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In Praise of Observations

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In Praise of Observations

1. Introduction

The magnitude and frequency of measurement errors, as well as the lack of transparency about these inaccuracies in economics, first caught my attention shortly before my graduation at the Economische Faculteit of Erasmus University. On one of my jobs as a working student as a junior country risk analyst at ABN Bank, I noticed that different sources often reported varying figures for the same key economic indicators. This was true for both developed and developing countries, and it was unclear why the statistics differed, and which sources were most reliable. My country risk reports required regular updates, and I quickly learned that I had to double-check the numbers from my previous reports because they frequently changed unexpectedly, even for periods where revisions should have been irrelevant. These changes in figures like GDP, the trade balance, inflation and the current account significantly impacted past, present, and future debt ratios, thereby affecting solvency. I was surprised that economic data were not fixed and that I had never been taught this at university.

While preparing for the final exam of my major in Theoretical Economics, however, I found Oskar Morgenstern's *On the Accuracy of Economic Observations* on the recommended reading list. The book included numerous case studies revealing inaccuracies in widely accepted economic statistics, often by ten to twenty percent and sometimes even more. The case that particularly convinced me was about inaccuracies in gold movements between neighbouring countries. Given the precision expected of Central Bank administrators and the high value of gold, it was surprising that Morgenstern (1963, p. 141) concluded that these 'statistics are so grossly bad that for most purposes they must be rejected.'

When asked about my views on the book during the exam, I responded, 'Why haven't I been told this before? This should be a topic of first principles classes'. The examiner, Jan Veenbergen, later explained that there were typically two types of reactions to this question. Although this was the era of Leamer's 1983 'Let's take the con out of econometrics' and Griliches's 1985 'Data and econometricians – the Uneasy Alliance', most students in the 1980s believed Morgenstern's book was outdated due to advancements in computer technology and econometrics, which supposedly improved data accuracy. My reaction fell in the minority: the conviction that the book remained as relevant as ever. This conviction still holds today.

Consider the large data-driven projects such as the United Nations' Sustainable Development Goals (SDGs) that are seen as a major step forward by many. Since no attention is paid to the accuracy of the target variables during the selection of quantified goals, disappointment is, so to speak, built-in. A good example is the goal to reduce global poverty. Prydz, Jolliffe, and Serajuddin (2022) compared *per capita* income based on two thousand nation-wide household surveys (166 countries) over the years 1965 to 2019 with data based on national accounts. They found a difference of fifty percent and calculated for the year 2011 that the World Bank's poverty target of less than 3% global poor was achieved based on national accounts, but that the share was still twice as high when household surveys were considered. Those who do not report inaccuracy risk resting on their laurels before the work is done.

My topic today is 'observations'. While this valedictory focusses on economic observations and launches my last book *On the inaccuracies of economic observations: how we could and should do better*, the farewell lecture is delivered in the artistic context of a clinic on art-based data collection by Tu Anh Hoang and Imogen Bellwood-Howard and an international exhibition co-curated with Pauline Oosterhoff and Sandy Kamerling and with the participation of fellow artist-scientists Imogen Bellwood-Howard, Ruben Gowricharn, Helen Hintjens, Vincent Icke, and Maartje Raijmakers. Our 'Observations' encourage you to explore and comprehend the world in a broader sense, moving beyond mere

narratives and numerical data. Observation stands as a cornerstone in both art and science, offering a pathway to grasp the complexities of our uncertain world. In these realms, observation surpasses mere visual perception; it unfolds as an ongoing journey of exploration, interpretation, and enlightenment, enriching our comprehension of ourselves and the universe we inhabit. Artists and scientists alike, through astute observation, reveal the beauty, intricacy, and interconnectedness of existence. Observation nurtures curiosity, critical thinking, and an evolving, never-static understanding of our world.

The exhibition, my last book, and this farewell lecture once again establish connections between science and art – a link that I first discovered and explored in the mid-1980s as a student at the Faculty of Economics and cartoonist of the leftish student magazine *Venijn*. During my inaugural lecture at the same faculty in 1999, the idea arose to use artistic images during academic ceremonies. For my inaugural lecture at the ISS in 2009, I arranged for the first time the space for an academic ceremony with an international exhibition (co-curated with Philip Hans Franses; van Bergeijk and Franses 2009). The Erasmus Trust Fund supported ‘Antidotes from the Dismal Sciences’, an exhibition of economists who also work as artists, and I am grateful for the Trust’s thrust in me to also enable today’s ‘Observations’.

I will return to this artistic perspective but start with the inaccuracies of economic observations. I have selected three important topics from my last book: the need to decolonize the debate on measurement error (Section 3), the behaviour of the economic and statistical professions during the data fog of the COVID-19 lockdowns (Section 4) and the issue of why accuracy does not improve (Section 5). Then I take a deep breath in Section 6 and ask the big question: can economics become scientific? Once we have dealt with the Dismal Science, that as will become clear, could perhaps be more aptly baptised the Dismal Decimal Science, I move in Section 7 to the more colourful world of art and offer my five cents of thoughts on the relation between art and science. But first I have a few non-economic, non-artistic and personal observations to share.

Textbox 1 A big thank you to editors, co-authors, (co-)editors, (co-)promotores, PhD students and Research assistants (and a few more)

Sylvanus Afesorbor, Koos Andriessen, Morad Bali, Jamie Baltus, Martijn Bazen, Thorsten Beck, Marcel van den Berg, Jan Marc Berk, Ron Berndsens, Tibor Besedeš, Thomas Biersteker, Remco Bos, Lans Bovenberg, Steven Brakman, Simon Bremer, Sander de Bruijn, Antonia Bultrini, Frank den Butter, Mariela Carolina, Manas Chatterji, Li Chenmei, Carla Costa, Kim Tung Dao, Eric van Damme, Binyam Afewerk Demena, Mathijs van Dijk, Mark Dijkstra, Sajjad Dizaji, Iana Dreyer, Henk Don, Govert Eijsvogel, Jaswina Elahi, Gerrit Faber, Susanna Fellman, Rens Fentur, Gianluca Ferrittu, Djalita Fialho, Fabienne Fourtanier, Philip Hans Franses, Robin Fransman, Pierrette Gaasbeek, Harry Garretsen, Ad Geelhoed, Annet van Geen, Mandy van Gelder, Matthijs Gerritse, Cees van Gent, Willem van Genugten, Peter Gerbrandts, Matthijs Gerritse, Francesco Giumelli, Martin Godfried, Heleen van Gorcum, Desiree van Gorp, Gerard de Groot, Henri de Groot, Thomas Grossvelt, Desiree van Gorp, Marie Goppelsroder, Pedro Goulart, Ruben Gowricharn, John Groenewegen, Ferry Haan, Arjan de Haan, Henk de Haan, Robert Haffner, Gilbert van Hagen, Bram Hendriks, Larissa van den Herik, Ernst-Jan Heuten, Chris Hiddink, Frank Hindriks, Rolph van der Hoeven, Eri Ikeda, Diane Irankunda, Ebuka Itumoh, Marjolein Jaarsma, Henk Jager, Jos Jansen, Rene Jansen, Karel Janssen, Gabriela Benalcazar Jativa, Shyamika Jayasundara-Smits, Catrinus Jepma, Linda Johnson, Albert Jolink, Dick Kabel, Frank Kalshoven, Flip de Kam, Sandy Kamerling, Astrid Kamp, Igor Kania, Jaap de Keijzer, Patrick Kimararungu, Vetonatus Kamwela, Zoltan Kenessey, Hugo Keuzekamp, Aad Kleijweg, Erik Kloosterhuis, Ernst van Koesveld, Peter Koster, Rolf Künneke, Rob van der Laan, Jussi Laine, Esther Lamboo, Evans Langat, Ger Lanjou, Sara Lazzaroni, Bertholt Leeftink, Fieke van der Lecq, Robert Lensink, Gina Ledda, Libby Leher, Coby van der Linde, Hans Linnemann, José Luengo-Cabrera, Jasper Lukkezen, Norine Maniran, Charles van Marrewijk, Volpe Martincus, Anagew Mebratie, Gerdien Meijerink, Jan Melissen, Marcel Mennen, Harma Meins, Nico Mensink, Peter Meulmeester, Michela Marcatelli, Willem Molle, Ruud de Mooy, Mary Morgan, Fauzul Muna, Mansoob Murshed, Selwyn Moons, Donald Mmari, Jane Mpapalika, Jamal Msami, Renata Cavalcanti Muniz, Stephen Mwombela, Susan Newman, Nguyen Thi Mai Lan, Howard Nicholas, Volker Nitsch, Wim Noe, Monique van Oers, Maaïke Okano-Heijmans, Harry Oldersma, Maartje Ooijevaar, Pauline Oosterhoff, Elissaios Papyrakis, Lee Pegler, Lilian Petit,

Sandra Phlippen, Clara Portela, Bas Postema, Raul Ramos, Hans Ramsoedh, Alex Reta, Andre Rhoen, Annemarie Rima, Theo Roelandt, Jessica Saat, Martin Shanahan, Cyntha Sathyamala, Nico Schrijvers, Erik Schut, Leandro Serino, Muhammad Siddiquee, Berndt Jan Sikken, Jarig van Sinderen, John Sinjorgo, Mirko Sossai, John Steenwinkel, Friso Stoffer, Jose de Sousa, Paul Tang, Sandra Trienekens, Cees Ullersma, Elisabeth Vallet, Mark Vancouveren, Jan Veenbergen, Marielise van Veenstra, Michiel Verkoulen, Ludo Visscher, Femke van der Vliet, Ben Vollaard, Pieter Waasdorp, Natascha Wagner, Kim Wannet, Dinand Webbink, Thijs Welter, Ed Westerhout, Jelle Wijnstok, Arjan Wildschut, and Mina Yakop.

2. Preliminary observations

A valedictory is of course a celebration speech and a point to express gratitude. Typically saved for the end of the farewell lecture I prefer to do this first. The most important people in my life are Hanneke Sassenburg, Doris, Vera, and Eva, and in the men cave Bob, Chris, Stan, and Wies. Next come the two hundred odd co-authors, (co-)editors, (co-) promoters, PhD students and research assistants that supported me both in my academic work in Groningen, Rotterdam, The Hague, and Zurich and when I was working at the Ministry of Economic Affairs, the Dutch Competition Authority and the Dutch Central Bank (Textbox 1).¹ People have told me that I write faster than they can read, but it is clear that I have leaned heavily on others while my pen was scribbling. Especially the combination of writing, teaching and doing research with my students was a joy and I have always been very proud of the academic publications that were based on their MA theses and the chapters of their PhD theses.

I am also grateful for the freedom that ISS has given me to do research on the topics that I find interesting and relevant. My research has developed in semi-concentric circles. In 1986 when I was a self-financed

¹ The textbox would have occupied at least another two pages if I had included the contributors to the volumes that I edited.

working part-time student I wrote my first article on the potential effectiveness of sanctions against the Apartheids regime in South Africa, a case that at the time of writing by the mainstream was considered a right-out failure (a consensus that radically changed with the liberation of Wilson Mandela in 1990).² I made the connection between sanctions and Morgenstern's work for the first time in my logit analysis of success and failure of economic sanctions (van Bergeijk, 1989), that was the basis of a chapter in my PhD thesis *Handel en Diplomatie* (trade and diplomacy) at Groningen University.³ Positive and negative sanctions and economic diplomacy have been a recurring theme. The circle was completed when I was asked to become editor of two research handbooks on economic diplomacy and on economic sanctions, respectively.⁴ Globalization is another thread in my oeuvre and since my inaugural at ISS in 2009 *I come to bury globalization not to praise it*, deglobalization has occupied the centre of the stage. Measurement has also here from the start been an important component (van Bergeijk and Mensink 1997) In the early 1990s the existence and relevance of globalization was vigorously contested and surprisingly academia is currently debating if deglobalization is really occurring. The closure of the circle here thus comes in the forms of the long wave in economic thinking, that reflects the eternal disagreement among economists about major events, and the research agenda from

² My 1986 article is in Dutch, my first writing on the case in English is van Bergeijk (1995) and appeared in the last publication of the Amsterdam-based Shipping Research Bureau, a specialist organisation, mainly dealing with research into the oil trade with South Africa and alerting the world to breaches of the UN oil embargo, founded and funded by the NGOs Komitee Zuidelijk Afrika and Kairos in 1980.

³ Again, in Dutch – the extended English version appeared as van Bergeijk (1994 and 2009; the publisher insisted that the 2009 version should not be a second edition as I initially intended but that it needed a new title)

⁴ The *Research Handbook on Economic Diplomacy: Bilateral Relations in a Context of Geopolitical Change* was coedited with my PhD student Selwyn Moons and the *Research Handbook on Economic Sanctions* appeared with the assistance of my PhD student Gina Ledda.

start to finish of a professorship in macroeconomics, international economics and eventually earth economics.⁵

I am also privileged by the culture shock that, at fifty, I wanted to experience. I have learned a lot from being in an environment where people refuse to speak your language, where you are from the start too old for the major grants and where you are considered to be an outsider, if not a dinosaur, because you are basically perceived as white, male, and old. It gives at least a taste of what discrimination and alienation feels like if you are the only person with these characteristics in a crowd. ISS has in a sense been my midlife crisis, a source of wonder and a learning experience. Now let's start with the meat of the valedictory.

3. Decolonizing the debate on inaccuracy

In economic analysis, precision has long been revered as the ultimate goal. However, beneath the surface of statistical accuracy lies a troubling reality: the widespread presence of measurement errors, often ignored and sidelined. The current debate on the reliability of economic and social statistics is flawed and rooted in colonial notions and power dynamics. Many professionals, including myself, have encountered the unsettling truth that economic observations are very inaccurate, early in their careers. Indeed, economic and social statistics, even from reputable sources, are riddled with inconsistencies and inaccuracies. This realization can be profoundly disillusioning, as young professionals discover that the data they rely on for critical decisions is far from infallible.

⁵ Earth economics was an un-boring remedial teaching course that was necessary to create a level playing field for the new batch of economics students (it dealt with the closed economy and with data collection) that became a self-study text book (van Bergeijk 2013) and a MOOC with 1200 paying course completers and available free of charge at <https://www.coursera.org/learn/earth-economics>

Oskar Morgenstern's influential (1950, 1963) work, *On the Accuracy of Economic Observations*, highlighted the pervasive inaccuracies in economic and social statistics through detailed case studies. Despite the significance of his findings, the discourse around measurement error has remained largely absent from mainstream economic narratives. There is more to unpack in Section 5 when I investigate why this situation is not changing, but here my point is that currently this omission is rooted in the biases of academia in the Global North, where economists are trained to prioritize precision and overlook imperfections. This culture of statistical superiority perpetuates power imbalances in academic and policy discourses, in a sense marginalizing the Global South. The narrative that measurement issues are unique to developing countries ignores the systemic inaccuracies in advanced economies. The publication of Morten Jerven's *Poor Numbers: How We Are Misled by African Development Statistics and What to Do about It* in 2013 was a wake-up call for me. The subtitle unintentionally highlighted the need to challenge the biases in our understanding of measurement error. Jerven's work, however, fell into the trap of framing measurement issues as a problem specific to the Global South, and the mainstream discourse continued to ignore the need for transparency and accountability in reporting measurement error.

My call to decolonize the measurement error debate is urgent. We must dismantle the colonial mindset that is shaping the world's approach to economic data accuracy, necessitating a re-evaluation of our methodologies and practices based on transparency, accountability, and inclusivity. In my last book, *On the Inaccuracies of Economic Observations: Why and How We Could Do Better*, I pay tribute to Morgenstern while proposing a methodology and strategy for assessment of measurement error at low cost and well in reach of individual data users. This empowers data users to dismantle the power hierarchies that perpetuate colonial perspectives in this economic discourse. The implications extend beyond academia: policymakers must acknowledge the uncertainties in economic data and recognize the limitations of flawed data for decision-making. Researchers therefore must adopt

methodologies that emphasize inclusivity and equity while maintaining scientific rigor and accountability.

The case of Dutch GDP growth estimates

A preliminary warning is in order. The example of the inaccuracy of early estimates of GDP growth by CBS Statistics Netherlands is not arbitrary, as it has been chosen because the topic is a recurrent theme in my work⁶, but it should be clear that the issue of the inaccuracy of economic-statistical material is not a Dutch Disease. The Netherlands is only a special case because it has an excellent statistics bureau with highly qualified staff, a fair amount of financial resources, and extensive experience. Therefore, the findings below are particularly sobering: in many countries, the statistical apparatus is less well developed, and the margins of error will accordingly be greater.

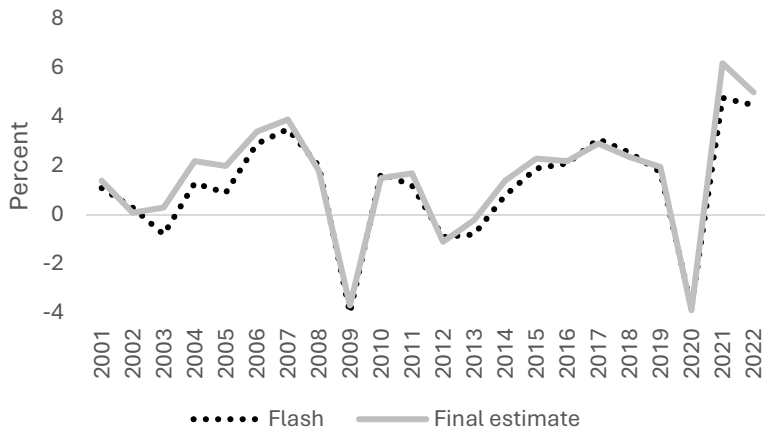
At the introduction of the national accounts in the Netherlands, the CBS was for the first and last time transparent about the inaccuracy of its GDP estimate and provided a quantitative indication per component (CBS, 1953). The most accurate observations (for example, for indirect taxes or the wage bill) had a reported inaccuracy of 2% to 5%; business reserves were the least accurately observed (with a margin of error of more than twenty percent; there is actually no reason why the accuracy for this category would have improved over time). With such inaccuracies, it is clearly scientifically dubious to report GDP growth to 1 decimal place. Indeed, a 'true' growth rate of, for example, 3% can be observed as somewhere between minus 1% and plus 7% with a small measurement error of only 2 percent of the initial and final values. Since statistics producers are generally not transparent about their inaccuracies, we will use an indirect observation, namely the comparison of changes that occur over time in the reported estimates for a specific year. This

⁶ Inaccuracy of CBS data was reported in van Bergeijk (1992), Andriessen et al. (1995), van Bergeijk (2010), van Bergeijk (2021) and van Bergeijk (2024). The case study in this subsection is based on the most recent data, in that sense 'new' and made accessible through this valedictory in the English language.

comparison logically provides a conservative, minimal indication of the inaccuracy because each estimate has a measurement error.

The idea that the accuracy of GDP estimates has increased over time is widespread, but unfortunately an illusion, also in the Netherlands. Over the period 2001-2022, the average absolute difference between the first ‘flash’ estimate of GDP (45 days after the end of a year) and the final estimate (two years later) is 0.5 percentage points (Figure 1). With an average growth rate of 1.5 percent per year, the inaccuracy is thus one-third. This is a notable increase compared to earlier determinations of the inaccuracy of CBS estimates: Geelhoed and Van Sinderen (1993) reported that the average measurement error of GDP growth was roughly one-quarter of the average growth rate in the years 1971-1992 and for 1993-2005, this was just over one-fifth (van Bergeijk 2010).

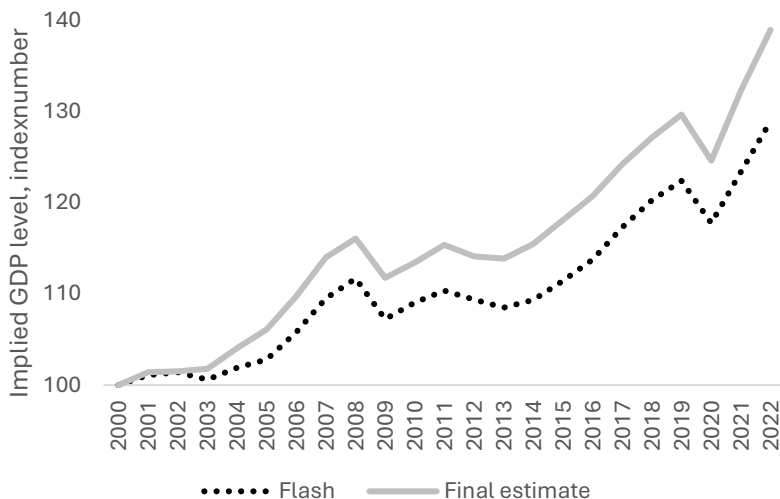
FIGURE 1
Earliest estimate of Dutch GDP growth and final estimate 2001-2022



The differences in Figure 1 seem small and the economic picture is not visually distorted too much (in 2003, the flash estimate has the wrong sign and in 2013, the economic turning point is observed too late), but the impact is significant, especially when considered over the entire observation period. Figure 2 reports a thought experiment and compares

the GDP level that results if we consider the flash estimate as the correct figure with the null alternative that the final estimate is correct (N.B. it *is* a thought experiment because each estimate has a measurement error, and neither is thus correct). By the end of the thought experiment, the difference between the hypothetical GDP levels amounts to about ten percentage points. The GDP level is important for key indicators such as the debt ratio and the government deficit for which international standards have been agreed upon. Adjusting the economy requires time, and financial-economic policy based on the early flash estimate can, due to this distortion, be misguided in the long term.

FIGURE 2
Implied GDP levels based on different data versions (the Netherlands, 2000-2022)



4. Some lessons from the COVID-19 Pandemic

The lockdown of society during the pandemic is a unique natural experiment for the reporting of inaccurate data! It is certain that economic observation was severely hindered. Information stagnated or was distorted.

- Large parts of production and consumption evaporated, and prices lost their meaning (Chowdhury and Dixon 2024).
- New products and sales channels emerged overnight, and many activities moved to the grey sector, which became illegal due to the lockdown measures, and to home production. Both the grey sector and home production are difficult to observe.
- Concepts such as unemployment changed instantly because people willing to work were not allowed to, and technically unemployed individuals were paid by their employers (Barnichon and Yee, 2020).
- The enormous efforts of the healthcare sector were not well reflected in the statistics, neither during the period of crowded ICUs and busy testing sites nor when vaccines were made available for free (van Bergeijk 2022).

The natural experiment during the pandemic provides remarkable insights into the production of statistics. From the beginning, it was clear that there were enormous observational problems, but also that statistics had to continue as much as possible according to the pre-established publication calendars. The reason for this was to maintain public confidence, although these statistics would have had to be accompanied by extensive notes (**not**: hidden footnotes) explaining that the figures were very inaccurate and that revisions would be larger than usual because 'transparency is always important, but especially during this challenging period' (IMF, 2020). In hindsight, thanks to the updated and completed information about the lockdown period, it can be established that the initial impact of the COVID shock was generally overestimated, as already expected at the time of the pandemic (van Bergeijk 2021). The general

tendency to revise historical GDP growth rates is illustrated in Figure 3. The Figure compares two estimates for the year 2020: one from 2021 and the most recent one.

FIGURE 3
Comparison of assessments of GDP growth for the year 2020

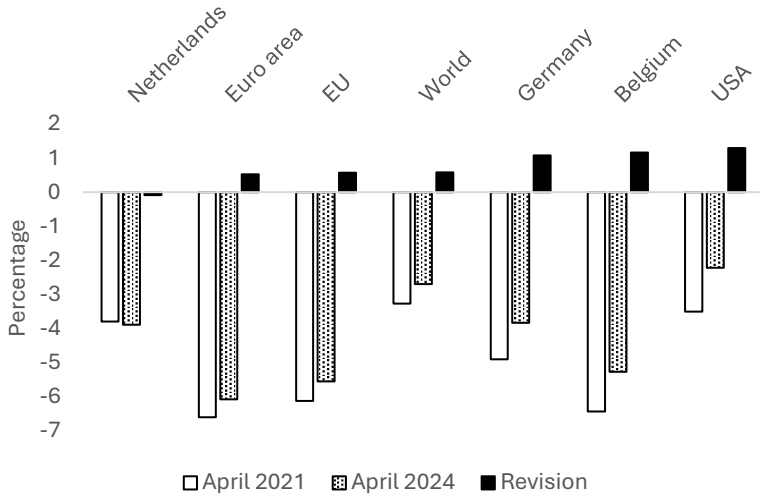


Figure 3 is ordered by the size of the revision and shows substantial differences for neighbouring countries, the EU and the euro area. The largest revision is 1.3 percentage points for the United States. This is an initial overestimation by a third! Two important lessons follow from this natural experiment. First economic data on the pandemic were initially quite inaccurate and are still being revised. Second, evaluations of the effectiveness of the economic policies conducted must therefore necessarily still have a provisional character. Indeed, when assessing statistical material during large shocks and adjustments, a long-term

perspective is needed also to see the figures in the right context.⁷ The Dutch adjustment of -0.1 percentage points differs in terms of sign and magnitude from the picture for Europe and our neighbouring countries. Some may see this as an indication of the accuracy of Dutch statistics, but equally probable is that this is a symptom of incredible certitude.

During the pandemic clear communication about the increased inaccuracy was generally lacking. In the Netherlands, the Dutch Central Bank DNB reported as if nothing was wrong and without any warning, CBS Statistics Netherlands got lost in unscientific interpretations of growth figures (Abeln and Jacobs 2021), and to add another example on the confusing data fog: by the end of June 2021, there was still major disagreement between CPB Netherlands Bureau of Economic Analysis and CBS Statistics Netherlands on basic data for 2020 such as government expenditures (van Bergeijk 2022, 2024). Figure 3, importantly, illustrates that the measurement problems are not unique to the Netherlands. Now the interesting observation is that error margins were nowhere explicitly stated. This natural experiment thus highlights the underlying structural problem: economists are generally unaware of the measurement errors of their objects of study, do not report them, and scientific discussion on the reliability of the data is extremely limited.

The pandemic episode has another sobering lesson for those who place their hopes on Automated Intelligence and Big Data. The use of new techniques to achieve 'nowcasting' of economic key figures was encouraged by the observation crisis and the use of previously unknown policy instruments such as non-pharmaceutical measures. Evaluations, such as Barbaglia et al. (2022) of the dynamic Bayesian model averaging of the European Commission's Joint Research Centre, show that the alternative data sources that were selected by the Bayesian model during the lockdown period were dropped afterward. In light of the discussion above, it is unclear whether this is because the statistical quality of the

⁷ These problems apply to all economic, social and health statistics, including the much discussed (excess) mortality figures (Gill, Kehler, and Schneider 2024; van Bergeijk 2021, 2024).

existing series returned to normal or due to the lockdown measures themselves. Remarkably, indicators for social mobility and official COVID-19 statistics were never selected in the Bayesian procedure because there were no sufficiently long series of observations to add value to the prediction models. In this sense, the findings are sobering – what is most important for daily life and policy does not add value to the information collection. This disillusionment was also to be expected. The training material for AI models is inherently imperfect, and as measurement errors are currently not reported, AI models will tend to simply repeat current poor practices and AI software are moreover is known to hallucinate when data is missing. Moreover, the Big Data Paradox (Meng, 2016) plays a role: increasing the sample size suggests greater accuracy because the large number of observations from new sources narrows the confidence intervals, but at the same time, it increases the bias of imperfect samples. In most cases, it holds true that: ‘the more data, the more we fool ourselves’.

5. Why does Accuracy not improve?

It seems surprising that the accuracy of the estimates does not improve despite the enormously increased computational capacity and new registration possibilities brought about by the digital revolution, but it is a general phenomenon for which plausible explanations exist.

First, Simpson's paradox is relevant: the development of the total can be contrary to the unambiguous development of the constituent parts due to shifting shares of the components. For each of the parts, observation over time may thus improve while the aggregate worsens: if the share of hard-to-observe activities increases, the accuracy at the macro level does not improve. The shift to hard-to-observe components is of all times because new activities are by definition harder to observe (Griliches 1994). The dynamics of market economies, the increasing importance of services, innovation, and (de)globalization continually pose enormous challenges to the statistical apparatus.

A second explanation for the persistent inaccuracy is the attention that data producers, under pressure from policymakers, have started to give to delivering statistics as quickly and early as possible, also to increase the newsworthiness of their figures and thereby strengthen social support (Dang et al., 2023). Marketing and accelerated production take up resources and people; with budgets under pressure, it is logical that this leads to less room for other characteristics, including accuracy (Fixler, 2007). Three aspects play a role here: the lack of external monitoring of the accuracy of statistics because measurement errors are not reported, the description of the quality of statistics that increasingly focuses on process description (Kooiman et al. 2003), and the marketing for increased societal use of statistical material. The popularization of statistics makes irresponsible concessions to scientific quality and leads to 'verbal fake statistics': that is: press releases that attach importance to completely insignificant changes after the decimal point and wrongly present contraction and growth within the margin of error as significant newsworthy items.

A third possible explanation is that the inaccuracy of statistics is not a problem, or at least that an implicit consensus exists that the margin of error does not hinder economic analysis and policy. Econometrics has developed techniques to correct for so-called classical measurement errors. However, there are increasingly more indications that measurement errors do not behave 'classically' (as is also suggested by Figure 2) and then error corrections actually lead to additional distortion. To the innocent bystander the technical feats may maintain the illusion that research corrects for the imperfections in the source material. Additionally, policymakers are primarily interested in the most recent data. The fact that these figures are also revised years later attracts little policy attention. If policymakers' behaviour is indeed determined by the earliest available figures, it is less relevant for the analysis of their activities to look at the more accurate estimates that become only available long after the fact.

Finally, among statistics producers, there is the idea that it is better to report measurement errors only if these can also be determined

accurately. There is also a certain reluctance because transparency could undermine public confidence in the statistics. The paradox is that by concealing the inaccuracy, insufficient resources are used to improve the statistics, while the risk of reputational damage increases further if accuracy deteriorates.

6. Can economics become scientific?

Can we professional economists actually report our measurement errors without undermining the authority and reliability of economic analyses? On a very basic level, the answer is: we must. Large data-driven projects such as the OECD's Structural Reform Agenda were considered as important steps forward, but since no attention was paid to the accuracy of the target variables the OECD's policy advice ran the risk of being misguided.

Indeed, my finding is that inaccuracies and the associated uncertainty are not transient. Firstly, this is true in a broad conceptual sense: economic activities and structures are constantly changing thereby complicating observation and requiring new modes of data collection for new concepts. New measurements are initially inherently less precise because their measurement errors are less well understood and often have not yet been established. The world is also changing in other ways with new opportunities for observation (Big Data, social media, satellites, etc.) but at the same time with an increasing popular distrust in science and statistics. Ignoring the measurement errors inherent in economic observations is not the way forward to restore trust (van der Bles et al. 2019; Galvão and Mitchell 2024). Economists like to refer to their field as the Queen of the social sciences, but risk that economic is exposed as the social sciences Emperor whose clothes consists of pretensions of accuracy that do not live up to reality. Secondly, measurement error is not even transitory for the vintages of many well-established time series and shows a pattern of discrepancies that continues and fluctuates even many decades after the fact. The data produced by key institutions and leading academic research consortia such as the teams that produced the Penn World Tables are also not free from measurement error. Indeed,

an important message of my last book is that measurement error and imprecision are not only problems for the Global South. Measurement errors are perhaps more acute and certainly deserve more resources in the Global South, but inaccuracy will not disappear due to the focus on improving the statistical apparatus in developing countries. Also in this sense, the inaccuracies of economic observations are not transient.

The implications of these findings for theory (testing) and applied research are as yet unclear. On the one hand, a fair share of replications and data sensitivity analyses challenge key findings of peer reviewed articles in the top journals. On the other hand, investigations of data sensitivity suggest that a large share of earlier established results is still robust in a qualitative sense (that is: the value of (re)estimated parameters changes but this does not change the interpretation of the results). The only way to arrive at a more meaningful conclusion is to investigate this issue more thoroughly and to make a data sensitivity test a standard requirement of research procedures and to give replication of earlier established findings a much more important role in the economic discourse. Most economists are aware that the validity of economic relationships, theories and laws often depends on specific conditions of time and place. This awareness needs to be broadened to also cover the dependence on data constructed at different times and places.

The inaccuracies of economic observations provide also highly relevant challenges for policy makers, since policy making by its very nature is especially concerned with the most recent statistics and often with emerging concepts that have only been recently developed in response to societal demands. The world of the policymaker is therefore all too often one in which insufficient observations exist to use advanced econometric assessments for the statistics that matter most in policy making. It is also insufficiently recognized that even the classical measurement errors that pose less problems for econometric estimation of relationships can and often do play havoc in the interpretation of the most recently released statistics. Policy makers thus have a lot to gain by knowing and understanding the inaccuracies of economic observations.

Working with statistics with only fair or even poor data accuracy in itself is not impossible or unscientific but presenting and analysing those numbers as if they were accurate, is always bad practice, and so is non-reporting of measurement error. There are no good reasons for such bad practices, because also non-professional data users can understand and handle numerical indications of inaccuracy and uncertainty quite well. Transparency about the inaccuracies of economic observations does also not appear to reduce trust in data producers. These results from recent research are important and necessary elements to attack the hysteresis in reporting standards. However, in themselves these findings are not likely to be sufficient for breaking with the bad habit of not reporting measurement errors of economic observations. Recognizing these challenges, my last book offers the building blocks for an alternative strategy, namely: to empower and mobilise data users to so to say 'crow-research' and 'crowd-report' measurement error in order to enhance understanding and awareness of the inaccuracies of economic observation. This is a strategy that has not been used so far.

There are three elements that could strengthen this strategy considerably. First, all too often papers even in respected journals do not routinely report key information, including the number of observations, the standard deviations of variables, the specifics about the data series, etc. Economics should introduce a standard data reporting format and require that this is always followed. Data sections in papers need to be more explicit, detailed and expanded. Second, change logs and assessments of the accuracy of statistics should be made fully available and easily accessible – this is an important task for the statistical offices. Third, *ex ante* error prognoses should become an important element of the research strategy.

The incentive for data producers is that this helps them to fulfil their duty to inform. This is not a moral duty, but a professional standard. Uncertainty and inaccuracy are key elements of knowledge and therefore need to be transparently shared. For policy-making data users the benefits are that knowing the extent of error helps to understand the robustness or uncertainty of the evidence base and thereby to make

better decisions. Academic data users will be motivated by the ability to produce better research and thereby better knowledge.

I am an optimist. I believe that it is possible to make economics more scientific. It is 'only' necessary to recognize the inaccuracies of economic observations and to do so both in education and data production. The change of the curriculum has been a recurring item of those interested in measurement error. I hope that my last book will contribute to such teaching by offering some building blocks. The assessment of discrepancies does not require a lot and could be a standard item of teaching undergraduates, not only in economics and statistics but in the social sciences more general and in journalism. Putting rough numbers to the inaccuracies of economic observations by means of the tool of implicit minimal measurement error in my experience is motivating students, also because they actually learn a lot from their peers in such projects. As to data production and research I am also optimistic although a big mental shift is necessary:

We all shall have to go through a long and painful process of adjusting to the fact of error.' (Morgenstern 1963, p. vii).

For many decades the instinctive response in academia and at the statistical offices and international organizations has been to try to improve data collection, to make measurement more precise and to develop advanced econometric modelling of measurement error. These efforts, laudable as they are, have not reduced mismeasurement in general. We thus need to change our perspective and working procedures. The first step is to assess and report measurement error consistently and transparently. It is perfectly doable and there is no reason to postpone action.

7. Art and science

Somewhere in a distant past I did not become the artist that I wanted to be. Lifetime events and a severe economic crisis forced a though

decision: not to pursue my involvement with the arts and to become a professional economist instead. I had already published some economic articles about real world problems and had discovered the merits of a well-formulated argument but was also starting to see the Beauty inherent in the mathematics of an economic model and the Quality of a theory as argued with and within the model. Mathematical economics is fun and some of my early professional output is indeed to some extent *l'art pour l'art*. However, I wanted my work to matter and to make a difference. Thus, I drifted away from mathematical economics (although I never abandoned it completely) and well-informed argumentation became my main dish both in policy and in academic work. Indeed, I always felt that it was the Beauty of writing well while contributing to the economic discourse that made up for the loss of the artistic career that I once pursued. So, my creativity went into my academic writing. Writing well brings me in a similar flow of concentration and bliss as making art, a formal mathematical model has a beauty of its own, and empirical research brings the joy of finding things out. This worked quite well, I thought, for perhaps two decades. But then I got involved in a 'freak' accident (an oncoming car driver had fainted behind his wheel). After that crash life was difficult. I continued though and counted my blessings. After all, I had survived a very serious accident! I tried to stay happy. I did not, however, succeed, because I could no longer remember, no longer recognise, no longer count, and was continuously and completely exhausted. The people around me did not notice how I slipped into a very severe depression. Depression is a strange sickness where you lose all feeling. A bitter period. Eventually, after a period of deep darkness, slowly some colour returned into my life: one day you see the sun shining again and you discover that someone actually loves you. It was art that helped me climb out of the black hole: initially I killed the time until medication kicked in with large drawings in ink, then followed the path to colourful oil painting and the *fluo* that for some time became my trademark, and art still continues to help me through my winter blackness. The good news is therefore that recovery is possible even after a deep depression: the dismal events helped me to reach the sources of creativity and to

rediscover my talents. This is my accidental source of happiness. At first this was more like a therapy, but the arts became one of my goals in life. I started to sell my work and held my first exhibitions. I took courses in several print making techniques including etching and silkscreen (something that I wanted to do but could not pay for in 1983). I bought myself my first second-hand printing press and learned how to become a lithographer under the supervision of Aad Hekker and Georg Hadelers. For ten years, I am the lucky occupant of my own printing studio in Park Oosterbeek that hosts my Karl Krausse press constructed around the end of the nineteenth century.

For me it has over the last quarter of a century never been science and art, but rather art and science. So, the heading of this section has the proper sequence. People find the combination of an economic professorship and an artistic life odd. (I like to joke that if the stress of art and lithography becomes too much, I return to my hobby at ISS). The true wonder is in being an artist while holding demanding jobs in academia, the private sector and policymaking. What did I learn from living simultaneously in all these worlds?

The dismal science, the art of economics and the addiction to originality

For many, art represents a vibrant realm of imagination and emotions, while economics is viewed as a bleak domain filled with realism, sobering truths, and numbers. It's true that certain individuals are drawn to economics, while completely different people are attracted to working with paint, stone, or fabric. The precision of definitions and numbers in economics at first sight contrasts sharply with the multiple interpretations that can be derived from a good piece of art (although as we have seen this is a mirage of incredible certitude, addiction to digit inflation and mock accuracy). Economics is, moreover, often seen as embodying professional pessimism. This reputation goes back to the classical economists Malthus, Ricardo, and Marx, and their predictions of unavoidable disaster and collapse. They suggested that while economic processes might temporarily improve living conditions (usually for the select few only), biological factors would ultimately lead to over-

population, *verelendung*, and resource shortages, resulting in hunger, disease, and (civil) war to restore the balance between humans and resources. Thus, economics is sometimes viewed as the science of Dr Doom, filled with bleak forecasts of perpetual hardship and poverty. This is why many believe it is called the Dismal Science. However, the term 'dismal science' was actually coined by the Victorian historian Thomas Carlyle in 1849. He used it in his critique of the classical economists' arguments against slavery and their belief that institutions, rather than race, were responsible for a nation's poverty.

Not a “gay science”, I should say, like some we have heard of; no, a dreary, desolate, and indeed quite abject and distressing one; what we might call, by way of eminence, the dismal science.
(Carlyle 1849 [2014], 472)

Carlyle's critique was a response to John Stuart Mill's support for the emancipation of slaves.⁸ So, the term 'dismal' is actually a badge of honour: we should take pride in the fact that political economy was a force for emancipation and against oppression — an aspect often overlooked, even by economists discussing their own field. It is in this historical spirit of the dismal science that my plea for decolonization of the debate on inaccuracy has to be seen.

New ideas are essential for human advance. New medicines, new materials, new production processes, new insights are the basis for progress and thereby for welfare. It is thus quite understandable that originality is the Holy Grail of Academia. For some scientists, however, this quest has definitely become a millstone and over the last decade quite a number of leading Dutch scientists have been exposed that massaged and even made up fake scientific observations. This research was published in leading refereed scientific journals, used in evaluations of research by funding organizations and served as a basis for hiring and

⁸ It was this fact — that economics assumed that people were basically all the same, and thus all entitled to liberty — that led Carlyle to label economics ‘the dismal science’ (Levy and Peart 2001).

promotion. The reaction from the Ivory Academic Tower was a predictable mantra: this is an incident and the self-purifying academic procedures have been sufficient. In my opinion, however, the Dutch cases are more than incidents and point to the fact that the pressure (if not duty) to be original has become too strong. This assessment is not based on the professional urge to publish or perish that some have pointed out to be the driver of academic fraud. I believe that something else is at stake: the low esteem and valuation for vital but less creative craftsmanship that forms the basis for solid, replicable and reliable scientific results. Every academic economic author that has ever dared to use the word replication in an article, knows how referees react: the article 'does not add value'; it is 'not new'. My own experience with discussions on the accuracy of the data is also sobering. The strive for originality implies that extreme and contradicting results stand a better chance to get published and this publication bias has been confirmed in many meta-analyses. Finally, 'non results' cannot count on any mercy from scientific journal editors.

Why are we so concerned with scientific originality? The contrast with the Arts is striking. Admittedly, to many laypersons art and originality are almost synonyms, but a closer look reveals that imitation, copying and self-plagiarism are perfectly acceptable in the Arts: some styles and themes are replicated, recycled and 'reinvented' *ad infinitum*. The ideal of originality is a modern concept. Before the Romantic Movement, copying the Master (works) as close as possible was the highest norm. It is in this same artistic tradition that exiting works continue to be topics for study and further development and change. Munch's *Srik* is a well-known example but if you google 'gogh+chair' you will see how the blue chair re-emerges both in Van Gogh's work and in modern art.

My art offers the scientist a mirror that reflects how the same idea can be valuable, different and new even if it only repeats what has been done earlier. It is essential that this insight recovers ground in the social sciences. The pressure to always be original is not only too strong because it creates stress and increases the risks of academic fraud – the deifying of originality is also counterproductive. Good science after all

should be replicable, replicated and checked. The problem, however, is that the key activities of repetition and checking are not sufficiently appreciated due to our addiction to originality. Therefore incentives need to be created. This is a realistic goal also at a national level. Oblige PhD candidates to check and replicate one key article as part of the thesis. Require in funding applications as well as in academic hiring and promotion procedures that applicants provide concrete evidence that earlier research has been replicated. Scientific journals should create a digital replication corner. Academics should quote both the original source and the replications of that source. Lack of originality is the life buoy of excellent research.

The role of uncertainty, serendipity and observation

I love the rush of discovering and use art and science to see the things that everyone already saw but in such a way as no-one has seen before. My discoveries are the result of repetition, doing the same but under different conditions. The most important lesson is that there is a role for uncertainty, chance, errors, mistakes and serendipity to play in both formal research strategies and in the strictly prescribed chemical lithographic procedures.

Graphical artwork – and lithography in particular – requires a meticulous and precise design and the chemical magic that binds an image to a stone follows prescribed detailed procedures. The craftsmanship of lithographic printmaking is an essential element of creating art for me. But within this more or less predetermined framework I have learned to create a special place for chance. The challenge is to create the conditions for effects that cannot be exactly predicted, and then let water, ink, spirit, pencil, *tusche* and time fight their battle on your stone. I adjust image and colour during the printing process step by step and allow my stones to influence artistic decisions. Surprises that others would consider as errors or mistakes are actually gifts from nature that can be incorporated in the artwork. This means that experiment and discovery are always essential elements of my artwork. There are clear risks of ending in a dead-end alley and sometimes you run of a cliff and

have to abandon the project and grind your stones. So, you have to mind your steps.

Observation is key in this process as accidental discovery brings gifts as well as risks that emerge both at the macrolevel (the composition or the image as a total), its components (the colour separations and structures), and the details. Since variation occurs at all these levels and also because lithography is a natural product you need to be constantly on the alert, and you cannot rely on your eyes only.⁹ In a lithographic atelier you also need to smell and feel and be aware of temperature, humidity and even air pressure and this adds to the physical challenges of operation heavy stones and a press constructed around the time Edison invented the light bulb. If you miss the signals on either the stones or on paper (both can behave quite differently) you can end up with distortions and messy, unsharp and weak prints. Not useless, because you will have learned a lot, but certainly not stuff that you can show or sell.

So, my aim is not to produce an edition of identical prints, but to create a great diversity, using different inks, intensities and sequences in the colour separations. Typically, this diversity is lost as a constant edition is the commercial aim of artist and printer and the nuances, divergencies and surprises that occur on the road to the holy constant edition are unknown to the public. This palette is one of the printer's secrets, that also consist of the landscape of a large number of drying prints that reveal a rhythm that is hardly ever shared as well as the experience of how a print emerges from stone and transfers to paper. Many of my designs, moreover, have no predetermined top or sequence and typically I let buyers decide in which of the corners they want my signature. In this context in which each print is unique I see no reason to give the prints a number. Typically, I sign with the date of the purchase and a dedication to the buyer who after all decided how the artwork should be seen. Of

⁹ Similarly, good economists recognize the need of a multidimensional analysis of a dynamic system where everything is connected, and distortions and biases are abundant. Signals of change will initially be tiny and always contradictory.

course, there are also clear differences between what I do in science and in art: I have never let a reader decide on what I write and always tried to avoid the possibility of multiple interpretation.

Creating a role for chance implies that you will not know what the exact result will be (this is in my experience 'luck') but your approach is professional as it creates the right conditions for new and interesting findings. Many presented results are part of the art of economic science but more importantly is that we all know about the graveyard where we bury our non-publishable results. The same is true in a lithographic atelier when the printer's secret reigns. Seeing in these contexts requires trained observation and a mind open to finding the opposite of what you expect. The world is full of such wonders.

8. Time can always be found¹⁰

It is perhaps a bit out of order to give advice on time management. After all I planned to retire April 1, 2022, at the age of 62 and therefore stopped accepting new PhDs in 2017, following a wise lesson I learned from Jarig van Sinderen.¹¹ Accordingly, the journey towards early retirement was a recurring theme in HRM assessments. As I did not want to retire before my last PhD had defended successfully, the retirement date was not in my hands. When COVID-19 fell upon us, I discussed the matter with Han and she agreed that the PhDs should not suffer so that I had to postpone my planned retirement. Some delays were due to special treats, such as the invitation to become editor of Edward Elgar's *Research Handbook on*

¹⁰ When I was the speechwriter for Koos Andriessen in the early 1990s I came across a draft of 60 pages for 10 minutes and a footnote on page 25 'If you are pressed for time, you can skip the next ten pages'. On delivery of the valedictory I was happily saved at this point by the 'hora est'.

¹¹ When Jarig asked me to be second promotor for Lilian Petit, he told me this was his last one. I had to laugh and said 'come on, you are just 60' and then Jarig explained to me convincingly that you can only be a good promotor when you are still taking fully part in academic life. Jarig broke his rule once and so did I; Tung Đào delivered on time as promised

Economic Sanctions. Again, I discussed this with my wife, and she told me that the *Handbook* was such a unique opportunity that I should do it although I had warned that it would take a year (the pandemic also slowed down this project but then the timing of the *Handbook* just before the sanction tsunami against Russia was perfect). Sometimes projects simply ran out of control. Binyam Demena and I must have been crazy to do a capacity building project in Tanzania with Repoa for the EU-ACP TradeCom scheme and on top of that produce *Trade and Investment in East Africa: Prospects, Challenges and Pathways to Sustainability* (an A+ edited book in the prestigious Springer series Frontiers in African Business Research with work from young Tanzanian academics), and a MOOC *Trade & investment: evidence-based policies for development* at Coursera. Here COVID-19 was actually the driver: we were not allowed to do fieldwork and we were convinced that the lockdowns would return so that we wanted to have good material to teach. My point is: would you believe me if I gave advice on how to find the time for art?

The most important lesson here is that one needs to organize decoys and smoke screens. It is, in the words of the Karel Jansen important to always keep the centre in the dark about what you are doing. I found the time to do what later turned out to be the base of my PhD research as a country risk analyst by engaging in a logit-model aimed at predicting debt problems. Logit was a new method at the time and therefore an econometric benchmark study on a slightly related topic was helpful to understand what could and could not be done. A new study on economic sanctions had just arrived at the shelves of the library of the bank's economic research department, it contained a data set that could be recoded to zeros and ones, and I could get the computer time for free to do the analysis. I learned the best lesson on decoy of scientific work in a policy environment from Steven Brakman. Prepare your answer to an emerging policy question but put it in the top drawer of your desk until your manager asks for a second time for your note. This avoids at least one round of comments and creates the time to do what you really want to do. The best trick, but probably not available to everybody, was the organization of two working places at the Ministry of Economic Affairs so

that colleagues and superiors who did not find me at one office would think that I was at the other one. Over the last decade it has been important to design and market artwork and exhibitions in such a way that it looked as if this was dealing with essential activities of my employer: conferences, inaugurals, valedictories, graduations, and the dies natalis. To keep the managers happy, keep your production statistics at par with your peers and make sure that any future contributions to a strategic agenda have always essentially been done (a corollary is: never write a proposal unless you have the research already roughly done and the answer more or less ready).

Finally, I was exceptionally lucky to have an atelier close to ISS. If I found myself stuck in the research process or frustrated by red tape, office politics, and stupidity, I did not need to resort to looking out the window to find my calm. Instead, I could pick up my bike, ride to my workshop, listen to the birds and grind my stones. And now ... I do no longer need ISS anymore as a camouflage of my artistic life.

Ik heb gezegd

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This booklet is the farewell lecture delivered October 1, 2024. It is, however, unabbreviated, without accidental detours and in a more traditional (that is: less dynamic) format. The text is loosely based on earlier contributions that I wrote on art and economics.

- Zen, art and economics, in: *A Wealth of Creations*, catalogue Utrecht School of Economics, 2007
- Accidental Happiness, in: *Antidotes from the dismal science* catalogue ESB and Erasmus Gallery, 2009
- Originality as a millstone, in: *Derivatives: Replication and (auto) plagiarism in the social sciences*, *ISS working paper 550*, 2011.
- Oh, my dismal, dismal science, in: *Against Better Judgement: Rethinking Multicultural Society*, Brill, 2022

Also, material is reused from blogs and articles accompanying the publication of my last book *On the inaccuracies of economic observations: How we could and should do better* (Edward Elgar 2024), including the National Accounting Review, ESB, BLISS, ElgarBlog, MeJudice and Beste-ID.nl

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