Transitional dynamics and the evolution of information transparency: a global analysis*

Dinámica transicional y evolución de la transparencia en la información: un análisis global

Andrew David Williams**
Tsun Se Cheong***
Michal Wojewodzki****

Abstract

The last quarter of the 20th century was a period of sustained economic growth across many countries. Countries' institutional arrangements have been commonly employed as factors in the convergence studies of economic growth and income levels. However, the issue of whether institutions themselves converge has been under-researched. Using the nonparametric distribution dynamics approach and a sample of 194 countries during the 1980-2010 period, we examine a tendency for countries' informational transparency (IT) to converge over time. We find that whilst there is some evidence of unconditional convergence across countries, there is stronger evidence for convergence clubs to emerge, at both regional and income levels. Notably, the level of IT of the low- and lower-middle-income countries and those situated in Africa, and Middle East regions tend to converge towards a level significantly below the global average. We also find a strong relationship between income and IT.

Key words: *Institutional convergence, information transparency, convergence clubs, distribution dynamics, mobility probability plot.*

JEL Classification: *C4, E02, F55, P48.*

---

* We are particularly grateful to three anonymous referees and Prof. Rómulo Chumacero (Editor-in-Chief) for providing valuable comments and suggestions that significantly improved this paper.

** Business School, University of Western Australia, Perth, Australia. E-mail: andrew.williams@uwa.edu.au

*** Department of Economics and Finance, Hang Seng University of Hong Kong, Hong Kong. E-mail: jamescheong@hsu.edu.hk

**** [Corresponding author] Department of Economics and Finance, Hang Seng University of Hong Kong, Hong Kong. E-mail: michalwojewodzki@hsu.edu.hk

Received: March, 2021. Accepted: April, 2022.

Resumen

Varios países presentaron un crecimiento sostenido en los últimos 25 años del siglo recién pasado. Aunque los arreglos institucionales han sido comúnmente utilizados como factores para explicar la convergencia en crecimiento y niveles de ingreso, el estudio de si las instituciones convergen no ha sido suficientemente estudiado. Utilizando el enfoque de dinámica de distribuciones no paramétricas y una muestral de 194 países en el perido 1980-2010, este trabajo examina si existe la tendencia de la transparencia en la información (IT) a converger en el tiempo. Se encuentra que, aunque hay cierta evidencia de convergencia incondicional, también la hay de clubes de convergencia a nivel regional y de ingresos. El nivel de IT de países de ingresos bajos y medios y de aquellos situados en África y el Oriente Medio tienden a converger a niveles significativamente menores que el promedio global. También encontramos una relación estrecha entre IT e ingreso.

Palabras clave: *Convergencia institucional, transparencia en la información, clubes de convergencia, dinámica de distribuciones, mobilidad.*

Clasificación JEL: *C4, E02, F55, P48.*

1. Introduction

The issue of convergence has long fascinated economists. Whether that be a convergence of per capita incomes, income inequality, or across a range of different factors, convergence has been a way for economists to think about whether there is a tendency for countries across the world to 'get closer' to some common level. With respect to per capita incomes, much of the focus has been on the empirical verification of whether countries are, indeed, converging, or whether we are instead experiencing divergence (e.g., Pritchett, 1997). Although the evidence on unconditional convergence is still mixed, the idea of conditional convergence appears to have some empirical validity. Conditional convergence brings forth the idea that there are convergence clubs, whereby countries with similar initial conditions and circumstances will ultimately converge to a similar level of per capita GDP over time (e.g., Barro, 2015).

One of the driving factors behind economic growth is the institutional infrastructure of a country. Therefore, having an acceptable level of institutional capacity in a country not only can maintain the law and order in the society but also offer a required environment for promoting economic growth (e.g., Keefer and Knack, 1997; Hall and Jones, 1999). More specifically, the provision of a transparent and robust institutional environment can attract investment, which, in turn, would lead to an increase in the overall income level of a country, thereby making convergence possible for the developing countries through economic growth. As a result, it calls for a thorough study of the evolution pattern of

institutional information transparency (IT) of the countries so that pragmatic policy suggestions can be acquired for the formulation of development policies in promoting economic growth.

This paper, however, takes a slightly different approach to this issue. Instead of investigating whether the institutional situation of countries plays a role in their convergence of per capita income, we look at the issue of convergence with respect to the informational transparency of the institutional environment itself. At a global level, such institutional convergence might be expected to be observed under periods of substantive globalization. Transactions across borders are not frictionless, being subject to differences in regulations, contract enforcement and so on, across borders. Therefore, to deepen economic integration in the way we have observed in the late 20th century period, one might plausibly expect to see a convergence in institutional information openness occurring concurrently, as countries harmonize institutional arrangements to reduce the transaction costs of cross-border flows.

A second consideration relates to the degree of potential spillovers concerning the IT of institutions. If a country is surrounded by countries with stable and transparent institutions, it is certainly plausible that their institutional arrangements would be influenced by this. Conversely, being surrounded by countries with unstable and opaque institutions would make it difficult to maintain one's institutions robust and effective in the face of this.

The question of institutional convergence has received far less attention in the literature (e.g., Beyaert *et al.*, 2019; Pérez-Moreno *et al.*, 2020). The novel contribution of this paper is twofold. Firstly, building on the distribution dynamics methodology developed originally by Quah (1993a), we employ a new analytical framework: the Mobility Probability Plot (MPP) which has not previously been employed in a global context to look at convergence in institutional IT.[1] This framework allows us to look not only at convergence, but also at the transition dynamics over time, across both income levels, and regions in a comprehensive worldwide sample of 194 countries. Secondly, we use this information on institutional distributional dynamics to project forward and investigate whether globally we can expect institutional IT convergence (or divergence) in the future.

To clarify and motivate empirics, we first look at the existing literature in Section 2. Section 3 discusses the specific institutional measure employed, as well as the methodology of the distributional dynamics. Section 4 discusses our results, while Section 5 offers some thoughts on the implications and limitations of the paper.

---

[1] Although the research output on institutional convergence has been slowly growing in recent years, to the best of our knowledge, Beyaert *et al.*'s (2019) study on the convergence of euro area's institutions is the only one to employ the distribution dynamics analysis developed by Quah (1993a).

2. Literature Review

Institutional capacity is important for economic growth (e.g., Barro, 1991). Deeper institutional factors, such as the existence of a sound and stable legal system, the quality of the bureaucracy, as well as outcome measures such as corruption were all put forward as being plausible reasons why some countries were able to grow faster than others.[2] Relating directly to the idea of institutions and convergence Keefer and Knack (1997) employ datasets from the International Country Risk Guide (ICRG), and Business Environmental Risk Intelligence to isolate the role of the broader institutional landscape of countries in convergence. Other papers subsequently followed, employing different methodologies and institutional datasets (e.g., Chong and Calderon, 2003; Gwartney *et al.*, 2006). Since that time, it has been *de rigueur* for researchers to employ institutional quality as one of the dominant factors in the convergence literature (e.g., Ahmad and Hall, 2017). However, the issue of whether these institutions themselves converge (either unconditionally or otherwise) has been curiously under-researched. Intuitively, why might we expect institutions to converge over time?

Trade and globalization have been put forward as one avenue that could potentially lead to institutional convergence. For example, the movement towards free trade in goods, services and capital may require similar regulations and laws within domestic economies to make them compatible with regulations and laws in the partner countries. It could also be argued that competition, particularly for capital, may lead to a 'race to the top' concerning implementing rules that facilitate inflows of FDI (La Porta *et al.*, 2008).

In the recent past there has been a concerted effort on the part of some multilateral organizations (such as the World Bank, IMF, and the European Union) to impose certain institutional or governance conditions in order for countries to qualify for loans, or to be eligible for Structural Adjustment Plans. By imposing these conditions, the explicit hope was that countries would improve the institutional quality of their government, thereby promoting something of a virtuous circle which would then allow them to reduce their dependence on aid, or concessional loan facilities (Roland, 2004).

Furthermore, there are reasons to think that there might be, at best, conditional institutional convergence. Theoretically, Blackburn *et al.* (2006) develop a model whereby multiple equilibria corruption clubs emerge. Mukand and Rodrik (2005) are highly skeptical that a 'one size fits all' set of institutions would be either useful or indeed workable, at a global level. Roland (2004) discusses the issue of trying to fit a common set of 'slow-moving' institutions into an environment where very different 'fast-moving' institutions exist. Others (e.g., Rodrik, 2008) caution against the idea that Western-style institutions are

[2] It is not the intention of this paper to delve into the entire institutional literature. For further information, please refer to e.g., Rodrik *et al.* (2004) and Hall and Jones (1999) on the issue of the institutional determinants of income, and Mauro (1995) for the initial uses of these datasets to measure different aspects of institutions.

universally applicable. De Long and Summers (1993) suggest that regional location might play an important role in what could be termed 'social capability'. Collectively, these papers suggest that unconditional institutional convergence is unlikely to occur, particularly if no account is made of geographical, historical, and cultural factors.

Regarding the empirical evidence on institutional convergence, Ahmad (2008) finds some evidence of corruption convergence clubs emerging. Hall (2016) employs measures of economic freedom to demonstrate convergence. Savoia and Sen (2016), use the ICRG data on the rule of law, corruption, and bureaucratic quality. Their results show some evidence of unconditional β-convergence occurring slowly. Pérez-Moreno *et al.*, (2020) and Schönfelder and Wagner (2019) employ β- and σ-convergence[3] to analyze institutional convergence in the euro area countries. Perhaps the closest in spirit to our study is Beyaert *et al.* (2019) who investigate convergence in the euro area. They employ the unit root tests together with the distribution dynamics approach. Their results suggest a lack of institutional convergence with regards to indicators extracted from the ICRG database. Besides, Beyaert *et al.* (2019) observe institutional deterioration or even backsliding of the poorer peripheral or new (post-communist) states as compared with the core countries from western and northern Europe.

One aspect of institutions that has recently gained some attention is the measurement of the openness or transparency of political, legal, and bureaucratic institutions. For example, Hollyer *et al.* (2011) and Williams (2009) develop institutional indices derived from how much information is released by governments collated from the World Bank's World Development Indicators (WDI) database. There are potential economic and political benefits from greater transparency such as lower inflation (Crowe and Meade, 2007), public debt and budget deficits (Alt and Lassen, 2006). Focusing on information transparency to look at the question of institutional convergence has other important benefits. For instance, greater transparency can help reduce information asymmetries, within domestic markets (Gilbert, 2011), as well as promote transactions across borders. In other words, the greater the degree of (informational) openness, the more confidence agents (domestic and foreign) can have when engaging in economic transactions. Furthermore, informational transparency (IT) is likely to also be an important consideration when thinking about the potential spillovers between neighbours within the same geographical region (that is, whether we observe 'regional clubs' of convergence). Greater IT may also help impose constraints on the political class, in that their actions can be monitored by society, and consequently help in reducing bureaucratic inefficiency and corruption

[3] β-convergence measures whether the countries with lower values of a studied variable (e.g., GDP per capita) are catching up over time with the countries with higher values of this variable. In other words, β-convergence occurs if e.g., a poorer country's GDP per capita grows faster than that of an initially richer country. The concept of σ-convergence refers to a decrease in a dispersion (variance) of studied variables (e.g., institutional development) across countries.

(Brunetti and Weder, 2003). The final reason is a more practical one, in that the measure of IT used in this paper has extensive coverage across time and countries. Governments have (or at least had) a virtual monopoly over the release of information – both its quantity and quality, but also the infrastructure that allows for its dissemination. Information flows can therefore provide important clues as to governmental intent.

With improvements in technology over the latter part of the 20th century, particularly concerning the transmission of information, one might imagine that convergence across countries would indeed be possible in this realm. It is to this issue that we now turn our attention. Nevertheless, it is important to note that in what follows we are not ascribing any causal mechanism to this convergence. The crucial point here is to establish the existence (or otherwise) of institutional IT convergence. Once this has been established robustly, as is the intention here, then subsequent research can begin to unpick some of these causal mechanisms. Furthermore, we are not claiming that IT is the only way to observe broad institutional convergence.

3. Data and Methodology

3.1. Information transparency index

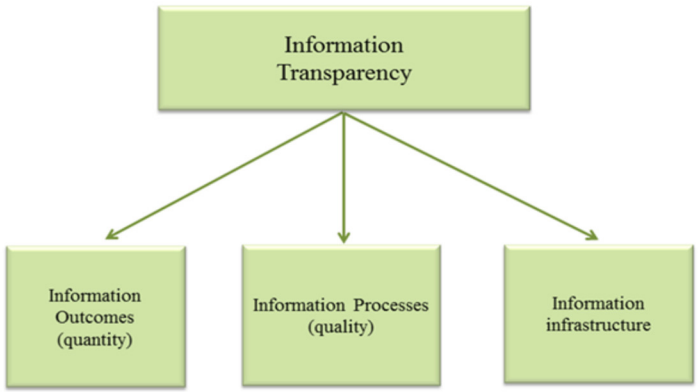
The measure of IT used in this study comes from the Information Transparency Index developed by Williams (2015). He derives a composite index for IT using existing datasets, for over 190 countries over the 1980-2010 period.[4] As such, IT Index focuses on measuring the quantity, quality and infrastructure associated with the release of information by governments such that a higher score represents a higher level of IT in the country (Williams, 2015).

As discussed previously, one of the main purported benefits of greater information transformation is that it facilitates greater investment by reducing transaction costs through a reduction of informational asymmetries between contracting parties. This is measured in the above index through both the quantity and quality of information produced. The quantity is important because the information available covers a greater range of economic indicators that might matter to decision-makers when considering an investment in an economy. Therefore, the index includes the quantity of information released by countries, obtained e.g., from the World Bank and IMF databases.

[4] Due to the lack of available information for some countries data begins after 1980. More specifically, we use an unbalanced sample, with the number of countries (with scores for the Information Transparency Index) increasing from 153 after 1980 and reaching 191 by 2010 (Williams, 2015). However, over the entire period (1980-2010) in different years, 194 countries have scores for the Information Transparency Index. The list of all 194 countries by region and income groups is shown in Table A1 and A2 in the Appendix.

However, quantity is not of much use to these agents if it cannot be relied upon, which is why the second sub-index includes the quality of the information. For example, using the World Bank's Statistical Capacity Indicator, which attempts to measure the quality of information produced by national agencies. The third element of the index relates to the ability of governments to widely distribute that information – hence the inclusion of 'information flows' from the index of globalization by KOF Swiss Economic Institute, and the proportional number of radios, as a proxy for the ability of society to receive that information. Collectively, this IT index is a useful candidate with which to look at convergence, even if only as a first step towards future research on this issue, as it broadly captures an institutional aspect that is vital for economic development (information). Figure 1 below summarizes these three sub-indices, whilst Table 1 provides additional information on all indicators and their sources used in the composition of the IT index.

FIGURE 1
COMPOSITION OF INFORMATION TRANSPARENCY INDEX



Source: (Williams, 2015).

As Tables 2 and 3 demonstrate, the average scores for IT vary considerably across regional groups, as well as income. With respect to regions, Africa (Europe) on average has the lowest (the highest) IT scores over the 30 years of investigation. In terms of income groups, the high-income OECD countries have the highest average IT scores, and low-income countries have the lowest average, thereby suggesting that a bidirectional causality between IT and the capacity of the resources of the country may exist.

TABLE 1
SOURCES OF INFORMATION TRANSPARENCY

Transparency Sub-Category	Indicator (Source)	Accessed from
Quantity of Information	Release of Financial Information Index (IMF's International Financial Statistics)	http://andrewwilliamsecon.wordpress.com/datasets/
	Release of Economic and Social Information Index (World Bank's WDI)	http://andrewwilliamsecon.wordpress.com/datasets/
	Release of Balance of Payments Information Index (IMF's Balance of Payments database)	http://andrewwilliamsecon.wordpress.com/datasets/
	Central Bank Transparency - Economic Transparency (Bank for International Settlements)	http://www.central-bank-communication.net/links/
	Institutional Profiles database – Quantity (CEPII's Institutional Profiles Database)	http://www.cepii.fr/institutions/EN/ipd.asp
	Statistical Capacity Indicator – *Periodicity and timeliness* (World Bank)	http://go.worldbank.org/UI0WGV6KW0
Quality of information	Banking Disclosure index (World Bank's Banking Regulation dataset)	http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20345037~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html
	Institutional Profiles database – Process (CEPII's Institutional Profiles Database)	http://www.cepii.fr/institutions/EN/ipd.asp
	Statistical Capacity Indicator – Source data and Statistical Methodology (World Bank)	http://go.worldbank.org/UI0WGV6KW0
	Central Bank Transparency - Procedural Transparency (Bank for International Settlements)	http://www.central-bank-communication.net/links/
Information Infrastructure	KOF Index of Globalization (KOF Swiss Economic Institute)	http://globalization.kof.ethz.ch/ (Sub-section data on 'information flows')
	Radios per 1,000 population (World Bank's WDI)	WDI (2005) for 1980-2000, Indices of Social Development for 2001-2010
	E-government - web measure, infrastructure, participation (United Nations survey)	http://unpan3.un.org/egovkb/about/index.htm

TABLE 2
REGIONAL INFORMATION TRANSPARENCY

Region	Mean	Standard Deviation
Africa	40.19	12.14
Asia	44.03	17.54
Europe	65.25	13.04
Middle East	48.22	13.04
North and Central America	54.16	12.39
Oceania	43.01	18.80
South America	58.47	10.24
World	49.53	16.65

Note: Average scores and standard deviations over 30 years (1980-2010).

TABLE 3
INFORMATION TRANSPARENCY BY INCOME GROUPS

Income Group	Mean	Std. Dev.
High-income OECD	70.08	9.47
High-income Non-OECD	52.81	13.47
Upper-middle-income	50.06	13.81
Lower-middle-income	44.14	12.95
Low-income	35.25	12.18

Note: Average scores and standard deviations over 30 years (1980-2010).

Table 4 shows the annual coefficients of variation (CVs) and annual percentage changes in CVs for the IT scores at the global level. Overall, it can be observed that over time, the values of CV gradually declined during the 1980-2010 period. Likewise, most annual changes in the CVs are negative, while the last small positive change (0.36 per cent) occurred in 1996. Therefore, Table 4 shows some evidence of σ-convergence in countries' IT, more so regarding the second half of the investigated period.

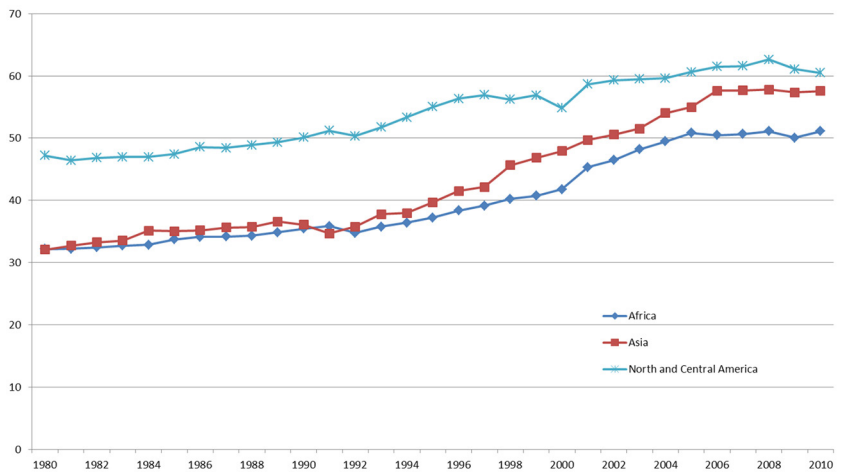
Figure 2 can help illustrate the issue of regional convergence in IT over time. At a broader level, Figure 2 demonstrates evidence of 'catch-up' at a regional level. For example, in 1980 there was a 15-point gap between the average IT score for North and Central America and Asia. However, by 2010 this gap had been reduced to around 3 points. Although of a smaller magnitude, there is even some evidence of convergence between North and Central America, and Africa (a 15-point gap decreased to around 10 points).

TABLE 4
IT SCORES' COEFFICIENT OF VARIATION AND ANNUAL PERCENTAGE CHANGE

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
CV	37.45	36.86	35.66	35.74	34.17	33.30	32.68	32.75	32.80	32.14	32.46
% change	-1.58	-3.26	0.22	-4.39	-2.55	-1.86	0.21	0.15	-2.01	1.00	-1.58
Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
CV	32.06	33.63	33.28	33.75	33.95	34.07	33.53	32.24	31.40	29.61	28.46
% change	-1.23	4.90	-1.04	1.41	0.59	0.35	-1.58	-3.85	-2.61	-5.70	-3.88
Year	2002	2003	2004	2005	2006	2007	2008	2009	2010		
CV	28.14	25.74	24.41	23.57	22.55	22.48	22.23	22.07	20.32		
% change	-1.12	-8.53	-5.17	-3.44	-4.33	-0.31	-1.11	-0.72	-7.93		

Note: The above calculations are based on a global sample during the 1980-2010 period.

FIGURE 2
REGIONAL INFORMATION TRANSPARENCY: 1980-2010



Note: The horizontal axis corresponds to the full 30-years period of investigation. The vertical axis represents the average scores of the Information Transparency Index for countries in three regions: Africa, Asia, and North and Central America.
Source: Authors' calculation.

3.2. Analytical framework

The nonparametric approach of distribution dynamics is used in this paper to study the evolution and future development of IT in various regions and income groups. This approach was firstly proposed by Quah (1993a, 1993b). It is now frequently employed in convergence studies (e.g., Maasoumi *et al.*, 2007; Juessen, 2009; Cheong *et al.*, 2019), and has several merits. Firstly, it considers

transitional dynamics so that it can reveal the evolution pattern of IT, while other approaches cannot provide this kind of important information. Secondly, it can provide a forecast of future distribution and finally, it can provide details of the mobility of the countries. Routinely employed β-convergence and σ-convergence cannot offer such details, instead only providing a summary of statistics for the evolution of the distribution. Furthermore, β- and σ-convergence are regarded by some as a misleading or insufficient test of the convergence hypothesis (e.g., Quah, 1993b; Maasoumi *et al.*, 2007).

There are two approaches to distribution dynamics analysis, namely the Markov transition matrix approach and the stochastic kernel approach. The latter is used in this paper because it can circumvent the problem of arbitrary demarcation of states. Indeed, this approach has a continuous infinity of states and can be considered an extension of the Markov transition matrix approach (Cheong and Wu, 2018). The method is centered on the bivariate kernel estimator which can be expressed as:

$$\hat{f}(x,y) = \frac{1}{nh_1h_2}\sum_{i=1}^{n} K\left(\frac{x-X_i}{h_1}, \frac{y-Y_i}{h_2}\right) \tag{1}$$

where h_1 and h_2 are the bandwidths, X_i is an observed value of the relative IT[5] of a country at time t, Y_i is the observed value of relative transparency for that country at time $t+1$, K is the normal kernel function, and n is the number of observations. The bandwidths h_1 and h_2 are worked out optimally according to the procedure suggested by Silverman (1986). Assuming that the evolution of the distribution is time-invariant and first order, and the distribution at time $t + \tau$ depends not on any previous distribution but on t only, then the relationship between the distributions of the relative IT values at time t and time $t + \tau$ can be computed as:

$$f_{t+\tau}(z) = \int_0^{\infty} g_\tau(z|x) f_t(x) dx \tag{2}$$

where $f_t(x)$ is the density function of the distribution at time t, $f_{t+\tau}(z)$ is the τ-period-ahead density function of z conditional on x, and $g_\tau(z|x)$ is the transition probability kernel which maps the distribution from time t to $t + \tau$. (see Juessen, 2009 for details). The final distribution, given the transitional

[5] In conducting stochastic kernel analysis, it is preferable to express the figures as relative values to make the comparison easier. Thus, the global average of information transparency is calculated for each year, and then the scores for each country are divided by this average to compute the relative IT value of each country. Consequently, a country's relative IT greater (less) than one indicates that this country's IT is above (below) the global average IT value.

dynamics remain unchanged, can be examined by the ergodic distribution. The ergodic density function can be computed by:

$$f_{\infty}(z) = \int_0^{\infty} g_{\tau}(z|x) f_{\infty}(x) dx \tag{3}$$

where $f_{\infty}(z)$ is the ergodic density function. However, to consider the relative sparseness of data, the adaptive kernel method with flexible bandwidth is used in this study. There are two main steps in the analysis: the first one is to compute a pilot estimate, and the second step is to rescale the bandwidth by a ratio that is based on the density at that point. This method can tackle the issue of under-smoothing in the areas with only a little data and can eliminate the problem of over-smoothing in areas with a lot of data. It can thus provide a better forecast of the transitional dynamics. However, given that the analysis needs to have an adequate number of transitions to provide reliable and accurate results, the data are aggregated into three episodes of transition, and annual transitions are used in the analysis.

A new framework of the stochastic kernel approach, namely the Mobility Probability Plot (MPP), is used to present the results (Cheong and Wu, 2018). The MPP has many advantages over the traditional tools used in presenting the results of the stochastic kernel approach. For example, it can greatly improve visual presentation and facilitate insightful comparisons.[6] The net upward mobility probability, *p(x)*, is calculated as:

$$p(x) = \int_x^{\infty} g_{\tau}(z|x) dz - \int_0^{x} g_{\tau}(z|x) dz \tag{4}$$

The MPP shows the net upward mobility probability against the relative IT value, expressed as a percentage ranging from -100 to 100. A negative (positive) value means that countries have a net probability of moving downward (upward) in the distribution. Thus, by examining the MPP, we can identify countries' transitional dynamics. Furthermore, several MPPs can be superimposed in one figure, which, in turn, can greatly facilitate comparison otherwise not feasible if one uses the traditional visual tools of the stochastic kernel approach.

Stochastic kernel analysis is first conducted using the data of all the countries to examine the global evolution of IT. The dataset is first divided into three episodes, namely, 1980-1990, 1990-2000, and 2000-2010, i.e., there are 10 annual transitions in each episode. Given that similar cultural values can often be observed across countries situated close to each other, the division according to geographic regions can provide vital information on the development of IT

6 This method has been recently employed in various research areas, such as in industrialization (Cheong and Wu, 2018), electricity consumption (Cheong *et al.*, 2019) and even credit ratings (Lee *et al.*, 2021).

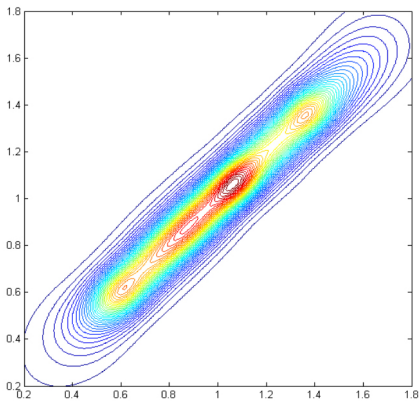
across different cultural settings. However, some may argue that transparency is not determined by culture or geographic regions, but is a by-product of income, and therefore more dependent on the capacity of the country. Therefore, the dataset is also divided according to income. Therefore, the data is further divided into smaller datasets according to geographic regions and income groups. More specifically, In the first stage of analysis, the countries are divided into seven regions: Africa, Asia, Europe, Middle East, North and Central America, South America, and Oceania.[7] The countries are then divided into five income groups in line with the World Bank's classification: high-income OECD, high-income non-OECD, upper-middle-income, lower-middle-income, and low-income. For the list of countries by region and income groups please see Table A1 and A2 in the Appendix.

4. Results and Discussions

4.1. Distribution dynamics for all countries

The contour map of the transition probability kernel for relative IT of all countries is shown in Figure 3. It should be noted that the horizontal (vertical) axis represents the value of relative transparency at time *t* (*t+1*).

FIGURE 3
CONTOUR MAP OF TRANSITION PROBABILITY KERNEL FOR RELATIVE IT OF ALL COUNTRIES



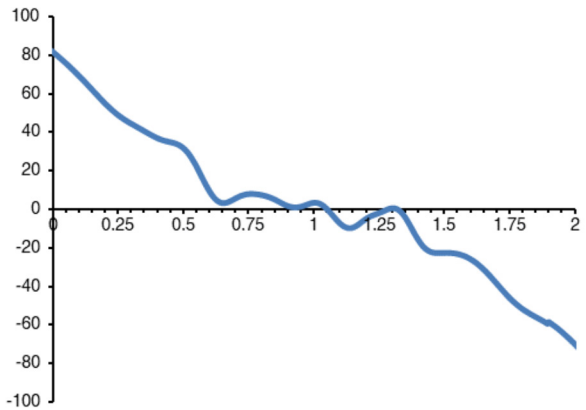
Note: The horizontal axis represents the value of relative transparency at time t, and the vertical axis represents the value of relative transparency at time t+1.
Source: Authors' calculation.

7 In this study, Oceania as a region corresponds to the Pacific Island Countries, New Zealand, and Australia.

There are four significant peaks in Figure 3, indicating that the distribution is not even and there are clusters of countries. Furthermore, we can observe that the peaks are situated along the 45-degree diagonal, while the transition probability kernel is narrow. Hence, the persistence in the relative IT is high and most of the countries will remain at their relative transparency levels without moving upwards or downwards in the coming years.

The Mobility Probability Plot (MPP) of all countries is shown in Figure 4, whilst the MPPs of all countries across the three decades are presented in Figure 5. The MPP plots the net upward mobility probability against the relative IT value. It can be observed from Figure 4 that the MPP lies above the horizontal axis between 0 and 1 and intersects it at about 1. This means that countries with relative IT values lower than the global average (equal to 1) have a higher tendency to move upwards over time. By the same token, the MPP lies below the horizontal axis after the intersection point, which implies that the countries with above-average relative IT values tend to move downwards in years to come. This will lead to convergence as many of the countries will move towards the average in the long run, though most will stay at the same levels in the short run because of the high persistence as observed in Figure 3. It means that the countries will move very slowly and so it takes a very long time to achieve convergence. Moreover, the above results seem to corroborate findings presented in Table 4, i.e., the evidence of σ-convergence occurring over time for countries' IT worldwide.

FIGURE 4
MOBILITY PROBABILITY PLOT (MPP) FOR RELATIVE IT OF ALL COUNTRIES

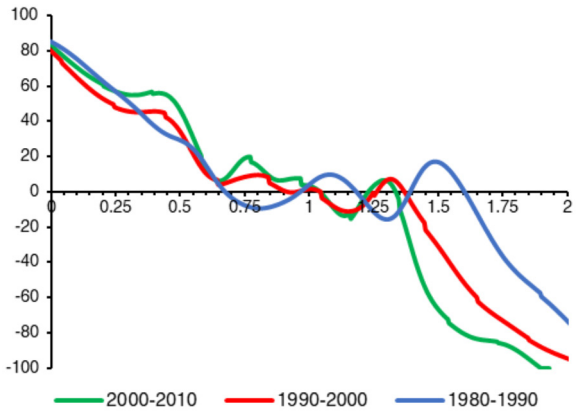


Note: The horizontal axis represents the value of relative transparency, and the vertical axis represents the MPP.
Source: Authors' calculation.

Figure 5 shows the MPPs for the three different transition episodes. The MPPs move higher for values between 0 and 1 overtime, and they move lower

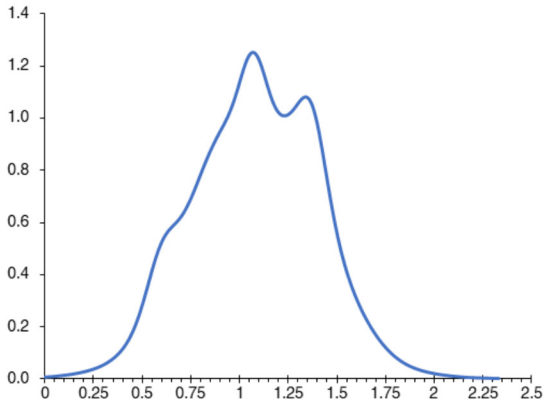
for values higher than 1. However, for the extremely low-IT countries, the performance of the 2000-2010 decade is slightly worse than that of 1980-1990. This implies that the tendency towards convergence has increased across time, even though it may take a long time to achieve due the high persistence (Figure 3).

FIGURE 5
MOBILITY PROBABILITY PLOT (MPP) FOR RELATIVE IT OF ALL COUNTRIES ACROSS THREE DIFFERENT PERIODS



Note: The horizontal axis represents the value of relative transparency, and the vertical axis represents the MPP.
Source: Authors' calculation.

FIGURE 6
ERGODIC DISTRIBUTION OF ALL THE COUNTRIES



Note: The horizontal axis represents the value of relative transparency, and the vertical axis represents the proportion.
Source: Authors' calculation.

This result is confirmed by the ergodic distribution (Figure 6), where the peak lies around the value of one. However, there is another small peak around 1.3, which suggests that convergence clubs may emerge in the future, with many countries attaining the global average level of IT, while some countries attaining an above-average level.

4.2. Distribution dynamics for different regions

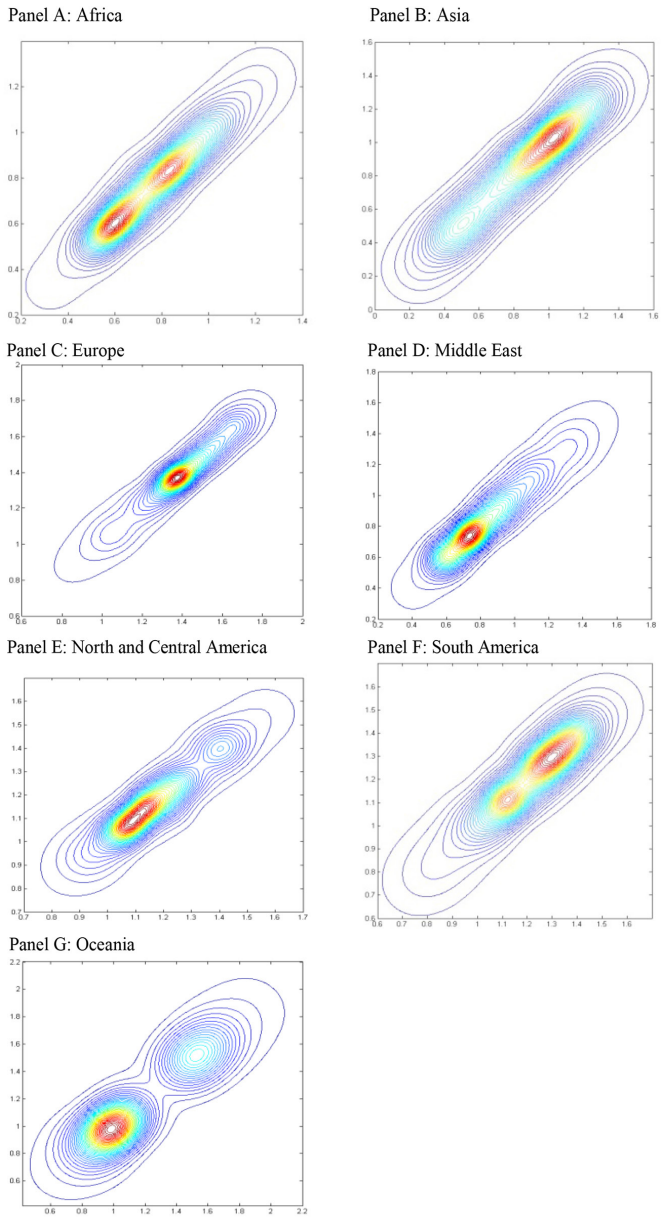
Although the analysis of the global development in IT is illuminating, it is also of interest to examine the transitional dynamics of different regions in the world. Therefore, the data is divided into seven regions and a stochastic kernel analysis is conducted individually for each of the regions. Figure 7 shows the contour maps of the transition probability kernels. The peaks are situated close to the diagonal, which again indicates that persistence is very high for every region. Two clusters of countries can be found in Panel A (Africa). Furthermore, many African countries have below-average relative IT values between 0.6 and 0.8.

Panel B shows that the countries in Asia tend to cluster around values between 0.5 and 1. Moreover, we can observe that many European countries (Panel C) have above-average relative IT values of 1.4, whereas in the Middle East (Panel D) many countries cluster around a value of 0.8. Panel E shows that most (some) countries in North and Central America cluster around two above-average IT values of 1.1 (1.4). Similarly, Panel F shows that many of the countries in South America have relative IT values of 1.1 and 1.3. Lastly, countries in Oceania (Panel G) also exhibit similar characteristics as many (some) appear to cluster around the values of 1 (1.6). However, the 'dumbbell' shape of the contour map suggests that the disparity between these two groups of countries is substantial. In sum, the stochastic kernels of many regions have twin peaks, thereby indicating that the countries within these regions have very different transitional dynamics. Perhaps unsurprisingly, this would seem to refute the idea that similar institutions are found in areas located geographically nearby.

The MPPs by region are shown in Figure 8. Given that countries have a higher tendency of moving upwards (downward) if the MPP lies above (below) the horizontal axis, one can expect countries to congregate around a value that is close to the intersection points in years to come. Hence, several intersection points suggest that the ergodic distribution will have multiple peaks, i.e., the emergence of convergence clubs is more likely to occur.

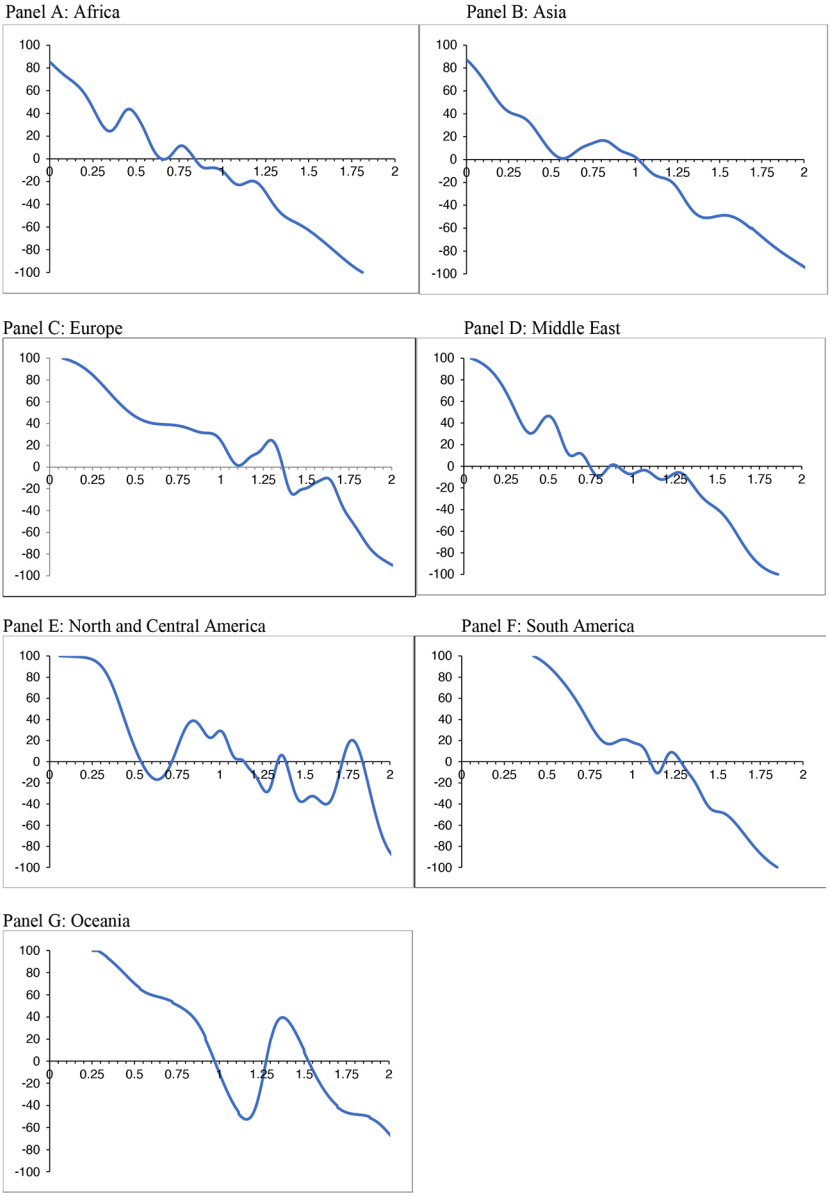
Looking at the MPPs of Africa (Panel A) and the Middle East (Panel D) region we can observe that both MPPs intersect the horizontal axis at values smaller than 1, indicating that some of the below-average countries in these regions will move further downwards. This finding is disturbing as it means that convergence to the global average may be difficult for some of these countries. In contrast, Panel B shows the Asian MPP intersecting the horizontal axis at the value of 1, thereby indicating that convergence of Asian countries to the global mean is far more likely. Panel C shows that the MPP of Europe intersects the axis around the values of 1.36, thus it can be expected that the European countries will converge

FIGURE 7
CONTOUR MAPS OF TRANSITION PROBABILITY KERNEL FOR RELATIVE IT OF DIFFERENT REGIONS



Note: The horizontal axis represents the value of relative transparency at time t, and the vertical axis represents the value of relative transparency at time t+1.
Source: Authors' calculation.

FIGURE 8
MOBILITY PROBABILITY PLOTS (MPPS) FOR RELATIVE IT OF DIFFERENT REGIONS



Note: The horizontal axis represents the value of relative transparency, and the vertical axis represents the MPP.
Source: Authors' calculation.

to an above-average value in years to come. Panel E shows that the MPP of the North and Central America region is the most volatile along large sections of the horizontal axis. Furthermore, the MPP of the South America region moves down and intersects the horizontal axis at several points (1.11, then at 1.18, and again at 1.29). A similar but more pronounced and dispersed pattern is visible in Oceania (Panel G) where the MPP intersects the axis at 0.97, 1.27, and 1.53.

Figure 9 presents regional MPPs across three decades. We can observe that with time, many MPPs move higher (lower) for the values below (above) 1. Such a movement in the MPP can lead to faster convergence, as the below- (above) average countries will have a much higher probability of moving upwards (downwards). This tendency, however, is not universally observed. More specifically, Panel G (Oceania) shows that in countries with IT values below 1, the MPP of the 2000-2010 (1980-1990) period is plotted above (below) the other two MPPs. Thus, the transitional dynamics of those below-average countries have deteriorated over time.

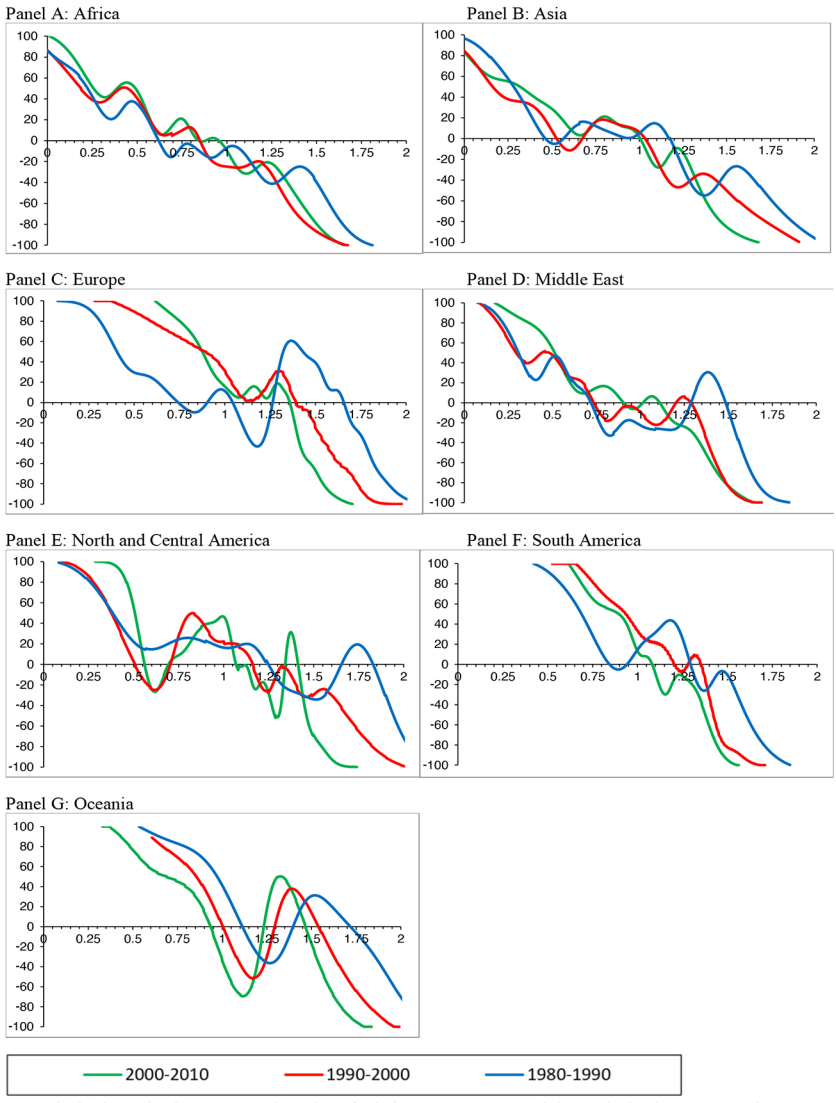
Figure 10 shows the ergodic distributions by regions, which reveals the potential future distribution of relative IT in the long run. It can be observed that Asia will converge to the global average in the future (under the assumption of no changes in transitional dynamics). Africa and the Middle East will, however, converge to a value much lower than the average, whilst Europe, North and Central America, South America, and Oceania will converge to above-average IT values. Moreover, a twin (three) peaks pattern can be observed in ergodic distributions representing Africa, South America, and Oceania (North and Central America) regions. These findings are in line with the conclusions derived from the MPPs (Figure 8).

It is worth noting that the results show how a lot of countries situated in the Global North regions enjoy higher levels of IT than their peers in the Global South. For example, the countries in Europe and North America (Africa and the Middle East) would converge to IT values higher (lower) than the global average. Asia would converge to the global average IT, perhaps because this region consists of rich (e.g., Japan and South Korea) and poor (e.g., Afghanistan, and Bangladesh) countries alike. This may indicate that the evolution of IT could be related to the economic performance of a country. It thus calls for an in-depth analysis of the relationship between the levels of income and development in IT in the future.

4.3. Distribution dynamics for different income groups

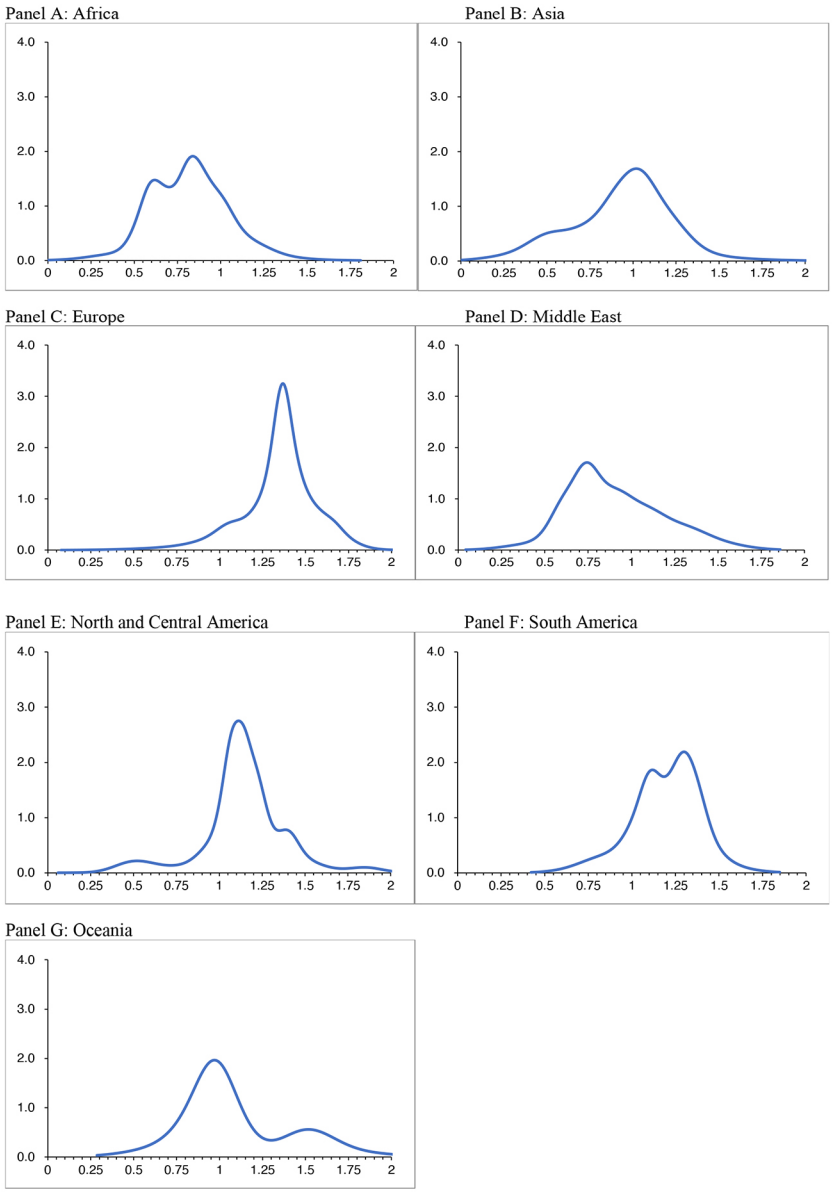
To examine the relationship between income and transitional dynamics of IT, countries have been divided into five income groups, namely: high-income OECD, high-income non-OECD, upper-middle-income, lower-middle-income, and low-income. Figure 11 shows the contour maps of these groups. We can observe many clusters within the same income group. In fact, at least two significant peaks can be found in every income group. Another finding is that persistence is high for all the income groups, which suggests that a lot of the countries will have a high probability of remaining at their relative levels of IT.

FIGURE 9
MOBILITY PROBABILITY PLOTS (MPPS) FOR RELATIVE IT
OF DIFFERENT REGIONS ACROSS DIFFERENT PERIODS



Note: The horizontal axis represents the value of relative transparency, and the vertical axis represents the MPP.
Source: Authors' calculation.

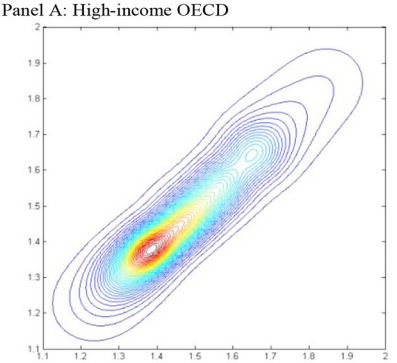
FIGURE 10
ERGODIC DISTRIBUTIONS OF DIFFERENT REGIONS



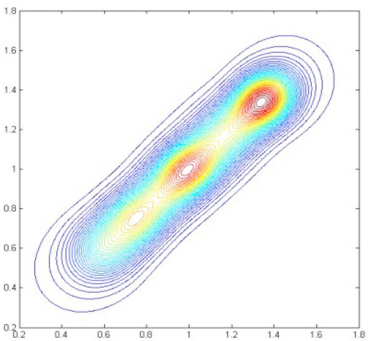
Note: The horizontal axis represents the value of relative transparency, and the vertical axis represents the proportion.
Source: Authors' calculation.

FIGURE 11
CONTOUR MAPS OF TRANSITION PROBABILITY KERNEL FOR RELATIVE IT OF DIFFERENT INCOME GROUPS

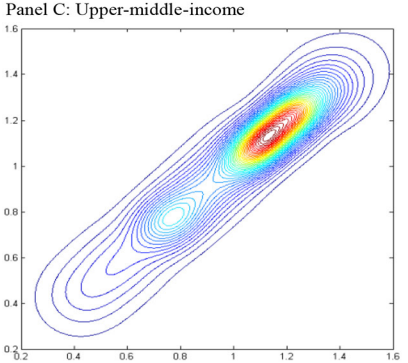
Panel A: High-income OECD



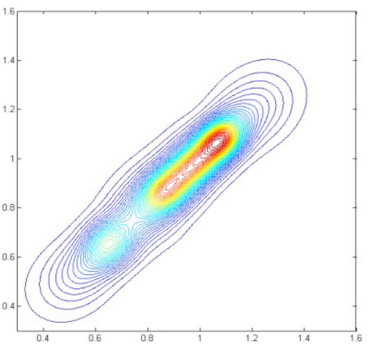
Panel B: High-income non-OECD



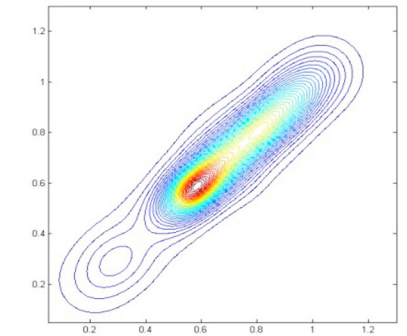
Panel C: Upper-middle-income



Panel D: Lower-middle-income



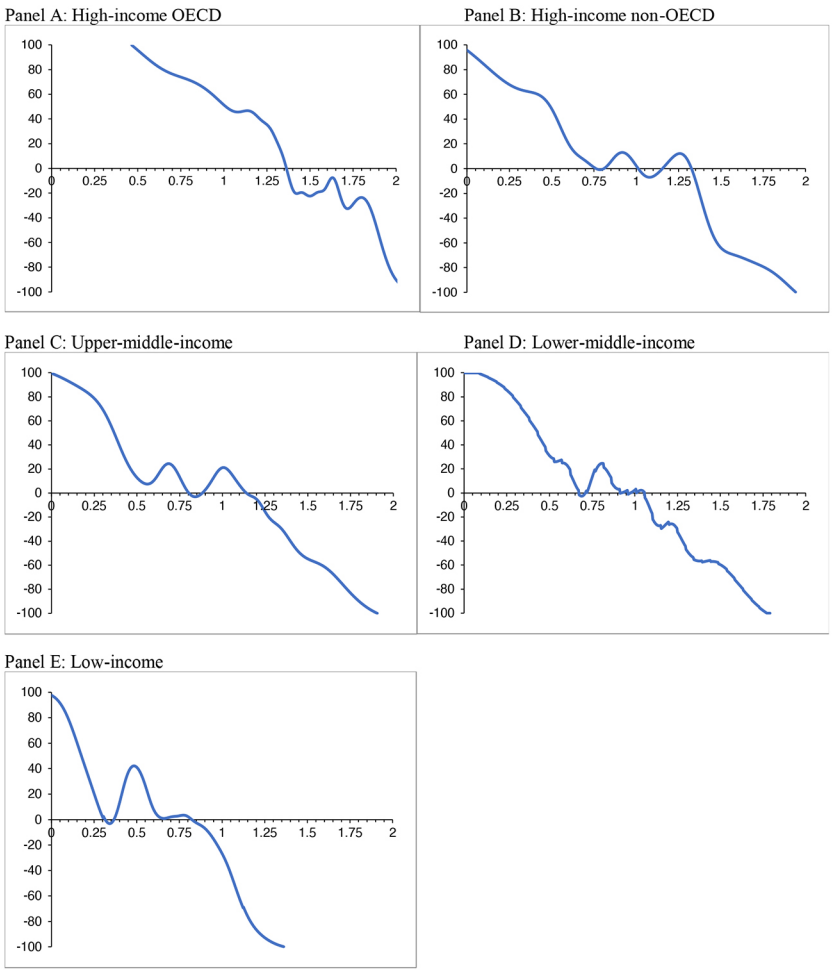
Panel E: Low-income



Note: The horizontal axis represents the value of relative transparency at time t, and the vertical axis represents the value of relative transparency at time t+1.
Source: Authors' calculation.

Figure 12 shows that the MPP of the high-income OECD countries (Panel A) intersects the horizontal axis at 1.37 which is the highest amongst all the income groups. Panel B shows that the MPP of the high-income non-OECD countries intersects the axis at several points, however, the values of these intersections are much lower than those in Panel A. In fact, by comparing Panels A and B, it can be observed that the transitional dynamics of the high-income non-OECD

FIGURE 12
MOBILITY PROBABILITY PLOTS (MPPS) FOR RELATIVE IT
OF DIFFERENT INCOME GROUPS



Note: The horizontal axis represents the value of relative transparency, and the vertical axis represents the MPP.
Source: Authors' calculation.

countries are far more complicated than those of the OECD countries. Since there are multiple intersection points in Panel B, the high-income non-OECD countries have a high probability of having several peaks in the ergodic distribution. This undoubtedly reflects the significant heterogeneity of this group, given countries ranging from oil-rich Middle East states such as Kuwait and the UAE to Hong Kong, and the Baltic states.

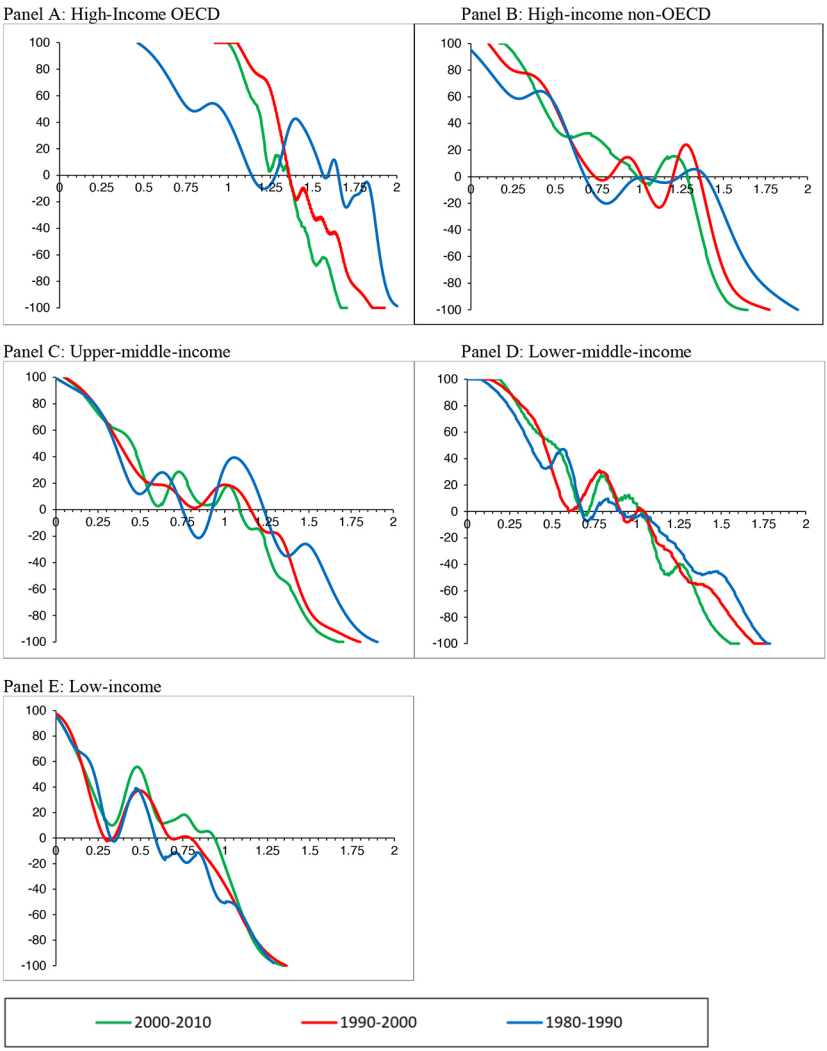
It is worth noting that the lower the income, the smaller the values of the MPPs' intersection points observed in Figure 12. For instance, Panel E shows that the MPP of the low-income countries intersects the axis at several points from 0.32 to 0.80, thereby indicating that the below-average transparency countries in the low-income group have a lower tendency of moving upward than their counterparts from the high-income OECD group. Thus, an important finding of this study is that there appears to be a strong relationship between income and upward mobility in IT. Panel E shows that the MPP of the low-income countries lies below the horizontal axis for values greater than 0.83. Furthermore, entities with a relative IT value of 1 have a 27 per cent net probability of moving downwards. This is somewhat concerning, as it means that the below-average countries in the low-income group are more likely to move further downwards in the future distribution. The difficulty of moving upward for the low-income countries suggests the existence of a development trap in IT.

Figure 13 shows the MPPs of different income groups across the three time periods. In Panel A (high-income OECD countries) the MPP of the 2000-2010 period lies below the MPPs of the earlier (1990-2000 and 1980-1990) periods for the IT values greater than the intersection point, indicating that the countries with high informational transparency have become more susceptible to falling downwards across time. Moreover, also on the left of the intersection with the horizontal axis, the MPP of the 2000-2010 period lies below the MPP of the 1990-2000 period, thus implying that the upward movement of countries with lower relative IT values decelerated somewhat during the most recent of investigated decades. Furthermore, we can observe a fair degree of resemblance amongst the MPPs of other income groups, which indicates that there is no substantial change to the transitional dynamics over time.

Figure 14 shows that ergodic distributions of all the income groups are quite dispersed, apart from the high-income OECD countries which have a noticeable high peak. It implies that the OECD countries will achieve similar levels of transparency in the future, while the other countries will exhibit large disparity. It is worth noting that the dramatic difference in shape between the two high-income groups (Panels A and B) suggests that factors other than income may also play a role in the transitional dynamics of countries' IT. Moreover, it is found that except for Panel A (high-income OECD countries), distributions have multiple peaks, thereby suggesting the emergence of convergence clubs.

FIGURE1 13

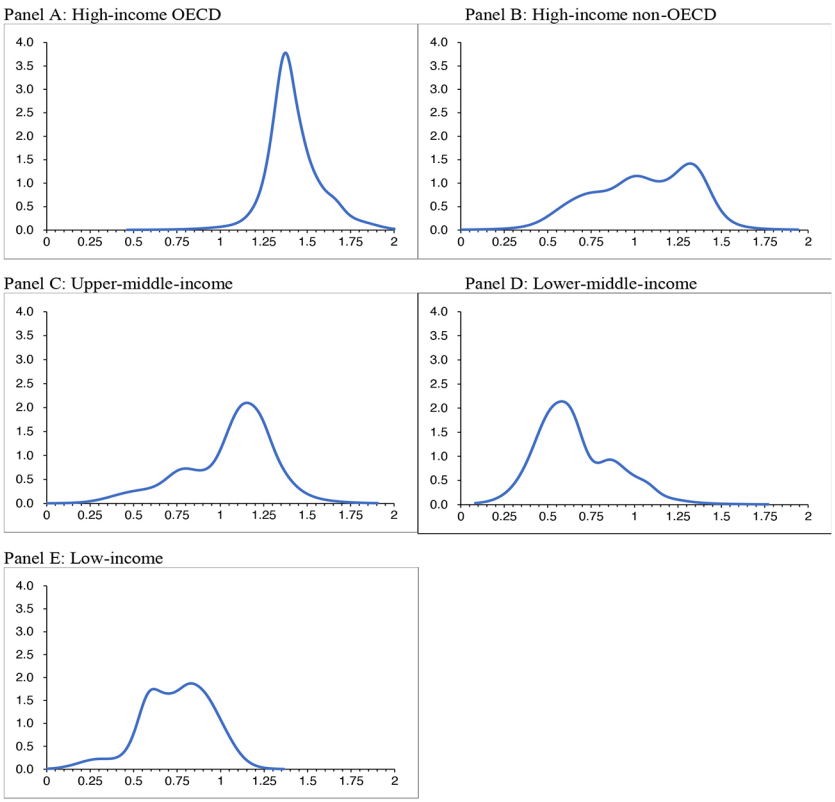
MOBILITY PROBABILITY PLOTS (MPPS) FOR RELATIVE IT OF DIFFERENT INCOME GROUPS ACROSS DIFFERENT PERIODS



Note: The horizontal axis represents the value of relative transparency, and the vertical axis represents the MPP.

Source: Authors' calculation.

FIGURE 14
ERGODIC DISTRIBUTIONS OF DIFFERENT INCOME GROUPS



Note: The horizontal axis represents the value of relative transparency, and the vertical axis represents the proportion.
Source: authors' calculation.

The findings in this section suggest that there is a positive relationship between the level of income and that of IT. The differences in IT can to a large extent be accounted for by the level of income and this is in line with our previous findings which suggest that there may be a bidirectional causality between IT and economic performance. If a country has a higher level of income, it can devote more resources to enhancing and improving IT. This, in turn, would lead to a surge in investments which may then contribute to higher economic growth, thereby resulting in a much higher level of income in the future. This is an alarming finding indicating that convergence clubs may emerge because of the sequence of reciprocal cause and effect in which the levels of income and IT strengthen each other in this process.

5. Conclusions

This paper has applied a nonparametric (dynamic distribution) approach to the issue of institutional convergence, using Williams' (2015) measure of Information Transparency (IT) in a global case study. Several issues stand out from this analysis. In the full global sample, there is some evidence supporting a slow move towards unconditional convergence in IT over time. However, closer examination reveals that there is stronger evidence for conditional convergence, whereby countries will move towards IT levels higher or lower than the global average, depending on their specific conditions.

The results derived from the regional analysis show that the countries within the regions of Europe, North and Central America, South America, and Oceania can converge to a value higher than the global average level of IT, while the countries within Asia will converge to the global average. Unfortunately, the results also show that the countries within the regions of Africa and the Middle East will converge to IT values much lower than the global average. Importantly, the ergodic distributions of many regions have more than one peak, thereby indicating the emergence of convergence clubs in many parts of the world.

Turning to the results derived from the study based on countries' income levels, the ergodic distribution of the high-income OECD countries has a noticeable single peak, while the distributions of other income groups are quite dispersed with multiple peaks. This implies that the OECD countries can attain a similarly high level of IT in the long run, while large disparities and convergence clubs will occur within other income groups. Another salient finding is that there is a positive relationship between income and IT levels, and the differences in IT can to a large extent be accounted for by the income levels. The findings derived from this study suggest that there may be a bidirectional causality between IT and economic performance. Given that the two can strengthen each other in the process, this may aggravate global disparity and lead to the emergence of convergence clubs in the future. Therefore, it is necessary to consider the income effect in formulating development policies for enhancing IT. Furthermore, because the two factors are positively related, they should be considered together in policy design.

The findings also pinpoint the importance of IT in the role of economic development and more resources should be supplied for improving IT while striving for economic growth. Furthermore, these findings may prove more meaningful to developing countries, and policies should be introduced there to increase IT accordingly. More assistance should be provided to the poor countries for setting up a satisfactory system of IT so that they can catch up with the developed countries in the years ahead. The analysis of this paper also depicts the evolution of IT by employing the new framework of the stochastic kernel approach, i.e., the Mobility Probability Plots (MPPs). MPPs highlight the convergence to a low level of IT for the low- and lower-middle-income countries and those situated in Africa, and the Middle East regions.

Overall, our findings give rise to a great concern for the efforts to promote IT around the world. Nevertheless, this is nascent research, of which this paper should be seen as only a small first step. It thus calls for another in-depth analysis of the determinants of IT. Moreover, it is worth noting that although the employment of MPP can provide information on the evolution of distribution, there are limitations to this approach. The first one is that the analytical results must be presented in the form of a figure. Another limitation is that, just like the other distribution dynamics analytical techniques, one cannot control for the driving factors but need to run the analysis for different sub-groups based on these factors. Thus, while it is undoubtedly true that low-income countries should increase their informational transparency, we are not able to offer detailed advice on how this can be achieved. Therefore, future research on IT can be conducted by using econometrics techniques such as σ- and β-convergence so that the importance of each factor can be established and compared with our results. In that sense, this paper should be seen as the first attempt toward a comprehensive understanding of the progress and development of the convergence in countries' institutional IT.

References

Ahmad, N. (2008). "Corrupt clubs and the convergence hypothesis". *Journal of Economic Policy Reform*, Vol. 11(1); 21-28.

Ahmad, M., and S. G. Hall (2017). "Economic growth and convergence: Do institutional proximity and spillovers matter?". *Journal of Policy Modeling*, Vol. 39(6); 1065-1085.

Alt, J. E., and D. D. Lassen (2006). "Fiscal transparency, political parties, and debt in OECD countries". *European Economic Review*, Vol. 50(6); 1403-1439.

Barro, R. J. (1991). "Economic growth in a cross-section of countries". *Quarterly Journal of Economics*, Vol. 106(2); 407-443.

Barro, R. J. (2015). "Convergence and modernization". *Economic Journal*, Vol. 125; 911-942.

Beyaert, A., J. García-Solanesa, and L. Lopez-Gomez (2019). "Do institutions of the euro area converge?". *Economic Systems*, Vol. 43(3-4); 100720.

Blackburn, K., N. Bose, and M. E. Haque (2006). "The incidence and persistence of corruption in economic development". *Journal of Economic Dynamics and Control*, Vol. 30(12); 2447-2467.

Brunetti, A., and B. Weder (2003). "A free press is bad news for corruption". *Journal of Public Economics*, Vol. 87(7-8); 1801-1824.

Cheong, T. S., and Y. Wu (2018). "Convergence and transitional dynamics of China's industrial output: A county-level study using a new framework of distribution dynamics analysis". *China Economic Review*, Vol. 48; 125-138.

Cheong, T. S., V. J. Li, and X. Shi (2019). "Regional disparity and convergence of electricity consumption in China: a distribution dynamics approach". *China Economic Review*, Vol. 58; 101154.

Chong, A., and C. Calderon (2003). "Causality and feedback between institutional measures and economic growth". *Economics and Politics*, Vol. 12(1); 69-81.

Crowe, C., and E. E. Meade (2007). "The Evolution of central bank independence". *Journal of Economic Perspectives*, Vol. 21(4); 69-90.

De Long, J. B., and L. H. Summers (1993). "How strongly do developing economies benefit from equipment investment?". *Journal of Monetary Economics*, Vol. 32(3); 395-415.

Gilbert, T. (2011). "Information aggregation around macroeconomic announcements: Revisions matter". *Journal of Financial Economics*, Vol. 101(1); 114-131.

Gwartney, J. D., R. G. Holcombe, and R. A. Lawson (2006). "Institutions and the impact of investment on growth". *Kyklos*, Vol. 59(2); 255-273.

Hall, J. C. (2016). "Institutional convergence: Exit or voice?". *Journal of Economics and Finance*, Vol. 40; 829-840.

Hall, R. E., and C. I. Jones (1999). "Why do some countries produce so much more output per worker than others?". *Quarterly Journal of Economics*, Vol. 114(1); 83-116.

Hollyer, J. R., B. P. Rosendorff, and J. R. Vreeland (2011). "Democracy and transparency". *Journal of Politics*, Vol. 73(4); 1191-1205.

Juessen, F. (2009). "A distribution dynamics approach to regional GDP convergence in unified Germany". *Empirical Economics*, Vol. 37; 627-652.

Keefer, P., and S. Knack (1997). "Why don't poor countries catch up? A cross-national test of an institutional explanation". *Economic Inquiry*, Vol. 35(3); 590-602.

La Porta, R., F. Lopez-de-Silanes, and A. Shleifer (2008). "The economic consequences of legal origins". *Journal of Economic Literature*, Vol. 46(2); 285-332.

Lee, W. C., J. Shen, T. S. Cheong, and M. Wojewodzki. (2021). "Detecting conflicts of interest in credit rating changes: a distribution dynamics approach" *Financial Innovation* Vol. 7(45).

Maasoumi, E., J. Racine, and T. Stengos (2007). "Growth and convergence: a profile of distribution dynamics and mobility". *Journal of Econometrics*, Vol. 136; 483-508.

Mauro, P. (1995). "Corruption and growth". *Quarterly Journal of Economics*, Vol. 110(3); 681-712.

Mukand, S. W., and D. Rodrik (2005). "In search of the Holy Grail: Policy convergence, experimentation, and economic performance". *American Economic Review*, Vol. 95(1); 374-383.

Pritchett, L. (1997). "Divergence, big time". *Journal of Economic Perspectives*, Vol. 11; 3-17.

Quah, D. T. (1993a). "Empirical cross-section dynamics in economic growth". *European Economic Review*, Vol. 37(2-3); 426-434.

Quah, D. T. (1993b). "Galton's fallacy and tests of the convergence hypothesis". *Scandinavian Journal of Economics*, Vol. 95(4); 427-443.

Pérez-Moreno, S., E. Bárcena-Martín, and J. Ritzen (2020). "Institutional quality in the Euro area countries: any evidence of convergence?". *Journal of Contemporary European Studies*, Vol. 28(3); 387-402.

Rodrik, D. (2008). "Second-best institutions". *American Economic Review*, Vol. 98; 100-104.

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

Roland, G. (2004). "Understanding institutional change: Fast-moving and slow-moving institutions". *Studies in Comparative International Development*, Vol. 38; 109-131.

Savoia, A., and K. Sen (2016). "Do we see convergence in institutions? A cross-country analysis". *Journal of Development Studies*, Vol. 52(2); 166-185.

Schönfelder, N., and H. Wagner (2019). "Institutional convergence in Europe". *Economics: The Open-Access, Open-Assessment E-Journal*, Vol. 13; 1-23.

Silverman, B. W. (1986). Density estimation for statistics and data analysis. New York: Chapman and Hall.

Williams, A. (2009). "On the release of information by governments: Causes and consequences". *Journal of Development Economics*, Vol. 89(1); 124-138.

Williams, A. (2015). "A global index of information transparency and accountability". *Journal of Comparative Economics*, Vol. 43(3); 804-824.

Appendix

TABLE A1
THE LIST OF 194 COUNTRIES GROUPED ACCORDING TO GEOGRAPHIC REGIONS

Region	Country
Africa	Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Democratic Republic of Congo, Republic of Congo, Cote d'Ivoire, Djibouti, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe
Asia	Afghanistan, Bangladesh, Bhutan, Brunei, Cambodia, China, Hong Kong Special Administrative Region, India, Indonesia, Japan, Kazakhstan, Democratic People's Republic of Korea, Republic of Korea, Kyrgyzstan, Laos, Malaysia, Maldives, Mongolia, Myanmar (Burma), Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Taiwan, Tajikistan, Thailand, Timor-Leste, Turkmenistan, Uzbekistan, Vietnam
Europe	Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic (Czechoslovakia), Denmark, Estonia, Finland, France, Germany (Federal Republic of Germany), Greece, Hungary, Iceland, Ireland, Italy, Kosovo, Latvia, Lithuania, Luxembourg, Macedonia, Malta, Moldova, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation (Soviet Union), San Marino, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom
Middle East	Armenia, Azerbaijan, Bahrain, Cyprus, Georgia, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Palestinian Autonomous Areas (also West Bank and Gaza), Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates, Yemen
North and Central America	Anguilla (overseas territory of the UK), Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Canada, Costa Rica, Cuba, Dominica, Dominican Republic, El Salvador, Grenada, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, St Kitts and Nevis, St Lucia, St Vincent and the Grenadines, Trinidad and Tobago, United States
South America	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela
Oceania	Australia, Fiji, Kiribati, Marshall Islands, Micronesia, New Zealand, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu

TABLE A2
THE LIST OF 194 COUNTRIES GROUPED ACCORDING TO INCOME GROUPS

Income	Country
High-income OECD	Australia, Austria, Belgium, Canada, Chile, Czech Republic (Czechoslovakia), Denmark, Estonia, Finland, France, Germany (Federal Republic of Germany), Greece, Iceland, Ireland, Israel, Italy, Japan, Republic of Korea, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States
High-income non-OECD	Anguilla, Antigua and Barbuda, Aruba, Bahamas, Bahrain, Barbados, Brunei, Croatia, Cyprus, Equatorial Guinea, Hong Kong Special Administrative Region, Kuwait, Latvia, Lithuania, Malta, Oman, Qatar, Russian Federation (Soviet Union), San Marino, Saudi Arabia, Singapore, St Kitts and Nevis, Taiwan, Trinidad and Tobago, United Arab Emirates, Uruguay
Upper-middle-income	Albania, Algeria, Angola, Argentina, Azerbaijan, Belarus, Belize, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, China, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, Fiji, Gabon, Grenada, Hungary, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Lebanon, Libya, Macedonia, Malaysia, Maldives, Marshall Islands, Mauritius, Mexico, Montenegro, Namibia, Palau, Panama, Peru, Romania, Serbia, Seychelles, South Africa, St Lucia, St Vincent and the Grenadines, Suriname, Thailand, Tonga, Tunisia, Turkey, Turkmenistan, Tuvalu, Venezuela
Lower-middle-income	Armenia, Bhutan, Bolivia, Cameroon, Cape Verde, Republic of Congo, Cote d'Ivoire, Djibouti, Egypt, El Salvador, Georgia, Ghana, Guatemala, Guyana, Honduras, India, Indonesia, Kyrgyzstan, Kiribati, Kosovo, Laos, Lesotho, Mauritania, Micronesia, Moldova, Mongolia, Morocco, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Paraguay, Philippines, Samoa, Sao Tome and Principe, Senegal, Solomon Islands, Sri Lanka, Sudan, Swaziland, Syria, Timor-Leste, Ukraine, Uzbekistan, Vanuatu, Vietnam, Yemen, Zambia
Low-income	Afghanistan, Bangladesh, Benin, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Comoros, Democratic Republic of Congo, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kenya, Democratic People's Republic of Korea, Liberia, Madagascar, Malawi, Mali, Mozambique, Myanmar (Burma), Nepal, Niger, Palestinian Autonomous Areas (also West Bank and Gaza), Rwanda, Sierra Leone, Somalia, Tajikistan, Tanzania, Togo, Uganda, Zimbabwe

Note: The list of countries is in accordance to the OECD member countries and World Bank's Classification as of the end of 2010.