

## ISI NEWSLETTER LY e-Newsletter of the International society for scientometrics and informetr

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## **EDITORIAL** LOOKING FORWARD TO **NEW HORIZONS**

**WOLFGANG GLÄNZEL & SARAH HEEFFER** ECOOM, Faculty of Economics & Business, KU Leuven, Belgium

This time we have the pleasure to announce two joyful events. Regarding internal affairs, we can now celebrate the 75th edition of the ISSI Newsletter, in which we reported highlights and successes but also thoughtful and even sad news in the past. So we always attempted to accompany many facets of our Society's life in a worthy and respectful manner.



At the same time, we now can announce the or-

ganisation of the 20<sup>th</sup> Conference on Scientometrics and Informetrics. The official announcement can be found on p. 37-39 of the present issue. This event will become a real milestone: The conference series was launched in 1987 thanks the pioneering initiative by Leo Egghe and Ron-

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ald Rousseau and, later, organised under the auspices of our society as ISSI Conferences for three decades. The event series has circled the globe several times by taking place in all continents (except Antarctica) and returning twice to the US, China, and Belgium, where it had its origin. Even the COVID-19 pandemic could not prevent us from continuing the success story. The 2021 conference has become the first (and hopefully the only) conference that had to be organised as a fully virtual event. Now the conference returns to Western Asia, and will be organised in Armenia, a country, which is with nearly three million inhabitants by far the smallest one in the history of the conference series. By contrast, this country has a long tradition in history, culture, arts and science and has a great potential in research and international scientific collaboration. We wish the organisers success in preparing and organising this event, hoping for many participants and excellent contributions.

We hope all readers can celebrate with us and will enjoy reading this anniversary number. Our thanks are due to all readers of our e-zine for their loyalty and, most notably, to the contributors to the past issues for their efforts, inspiring insights, and expertise. At the same time, we hope and wish for many more inspiring and fruitful years to come.

# POPULATION AND SOCIAL DATA SCIENCE SUMMER INCUBATOR PROGRAM

03 JUNE — 23 AUGUST, 2024

MAX PLANCK INSTITUTE FOR DEMOGRAPHIC RESEARCH ROSTOCK, GERMANY

### ANNOUNCEMENT FOR SUMMER RESEARCH VISIT



The Max Planck Institute for Demographic Research (MPIDR) is inviting applications from qualified and highly motivated students for a Summer Research Visit.

The goal of the Population and Social Data Science Summer Incubator Program is to enable discovery by bringing together data scientists and population scientists to work on focused, intensive and collaborative projects of broad societal relevance.

For a period of 3 months (June 3rd – August 23rd, 2024) participating students will work in small teams, with support from experienced mentors, towards a common research goal. For the summer of 2024, the focus of the program will be on three main areas:

 "Climate Change and Population Dynamics" mentored by Matt Hauer (Florida State University), Risto Conte Keivabu and Emilio Zagheni

- 2. "Network and Gender Dynamics on Mobility and Migration" mentored by Aliakbar Akbaritabar, Jisu Kim and Daniela Perrotta
- 3. "Estimation and Forecasting of Health Indicators in Data-scarce Contexts" mentored by Monica Alexander (University of Toronto), Ugofilippo Basellini and Irena Chen

Participating students will be exposed to best practices across the social sciences and data sciences while contributing to a hands-on project experience that will result in a scientific journal article. All participants will also have access to lectures and will be able to participate in other scientific activities taking place at the MPIDR.

#### APPLICATION REQUIREMENTS

Applicants must be enrolled in a doctoral, master's or undergraduate university program (at the time they visit the MPIDR). Selected candidates must obtain approval to participate in the program by their supervisor / administrator.

Applications must be in English and submitted online via this survey and include the following documents in one single PDF:

- Curriculum Vitae
- Cover letter (Max 2 pages)
  - → Please state why you are interested in spending the summer at the MPIDR, and in which ways you would benefit from participating in the Incubator program.
  - Please articulate your research interests and briefly describe a project you have worked on, the motivation for it and your contribution.
  - → Please describe your technical skills, as well as what you would like to learn over the course of the Summer visit.
- Copies of academic transcripts for undergraduate and, if applicable, graduate education
- Names and contact information for 2 academic referees (no recommendation letter is required at this step)

#### SELECTION CRITERIA

The Incubator program values research teams that include early-career scientists from a range of disciplines and backgrounds, with complementary skill sets. Priority will be placed on bringing together a diverse pool of students. The total number of attendees will be defined based on resources and quality of applications. The mentors will provide seed projects and data ideas, with flexibility for students to put forward their own ideas as well.

Successful candidates will have demonstrated ability to work on research projects independently and in interdisciplinary teams, and an interest in research problems related to both data science and the social sciences, broadly defined.

#### POLICIES ON EQUALITY

The Max Planck Society values diversity and is keen to employ individuals from minorities. We are committed to increasing the number of individuals with disabilities at our institutes and therefore encourage applications from such qualified individuals. Furthermore, the Max Planck Society seeks to increase the number of women in those areas where they are underrepresented and therefore explicitly encourages women to apply.

#### **IMPORTANT DATES**

In order to receive full consideration, applications should be received by January 10th 2024.Notifications will be sent out by March 2024.

#### FINANCING

This will be an in-person summer program, and students will be expected to be in residence at the MPIDR in Rostock for the period of the research visit and to devote most of their working time to the collaborative research project during that period. Selected students enrolled in a PhD program will be offered reimbursement for travel costs to/from Rostock, and a stipend. Selected students who are not enrolled in a PhD program will be offered reimbursement for travel costs to/from Rostock, lodging in Rostock, and a per diem.





#### MORE INFORMATION

You can find more information on previous program participants, projects and publication outcomes on the program webpage.

In addition, please consult the FAQ document for further detail.

#### CONTACT

 For remaining administrative questions, please get in touch with Kathrin McCann (mccann@demogr.mpg.de)

- For scientific questions please contact
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  - → Mobility Daniela Perrotta perrotta@demogr.mpg.de
  - → Health Ugofilippo Basellini basellini@demogr.mpg.de

## THE 2025 ISSI CONFERENCE WILL TAKE PLACE IN YEREVAN, ARMENIA

The 20th conference of the International Society for Scientometrics and Informetrics (ISSI) will take place in Yerevan, Armenia, in the summer of 2025. The conference will be organised by the Centre for Scientific Analysis and Monitoring (CSAIM), part of the Institute for Informatics and Automation Problems, National Academy of Sciences of the Republic of Armenia, and hosted by the Yerevan State University (YSU). Participants will enjoy the beauty and charm of a country with a millennia-old history and culture. The hospitality of the Armenian people, natural beauty, and impressive cultural monuments will certainly fascinate all participants.

Yerevan is a place where the distant past and the rhythmic present are beautifully interconnected. Here, you will find old churches, historical and cultural mon-



Opera, Freedom Square, Yerevan.



"The conference host, Yerevan State University (YSU), is Armenia's oldest and largest public university. Founded in 1919, it is informally known as the 'Mother University' of Armenia. YSU is centrally located in Yerevan, the capital of Armenia. The main conference hall provides space for more than 500 participants and several other halls are equipped for parallel sessions and posters."



Geghard monastery was cut into the living rock



Cascade complex, Yerevan

ourtesy of The Committee of Tourism



Garni Temple, the easternmost building of the Greco-Roman world. Garni, Armenia.



a visa-free status for CIS member states, Latin American, and Arab countries. Citizens of countries that need visa to enter Armenia may apply online for e-visas.

Zvartnots International Airport is the main gate for air travel into and out of Armenia. There are more than 55 direct flights from European and Asian cities (Athens, Barcelona, Beirut, Brussels, Deli, Doha, Dortmund, Dubai, Dusseldorf, Frankfurt, Istanbul, Kishinev, Milan, Moscow, Mumbai, Paris, Prague, Rome, Sofia, St. Petersburg, Stockholm, Tabriz, Tehran, Tel Aviv, Venice, Vienna, Vilnius, Warsaw, Yekaterinburg etc.). Airport buses regularly operate between Yerevan airport and the city centre. The journey from the airport to the city centre takes

Gyumri is the second largest city in Armenia and one of the oldest cities in the world.

uments mixed with modern sights and buildings, museums and galleries, clubs, restaurants and bars, etc. The rich Armenian national cuisine will be a discovery even for the most discerning gourmets.

As a crossroads between Asia and Europe, Armenia is easily accessible from every corner of the world.

It is quite easy to enter Armenia. Citizens of 45 countries such as those of the EU, USA, Australia, Canada, the UK, and others are exempt from visa requirements. Armenia has 30–40 minutes. The bus ride costs 300 AMD (\$0.70). Taxis are another option to reach the centre of Yerevan and cost about \$15.

It should be noted that Armenia is among the top 10 safest countries in the world, while the capital city Yerevan has been ranked the 20th safest city in the world.

Yerevan has a well-developed hotel network with over 250 hotels, 190 of which are less than 3 km from the city centre.

We are looking forward to welcoming you all to Yerevan in 2025!

# INTRODUCING THE DEREK DE SOLLA PRICE AWARDEES OF 2023

INTERVIEW BY CASSIDY R. SUGIMOTO



The awarding ceremony of the Derek de Solla Price Memorial Medal has become an essential part of the programme of ISSI conferences since the foundation of the Society in 1993. The Price Medal was conceived and launched by Tibor Braun, founder and Editor-in-Chief of the international journal Scientometrics, and is periodically awarded by the journal to scientists with outstanding contributions to the fields of quantitative studies of science. This year's awardees are Kevin Boyack & Richard Klavans (SciTech Strategies Inc.). Congratulations to the awardees!

## KEVIN BOYACK ලිං RICHARD KLAVANS

On June 1, 2023 I met with Kevin Boyack and Dick Klavans on Zoom to discuss their journey to the Derek de Solla Price Award. What was intended as an hour-long call quickly extended to two, as they wove a rich narrative of entrepreneurship, partnerships, faith, and forecasting. What follows is an excerpt of some key moments in this wide-ranging conversation.

I began by asking Kevin and Dick to describe what they do as researchers and the labels with which they identify. Kevin noted that his answer is not standard, but changes according to his audience. For a lay audience, he will say that

"We look for trends in what's going on in science."

For a more academic audience he will say

"We analyze the scientific literature, but from the standpoint of strategic planning because people want to know



**KEVIN BOYACK** 

what's happening so that they can make better investments in the future."

Regardless the answer, Kevin identified as a scientometrician. Dick, on the other hand, identifies as an academic entrepreneur. For him, the driving factor is the question, not the field:

"I am fascinated with the question of how knowledge is structured and how it evolves. This is a fundamental question... Like any problem, it's not a problem that is solvable. It's just once you get closer to a solution. As we produced maps, we got a sense that we were actually helping to communicate this fundamental abstract idea of how knowledge – in this case technical or scientific knowledge – is structured. I'm just as interested in knowledge about how we try and help one another. That's why we did a map of altruism."



RICHARD KLAVANS

Dick was drawn to the work of Kuhn during his doctoral work, but was skeptical of the predictive power of scientometrics. He walked two blocks down the street to meet Henry Small and found himself convinced that there was something waiting to be revealed in science mapping, but that academe would not be the place to foster it. He decided to "try and make a business out of it."

He started the company that eventually became SciTech Strategies. The early contracts were all for corporate development efforts, focusing on identifying hot topics, threats, and opportunities. He joined a society of competitive intelligence professionals, becoming elected to the board and eventually serving as president. In the space of three years, Dick doubled the size of the association and hosted several conferences, providing him a strong sense of the direction of the intelligence industry.

As an entrepreneur, he was consistently scanning the landscape for potential competitors and became aware of Kevin's work at Sandia. Dick arranged for Kevin to give a talk at a conference. This was a watershed moment. As Dick remarked:

"It was the first person I met who I felt shared that deep desire to really penetrate what's actually going on. It was such a joy to met someone that shared that."

Kevin had been doing science mapping at Sandia since the late 1990s. The rationale was primarily internal, as Kevin recalled:

"They were doing some tech forecasting, some tech road mapping, and so we looked at science mapping as a way to project and also check on technology roadmaps to see what the potential pathways were, and then also to check and see if progress was being made in past efforts along the projected paths. It was an extension of tech road mapping at that point. Then it grew into its own thing where what they wanted to do was understand the landscape so that they could use internal monies in the best way... They wanted to understand the whole landscape of research, where Sandia was doing research, and where these internal proposals would land. We were generating maps based on all that stuff. We were using latent semantic analysis at that point in time to throw proposals into this so that people at the head of the LDRD project could see the concentrations and the holes and all of this kind of thing. From a Sandia standpoint, it was planning."

Kevin also was struck by the alignment with Dick's work at their arranged meeting:

"I saw his stuff and he saw mine, and we were like, 'Okay, we're the only two in the world doing this.' It was clear to me that Dick was ahead of anything I'd read. I went back to Sandia and said, 'You got to add money to this project. We got to hire this guy.' They took me at my word, and they put money in it, and we brought Dick on as a consultant. Then two years or whatever it was later, he poached me."

Sandia offered an entrepreneurial leave, which allowed Kevin to take a leave absence, with the ability to return to Sandia within a three-year period. This provided him with a low-risk opportunity to try to build the rebranded SciTech Strategies with Dick. The risk calculation was imperative for Kevin, a father of six with eldest just graduating from high school. He and his wife "made it a matter of prayer, and that answer was, 'Go for it. We got your back.'"

Their vision with SciTech was to advance the field and to improve society. Although the corporate contracts were keeping the lights on, Dick recognized that the industry was changing direction:

"My sense was technical intelligence was going to shift away from industry (where we had an excellent track record) to academia (where we had no experience) and to government (where Kevin had some experience). At the same time, Elsevier heard about me as the only one selling bibliometric analyses (based on the ISI databases) to companies, so they asked me, they have this new thing called Scopus, 'Would you like to have access to it for free to develop a global model?'. This was the start of a long term collaboration. SciTech would focus on being the prototype developers (making more accurate models) - Elsevier would develop a product around them. But it was unclear where the market would head. I asked Kevin to follow up on the industry segment (which I thought was going to die – but just in case....). I put my effort on applications for the academic markets. My concerns about the future ended up being correct – the industrial market dried up. We were lucky to have shifted our focus."

Another watershed moment for the team was the Arthur M. Sackler Colloquium on Mapping Knowledge Domains which was organized by Katy Börner and resulted in a special issue in PNAS. Dick commented:

"Katy was critical. Once the Sackler conference occurred, that sent the symbol that this is now a legitimate area. Before that, it was never going to be accepted. Her putting together the conference and Kevin behind the scenes doing a lot of the work, at least from my observation, because Kevin does a lot of work behind the scenes, that was a turning point in mind... It gives it legitimacy."

This legitimacy also led to the University of California at San Diego (UCSD) mapping project, which was a methodological turning point for the team. The Provost at UCSD was interested in knowing the strengths of the university. SciTech started by combining the Journal-journal matrix from ISI and from Scopus, and ended up generating a compelling discipline-based map of science. But this approach didn't help the Provost because many of UCSD's strengths were interdisciplinary. Kevin realized:

"It's time for a more detailed classification system. If anybody is going to understand UCSD's strengths, we're going to have to do it with clusters of papers – not clusters of journals. We have not worked with journal clusters since."

Once the unit of analysis was identified, they focused on the clustering dimension. They note the essential contribution toward their thinking which came from another scientometric team: Ludo Waltman and Nees van Eck. As Kevin recalled:

"During that time that Spotlight was having its run, that's when Ludo and Nees put out their first big VOS clustering paper. Now, that wasn't VOSviewer, but it was the same clustering code applied at a large scale, and that to us, was the huge game changer. They did that work, they put the paper out on arXiv, we found it. Dick immediately called Ludo and, in fact, flew over and just sat there and went through stuff. We got a copy of the code, we ran it all on our own data and, lo and behold, the results were fantastic. Now, instead of taking annual 'cuts' of data, creating annual models and trying to stitch each annual model together, we could throw the whole database at it. That was really a watershed event when they published that code. That enabled everything, it enabled everything we've done in the past decade."

In the last decade they have built upon this, with a focus on improving accuracy and trustworthiness in science mapping. Kevin observes:

"As we look back on some of the gains we've made over the years, we've realized that each one of them has been a noise-reduction technique. People do not think about noise reduction when they think about scientometrics or bibliometrics. If you're looking at science mapping, if you're looking at structure and evolution, noise reduction is a huge deal."

An anecdote from Dick amplifies this point and extends it from the academic to the aesthetic:

"Bruno Latour had asked me to come over and give a talk to his class at École des Mines. It was at the time when Kevin and I were first working together. Of course, when I called Kevin,



Richard Klavans (left) and Kevin Boyack (right) in the company of Katy Börner and Henry Small at the ISSI 2005 Conference in Stockholm, Sweden

there'd be this awful-sounding violin as the kids were just starting to play in the background because they're practicing there<sup>1</sup>. I was inspired by that when I gave the talk to the class, and I said, 'Science mapping is like learning to play the violin. When you first start, it sounds horrible, but as you learn the craft of it, as you learn how to know how to manage the noise, it can be beautiful.' It is almost a feeling about whether or not you're getting there. While Kevin may call it noise reduction, there's also music. That's the other side of it. It's playing out the song that's underneath."

The harmony of the team is apparent in the conversation, in which there is a palpable play on turn taking and togetherness. I ask them how they have managed to continue this duet uninterrupted for so many years: Kevin: We like each other.

Dick: Ah, we love each other, come on.

Kevin: Yes, it's true. It's true.

**Dick:** Yes, we love each other. That's part of it.

**Kevin:** Really, we do have very complementary strengths. I can truly say none of this would have happened without both of us. I could not have gone out and reproduced any of this alone. The stuff that we've produced has required the mix of skills that we have together."

**Dick:** We both can think extremely abstractly. This is extremely important because not being able to think abstractly in that really deep way means that we can't make our independent contributions, but our independent contributions are really quite

The kids have gotten better – all have played in college-level or professional orchestras.

different. Kevin is tremendously productive in getting the work done. He can just put things on his stack and boom, boom, boom, just work, work, work, work. Unbelievable. I could never do that. I'm the one that comes up with this occasional dumb idea and occasional brilliant idea. I don't know which is which unless l can connect with someone who can. Also, I have no understanding of the social structure. I cannot understand how people interact. Kevin understands that deeply. He'll take an idea that I might say, and then he'll translate it so that others will understand it, which is invaluable. I would never be able to communicate that because I can't speak that language. I just don't know how to speak that language.

**Dick:** God does create us each wired differently. Really, really differently. If we appreciate that and how we can complement each other and get our own ego out of the way, we can get so much more done. We both do that.

**Kevin:** The other thing I would say that has made this work is we both have the same ethical core. Of all these things we've talked about, that's probably the key. That's probably the top thing. If we didn't both have that same feeling about what's right and what's wrong and what we're going to do and what we're not going to do, all of this wouldn't have lasted this long.

The end of the conversation returns again to the sense of ethics and purpose in life. Dick recalled their beginning, when Kevin prayed with his wife for guidance on taking this leap of faith: "When Kevin said and decided they wanted to pray on that, my heart sang because that goes back to that spiritual core. That means they're not acting on their fear, they're acting on the signal of what is right action. What is, what he says, from prayers. The Jewish one, the word Torah, it's a verb. It's like an arrow going through the air and you're trying to make sure that you're headed in the direction you're supposed to be going, that God is intending for you, knowing that most of the time you're off, and you have to keep correcting."

The team is continuing to push forward, correcting their course towards better predictive capacity, "shifting into the concept of exports, not just production."

They both agree, their best work may be yet to come. This award, therefore, serves not as an end, but as a beginning. For them, one of the most important elements of the award is that it signals to the community the importance of recognizing that contemporary science is not the work of individuals, but of collectives. Kevin concludes on the importance of this award for him:

"I'm pleased. I'm extremely pleased that it's a team thing. I would not have accepted it as a single winner. I just wouldn't, because it's a team effort all the way along, and it would have been just disingenuous to have a solo award. It would have been wrong, because we are so much a team. I'm pleased that our work has been highly enough thought of and deemed useful enough and has perhaps shaped the field enough that we would be thought of for this award. That's pleasing, but the thing that's most pleasing is that the work of the team has been recognized."

# THE BOWLES-CARLIN EXPERIENCED DIFFERENCE GINI COEFFICIENT



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**Abstract:** In this short note, I present the idea of experienced difference and the corresponding Gini coefficient, proposed by Tom Bowles and Wendy Carlin.

### INTRODUCTION

The Gini coefficient originates from the study of wealth (Gini, 1912) and is related to the Lorenz curve (Lorenz, 1905). It is often used as a measure of inequality or as a measure of unevenness. In this article, I do not go into possible problems with these uses (Chao and Ricotta, 2019) but just present another relatively recent variation, leaving a thorough investigation of this new approach for later.

### THE GINI COEFFICIENT

Given a set of N non-negative values  $Y = \{y_j\}$ , bibliometricians often define the Gini coefficient (or Gini index) by starting to rank the data as is done e.g., in (Rousseau, Egghe & Guns, 2018, p. 89). Yet, it is not necessary to perform this ranking and the Gini index can

also be defined without doing this preliminary step as was done by Bowles and Carlin (2020) and originally by Gini (1912). I now follow their approach. The classical Gini coefficient, denoted as G, is defined as:

one half of the ratio of the average difference between y-values (including differences of data with itself) divided by the average value of y, denoted as  $\mu_y$ .

Formally, this becomes:

$$G(Y) = \frac{\frac{1}{2} \frac{\sum_{i=1}^{N} \sum_{j=1}^{N} |y_{i} - y_{j}|}{\sum_{k=1}^{N} y_{k}}}{\frac{\sum_{k=1}^{N} y_{k}}{N}}$$

As an example, Bowles and Carlin (2020) present the case  $Y = \{3,10,4\}$ . Then the Gini index is:

$$\frac{I}{2} \frac{\frac{1}{9} \left(0 + 7 + I + 7 + 0 + 6 + I + 6 + 0\right)}{(3 + I0 + 4)/3} = \frac{I}{2} \frac{28}{3.17} \approx 0.2745$$

For the extreme cases

$$Y_E = \left\{\underbrace{c, c, \dots c}_{N \text{ times}}\right\}, c > 0$$

we find

$$G(Y_E) = \frac{I}{2} \frac{O}{c} = O,$$

while for

$$Y_D = \left\{ c, \underbrace{o, o, \dots, o}_{(N-1) \text{ times}} \right\}$$

we have

$$G(Y_D) = \frac{\mathrm{I}}{2} \frac{\frac{\mathrm{I}}{N^2} 2(N-\mathrm{I})c}{\frac{c}{N}} = \frac{N-\mathrm{I}}{N}.$$

Yet, Gini himself defined another "Gini" index, referred to as the difference-based Gini coefficient by Bowles and Carlin (2020). This coefficient, denoted as G<sub>D</sub>, is defined as:

one half of the ratio of the average difference between y-values (excluding differences of data with themselves) divided by the average value of y ( $\mu_{\gamma}$ )

Formally, this becomes

$$G_{D}(Y) = \frac{I}{2} \frac{\frac{I}{\binom{N}{2}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} |y_{i} - y_{j}|}{\frac{\sum_{k=1}^{N} y_{k}}{N}} = \frac{\frac{I}{N(N-I)} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} |y_{i} - y_{j}|}{\frac{\sum_{k=1}^{N} y_{k}}{N}}$$

For the case {3,10,4} this becomes

$$\frac{1}{2} \frac{\frac{1}{3(7+1+6)}}{\frac{3+10+4}{3}} = \frac{1}{2} \frac{14}{17} \approx 0.4118$$

For the extreme cases  $Y_E$  and  $Y_D$  we obtain:

$$G_D(Y_E) = \frac{I}{2} \frac{O}{c} = O$$

and

$$G_D(Y_D) = \frac{I}{2} - \frac{\frac{I}{N(N-I)} 2(N-I)c}{\frac{c}{N}} = I$$

Some older bibliometricians may recognize  $G_D$  as this index was wrongly introduced as a new measure by Pratt (1977), and even referred to by some as the Pratt measure. Chao and Ricotta (2019) prefer 1 –  $G_D$  as the better measure of evenness.

#### THE BOWLES-CARLIN EXPERIENCED DIFFERENCE GINI INDEX

Bowles and Carlin (2020) claim that for certain data, such as wealth, the inequality experienced by a person only depends on the persons with whom they are directly connected in a network. More precisely, one has a network of N nodes, for example representing persons and their wealth. The Bowles-Carlin experienced difference Gini coefficient, denoted as  $G_{exp}$ , is then defined as:

one half of the ratio of the average difference between directly connected y-values divided by the average value of  $y(\mu_y)$ 

For the case {3,10,4} situated on a line graph with 10 in the middle, this becomes:

$$\frac{1}{2} \frac{\frac{1}{4} \left(7 + \left(7 + 6\right) + 6\right)}{17/3} = \frac{26/4}{34/3} \approx 0.574$$

Introducing the indicator function  $\delta_{i,j}$  with a value of 1, if  $y_i$  and  $y_j$  are directly connected (and different) and a value of 0 if they are not, the experienced difference Gini index can be defined as:

$$G_{\exp}(Y_{o}) = \frac{1}{2} - \frac{\frac{1}{\sum_{m=1}^{N-1} \sum_{j=m}^{N} \delta_{i,j}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \delta_{i,j} |y_{i} - y_{j}|}{\frac{\sum_{k=1}^{N} y_{k}}{N}}$$

In this framework, the formula for the difference-based case corresponds to the case of a complete network (complete graph), i.e., each node is connected to each other node.

l leave generalizations, clarifications, and possible applications in the science of science for further research.

#### ACKNOWLEDGMENT

I like to thank Tom Bowles for explaining the experienced difference Gini coefficient to me, Gangan Prathap for drawing my attention to the Bowles-Carlin article, and my daughter Sandra for checking and correcting an earlier draft of this article.

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