059
	(0.045)	(0.045)	(0.047)
ECON_FREE	0.113	0.219***	0.185*
	(0.098)	(0.054)	(0.108)
POL_FREE	-0.113***	0.009	-0.008
	(0.027)	(0.074)	(0.090)
*ECON_FREE*GLOB*	0.002		0.001
	(0.002)		(0.002)
*POL_FREE*GLOB*		-0.003*	-0.002
		(0.001)	(0.002)
Countries	99	99	99
Observations	566	566	566
F-stat. (redundant effects)	217.55***	233.47***	210.39***
	(0.000)	(0.000)	(0.000)
Adj. R²	0.848	0.848	0.848

Notes: *, **, and *** denote, respectively, significance at the 10, 5, and 1 percent levels. HAC standard errors are in parentheses.
Dependent variable is $\ln(L_{it})$, where $L_{it} = \frac{s_{it}}{1-s_{it}}$. Constants are included in regressions though not reported above.
All estimations include fixed period effects. The null for the redundant fixed effects test is that the fixed effects are jointly insignificant. "L_{US}" indicates that the dependent variable, relative per capita GDP, was calculated using U.S. GDP per capita as the benchmark.
Panel is unbalanced and based on 5-year periods (1970-74, 1975-79, 1980-84, 1985-89, 1990-94, 1995-99, 2000-2004, and 2005-2009).

---

[13] In an appendix to this paper, Table A2 reports results that are analogous to those reported in Table 4 except that the richest country (as opposed to the richest OECD country) is used at the income per capita benchmark. The results are not meaningfully changed in terms of either the statistical significance or the quantitative magnitude of the effects. Social globalization always enters positively and significantly at the 1% level; the estimated effect is always comparable to that of the comprehensive globalization index in column 2 of Table 2.
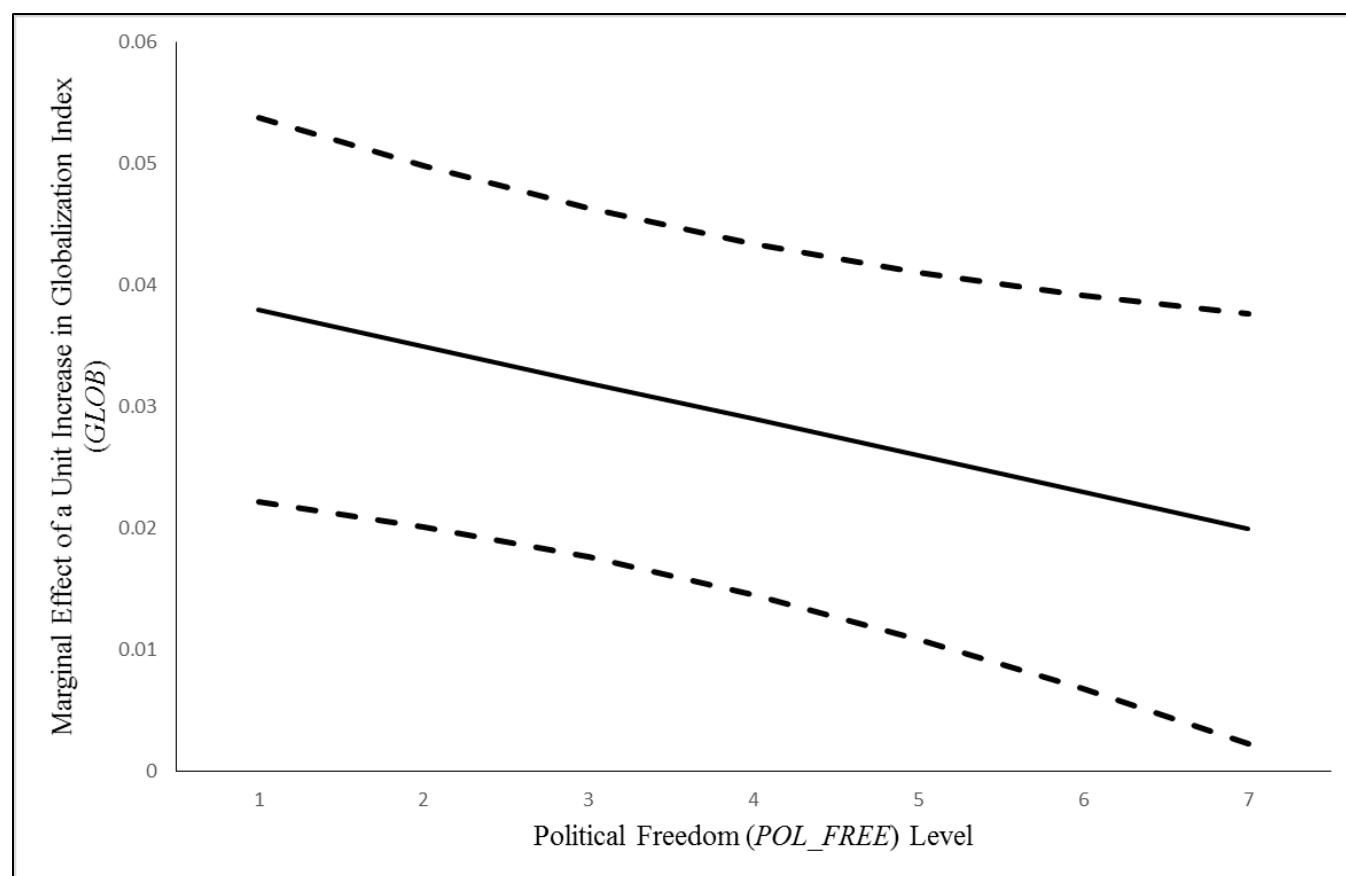
Figure 1. Marginal effect of increased globalization on the horizontal convergence rate; conditional on the level of political freedom.

Notes: Based on estimation reported in column 2 of **table 4**. Solid line indicates the point estimates; dashed lines indicate the 95% confidence intervals.

However, the most notable results from columns 4 and 8 of Table 4 involve, again, the social globalization sub-index. In both column 4 and column 8 the estimated effect of *S_GLOB* is considerably larger than that associated with political globalization. Globalization, as measured by the KOF index, is positively related to income convergence and, in particular, the social dimension – the flow of information, individuals, and their cultural beliefs – appears to drive the estimated effects. We interpret these findings as consistent with decentralized processes by which individuals of a county access and learn to utilize knowledge that is already used in richer countries. These are discovery processes through which a country can move itself closer to the world production frontier. The evidence suggests that these decentralized processes are considerably more important for income convergence than more centralized, political processes.

As described in Section 2, our empirical specification is based on Xu and Li (2008). These authors explore income convergence as a function of the same economic and political institutional variables that we control for (i.e., the Fraser Institute's economic freedom scores and the Freedom House political freedom scores). Xu and Li (2008) report that both economic and political freedoms are associated with greater income convergence.

Since we find that globalization has an economically meaningful, independent effect on convergence, we now explore whether the role of formal institutional quality is overestimated when a measure of globalization is excluded. For a point of reference, the coefficient estimates on economic political freedom from column 2 of Table 2 are 0.225 and -0.111, respectively. In column 1 of Table 5 we report the results of an analogous regression where the globalization index is not included as a control. The economic

and political freedom coefficient estimates are now 0.371 and -0.143 (both significant at the 1% level), respectively. While we cannot say that the coefficient estimates are statistically different across these alternative estimations, we note that the column 1 Table 5 economic freedom estimate is more than 2 (of its own) standard errors greater than 0.225. In column 2 we report on an estimation including economic freedom and the Polity IV institutional measure but, again, ex-

cluding globalization. This is analogous to the column 5 Table 2 regression that includes globalization. Moving from column 5 Table 2 to column 2 Table 5, the coefficient estimate on the Polity IV measure rises from 0.024 to 0.034. Again, this is not a statistically significant difference. That being said, our results suggest that not controlling for globalization may lead researchers to overestimate the effects of formal institutional quality on income convergence.

Table 4. Regressions of the income convergence rate on economic, social, and political globalization indices and other controls, 1970-2009.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
E_GLOB	0.011**			-0.006	0.009*			-0.010*
	(0.006)			(0.006)	(0.005)			(0.006)
S_GLOB		0.036***		0.039***		0.035***		0.040***
		(0.005)		(0.004)		(0.005)		(0.004)
P_GLOB			0.006***	0.005**			0.010***	0.008***
			(0.002)	(0.002)			(0.002)	(0.002)
K	-0.016**	-0.009	-0.015**	-0.007	-0.014*	-0.006	-0.011	-0.003
	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)
PRIM_EDU	-0.003	-0.000	-0.004	-0.000	-0.002	0.000	-0.002	0.001
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
SEC_EDU	0.018***	0.013***	0.022***	0.014***	0.020***	0.014***	0.022***	0.015***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
TER_EDU	0.006*	0.001	0.004	-0.002	0.010***	0.004	0.008**	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
LIFE_EXP	0.070***	0.053***	0.071***	0.051***	0.067***	0.050***	0.065***	0.045***
	(0.009)	(0.008)	(0.009)	(0.008)	(0.009)	(0.008)	(0.009)	(0.008)
POP	0.023	0.041	0.045	0.059	0.023	0.047	0.058	0.081**
	(0.044)	(0.037)	(0.048)	(0.040)	(0.043)	(0.037)	(0.047)	(0.039)
ECON_FREE	0.298***	0.212***	0.359***	0.229***	0.301***	0.198***	0.344***	0.222***
	(0.055)	(0.050)	(0.049)	(0.056)	(0.055)	(0.047)	(0.044)	(0.055)
POL_FREE	-0.134***	-0.103***	-0.138***	-0.099***				
	(0.027)	(0.025)	(0.028)	(0.025)				
DEMOC					0.033***	0.029***	0.029**	0.025**
					(0.012)	(0.010)	(0.012)	(0.011)
Countries	99	99	99	99	93	93	93	93
Observations	566	566	566	566	536	536	536	536
F-stat. (redundant effects)	203.89***	257.38***	196.68***)	225.03***)	207.43***	259.11***	197.43***	249.56***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Adj. R²	0.835	0.852	0.832	0.853	0.840	0.859	0.839	0.861

Notes: *, **, and *** denote, respectively, significance at the 10, 5, and 1 percent levels. HAC standard errors are in parentheses.

Dependent variable is ln(L_{it}), where $L_{it} = \frac{S_{it}}{1-S_{it}}$. Constants are included in regressions though not reported above.

All estimations include fixed period effects. The null for the redundant fixed effects test is that the fixed effects are jointly insignificant.

"L_{US}" indicates that the dependent variable, relative per capita GDP, was calculated using U.S. GDP per capita as the benchmark.

Panel is unbalanced and based on 5-year periods (1970-74, 1975-79, 1980-84, 1985-89, 1990-94, 1995-99, 2000-2004, and 2005-2009).

Table 5. Regressions of the income convergence rate on economic and political institutional measures and other controls, 1970-2009; excluding globalization controls.

	(1)	(2)
K	-0.016**	-0.014**
	(0.007)	*(0.007)*
PRIM_EDU	-0.003	-0.002
	(0.003)	*(0.002)*
SEC_EDU	0.021***	0.022***
	(0.003)	*(0.003)*
TER_EDU	0.007*	0.012***
	(0.003)	*(0.003)*
LIFE_EXP	0.071***	0.068***
	(0.009)	*(0.009)*
POP	0.030	0.031
	(0.044)	*(0.043)*
ECON_FREE	0.371***	0.356***
	(0.049)	*(0.045)*
POL_FREE	-0.143***	
	(0.027)	
DEMOC		0.034***
		(0.012)
Countries	100	94
Observations	569	539
F-stat.	204.07***	196.46***
(redundant effects)	*(0.000)*	*(0.000)*
Adj. R²	0.828	0.830

Notes: Refer to Table 4 for notes.

5. Conclusions

Does increased globalization promote cross-country income convergence? Based on a panel of up to 184 countries covering the years 1970 to 2009, we conclude that it does.

We argue that income convergence is largely a problem of poor countries gaining access to and effectively utilizing knowledge from rich countries. When poor countries can do this they move their economies closer to the world production frontier, near to which rich economies already operate. If such is the case, then the rate of convergence is likely to be higher when individuals in poor countries are allowed opportunities to experience and experiment with the behavior and conduct of individuals in rich countries. Allowing for this sort of informal, decentralized discovery may represent a powerful alternative to formal institutional change – something that economists and policymakers have not proved adept at bringing about in developing economies.

We estimate income convergence as a function of the KOF globalization indices described in Dreher (2006). The definition of globalization in this context is "the process of creating networks of connections among actors at multi-continental distances, mediated through a variety of flows including people, information and ideas" (Dreher, 2006, p. 1092). It is through these networks of connections that individuals may gain access to and experiment with the usable knowledge that constitutes the world production frontier.

Controlling for various additional factors, including measures of political and economic institutional quality, we find that a standard deviation increase in the KOF index is associated with a country closing the gap between its income per capita level and that of the richest country by an additional 13.6% annually. A standard deviation is, in this context, equivalent to countries like Trinidad and Tobago and the Philippines becoming as globalized as the U.S.

In addition to the comprehensive globalization index, KOF provides sub-indices for the economic, political, and social dimensions of globalization. We find that increased globalization has a statistically significant and large effect on the rate of income convergence. In particular, our results suggest that social globalization is associated with faster income convergence. The KOF social globalization index captures the extent to which a country is open to individuals, information, and cultural beliefs from other countries. This dimension of globalization seems particularly to offer what Hayek (1960, p. 30) prescribed: "maximum opportunity for unknown individuals to learn of facts that we ourselves are yet unaware of and to make use of this knowledge in their actions."

Excluding the globalization measures from our estimations tends to increase the estimated effects of formal economic and political institutional quality on income convergence. This statement is based on point estimates, and the changes in estimated effects are never statistically significant. However, the changes in the point estimates are often sizable, and this is at least suggestive that not controlling for globalization can bias upward our estimation of the importance of formal institutional quality for income convergence.

References

Acemoglu, D., S. Johnson, and J. Robinson. 2001. The colonial origins of comparative development: An empirical investigation. *American Economic Review* 91(5): 1369-1401.

Acemoglu, D., S. Johnson, and J. Robinson. 2002. Reversal of fortune: Geography and institutions in the making of the modern world income distribution. *Quarterly Journal of Economics* 117(4): 1231-1294.

Acemoglu, D., and S. Johnson. 2005. Unbundling institutions. *Journal of Political Economy* 113(5): 949-995.

Al-Marhubi, F.A. 2005. Openness and governance: Evidence across countries. *Oxford Development Studies* 33(3-4): 453-471.

Barro, R. 1996. Democracy and growth. *Journal of Economic Growth* 1(1): 1-27.

Barro, R. 2012. Convergence and modernization revisited. Working Paper No. 18295, National Bureau of Economic Research.

Barro, R.J., and X. Sala-i-Martin. 1992. Convergence. *Journal of Political Economy* 100(2): 223-251.

Bergh, A., and M. Karlsson. 2010. Government size and growth: Accounting for economic freedom and globalization. *Public Choice* 142(1-2): 195-213.

Bergh, A., and T. Nilsson. 2010a. Good for living? On the relationship between globalization and life expectancy. *World Development* 38(9): 1191-1203.

Bergh, A., and T. Nilsson. 2010b. Do liberalization and globalization increase income inequality? *European Journal of Political Economy* 26(4): 488-505.

Bergh, A., I. Mirkina, and T. Nilsson. 2014. Globalization and institutional quality- A panel data analysis. *Oxford Development Studies* 42(3): 365-394.

Bhattacharyya, S. 2012. Trade liberalization and institutional development. *Journal of Policy Modeling* 34(2): 253-269

Boettke, P.J., C.J. Coyne, and P.T. Leeson. 2008. Institutional stickiness and the new development economics. *American Journal of Economics and Sociology* 67(2): 331-358.

Bosker, M., and H. Garretsen. 2009. Economic development and the geography of institutions. *Journal of Economic Geography* 9(3): 295-328.

Brambor, T., W.R. Clark, and M. Golder. 2006. Understanding interaction models: Improving empirical analyses. *Political Analysis* 14(1): 63-82.

Carlino, G.A., and L. Mills. 1996. Testing neoclassical convergence in regional incomes and earnings. *Regional Science and Urban Economics* 26(6): 565-590.

Caselli, F., G. Esquivel, and F. Lefort. 1996. Reopening the convergence debate: A new look at cross-country growth empirics. *Journal of Economic Growth* 1(3): 363-389.

Cebula, R.J., J.R. Clark, and F.G. Mixon Jr. 2013. The impact of economic freedom on per capita real GDP: A study of OECD nations. *Journal of Regional Analysis & Policy* 43(1): 34-41.

Cebula, R.J., and J.R. Clark. 2014. The effects of economic freedom, regulatory quality and taxation on the level of per capita real income: A preliminary analysis for OECD nations and non-G8 OECD nations. *Applied Economics* 46(31): 3836-3848.

Chen, S., and M. Ravallion. 2012. An update to the World Bank's estimates of consumption poverty in the developing world. Accessed October 1. http://siteresources.worldbank.org/INTPOVCALNET/Resources/Global_Poverty_Update_2012_02-29-12.pdf.

De Groot, O. 2011. Spillovers of institutional change in Africa. *Kyklos* 64(3): 410-426.

Dreher, A. 2006. Does globalization affect growth? Evidence from a new index of globalization. *Applied Economics* 38(10): 1091-1110.

Dreher, A., J.E. Sturm, and H.W. Ursprung. 2008a. The impact of globalization on the composition of government expenditure. *Public Choice* 134(3): 263-292.

Dreher, A., N. Gatson, and P. Martens. 2008b. *Measuring Globalisation: Gauging its Consequences*. New York: Springer.

Evans, P. 1997. How fast do economies converge? *Review of Economics and Statistics* 79(2): 219-225.

Foley, M., and J.R. Clark. 2016. Economic freedom and real income. *Journal of Regional Analysis & Policy* 46(1): 39-51.

Gwartney, J., R. Lawson, and J.C. Hall. 2011. *Economic Freedom of the World: 2011 Annual Report*. Vancouver: Fraser Institute.

Hall, J.C., R.S. Sobel, and G.R. Crowley. 2010. Institutions, capital, and growth. *Southern Economic Journal* 77(2): 385-405.

Hayek, F.A. 1960. *The Constitution of Liberty*. Chicago: University of Chicago Press.

Hessami, Z. 2011. Globalization's winners and losers-evidence from life satisfaction data, 1975-2001. *Economics Letters* 112(3): 250-253.

Islam, N. 1995. Growth empirics: A panel data approach. *Quarterly Journal of Economics* 110(4): 1127-1170.

Knack, S. 1997. Institutions and the convergence hypothesis: The cross-national evidence. *Public Choice* 87(3): 207-228.

Knack, S., and P. Keefer. 1995. Institutions and economic performance: Cross-country tests using alternative measures. *Economics and Politics* 7(3): 207-227.

Levchenko, A.A. 2013. International trade and institutional change. *Journal of Law, Economics, & Organization* 29(5): 1145-1181.

López-Bazo, E., E. Vayá, A.J. Mora, and J. Suriñach. 1999. Regional economic dynamics and convergence in the European Union. *Annals of Regional Science* 33(3): 343-370.

Mankiw, N.G., D. Romer, and D. Weil. 1992. A contribution to the empirics of economic growth. *Quarterly Journal of Economics* 107(2): 407-437.

Parente, S.L., and E.C. Prescott. 2000. *Barriers to Riches*. Cambridge: MIT Press.

Potrafke, N., and H.W. Ursprung. 2012. Globalization and gender equality in the course of development. *European Journal of Political Economy* 28(4): 399-413.

Rey, S.J., and B.D. Montouri. 1999. US regional income convergence: A spatial econometric perspective. *Regional Studies* 33(2): 143-156.

Rodrick, D., A. Subramanian, and F. Trebbi. 2004. Institutions rule: The primacy of institutions over geography and integration in economic development. *Journal of Economic Growth* 9(2): 131-165.

Sala-i-Martin, X. 1996. Regional cohesion: Evidence and theories of regional growth and convergence. *European Economic Review* 40(6): 1325-1352.

Samimi, A.J., S. Ghaderi, R. Hosseinzadeh, and Y. Nademi. 2012. Openness and inflation: New empirical panel data evidence. *Economics Letters* 117(3): 573-577.

Seldadyo, H., P.J. Elhorst, and J. De Haan. 2010. Geography and governance: Does space matter? *Papers in Regional Science* 89(3): 625–640.

Sheehan, K.M., and A.T. Young. 2015. It's a small world after all: Internet access and institutional quality. *Contemporary Economic Policy* 33(4): 649-667.

Simmons, B.A., and Z. Elkins. 2004. The globalization of liberalization: Policy diffusion in the international political economy. *American Political Science Review* 98(1): 171-189.

Sobel, R.S., and C.J. Coyne. 2011. The time-series properties of country institutional measures. *Journal of Law and Economics* 54(1): 111-134.

Solow. R.M. 1956. A contribution to the theory of economic growth. *Quarterly Journal of Economics* 70(1): 65-94.

Villaverde, J., A. Maza. 2011. Globalisation, growth and convergence. *World Economy* 34(6): 952-971.

Williamson, C.R. 2009. Informal institutions rule: Institutional arrangements and economic performance. *Public Choice* 139(3): 371-387.

Xu, Z., and H. Li. 2008. Political freedom, economic freedom, and income convergence. *Public Choice* 135(3): 183-205.

Young, A.T., and K.M. Sheehan. 2014. Foreign aid, institutional quality, and growth. *European Journal of Political Economy* 36(1): 195-208.

Young, A.T., M.J. Higgins, and D. Levy. 2008. Sigma convergence versus beta convergence: Evidence from U.S. county-level data. *Journal of Money, Credit, and Banking* 40(5): 1083-1093.

Appendix: Additional Results with Alternative Richest Country Benchmark.

Table A1. Table 2 regressions re-estimated with 2-way fixed effects.

	(1)	(2)	(3) (L_{US})	(4) (L_{MONACO})	(5)
GLOB	0.017***	0.017***	0.018***	0.012***	0.015***
	(0.003)	(0.003)	(0.007)	(0.002)	(0.002)
K		0.014***	0.009***	0.010***	0.014***
		(0.002)	(0.002)	(0.002)	(0.003)
PRIM_EDU		0.002	0.002	0.000	0.001
		(0.002)	(0.001)	(0.001)	(0.001)
SEC_EDU		0.005***	0.001	0.004***	0.005***
		(0.002)	(0.002)	(0.001)	(0.002)
TER_EDU		0.006***	0.008***	0.008***	0.005***
		(0.002)	(0.001)	(0.001)	(0.001)
LIFE_EXP		0.006	-0.002	-0.001	0.008
		(0.005)	(0.004)	(0.003)	(0.005)
POP		-0.025**	-0.013**	0.001	-0.019**
		(0.010)	(0.006)	(0.008)	(0.008)
ECON_FREE		0.015	-0.004	0.012	0.038**
		(0.016)	(0.023)	(0.016)	(0.015)
POL_FREE		0.005	0.019	0.029***	
		(0.014)	(0.009)	(0.006)	
DEMOC					-0.007*
					(0.004)
Countries	183	99	99	99	93
Observations	1,199	566	550	574	536
Adj. R²	0.973	0.986	0.968	0.989	0.097

Notes: *, **, and *** denote, respectively, significance at the 10, 5, and 1 percent levels. HAC standard errors are in parentheses. Dependent variable is ln(L_{it}), where $L_{it} = \frac{s_{it}}{1-s_{it}}$. Constants are included in regressions though not reported above. All estimations include fixed period and country effects. "L_{US}" ("L_{MONACO}") indicates that relative per capita GDP was calculated using U.S. (Monaco's) GDP per capita as the benchmark. Panel is unbalanced and based on 5-year periods (1970-1974, 1975-1979, 1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004, and 2005-2009).

Table A2: Regressions of the income convergence rate on economic, social, and political globalization indices and other controls, 1970-2009; using the richest country in the world as the benchmark for the calculation of *L*.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
E_GLOB	0.015***			0.000	0.014***			-0.002
	(0.003)			(0.003)	(0.003)			(0.004)
S_GLOB		0.033***		0.033***		0.032***		0.032***
		(0.003)		(0.003)		(0.003)		(0.003)
P_GLO			0.002	0.002			0.005**	0.004**
			(0.002)	(0.002)			(0.002)	(0.002)
K	-0.018***	-0.011**	-0.017***	-0.011**	-0.016***	-0.008*	-0.014**	-0.007
	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)
PRIM_EDU	-0.002	0.001	-0.002	0.001	-0.001	0.002	-0.001	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
SEC_EDU	0.015***	0.011***	0.019***	0.011***	0.015***	0.011***	0.019***	0.011***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
TER_EDU	0.005*	0.000	0.003	-0.000	0.010***	0.004*	0.008***	0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)
LIFE_EXP	0.070***	0.055***	0.072***	0.055***	0.067***	0.052***	0.067***	0.051***
	(0.008)	(0.007)	(0.008)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
POP	0.036	0.055*	0.051	0.060*	0.022	0.049	0.047	0.062*
	(0.039)	(0.032)	(0.041)	(0.034)	(0.038)	(0.032)	(0.041)	(0.034)
ECON_FREE	0.201***	0.148***	0.285***	0.147***	0.210***	0.145***	0.277***	0.148***
	(0.039)	(0.036)	(0.036)	(0.040)	(0.040)	(0.037)	(0.037)	(0.040)
POL_FREE	-0.085***	-0.059***	-0.095***	-0.057***				
	(0.022)	(0.020)	(0.023)	(0.021)				
DEMOC					0.016	0.013	0.015	0.011
					(0.010)	(0.009)	(0.011)	(0.009)
Countries	99	99	99	99	93	93	93	93
Observations	574	574	574	574	541	541	541	541
F-stat. (redundant effects)	319.81***	411.59***	305.99***	365.08***	310.15***	410.49***	304.37***	376.49***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Adj. R^2	0.866	0.888	0.858	0.888	0.866	0.888	0.860	0.889

Notes: *, **, and *** denote, respectively, significance at the 10, 5, and 1 percent levels. HAC standard errors are in parentheses. Dependent variable is $\ln(L_{RICH_{it}})$, where $L_{RICH_{it}} = S_{RICH_{it}}/(1 - S_{RICH_{it}})$. Constants are included in regressions though not reported above. All estimations include fixed period effects. The null hypothesis for the redundant fixed effects test is that the fixed effects are jointly insignificant. "L_{US}" indicates that dependent variable relative per capita GDP was calculated using U.S. GDP at the benchmark for all periods. Panel is unbalanced and based on 5-year periods (1970-1974, 1975-1979, 1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004, and 2005-2009).